Foreword

This code is developed by WISDRI Engineering & Research Incorporation Limited with other involved organizations according to the requirements of Document JIANBIAO [2008] No.105 issued by the Ministry of Housing and Urban-Rural Development(MOHURD)of the People's Republic of China-"Notice on Printing and Distributing 'the Development and Revision Plan of National Engineering Construction Standards and Codes(the 2nd Batch)in 2008'".

This code is finalized by the development team through conducting extensive investigation and research during development, earnestly summarizing the practical experiences and acquiring diversified comments with reference to the related advanced standards home and abroad.

This code consists of 15 chapters, covering: general provisions, terms and abbreviations, basic requirements, process and equipment, general layout and transportation, power distribution, electrical drive, automation instruments, automation system, telecommunication, utilities, architecture, structure, energy conservation and environmental protection, safety and fire fighting.

This code is under the jurisdiction of the Ministry of Housing and Urban-Rural Development of the People's Republic of China, WISDRI Engineering & Research Incorporation Limited is in charge of explancation of technical specification. During implementation of this code, any comments or advices can be posted or passed on to the Technical Quality Department of WISDRI Engineering & Research Incorporation Limited (Address: No. 33, Daxueyuan Road, Donghu High-Tech Development Zone, Wuhan, Hubei Province; Postcode: 430223) for reference in future revision.

Chief Development Organization, Co-Development Organizations, Chief Drafters, Chief Reviewers, Translators and Proofreader of this code:

Chief Development Organization:

WISDRI Engineering & Research Incorporation Limited

Co-Development Organizations:

Shanxi Taigang Stainless Steel Co., Ltd.

Maanshan Iron & Steel Co., Ltd.

National Research Center of Silicon Steel Engineering Technology

Chief Drafters:

XIANG Mingwu SHAO Yuanjing HE Lihong LIAO Yanlin
GUAN Changlin HU Jinrui ZENG Chun XU Yaomin CHEN Fan
LI Maoxin YUAN Jinghui CHEN Jingcheng CHEN Huimin LU Shengfu
YAO Huabo ZHAO Hongjie BAO Changhua WU Bingcheng GUO Min
WEN Baozhuang MEI Dong YANG Jun ZHANG Xi PING Fengqi
CAI Yi MA Ming QIANG Jian HU Shizhang GUO Hua WAN Jibin
WAN Huantang

Chief Reviewers:

GUO Qijiao LUO Yutian ZHANG Fubin SHEN Xinyu YOU Guangming
GUO Bin LU Zhangjin YE Lide DING Yu FU Yan LIU Ying

ZHU Huiling　HUANG Hao　WANG Zhengbao　HUANG Yonghong
ZHAO Jing　OU Yan

Translators:

ZHANG Pujian　WEI Xin　ZHANG Zhenjia

Proofreader:

ZHANG Pujian

Contents

1 General provisions

1.0.1 This code is prepared to standardize the design of cold-rolled electrical steel project in a bid to ensure technical advancedness, cost-effectiveness, safety, practicality, energy-saving and environmental protection in such projects, so that both sound economic and social benefits can be achieved.

1.0.2 This code is applicable to the design of new construction and renovation of electrical steel production facilities, auxiliary facilities, office and living facilities.

1.0.3 In addition to the requirements stipulated in this code, the engineering design of cold-rolled electrical steel plant shall also be in accordance with the current relevant national standards.

2 Terms and abbreviations

2.1 Terms

2.1.1 Electrical steel

Electrical steel is a soft magnetic alloy, which is mainly used to manufacture iron cores of transformer and motor, and other magnetic conductive components in the electrical industry.

2.1.2 Cold-rolled electrical steel

It refers to electrical steel produced through such process as pickling, cold rolling, annealing and finishing, etc. with hot-rolled electrical steel coil as starting material.

2.1.3 Cold-rolled grain-oriented electrical steel

It refers to cold-rolled electrical steel with more than 75% internal crystallite as (110)[001] Gauss texture and featuring excellent magnetic property in rolling direction.

2.1.4 Highly magnetic permeability oriented electrical steel

It refers to cold rolled grain oriented electrical steel with magnetic polarization strength J in the rolling direction is 1.85T(Tesla) when the magnetic field strength is H=800A/m.

2.1.5 Cold-rolled non-oriented electrical steel

It refers to the cold-rolled electrical steel with grain oriented freely and characterized by uniform magnetic property in all directions.

2.1.6 High magnetic induction cold-rolled non-oriented electrical steel

It refers to the cold-rolled non-oriented electrical steel, of which maximum specific iron loss is equivalent to that of the common cold rolled non-oriented electrical steel, but its minimum magnetic polarization strength J is 0.02T to 0.10T(Tesla) higher than the latter when the magnetic field strength H is 250000A/m. It is suitable for fabricating high efficiency iron core.

2.1.7 Normalizing process

It refers to the annealing process of hot rolled strips used for producing high magnetic permeability oriented electrical steel, high magnetic induction cold rolled non-oriented electrical steel, high grade and part of medium grade cold rolled non-oriented electrical steel before pickling process. Generally, normalizing is carried out on the same production line with shot blasting and pickling process.

2.1.8 Pickling process

It refers to the process of removing scale from the surface of hot rolled strip of electrical steel by hydrochloric acid liquor of a certain concentration.

2.1.9 Rolling process

It refers to the process of rolling hot-rolled electrical steel strips from initial thickness to intermediate thickness or finished product thickness at temperatures not exceeding 300℃.

2.1.10 Coil welding process

It refers to the process of trimming the cracked strip edge, welding the broken strips and cutting off the off-gauge head and tail parts during strip rolling.

2.1.11 Intermediate annealing process for cold rolled electrical steel

It refers to the process of eliminating work hardening and restoring plasticity of electrical steel

between two rolling stages, and decarburing according to the requirements of production process.

2.1.12 Decarburizing & annealing and insulating film coating

It refers to the process of degreasing, decarburing annealing and insulating film coating for the rolled non-oriented electrical steel.

2.1.13 Decarburizing & annealing and MgO coating

It refers to the process of degreasing, decarburing annealing and MgO coating of the rolled grain-oriented electrical steel.

2.1.14 Temper process

It refers to the process of improving flatness and hardness of cold rolled non-oriented electrical steel strip after incomplete annealing to improve sheet drawing performance.

2.1.15 High temperature annealing process

It refers to the process of secondary recrystallization and inclusion removal of cold rolled oriented electrical steel after continuous decarburization annealing and MgO coating.

2.1.16 Continuum tension

It refers to the process of pickling, temper rolling, stretching and insulating film coating of oriented electrical steel after high temperature annealing.

2.1.17 Domain refinement process

It refers to the process of reducing 180° magnetic domain width of high permeability cold-rolled oriented electrical steel by means of laser irradiation, plasma jet, mechanical scribing and electrolytic corrosion, etc. to reduce iron loss.

2.1.18 Laser scribing

It refers to the process of reducing 180° magnetic domain width of high permeability oriented electrical steel by means of laser irradiation to reduce iron loss.

2.1.19 Finishing process

It refers to the process of edge trimming, coil dividing, slitting, cross cutting and packaging of cold-rolled electrical steel according to user requirements.

2.1.20 General layout

It refers to the design for reasonably determining the spatial position of buildings, structures and facilities on the site.

2.1.21 Plant site selection

It refers to the work of choosing a place for a planned enterprise, which could not only meet the needs of production but also offer the possibility of obtaining the best social and economic benefits.

2.1.22 Vertical design

The works focus on reasonably determining the site elevation of various facilities in cold-rolled electrical steel strip plant according to the natural conditions of the site and production process requirements.

2.1.23 Integrated pipeline arrangement

It refers to the unified arrangement of routing and spatial position of pipelines according to the technical requirements of pipelines and the layout of the cold-rolled electrical steel strip plant.

2.1.24 Acid regeneration plant

It refers to the facilities that produce acid from the waste acid liquor of pickling line through regeneration reaction.

2.1.25 Basic automation system(L1)

It refers to the control system functioning for acquisition and processing of field data, data exchange, and execution of instructions required by output equipment.

2.1.26 Process automation system(L2)

It refers to the control system functioning for controlling and coordinating the capability of production equipment, direct control of production, and optimizing the control parameters of production process through data model oriented to the production goal of manufacturing execution system.

2.1.27 Manufacturing execution system(MES)

It refers to the system which is responsible for coordinating production among different processes and workshops, rationally allocating resources, executing and fulfilling production tasks assigned by the ERP system. In addition, it also functions for scheduling the production in response to the problems occurring in actual production and carrying out product quality management and control.

2.2 Abbreviations

B/S(Browser/Server)
C/S(Client/Server)
D1(Digital 1, Digital TV system 480i display format)
ERP(Enterprise Resource Planning)
IPC(Industrial Personal Computer)
OA(Office Automation)
QoS(Quality of Service)
PLC(Programmable Logic Controller)
RAID(Redundant Arrays of Independent Disks)
UPS(Uninterruptible Power Supply)
VLAN(Virtual Local Area Network)

3 Basic requirements

3.0.1 Cold-rolled electrical steel engineering design shall adopt proven, reliable, and advanced process, technology and equipment.

3.0.2 The annual output of oriented electrical steel in the green-field cold-rolled electrical steel project should not be less than 60000 tons and that of non-oriented electrical steel should not be less than 100000 tons. The main technical and economic indicators of the green-field or brown-field cold-rolled electrical steel project shall be in accordance with the relevant requirements of the current national standard GB 50629 *Code for Design of Rolling Process for Plate and Stirp Mill*, and the energy consumption of the process shall meet the requirements of the current national standard GB 50632 *Code for Design of Energy Saving of Iron and Steel Industry*.

3.0.3 Cold-rolled electrical steel project shall adopt clean production process to improve resource and energy utilization and reduce emission of waste water, waste gas and solid waste.

3.0.4 Level of the automation control system shall meet the requirements of the production process and be on a par with the production equipment level.

3.0.5 The production of cold-rolled electrical steel shall adopt the consistent production quality management spanning from iron making, steel making, continuous casting and hot rolling to cold rolling.

3.0.6 The width of cold-rolled electrical steel strip in the green-field project should not be less than 600mm.

4 Process and equipment

4.1 General provisions

4.1.1 The production process, process plan and equipment selection shall be determined after techno-economic comparison according to factors such as production scale, product plan, production standard, delivery status, type of raw material and fuel type, construction condition, etc.

4.1.2 The shop process arrangement shall be determined according to the production process, process plan, type of equipment and general layout, and shall meet the requirements of logistics, operation, maintenance, construction, installation, fire fighting, safety, etc.

4.1.3 Water-saving, energy-saving and environmentally friendly production process and equipment shall be adopted.

4.2 Process

4.2.1 Production process of cold-rolled grain-oriented electrical steel should be: hot-rolled starting material + (normalizing) → pickling → primary rolling → (coil welding) + (intermediate annealing) → (secondary rolling) → (coil welding) → decarburizing & annealing and MgO coating → high temperature annealing → continuum tension(domain refinement) → (laser scribing) → finishing.

4.2.2 Production process of cold-rolled non-oriented electrical steel: hot-rolled starting material + (normalizing) → pickling → primary rolling → (coil welding) + (intermediate annealing) → (secondary rolling) → (coil welding) → decarburizing & annealing and insulating film coating → (temper rolling) → finishing.

4.3 Equipment selection

4.3.1 The capacity of the production lines in each process shall match each other.

4.3.2 The equipment selection shall be in accordance with the relevant requirements of the current national standards GB 50632 *Code for Design of Energy Saving of Iron and Steel Industry*, GB 50506 *Code for Design of Water Saving for Iron and Steel Enterprises*, GB 50629 *Code for Design of Rolling Process for Plate and Strip Mill*, GB 50713 *Code for Design of Finishing Process of Plate and Strip Steel* and GB 50486 *Code for Design of Industrial Furnaces in Iron & Steel Works*.

4.3.3 The cold-rolled electrical steel project shall not adopt second-hand cold-rolled electrical steel production equipment that has been obsolete at home and abroad.

4.4 Shop layout arrangement

4.4.1 In the shop layout of cold-rolled electrical steel project, the production line and production auxiliary facilities shall be arranged according to the production process and process scheme.

4.4.2 Those shall be arranged in the shop include walkway, transport corridors for various equipment, materials and wastes, operational safety zones, equipment maintenance areas and storage areas for raw materials, intermediate products and finished products.

4.4.3 Production lines of the same type should be arranged in the same bay or adjacent bays.

4.4.4 The layout arrangement shall enable less transportation frequency and transportation distance of intermediate products.

4.4.5 The distance between the production lines and the distance between the production line and the building shall meet the requirements of operation, installation, maintenance and fire fighting.

4.4.6 The rail top level in the shop shall meet the requirements of production, and equipment maintenance at its highest point.

4.4.7 The process equipment shall be arranged within the approach limit of shop crane hook. For equipment out of the crane hook approach limit, appropriate maintenance girder (or rack) and maintenance hoist should be provided.

4.4.8 Auxiliary facilities should be arranged close to the production line.

4.5 Shop transportation

4.5.1 The direct coil transport device should be used for the coil transport from the upstream process to the downstream process.

4.5.2 The scraps from cropping and side trimming operation should be directly transported away from the shop.

4.5.3 The selection of shop crane shall be in accordance with the following requirements:

1 The crane's span shall be determined according to the span of the shop and the arrangement of the pipes beneath the crane beam.

2 The quantity of crane shall be determined by calculating the daily lifting frequency, lifting cycle time, etc.

3 The rated lifting load shall be determined according to the maximum lifting mass during normal operation and the total mass of lifting tools and accessories.

4 The overall work duty of crane shall be calculated and selected according to the service duty of crane, the status level of loads to be lifted and the relevant requirements of the current national standard GB/T 3811 *Design Rules for Cranes*.

5 The work duty of lifting mechanism shall be calculated and selected according to the service duty of the mechanism, the status level of loads to be lifted and the relevant requirements of the current national standard GB/T 3811 *Design Rules for Cranes*.

6 The traveling and lifting speed shall be determined according to the usage and lifting frequency of crane.

7 The lifting stroke shall be determined according to the usage of crane. The upper and lower limits should meet the maintenance needs of equipment at the highest position and the lowest position of the shop.

8 The slewing and(or)locking function of the lifting tools(tackles)shall be determined according to its lifting task.

9 The type of lifting tools (tackles) shall be selected according to the type, condition and temperature of the goods to be lifted.

10 The driver cabin shall be arranged according to the equipment layout and the position of goods to be lifted. It can be fixed at one end, fixed in the middle or can be of movable type. When there are several cranes in the same bay, at least driver cabin of each two adjacent cranes shall enable the driver to observe the other crane from the front side of its cabin.

11 The service temperature shall be determined according to the local meteorological temperature, the heat loss from the production line equipment and the ventilation condition of the shop. In case no relevant information is available, the temperature of raw material shop, rolling shop, finishing shop and finished product shop should not be higher than 45°C, and the temperature of heat treatment shop should not be higher than 55°C.

12 Polyurethane buffer should be selected and used for crane carriage.

13 H-type safe and energy-saving trolley bus should be selected.

14 The structure of main girder shall be determined according to the characteristics of crane and the site conditions.

15 The master control mode shall be adopted, and the operation mode, i.e. cabin operation or remote operation, shall be selected according to the site conditions.

16 The infrared decelerating anti-collision device should be used for the carriage.

4.5.4 The selection of motorized platform car shall be in accordance with the following requirements:

1 The rated loading capacity shall be determined according to the mass to be transported during normal operation.

2 The required quantity of platform cars shall be determined by calculating the daily transport frequency, transport cycle time, effective operation rate and effective working time.

3 The power supply mode shall be determined according to the transport distance, rated load, ambient temperature, transport frequency and working environment.

4 The track gauge shall be determined according to the rated load, and the track gauge of other platform car on the same track and site conditions.

5 The size of the platform shall be determined according to the size of the goods and the working mode.

6 The length of the track shall be determined comprehensively according to the distance of the transport, the size of the platform and the convenience of lifting.

7 The operation mode, i.e. remote control, fixed point control or follower control, shall be selected according to the site conditions and the power supply mode of the motorized platform car.

8 The running speed shall be determined according to the usage and transport frequency of the motorized platform car, and it may preset as 30m/min if no relevant information is available.

4.5.5 Maintenance hoist and maintenance platform for the crane shall be provided in the shop.

5 General layout and transportation

5.0.1 The general layout and transportation of cold-rolled electrical steel strip plant shall be designed considering the plant geographic conditions and general arrangement of the steel enterprise, and shall feature compact and reasonable arrangement, and smooth process flow.

5.0.2 The site selection of independent cold-rolled electrical steel strip plant shall meet the relevant requirements of the current national standard GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise*.

5.0.3 The site of cold-rolled electrical steel strip plant (shop) in steel complex shall be selected in accordance with the following requirements:

1 It shall be located on the downwind side of the perennial minimum frequency wind direction of the plant area.

2 It shall have convenient conditions for the delivery of finished products.

3 It should be close to the hot rolling plant that supplies raw materials to it.

5.0.4 The general layout of the cold-rolled electrical steel strip plant shall be determined based on the production process, enabling short and smooth goods flow, people flow and medium flow; people flow and goods flow should be separated.

5.0.5 Safety protection distance, anti-vibration distance and anti-noise distance among buildings and structures and that from buildings and structures to railways, roads and pipelines shall meet the relevant requirements of the current national standards GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise*, GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*, GB 50016 *Code for Fire Protection Design of Buildings* and GB 12348 *Emission Standard for Industrial Enterprises Noise at Boundary*.

5.0.6 For a plant to be built in phases, the near future facilities should be arranged in a centralized manner, and the far future facilities should be arranged in the area outside the battery limit of the near future facilities.

5.0.7 The arrangement of main building of cold-rolled electrical steel strip plant shall be in accordance with the following requirements:

1 In mountainous and hilly areas, the vertical axis of the main building should be parallel to the topographic contours, and measures shall be taken to prevent hazards caused by deep excavation and high filling of the side slope.

2 In hot weather areas, the intersection angle between the vertical axis of the main building and the prevailing wind direction in summer should not be less than 45°.

5.0.8 General layout of auxiliary facilities shall be in accordance with the following requirements:

1 The facilities shall be close to their users respectively.

2 The main step-down substation shall be arranged at the boundary of the plant area where high-voltage wire can be led-in conveniently.

3 Fuel gas facilities shall be arranged in areas with less people and traffic flow.

4 Acid regeneration plant should be arranged near the pickling shop, and should be on the upwind

side of the perennial minimum frequency wind direction of the main building of cold-rolled electrical steel strip plant.

5 Cooling facilities of circulating water treatment system should be arranged on the upwind side of the minimum frequency wind direction in winter of the buildings and structures. Protection distance (separation distance) from the cooling facilities to the buildings and structures shall meet the relevant requirements of the current national standard GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise*.

6 Air compressor station shall be arranged away from the fuel gas facilities, boiler room and waste acid treatment facilities. It shall be located on the downwind side of the perennial minimum frequency wind direction of fuel gas facilities, boiler room and waste acid treatment facilities.

5.0.9 Office and living facilities should be arranged in a people-concentrated area at the downwind side of the perennial minimum frequency wind direction of cold-rolled electrical steel strip plant.

5.0.10 Material transportation mode of cold-rolled electrical steel strip plant shall be determined through techno-economic comparison in external transportation conditions, source of raw materials, destination of finished products, and transport volume.

5.0.11 When the cold-rolled electrical steel strip plant is located near the hot rolling plant that supplies raw materials to it, a special raw material transport passage should be set up between the hot rolling plant and the cold rolling plant without grade crossing with the railway or the road.

5.0.12 Vertical arrangement, integrated pipeline arrangement, landscaping, and railways and road transportation systems shall be designed in accordance with the relevant requirements of the current national standard GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise*.

6 Power distribution

6.1 Power supply

6.1.1 Design of power distribution of each production line shall meet the relevant requirements of the current national standard GB 50052 *Code for Design of Electric Power Supply Systems*.

6.1.2 The main power load required for the cold-rolled electrical steel project shall be of class Ⅱ while the seal roll of annealing furnace, the hearth roller of annealing furnace and drying oven, and the circulating pump of rotary hearth furnace shall be classified as loads of class Ⅰ. Class Ⅱ load should be powered by two 110kV (35kV) power circuits, and if any one of which fails, the other circuit shall be able to carry all the loads. Additionally, one circuit of emergency power supply shall be led in from different power sources for class Ⅰ loads, or diesel generators shall be installed for them.

6.1.3 Quantity of main transformers of 110kV(35kV)/10kV main step-down substation should be determined according to the power loads and construction time, 2 to 3 two-winding transformers should be set. When any one of the transformers fails, the others shall be able to meet the demands of the all power loads.

6.2 Power distribution system

6.2.1 The medium voltage distribution system of each production line should be 10kV system.

6.2.2 One 110kV(35kV)/10kV main step-down substation should be provided for the cold-rolled electrical steel strip plant. The necessity of setting discrete switchgear station in different areas shall be determined according to the arrangement of production lines and the switchgear station of each area shall be close to the load center.

6.2.3 Main connection of power distribution system should be of single bus or sectionalized single-bus configuration with power distributed in a radial way.

6.2.4 Power quality problems caused by the power users of each production line should be controlled and handled in the main step-down substation or switchgear station of the related area.

6.2.5 Microcomputer-based monitoring system should be provided for the relay protection device and automatic security device. The main monitoring station (station monitoring level) should be arranged at the 110kV(35kV)/10kV main step-down substation or the switchgear station of rolling mill.

6.2.6 Earthing mode of 110kV(35kV)system shall follow its upper level substation. The 10kV power distribution system may adopt small earthing resistor or arc suppression coil for earthing. Design of earthing system shall meet the relevant requirements of the current national standard GB/T 50065 *Code for Design of AC Electrical Installations Earthing*.

6.3 Power distribution wires

6.3.1 Design of power distribution line shall meet the relevant requirements of the current national standard GB 50217 *Standard for Design of Cables of Electric Power Engineering*.

6.3.2 XLPE insulated PVC sheathed power cable should be used.

6.3.3 Power distribution line in the plant area should be laid mainly in the cable tunnel, and partially in the cable trench, concealed conduit or laid along the bottom of crane beam.

7 Electrical drive

7.1 Low voltage distribution

7.1.1 Regarding the power load of cold-rolled electrical steel strip plant, not only normal power supply, but also emergency power supply shall be provided for the driving motors of seal roll of annealing furnace, the hearth roller of annealing furnace and drying oven, and the circulating pump of rotary hearth furnace. When diesel generator set is used for emergency power supply, several production lines may share one or more diesel generator sets according to the capacity of the loads needing emergency power.

7.1.2 Power load class of firefighting equipment shall meet the relevant requirements of the current national standard GB 50016 *Code for Fire Protection Design of Buildings*.

7.1.3 Automation control system, critical instrument, switch and telephone of IP communication system shall use uninterruptible power supply (UPS) as the emergency power supply, of which the backup time shall meet the emergency demands when the working power supply fails.

7.1.4 Lighting and crane in cold-rolled electrical steel strip plant should be powered by special transformers respectively.

7.1.5 Power transformer of each production line should adopt the D/ynll connection. Rectifier transformer should adopt connection mode which can suppress harmonic wave.

7.1.6 Low-voltage power distribution system should adopt radial power supply mode.

7.1.7 Design of low-voltage power distribution system shall meet the relevant requirements of the current national standard GB 50054 *Code for Design of Low Voltage Electrical Installations*.

7.2 Electrical drive

7.2.1 Electrical drive system should adopt full AC drive mode. Drives that require speed regulation shall be of full-digital AC variable frequency type. Rolling mill main drive system should be configured by water-cooled AC-DC-AC variable frequency drives. Constant motor shall be controlled by motor control center. Constant squirrel-cage motor shall be started under full-voltage. When full-voltage starting is not possible, soft starting and other step-down starting shall be adopted.

7.2.2 The VVVF drive motor of a continuous production line should be powered via "common rectifier+ inverter". Inverters of the same production line, which are in inverting state and in generating state simultaneously, should be connected to the DC bus of one common rectifier. Rectifier with energy feedback should be used.

7.2.3 Various types of pumps and fans which are required for speed regulation should adopt AC variable frequency speed control system.

7.3 Electrical engineering

7.3.1 Electrical room shall be close to the load center. The quantity of electrical rooms of each production line shall be determined according to the line process arrangement and the distribution of power load.

7.3.2 Basement or cable floor should be designed for the electrical rooms of(normalizing)pickling line, rolling mill, decarburizing annealing and insulating film coating line, decarburizing annealing and MgO coating line, continuum tension line and rotary hearth furnace, etc.

7.3.3 Cables for rolling mill shall be should be laid in cable tunnel, cable trench and partially through conduit. Cables for(normalizing)pickling line, rolling mill, decarburizing annealing and insulating film coating line, decarburizing & annealing and MgO coating line, continuum tension line and rotary hearth furnace should be laid via cable trench, cable tray under steel structure platform, and through conduit partially. Cables for laser scribing line and finishing line should be laid via cable trench, and through conduit partially.

7.3.4 Air inlets of the electrical room, operation room and cable tunnel shall be arranged away from the areas that emit toxic and harmful substances such as acid and alkali mist.

7.3.5 Electrical equipment, cables and cable laying materials arranged in area suffering acid and alkali mist shall adopt acid and alkali resistant materials or other protective measures.

7.3.6 Design of cables shall meet the relevant requirements of the current national standard GB 50217 *Standard for Design of Cables of Electric Engineering*.

7.3.7 Design of fire protection shall meet the relevant requirements of the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*.

7.3.8 Lighting shall adopt energy-saving and efficient narrow angle luminaire, and shall meet the relevant requirements of the current national standard GB 50034 *Standard for Lighting Design of Buildings*.

7.3.9 Lightning protection design shall meet the relevant requirements of the current national standard GB 50057 *Code for Design Protection of Structures against Lightning*.

7.3.10 Earthing design shall meet the relevant requirements of the current national standard GB 14050 *Types and Safety Technical Requirements of System Earthing*.

7.3.11 The engineering of electric installations within explosion and fire hazard atmospheres shall meet the relevant requirements of the current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

8 Automation instruments

8.1 Automation instrument equipment

8.1.1 Temperature measuring instrument shall be in accordance with the following requirements:

1 For resistance temperature detector(RTD), Pt100 should be selected, and the thermocouple selected shall be of type E, K, S and B.

2 Sheathed thermocouple shall be used for temperature measurement of radiant tube wall in annealing furnace.

3 Insertion depth of plug-in temperature measurement instrument shall be determined according to the diameter of process pipe.

4 Material of protection tube for temperature measurement component shall be determined according to the corrosiveness, temperature and pressure of medium to be measured.

5 Infrared pyrometer should be used for continuous measurement of strip temperature.

8.1.2 Material of pressure instrument, which will contact the medium to be measured, shall be selected according to the corrosiveness of the said medium. Diaphragm seal pressure transmitter should be used for highly-corrosive acid medium.

8.1.3 Flow instrument shall be in accordance with the following requirements:

1 Throttling device shall be in accordance with the following requirements:

1) Throttling device should be used for flow measurement of gas and non-conducting liquid;

2) Temperature and pressure shall be compensated as measuring the flow of gas with great temperature and pressure fluctuation;

3) Pressure tapping and installation of throttling device shall meet the relevant requirements of the current national standards GB/T 2624.1 to GB/T 2624.4 *Measurement of Fluid Flow by Means of Pressure Differential Devices Inserted in Circular Cross-Section Conduits Running Full.*

2 Electromagnetic flowmeter should be in accordance with the following requirements:

1) Electromagnetic flowmeter should be used for flow measurement of conducting liquid medium.

2) Electromagnetic flowmeter should not be used for measurement of medium containing magnetic or magnetizable substance.

3) Stainless steel electrode should be used for measurement of alkaline medium and tantalum electrode for highly-corrosive acid medium, and lining material should adopt PTFE.

4) Electromagnetic flowmeter with remote indication should be used in places with insufficient maintenance space or large vibration.

8.1.4 Level measurement instrument shall be in accordance with the following requirements:

1 Static pressure level gauge and differential pressure level gauge should not be used for the medium of which liquid density changes easily under normal operating conditions.

2 Magnetic flap level gauge/level meter with magnetic float should not be used for measurement of medium containing magnetic or magnetizable substance.

3 Non-contact level gauge should be used for liquid level measurement of high-corrosive medium.

8.1.5 Analysis instrument for annealing furnace shall be in accordance with the following requirements:

1 Analysis instrument shall be installed for analyzing gas composition of atmosphere in the annealing furnace, and its installation quantity and position shall meet the requirements of production process.

2 Analysis instrument should be arranged for analyzing the composition of waste gas from combustion.

3 Leak detection alarm device and portable leak detection alarm device should be provided in areas where dangerous gas may leak.

8.1.6 Control valve shall be in accordance with the following requirements:

1 The control valve shall open/close in safe position in case of emergency.

2 Hand wheel shall be provided for control valve which is critical for safety but not equipped with bypass valve.

8.1.7 Special instrument shall be in accordance with the following requirements:

1 Arrangement of special instrument on production line shall meet the production process requirements.

2 Radioactive instrument shall be installed in accordance with the relevant requirements of the current national standard GB 18871 *Basic Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*.

8.1.8 Measurement of energy medium shall be carried out in accordance with the following requirements:

1 It shall meet the managing requirements of enterprise, and shall be in accordance with the relevant requirements of the current national standard GB/T 21368 *Specification for Equipping and Managing of Measuring Instrument of Energy in the Iron and Steel Industry*.

2 Measurement of energy medium shall be performed in accordance with the following requirements:

1)Measuring instrument shall be provided for energy medium incoming to/outgoing from the cold-rolled electrical steel strip plant;

2)Measuring instrument shall be provided for energy medium generated, consumed and recycled by each production line.

3 Energy medium measurement signal of the production line should be displayed on and managed by its corresponding basic automation system.

4 The measurement unit of energy medium shall conform to the relevant requirements of the current national standards GB 3100 *SI Units and Recommendations for the Use of Their Multiples and of Certain Other Units*, GB 3101 *Quantities and Units–General Principles*, and GB 3102.1 to GB 3102.13 *Quantities and Units*.

8.2 Instrument power source

8.2.1 The incoming power source of instrument system shall be three-phase 380V AC or single-phase 220V AC power supply.

8.2.2 Air source of instrument shall be in accordance with the following requirements:

1 Purified compressed air shall be selected for instruments in buildings and structures while air or

nitrogen shall be selected for outdoor instruments, but appropriate safety measures shall be taken when nitrogen is used.

2 The normal supply pressure of instrument air/nitrogen shall be 0.4MPa to 0.6MPa.

3 Quality of the instrument air/nitrogen shall meet the requirements of the selected pneumatic instrument.

8.3 Instrument engineering

8.3.1 The installation location of instrument shall satisfy the requirement for measurement and maintenance.

8.3.2 The anti-corrosion performance of corrosive medium sampling devices shall not be inferior to that of the corresponding process pipe and equipment.

8.3.3 Cables and cable laying materials in areas where there exist highly-corrosive media shall be corrosion-proof or corrosion protected.

8.3.4 Protective measures shall be taken for the outdoor instrument transmitter and converter.

8.3.5 Heat tracing shall be applied to the instrument and measuring pipeline where the medium inside might be frozen, solidified and crystallized.

8.3.6 When both instrument air and the power air are supplied from one air compressor(station), the branch pipe for instrument air should be separately introduced from the compressed air main in shop, and should be separated from the air branch pipe for process equipment. Location and quantity of branch pipes shall be determined according to the arrangement and quantity of instruments.

9 Automation system

9.1 General provisions

9.1.1 Automation system should be divided into basic automation system (L1), process automation system (L2) and manufacturing execution system (MES).

9.1.2 Automation system shall be expandable and compatible, and shall meet the needs of additional functionality or modification.

9.2 Basic automation system (L1)

9.2.1 Basic automation system (L1) shall include electrical drive control and automation instrument control, which should be designed as an integrated system.

9.2.2 Independent basic automation system (L1) shall be provided for each production line.

9.2.3 For the controlled object which may cause danger to people and equipment, hardware logic protection loop independent from the controller shall be designed.

9.2.4 Application software shall meet the requirements of production process control, and it shall ensure that no personal injury or equipment damage will occur during commissioning and operation due to defects in the application software.

9.2.5 Human-machine interface shall be in accordance with the relevant requirements of the current national standard GB/T 4205 *Basic and Safety Principles for Human-Machine Interface (MMI), Marking and Identification—Actuating Principles*, and shall be in accordance with the following requirements:

1 Human-machine interface shall satisfy the operations under various working conditions.

2 Human-machine interface shall be humanized, and shall meet the requirements of symbol, safety color and safety sign in the current national standard GB 2893 *Safety Colors*.

3 Buttons for normal stop, quick stop and emergency stop shall be provided in the operation room and on the local operation pulpit (box) of each production line, in which the emergency stop button should be a red mushroom button with mechanical lock.

4 Measures to prevent mis-operation shall be taken for important operations performed by human-machine interface computer or touch screen.

9.2.6 Emergency stop shall be in accordance with the following requirements:

1 Division of the emergency stop area shall be determined according to the relevance of equipment to process production. Equipment closely related to the emergency-stop trigger point shall be divided into the same area.

2 The emergency stop system shall be composed of hardware circuit consisting of safety relays or safety PLC.

3 The state of emergency stop shall be manually released after confirmation by the operator, but such release shall not cause automatic restart of the relevant equipment.

9.2.7 Process data acquisition system shall be in accordance with the following requirements:

1 Process data acquisition system should be designed for production line with complex control

functions.

2 The architecture of the system and modes of data sampling, storage and processing shall be determined according to the functional requirements.

9.3 Process automation system (L2)

9.3.1 Functions of process automation system shall be in accordance with the following requirements:

1 Process automation system should be provided respectively for each production line, and its management scope shall cover the whole production process.

2 Design of process automation system shall be guided by user demand analysis through investigation, and shall meet the needs of production management.

9.3.2 Hardware configuration shall be in accordance with the following requirements:

1 The server, engineer station and operation terminal should be configured according to the production scale, software running requirements and operational requirements of each line.

2 Computer featuring high reliability and strong capabilities in computing, storage and communication should be used as the server and it shall be equipped with data verification, redundant storage, redundant network card and etc, and can be expanded with the storage devices such as disk cabinet and magnetic tape line as needed.

3 The configuration shall be able to communicate with L1, MES or L2 of other associated production line via the server.

4 IPC shall be used as the operation terminal in areas suffering large electromagnetic interference.

9.3.3 As for software configuration, the operating system, development tool, database system, data communication program, debug and maintenance tool shall be configured based on system size, operating environment, and operational requirements.

9.4 Manufacturing execution system (MES)

9.4.1 Manufacturing execution system shall be designed in accordance with the following requirements:

1 Configuration of MES of the cold-rolled electrical steel strip plant shall enable refinement management of logistics and information flow required by the production process and enterprise management, and shall be compatible with the development plan as well as the production and operation management mode of the enterprise.

2 Management scope of MES shall cover the production organization and logistics management of all production lines, roll shop, lab, raw material storage, intermediate product storage and finished product storage of the entire cold-rolled electrical steel strip plant.

3 In addition to unified planning, the design of MES shall also follow the principles of rational configuration, interconnection and resource sharing.

4 Revamping of MES shall be carried out by making full use of the existing equipment and facilities.

5 Safety design of MES shall meet the relevant requirements of the current national standard GB/T 22081 *Information Technology–Security Techniques–Code of Practice for Information Security Management.*

9.4.2 Architecture of MES shall be in accordance with the following requirements:

1 Network shall be designed based on open network architecture, and follow the principle of

unified naming rule, domain name system and VLAN division.

2 MES network shall be an independent local area network logically, and it shall be able to communicate with enterprise ERP system, upstream and downstream MES, process automation system of each process line and some basic automation systems(if necessary)via internetworking device.

3 Isolation shall be made for the connection between MES network and other local area networks.

4 C/S, B/S or its mixed mode shall be used for the architecture of the application software.

9.4.3 Configuration of system hardware and software shall be in accordance with the following requirements:

1 System host and storage device shall be expandable.

2 Configuration of hardware device shall adapt to the application software.

3 Server host shall be in accordance with the following requirements:

1)Departmental server should be used.

2)Two servers should be adopted for mutual standby.

3)RAID storage technology shall be used.

4 The open operating system shall be used, and well-proven general purpose development tool software, database management system, network management software, anti-virus software, and communication middleware should be used.

5 Key devices used in the network, such as router, switch and firewall, shall be of intelligent and manageable type.

6 The core switch shall be enterprise switch at Layer-3 and above.

7 The distribution layer and access layer should be configured by Layer-2 workgroup level switch or departmental switch.

9.4.4 System functions shall be in accordance with the following requirements:

1 Application software functions shall meet the needs of production and management of cold-rolled electrical steel strip plant, and shall meet the functional requirements and information sharing requirements of each business department.

2 The application software shall be modularized and have user-friendly interface.

9.5 Automation engineering

9.5.1 Design of computer room shall meet the relevant requirements of the current national standards GB 50174 *Code for Design of Electronic Information System Room* and GB/T 2887 *General Specification for Computer Field*.

9.5.2 Design of Lightning protection and earthing of automation system shall meet the relevant requirements of the current national standards GB 50057 *Code for Design Protection of Structures against Lightning*, GB 50343 *Technical Code for Protection of Building Electronic Information System against Lightning* and GB 14050 *Types and Safety Technical Requirements of System Earthing*.

10 Telecommunication

10.1 Telephone system

10.1.1 The configuration of intra-plant telephone and dispatching telephone shall meet the needs of production process and enterprise management, and shall be compatible with the development plan of the plant and communication mode of the enterprise.

10.1.2 Dispatching telephone exchange shall be provided for the cold-rolled electrical steel strip plant of an enterprise which has secondary dispatching system.

10.1.3 The dispatching telephone exchange shall be SPC digital type with recording function.

10.1.4 Telephone shall be provided in the dispatch room, electrical room, operation room, instrument room, computer room, duty room, office, guard room and etc. of each production line and auxiliary facilities.

10.1.5 IP telephony system shall be configured with QoS guarantee.

10.2 Intercom system

10.2.1 Wired intercom station shall be arranged in electrical room and operation room of each production line as well as local operation pulpit(box)where intercom is required.

10.2.2 Wired intercom station should be arranged for the production post in hydraulic station, lubrication station, acid regeneration plant, protective gas station, water treatment plant and diesel generator room, etc.

10.2.3 Twisted pair cable should be used as the signal cable of intercom system.

10.2.4 Explosion-proof level of intercom station and loudspeaker within explosion hazard shall meet the relevant requirements of the current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres.*

10.2.5 Centralized power supply mode should be used for intercom system.

10.3 Radio system

10.3.1 Radio shall be used for communication among crane operator, ground command personnel and operation room.

10.3.2 Radio shall be used for communication between mobile work-posts such as equipment maintenance, commissioning, etc., as well as communication among mobile work-posts and dispatching rooms and operation rooms.

10.4 Industrial television system

10.4.1 Configuration of industrial television shall meet the needs of production management and operation.

10.4.2 Industrial television with video recording function shall be provided for the key points of production line and the points where tracing is required by production or management.

10.4.3 Access platform, guardrail and stairway shall be provided if it is inconvenient to install and

maintain the camera.

10.4.4 Video compression format of video server/DVR shall be consistent with that of enterprise dispatching television system.

10.4.5 The video compression format of IP camera shall be consistent with that of enterprise dispatching television. When high-quality monitoring screen is required, the video compression format of the camera should be MEPG4 or better, its resolution should not be lower than D1, and its real-time image transmission speed rate should not be lower than 25 frame/second.

10.4.6 Fiber shall be used when the transmission line of camera suffers strong electromagnetic interference, or when the transmission distance exceeds the limit of copper cable.

10.4.7 Camera and its supporting facilities within explosion hazard area shall be in accordance with the relevant requirements of the current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

10.5 Generic cabling system

10.5.1 Generic cabling system shall be provided in the office building.

10.5.2 Generic cabling system should be provided in offices, management rooms and labs inside the production workshop and auxiliary facilities.

10.5.3 Other rooms that require network systems, such as OA, MES and enterprise ERP, may be equipped with generic cabling system as needed.

10.5.4 Telephone voice communication in office building shall be included in the design of generic cabling system.

10.5.5 Connection can be made via consolidation point when socket-outlets for information are relatively concentrated and far from the distributing frame.

10.5.6 Generic cabling system shall meet the requirements of the current national standard GB 50311 *Code for Engineering Design of Generic Cabling System*.

11 Utilities

11.1 General provisions

11.1.1 The utilities shall be designed considering the construction conditions, production process and equipment requirements of the cold-rolled electrical steel strip plant for optimized configuration, and the design shall adopt appropriate treatment technology and equipment with excellent performance, advanced indicators and environment-friendly nature.

11.1.2 Medium metering device for fuel, steam, compressed air, nitrogen, hydrogen and water for cold-rolled electrical steel strip plant shall be provided separately at the connection point with the external energy pipeline of the plant; For each line, metering device shall be designed according to the management requirements of the plant.

11.2 Machine repair facilities

11.2.1 Configuration of the facility shall be in accordance with the following requirements:

1 Production tasks of roll shop shall be determined according to the configuration and requirements of the main production equipment, which shall include roll grinding, and cleaning and inspection of roll bearings and bearing block.

2 Roll shop should be arranged adjacent to the mill.

3 Roll shop should be managed via computer.

4 Rubber-covered roller and blade grinding facilities should be arranged together with other maintenance facilities or arranged separately, or such grinding activities may be outsourced.

5 Machining of spare parts for the daily maintenance of production equipment and the large, medium and small repair facilities of the equipment should be jointly constructed with other maintenance facilities or go for outsourcing solution, or they can be configured separately.

11.2.2 Equipment shall be selected in accordance with the following requirements:

1 Specifications of the roll grinding machine shall be selected according to the type, specification, material processing accuracy and surface machining accuracy of the rolling mill.

2 Quantity of roll grinding machines shall be determined according to the grinding workload, machining efficiency and workshop work system.

3 Roll disassembly and reassembly equipment shall be selected according to the structure type, specification and workload of the roll and bearing block.

4 Roll bearing cleaning equipment shall be selected according to the types, specification and workload of the roll bearing.

5 The roll bearing and bearing block should be disassembled and reassembled, and cleaned mechanically.

6 The rubber covered roller and blade grinding equipment shall be selected according to the specification and material of the roll and blade, the grinding workload, and the work system of the workshop.

11.2.3 Equipment configuration shall be in accordance with the following requirements:

1 The equipment in the roll shop shall be so arranged that it connects with the main production equipment designed in the process layout, and its arrangement shall enable smooth logistics and easy management.

2 The rail top elevation of machine repair shop shall adapt to the lifting height and lifting space of the largest work-piece.

3 Cooling and heating sources of workshop should not be directly facing the roll grinding machine.

11.3 Testing facilities

11.3.1 Configuration of facilities shall be in accordance with the following requirements:

1 An electrical steel laboratory should be set independently.

2 Test items of finished product shall be determined according to product variety and production process; and the test shall be implemented in conformance with the relevant requirements of current national standards GB/T 2521 *Cold-Rolled Grain-Oriented and Non-Oriented Electrical Steel Strip (Sheet)*, GB/T 25046 *High Magnetic Induction Cold-Rolled Non-Oriented Electrical Steel Strip and Sheet* and GB/T 17951.2 *Cold-Rolled Non-Oriented Electrical Steel Strip Delivered in the Semi-Processed State.*

3 Test items of work process and media shall be determined according to the requirements of each production line.

11.3.2 Equipment configuration shall meet the following requirements:

1 Quantity of processing, analysis and performance testing equipment to be configured should be determined based on calculations.

2 Quantity of wet type chemical analysis equipment should be determined according to the "Matching Method".

3 The equipment for the testing items required by the product standard and process shall be arranged. The equipment for other testing items should be outsourced from other workshops of the plant or from outside, or configured by the plant itself in a minimum quantity.

4 The testing equipment should be selected according to the accuracy and capability required by the process.

11.3.3 Equipment arrangement shall be in accordance with the following requirements:

1 The lab should be arranged outside the production workshop. A reasonable arrangement shall be developed taking into account the topographical and meteorological conditions at site, and considering the convenience of the sampling and sample conveying between production lines and auxiliary utilities.

2 Sample processing equipment should be arranged on the first floor of the building.

3 Arrangement of the sample processing equipment shall be determined according to the sample processing process, operational safety of the workers, and convenient sampling and sample conveying.

4 Space around the sample processing equipment shall be large enough for operation, maintenance and waste transportation.

5 Adequate space for operation and maintenance space shall be reserved around the analysis equipment.

6 The precision instrument room shall be designed with vibration-proof, damp-proof, dust-proof and acid-proof measures.

7 Chemical analysis room should be set on the top floor of the building and equipped with ventilation device.

8 Power distribution room and sample storage room should be arranged on the first floor of laboratory. The sample storage room should be able to storge samples for at least half a year.

9 Gas cylinder room shall be designed on the first floor of the laboratory. Flammable and explosive gas cylinders shall be placed in a separate room with explosion prevention measures.

11.4 Combustion gas facilities

11.4.1 Design of fuel gas facilities shall be in accordance with the following requirements:

1 Coke oven gas, natural gas, liquefied petroleum gas and other fuels shall be selected in accordance with the gas balance of the whole plant, and the requirements of the process and equipment.

2 Technical parameters of the fuel shall be in accordance with the following requirements:

1) Technical parameters of coke oven gas shall meet the relevant requirements of the current national standard GB 50486 *Code for Design of Industrial Furnaces in Iron & Steel Works*;

2) Technical parameters of natural gas shall be in accordance with the relevant requirements of class Ⅰ gas or class Ⅱ gas in current national standard GB 17820 *Natural Gas*;

3) Technical parameters of liquefied petroleum gas shall meet the relevant requirements of the current national standard GB 11174 *Liquefied Petroleum Gases*.

3 When the technical parameters of coke oven gas cannot meet the requirements of process and equipment, the measures like pressurization, and purification, i.e. desulfurization, de-naphthalene and de-tarring, shall be taken.

4 Wastewater, off-gas and residues generated during the operation of the gas purification facility shall be treated by corresponding system, or collected and transported to the relevant existing facilities for treatment up to the standard before emission; and the generated noise shall be controlled also.

5 Capacity of the gas purification equipment shall be determined according to the maximum hourly gas consumption and the impurity content of the gas source.

6 Design of gas purification facilities shall meet the relevant requirements of the current national standard GB 50028 *Code for Design of City Gas Engineering* and GB 6222 *Safety Code for Gas of Industrial Enterprises*.

7 Design of natural gas and liquefied petroleum gas facilities shall meet the relevant requirements of the current national standard GB 50028 *Code for Design of City Gas Engineering* and GB 6222 *Safety Code for Gas of Industrial Enterprises*.

8 Gas leakage alarm device shall be installed in the fuel purification area and process facility area in accordance with the relevant national standard GB 50493 *Specification for Design of Combustible Gas and Toxic Gas Detection and Alarm for Petrochemical Industry*.

11.4.2 Design of hydrogen facilities shall be in accordance with the following requirements:

1 Technical parameters of hydrogen shall meet the relevant requirements of the current national standard GB 50486 *Code for Design of Industrial Furnaces in Iron & Steel Works*.

2 According to the user's consumption and raw material conditions, the hydrogen making process shall be determined through techno-economic comparison. Hydrogen making via coke oven gas pressure swing adsorption process shall be selected if coke oven gas supply is available, otherwise, natural gas conversion process, water electrolysis or methanol steam conversion process may be used.

3 Capacity of the hydrogen generation unit shall be determined according to the user's consumption and usage system.

4 When the purity of the supplied hydrogen cannot meet the requirements, purification facility shall be installed.

5 Hydrogen generation station shall be designed with hydrogen storage tank. The volume of the storage tank shall meet the hydrogen pressure stability requirements of the production line and the consumption requirement for ensuring the quality of the strip product inside the production line furnace in case of failure of hydrogen generation unit.

6 Design of the hydrogen generation station shall meet the requirements of the current national standard GB 50177 *Design Code for Hydrogen Station.*

11.4.3 Design of nitrogen facilities shall be in accordance with the following requirements:

1 Technical parameters of nitrogen shall meet the relevant requirements of the current national standard GB 50486 *Code for Design of Industrial Furnaces in Iron & Steel Works.*

2 Appropriate nitrogen supply and generation processes shall be selected according to the user's consumption, technical parameters and practical conditions of the project. When pipeline nitrogen supply is available, the pipeline nitrogen supply process is selected; otherwise, nitrogen generation process such as pressure swing adsorption, air separation, or gasification of liquid nitrogen may be employed.

3 Capacity of the nitrogen supply system shall be determined based on the user's consumption and usage system.

4 When the purity of the supplied nitrogen cannot meet the requirements, purification facility shall be arranged.

5 The nitrogen supply system shall be designed with nitrogen storage tank. The volume of the storage tank shall meet the nitrogen pressure stability requirements of the production line and the consumption requirements for purging of the production line pipeline and furnace in case of the failure of nitrogen supply system.

6 Standby liquid nitrogen storage and gasification facilities shall be foreseen for the pipeline nitrogen supply process or the supply system of nitrogen generated through pressure swing adsorption or air separation process, so as to ensure nitrogen supply to the production line in case of working nitrogen supply system failure.

11.4.4 The ammonia gas facilities design shall be in accordance with the following requirements:

1 The gas supply proposal shall be determined according to the requirements of the user on the consumption of ammonia gas and the usage system.

2 The liquid ammonia quality shall reach the top or first-class product criteria specified in the current national standard GB 536 *Liquefied Anhydrous Ammonia.*

3 The storage capacity of liquid ammonia storage tank should meet the cold rolling user's consumption demand for 7-day continuous production.

4 The arrangement of the liquid ammonia gas supply station shall meet the relevant requirements of the current national standard GB 50016 *Code for Fire Protection Design of Buildings*.

5 The residual liquid ammonia of liquid ammonia gas supply station shall be discharged to a special water tank for being treated up to the standard before emission.

11.5 Heating facilities

11.5.1 Design of steam facilities shall be in accordance with the following requirements:

1 The steam heat load shall include the production process equipment, air conditioning, heating and domestic heating, and shall be calculated and determined after taking into account the simultaneous use coefficient and the pipeline leakage coefficient.

2 The steam pressure for production should be 0.5MPa to 0.7MPa; and the steam pressure for living facilities should be 0.2MPa to 0.3MPa. The steam pipelines shall be laid separately to the users according to their application, i.e. industrial or domestic application.

3 The steam should be supplied in a centralized way via the plant-wide steam pipe network, if any. Otherwise, steam boiler room can be set. The design of the boiler room shall meet the relevant requirements of the current national standard GB 50041 *Code for Design of Boiler Plant*, and the boiler should be fueled by gas or oil.

4 When the steam pipe network parameters of the plant are higher than the working parameters, the temperature reduction and decompression station shall be set in the area.

5 Steam condensate recovery facilities shall be provided under technically and economically reasonable conditions.

11.5.2 Design of compressed air facilities shall be in accordance with the following requirements:

1 The compressed air load shall be calculated and determined according to the consumption amount of production line with the simultaneous use factor and the leakage coefficient of the pipeline taken into account.

2 The cold-rolled electrical steel strip plant should be equipped with an independent compressed air station. Design of the compressed air station shall be in accordance with the relevant requirements of the current national standard GB 50029 *Code for Design of Compressed Air Station.*

3 Technical parameters of compressed air shall satisfy the production process and equipment.

4 Centrifugal air compressors should be selected for new compressed air station.

5 Suction pipe of the centrifugal air compressor should be stainless steel pipe.

6 Drying device of compressed air should be arranged in the compressed air station in a centralized manner.

7 Safety protection device shall be provided for the unattended compressed air station. Audible and visible alarm of the protection device shall be transmitted to the process centralized control panel and the remote monitoring operation room, which shall be triggered when the fault occurs and activate automatic stop.

8 When an adsorption type drying device is installed in the compressed air station, the regeneration exhaust gas should be recycled.

11.6 Water supply and drainage facilities

11.6.1 Different water supply systems shall be set according to the different supply water quality, and water drainage shall adopt a completely separate system. Design of water supply and drainage facilities shall meet the relevant requirements of the current national standard GB 50721 *Code for Design of Water Supply & Drainage of Iron and Steel Enterprises.*

11.6.2 Water supply and drainage facilities shall be set according to the process requirements. In the

design of revamping and extension projects, the existing water supply and drainage facilities shall be fully reutilized.

11.6.3 Rain proof and freeze protection measures shall be taken for the operational parts, instruments, sampling device and valves of water supply and drainage facilities which are arranged outdoors.

11.6.4 Auxiliary rooms such as dosing room, lab, operation room and equipment maintenance room shall be arranged in the water treatment plant as required by production management of the whole plant.

11.6.5 Circulating water system shall be in accordance with the following requirements:

1 The composition and capacity of water supply system and water treatment facilities should be determined on premises of satisfying the required water quality and temperature by the production process. Capacity of water supply shall be designed according to the maximum hourly supply water flow. Recycling rate of circulating water system shall not be lower than 97%, and shall meet the relevant requirements of the current national standard GB 50050 *Code for Design of Industrial Recirculating Cooling Water Treatment.*

2 Side stream filtration facilities shall be designed for indirect open recirculating cooling water. Water flow passing through the side stream filter shall be determined according to the suspended solids content in makeup water, circulating cooling water and filtered water, and air flow in the cooling tower as well as dust content in the air, and shall meet the relevant requirements of the current national standard GB 50050 *Code for Design of Industrial Recirculating Cooling Water Treatment*. If relevant calculation data is not available, it can be calculated as 5% to 10% of the circulating cooling water consumption.

3 Water quality stabilizer dozing device shall be arranged in the circulating water system.

4 To implement the principle of comprehensive utilization and meet the requirements of environmental protection, sewage discharged from circulating water system shall be recycled through techno-economic comparison in consideration of actual conditions of the plant-wide sewage treatment facilities.

5 The safe water supply system shall be set in circulating water system, which shall meet the relevant requirements of the current national standard GB 50721 *Code for Design of Water Supply & Drainage of Iron and Steel Enterprises.*

6 Water supply pipeline system shall be designed with return pipe and supply water pressure stabilizing facility.

7 When the supply of circulating water is stopped, the signal shall be transmitted to the relevant production line.

11.6.6 Design of filtered water system shall be in accordance with the following requirements:

1 Capacity, process and equipment for the preparation of filtered water shall be determined according to the quality of supply water and the required quality and flow of filtered water by the production. Stand-by filtration facility shall be designed.

2 Variable frequency pump should be used for the supply of filtered water.

11.6.7 Design of demineralized water system shall be in accordance with the following requirements:

1 Capability and process of demineralized water treatment station shall be determined according to the required quality of demineralized water by the production line and the condition of demineralized water supply pipe network in plant area.

2 Acid and alkali laden wastewater generated from the demineralized water treatment station

shall be discharged into the wastewater treatment system of cold-rolled electrical steel strip plant for centralized treatment.

3 In the arrangement of demineralized water treatment facilities, the equipment and storage tank etc. should be located in different areas according to the process flow, and the equipment and pipeline shall be arranged orderly with installation, maintenance and operation convenience of the equipment and pipeline ensured.

4 Design of demineralized water system shall meet the relevant requirements of the current national standard GB/T 50109 *Design Code for Softening and Demineralization of Industrial Water.*

11.6.8 Design of wastewater treatment system shall be in accordance with the following requirements:

1 Capacity and process flow of wastewater treatment system shall be determined according to the quality, flow and temperature of the wastewater discharged from each production line, the drainage system, drainage mode and the required drainage index, etc.

2 Oily wastewater, acid-containing wastewater, alkali-containing wastewater, chromium-containing wastewater, environmentally-friendly coating liquid-containing wastewater, etc. shall be collected as per category separately, transported to the wastewater treatment station separately, and treated by category separately. Limits for pollutant emission concentration and benchmark effluent volume per unit product shall meet the relevant requirements of the current national standard GB 13456 *Discharge Standard of Water Pollutants for Iron and Steel Industry.*

3 Chromium-containing wastewater and sludge shall be treated separately.

11.6.9 Design of acid regeneration plant shall be in accordance with the following requirements:

1 Capacity and treatment process of acid regeneration plant shall be determined according to the composition of the waste acid, the discharge system, and the processing capacity, raw material, product specifications and working time of the pickling line.

2 Acid tank farm of acid regeneration plant and that of pickling line should be in integrated arrangement.

3 The acid regeneration plant should be equipped with desilication device.

4 Wastewater generated by acid regeneration plant shall be discharged into the wastewater treatment system for centralized treatment.

5 Limits for pollutant emission concentration in exhaust gas from the acid regeneration plant shall meet the relevant requirements of the current national standard GB 28665 *Emission Standard of Air Pollutants for Steel Rolling Industry.*

11.7 Ventilation facilities

11.7.1 Design of heating and ventilation facilities shall meet the relevant requirements of the current national standard GB 50019 *Design Code for Heating Ventilation and Air Conditioning of Industrial Buildings.*

11.7.2 Design of heating facilities shall be in accordance with the following requirements:

1 Good natural ventilation conditions should be provided for the main building with least auxiliary buildings attached to its external wall. The auxiliary buildings should avoid the windward side of the dominant wind direction.

2 The main building shall be protected with sound heat insulation for its enclosure structure. The minimum thermal resistance of the roof, external wall and gutter meeting the requirements of energy

saving and dew condensation prevention, and determined according to shop temperature and humidity, and the meteorological conditions.

3 Design temperature of the main building of cold-rolled electrical steel strip plant should be determined according to the requirements of process equipment. If no process information is available, the indoor temperature should be designed as 5℃ to 8℃ for the starting coils storage, after-rolling coil storage and finished product storage, and 16℃ to 18℃ for roll shop, and 8℃ to 10℃ for other shops.

4 Medium for heating of main building and auxiliary buildings should be steam of 0.2MPa to 0.3MPa or hot water ≥100℃. Condensate recovery device shall be installed when the steam consumption is more than 0.6t/h.

5 The main building should be heated by warm air blower with hot air curtain installed at the gate, and the auxiliary rooms by warm air blower or radiator.

6 Thermal expansion of heating pipes of the main building shall be calculated. Compensator shall be foreseen when the natural compensation of the required pipe section cannot meet the requirements.

7 The heating pipe shall be laid with a certain slope. If it is not possible, flow rate in the hot water pipe shall not be less than 0.25m/s. One emptying/venting joint should be arranged every 80m to 100m for steam pipe, condensate pipe and hot water pipe which cannot be laid with slope.

11.7.3 Design of ventilation facilities shall be in accordance with the following requirements:

1 Controlled natural ventilation should be adopted in the design, and if it cannot meet the requirements of indoor safety, sanitation, environmental protection or production, mechanical ventilation or combined ventilation of natural ventilation and mechanical ventilation may be adopted.

2 Local exhaust device should be used for the hot and wet air generated locally by production line in the main building.

3 Inside the main building, natural ventilation and cooling facilities shall be arranged at the heat treatment furnace area (if any) of the production line. When natural ventilation cannot meet the requirements, mechanical air supply system should be foreseen additionally. In case no process information is available, the air supply can be calculated on the basis of 2times/h to 4times/h of ventilation rate.

4 Electrical rooms, cable floors, and cable tunnels that are not air-conditioned or have no special room temperature requirements may be ventilated naturally or mechanically, or a combination of both. Self-closing fire damper with signal feedback function shall be set at the inlet/outlet of ventilation pipe for underground cable floor and cable tunnel.

5 Underground hydraulic stations and lubrication stations, etc. shall be designed with mechanical ventilation devices. Self-closing fire damper with signal feedback function shall be set at the fire prevention partition through which the ventilation pipe passes through.

6 Local air supply shall be designed for the operation post where the ambient temperature cannot meet the requirements of industrial health, or the radiation intensity is greater than 350W/m^2.

7 Emergency ventilation device shall be arranged for the buildings and structures of gas booster station, gas purification station and protective gas station, of which the ventilation capacity shall be determined through calculation according to the process requirements, and the ventilation frequency shall not be less than 12 times per hour and its electrical switches shall be located at the indoor and outdoor points easy for operation.

11.7.4 Design of air conditioning facilities shall be in accordance with the following requirements:

1 Indoor calculation temperature shall be determined considering both the process and equipment requirements and comfort of people.

2 The air conditioning system in electrical room should be the centralized type or water/air-cooled air conditioner unit. When waste heat utilization is applicable, steam jet refrigerator or lithium bromide refrigerator should be adopted.

3 The discrete air conditioning system should be water-cooled type, and air-cooled type may also be used in areas with good environmental conditions. Air-cooled air conditioner serving under high temperature environment shall be of special high temperature resistant type.

4 Air conditioning facilities shall be interlocked with fire alarm system installed in the area covered by the facilities.

5 Cold water pipe should not pass through rooms such as electrical room, instrument room and computer rooms. Heat preservation and anti-condensation measures shall be taken for the air duct of electrical room. Air supply duct of air conditioner should not be placed above the electrical cabinet.

11.7.5 Design of dedusting system shall be in accordance with the following requirements:

1 Corresponding dedusting system shall be designed for the iron-containing dust and MgO-containing dust generated from the production line. Bag filter should be used for dust collection.

2 Measuring hole shall be arranged at the inlet duct of filter and at the chimney, and the specific position shall meet the relevant requirements of the current national standard GB/T 16157 *The Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of Stationary Source*. When the level of measuring point is higher than 3m, working platform, ladder and special power supply for measuring and monitoring shall be arranged.

11.7.6 Design of waste gas cleaning system shall be in accordance with the following requirements:

1 Fume collecting and cleaning system shall be designed for treatment of acid-laden fume and alkali-laden fume generated by the production line.

2 Fume collecting and cleaning system shall be employed for treatment of oily fume generated by equipment such as rolling mill and temper mill, etc.

3 Coating fume collecting and cleaning system shall be provided at the insulation coating liquid preparation and circulating system, and at the coater, etc.

4 Vapor exhaust system should be installed for strip spray cooling facilities.

5 The combined cleaning system consisting of cyclone separator and multistage scrubber should be selected for the treatment of flue gas of roaster in the acid regeneration plant, and bag filter should be installed at the top of iron oxide powder bin.

6 Measuring holes shall be arranged at the inlet duct of cleaning equipment and at the chimney, and the specific installation position shall meet the relevant requirements of the current national standard GB/T 16157 *The Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of Stationary Source*. When the level of measuring point is higher than 3m, working platform, ladder and special power supply for measuring and monitoring shall be arranged.

11.8 Piping design

11.8.1 When several pipes are arranged one above another, their arrangement shall be in accordance with the following requirements:

1 Hot media pipe shall be installed above the cold media pipe.

2 Non-corrosive media pipe shall be above corrosive media pipe.

3 Gas pipe shall be above liquid pipe.

4 Metal pipe shall be above non-metal pipe.

5 Heat insulation pipe shall be above non-insulation pipe.

11.8.2 When several pipes need to be installed horizontally against the wall, large-diameter pipe, room-temperature pipe and less-branched pipe shall be placed against the wall, while small-diameter pipe, hot pipe, and more-branched pipe should be arranged outer.

11.8.3 Flanges and valves of hot media pipe and corrosive media pipe shall not be arranged above the walkway. Valve on the stand pipe shall be 1.2m to 1.5m above the ground. When the valve is installed above 2m, an operation platform shall be designed.

11.8.4 The shop piping of the cold-rolled electrical steel strip plant shall be laid along the columns of the building without hindering the open/close of the doors and windows, and shop lighting.

11.8.5 Design of pressurized piping shall meet the relevant requirements of the current national standards GB/T 20801.1 to GB/T 20801.6 *Pressure Piping Code-Industrial Piping*.

11.8.6 Piping design shall meet the relevant requirements of the current national standards GB 50316 *Design Code for Industrial Metallic Piping*, GB 50235 *Code for Construction of Industrial Metallic Piping Engineering* and GB 50184 *Code for Acceptance of Construction Quality of Industrial Metallic Piping*.

11.8.7 Pipe arrangement should adopt natural compensation, and compensator shall be provided when natural compensation cannot meet the requirements.

11.8.8 Distance among pipelines and distance between pipeline and structures shall meet the relevant requirements of the current national standard GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise*.

11.8.9 Design of coating for pipes and pipe supports shall meet the relevant requirements of the current professional standard YB/T 9256 *Specification for the Painting Work Technology of Steel Structure and Pipe*.

11.8.10 Design of fuel gas pipe shall be in accordance with the following requirements:

1 High purity hydrogen and nitrogen should be conveyed through stainless steel pipe or seamless steel pipe.

2 Carbon steel used for conveying high purity hydrogen and nitrogen shall be pickled, degreased and passivated. The selected valves, accessories and instruments to be installed on the hydrogen pipe and nitrogen pipe shall not affect the quality of hydrogen and nitrogen.

3 Fuel gas pipe should be laid overhead, and its support shall be non-combustible.

4 Overhead fuel gas pipe which shares support with other pipes shall meet the relevant requirements of the current national standards GB 6222 *Safety Code for Gas of Industrial Enterprises*, GB 16912 *Safety Technical Regulation for Oxygen and Relative Gases Produced with Cryogenic Method*, GB 50177 *Design Code for Hydrogen Station* and GB 50028 *Code for Design of City Gas Engineering*.

5 Fuel gas pipe should not be arranged on the same side as the cable tray, and if it has to be, the arrangement shall comply with the relevant requirements of the current national standard GB 50054 *Code for Design of Low Voltage Electrical Installations*.

6 Arrangement of fuel gas pipe shall not be arranged on the power supply side of shop crane.

11.8.11 Design of thermal power pipe shall be in accordance with the following requirements:

1 Thermal power pipe should be laid overhead, and the overhead thermal power pipe should share the same supports with the gas pipe or should be laid along buildings and structures.

2 The buried steam pipe shall be safe and reliable composite pipe, and shall meet the relevant requirements of the current professional standard CJJ/T 104 *Technical Specification for Directly Buried Steam Heating Pipeline in City*.

3 The π-shaped compensator on steam pipe should be arranged horizontally.

4 The thermal power pipe shall be seamless steel pipe, and it should be connected with equipment and orifice plate, etc. via flanges.

5 The heat insulation of steam pipe, drain pipe and equipment on the pipe shall meet the relevant requirements of the current national standard GB 50264 *Code for Design of Industrial Equipment and Pipeline Insulation Engineering*.

11.8.12 The design of water supply and drainage pipe shall be in accordance with the following requirements:

1 Acid liquor pipe, alkali liquor pipe, coating media-containing wastewater pipe and acid/alkali-containing wastewater pipe should be arranged in pipe trench or pipe corridor.

2 The waste water in pits of pay-off reel and tension reel shall be discharged to the wastewater treatment plant.

3 The production water supply pipe and fire water supply pipe in the plant area shall be arranged in ring, and domestic water supply pipe may be branched.

4 The corrosion-resistant plastic pipe should be used for acid-containing and coating medium-containing wastewater, and metal pipe should be used for alkali-containing and oil-containing wastewater.

5 The buried pipe should be arranged under green belt; if it has to be buried under the road due to space limit, it should be arranged under the non-motor vehicle lane.

6 The design of water supply and drainage pipe shall meet the relevant requirements of the current national standards GB 50013 *Code for Design of Outdoor Water Supply Engineering* and GB 50014 *Code for Design of Outdoor Wastewater Engineering*.

12 Architecture

12.1 General provisions

12.1.1 The architectural design shall adopt well-proved and reliable architectural forms, new materials and new technologies.

12.1.2 The fire protection design of buildings shall meet the relevant requirements of the current national standards GB 50016 *Code for Fire Protection Design of Buildings*, GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*, GB 50229 *Standard for Design of Fire Protection for Fossil Fuel Power Plants and Substations*, GB 50222 *Code for Fire Prevention in Design of Interior Decoration of Buildings* and GB 50098 *Code for Fire Protection Design of Civil Air Defense Works*.

12.1.3 The natural ventilation design of buildings shall meet the relevant requirements of the current national standard GB 50019 *Design Code for Heating Ventilation and Air Conditioning of Industrial Buildings*.

12.1.4 The natural lighting design of buildings shall meet the relevant requirements of the current national standard GB/T 50033 *Standard for Daylighting Design of Buildings*.

12.1.5 The anti-corrosion design of buildings shall meet the relevant requirements of the current national standard GB 50046 *Code for Anticorrosion Design of Industrial Constructions*. Anti-acid corrosion building materials such as F1 flame-retardant FRP sheet shall be used as roof panel and wall panel in pickling area and other areas.

12.1.6 The water-proof design of buildings shall meet the relevant requirements of the current national standards GB 50345 *Technical Code for Roof Engineering* and GB 50108 *Technical Code for Waterproofing of Underground Works*. Snow-water seepage prevention and anti-icing measures shall be taken in snowy areas.

12.1.7 The occupational health design of buildings shall meet the relevant requirements of the current national standard GB/T 50087 *Code for Design of Noise Control of Industrial Enterprises* and current national hygienic standards for the design of industrial enterprises.

12.1.8 The design of office and living facilities in plant area shall meet the relevant requirements of the current national standards GB 50352 *Code for Design of Civil Buildings*, JGJ 67 *Design Code for Office Building*, JGJ 64 *Standard for Design of Dietetic Buildings*, GB 50189 *Design Standard for Energy Efficiency of Public Buildings*, GB 50176 *Code for Thermal Design of Civil Building* and GB 50325 *Code for Indoor Environmental Pollution Control of Civil Building Engineering*.

12.1.9 The design of buildings shall be made taking into account the influences from different regions and different climatic conditions on buildings.

12.2 Main shop

12.2.1 The design of main workshop building shall be developed in accordance with the production process requirements, and shall ensure necessary space for operation and maintenance required by production process.

12.2.2 The main structure and enclosure structure form of the main workshop building shall be determined through comparison of techno-economic indexes of different solutions according to the process requirements, regional characteristics and other comprehensive factors.

12.2.3 The design of enclosure structure of main workshop building shall fully satisfy the requirements with respect to fire prevention, natural ventilation, natural lighting, heat insulation, anti-condensation, anti-corrosion, typhoon resistance, anti-seepage of snow water and anti-ice slush. The finished product storage in the building without heating should be protected by heat insulation and anti-condensation design.

12.2.4 In the design of main workshop building floor, the floor base shall be made of reinforced concrete or steel fiber concrete and the floor top shall be made of wear-resistant materials considering the foundation treatment, anti-frost heave and other factors.

12.2.5 On the premise of satisfying the requirements of natural ventilation and natural lighting, the design of the main workshop building doors and windows shall also select practical and durable solution and meet the requirements of fire prevention, anti-corrosion, heat insulation.

12.3 Architecture of utilities

12.3.1 Architectures of utilities shall meet the requirements of fire prevention, natural ventilation and natural lighting.

12.3.2 The buildings of wastewater treatment station, acid regeneration plant and demineralized water station shall meet the requirements of corrosion protection.

12.3.3 The air compressor station and the operation room of each production line shall meet the requirements of sound insulation of the building.

12.3.4 In addition to protection for heat insulation, anti-seepage of snow water and anti-ice slush, the architecture design of utility building in severe cold areas and cold areas shall meet the requirements of anti-condensation and anti-frost heave.

12.3.5 For architecture of utility building in areas suffering typhoons, effective corresponding protection measures shall be taken.

12.4 Architecture of office and living facilities

12.4.1 Architecture of office and living facilities shall meet not only the requirements of fire prevention, heat insulation and anti-condensation, but also the requirement of natural ventilation, natural lighting and energy conservation for the building; the building of canteen shall also meet the hygiene requirements.

12.4.2 Office and living facilities in the severe cold area and cold area shall meet the requirements of anti-leakage of melting snow, anti-ice slush and anti-frost heave.

12.4.3 For the office and living facilities in areas affected by typhoon, effective measures of corresponding protection shall be taken.

13 Structure

13.1 General provisions

13.1.1 The structural design shall follow the principles of technical advancement, cost-effectiveness, safety and applicability as well as good quality.

13.1.2 The design shall meet the requirements of the production process, and shall be determined according to local meteorological, geological, construction and material supply conditions.

13.1.3 The structure shall have sufficient strength, rigidity and ductility, and shall meet the stability and durability requirements.

13.1.4 On the premise of solid scientific basis and sufficient techno-economic demonstration, new structures, new materials and new technologies shall be adopted in the structure design with industrial waste fully recycled.

13.1.5 The seismic fortification category of buildings in seismic fortification zone shall be determined based on the relevant requirements of the current national standard GB 50223 *Standard for Classification of Seismic Protection of Building Constructions* with consideration of the factors such as the plant production scale, the casualties caused by building damage, social impact, and the economic loss and difficulty of remedy after the shutdown of production.

13.2 Structural type selection and arrangements

13.2.1 The column network of the building shall be uniform and regular under the precondition of meeting the production process requirements.

13.2.2 The main workshop building should be of full steel framed bent structure where possible.

13.2.3 Buildings adjacent should be separated from the main workshop building by settlement joints or expansion joints.

13.2.4 The main workshop building should adopt the upper column of solid-web I-beam and lower column of lattice-type concrete-filled steel pipe. The column foot should be of insert type or explosion type, and welded I-beam should be selected for the steel structure of crane beam. The roof system and wall system should be of light steel structure.

13.2.5 The main operation platform and piping platform of the production line should be steel structure platform.

13.2.6 The electrical room of the production line should be of cast-in-place reinforced concrete frame structure.

13.2.7 The structure of the buildings, such as operation room of the production line, online inspection room, management room and non-production room and rooms of auxiliary system near the line shall be determined according to their required functions and surrounding environment comprehensively.

13.3 Design load

13.3.1 The load value of building structures shall be selected in accordance with the relevant requirements in the current national standard GB 50009 *Load Code for the Design of Building*

Structures.

13.3.2 During the production operation, erection and maintenance of production line, the load generated by equipment, pipelines, transportation tools, steel coil placement, etc. on the operation platform, equipment foundation and ground floor shall be determined according to the process requirements.

13.3.3 Drainage measures such as overflow holes should be designed for flat roofs with parapet walls and awnings. Water log load caused by drain blockage may be determined according to the specific drainage measures.

13.4 Selection of material

13.4.1 The concrete strength should not be lower than C20 for common reinforced concrete structure and C25 for the electrical room and equipment foundation of the production line.

13.4.2 Steel products shall be in accordance with the following requirements:

1 Q235 steel and Q345 steel should be used for steel structure workshop building columns and crane girders, and Q235 steel for other systems.

2 Q235 steel should be used for production line operation platform and piping platform.

13.5 Construction measures

13.5.1 The maximum spacing of structural expansion joints shall meet the relevant requirements of the current national standard GB 50010 *Code for Design of Concrete Structures* and GB 50017 *Code for Design of Steel Structures*. Expansion joint and seismic joint should be set in one position and shall comply with the requirements of seismic joint.

13.5.2 Columns should be set on both sides of the expansion joint of the building, and the foundation shall be an integral one without joint.

13.5.3 The embedment depth of main workshop building column foundation shall be determined depending on the schedule of the plant construction, and meeting the relevant requirements of the current national standard GB 50007 *Code for Design of Building Foundation*.

13.5.4 Large equipment foundation, separate structure and monolithic pit that are adjacent to main workshop building columns should be separated from the foundation of main workshop building columns.

13.5.5 In workshop where vibration equipment is arranged on the floor, the equipment shall be arranged as far as possible from workshop building column; the column foundation should be separated from the vibration equipment foundation in case the equipment is close to workshop building column.

13.5.6 The steel structural rod member shall be of solid-web or closed section at the portion suffering corrosive media, and shall be in accordance with the following requirements:

1 For the truss formed by angle steel, the thickness of important rod member such as chord member and end diagonal member as well as gusset plate shall not be less than 8mm, and that of other rod members shall not be less than 6mm.

2 For the rod member formed by steel plate, the steel plate shall not be less than 6mm thick.

3 The rod member of closed section shall not be less than 4mm thick, and its end shall be enclosed.

14 Energy conservation and environmental protection

14.1 Energy conservation

14.1.1 The energy conservation design of cold-rolled electrical steel strip plant shall meet the relevant requirements specified in the current national standard GB 50632 *Code for Design of Energy Saving of Iron and Steel Industry*.

14.1.2 The design of buildings and structures shall meet the thermodynamics performance requirements of the building enclosure structure.

14.1.3 The exhaust gas temperature from the industrial boilers and the external surface temperature of industrial furnaces shall meet the relevant requirements specified in the current national standard GB/T 3486 *Technical Guides for Evaluating the Rationality of Heat Usage in Industrial Enterprise*.

14.1.4 The design of flue gas waste heat recovery process and devices of industrial furnace shall meet the relevant requirements specified in the current national standard GB/T 3486 *Technical Guides for Evaluating the Rationality of Heat Usage in Industrial Enterprise*, GB 50486 *Code for Design of Industrial Furnaces in Iron & Steel Works* and GB/T 1028 *Terms*, *Classification*, *Grade of Waste Heat in Industry and Calculating Method of Quantity of Waste Heat Resources*.

14.1.5 The thermal insulation design of equipment and pipes shall meet the relevant requirements specified in the current national standard GB/T 4272 *General Principles for Thermal Insulation Technique of Equipment and Pipes*.

14.1.6 The cooling insulation design of equipment and pipes shall meet the relevant requirements specified in the current national standard GB/T 4272 *General Principles for Thermal Insulation Technique of Equipment and Pipes.*

14.1.7 The design of recovery of condensate from steam heating system of production line shall meet the relevant requirements specified in the current national standard GB/T 12712 *The Requirements for Supervision of Recovery of Condensate from Steam Heating System and Technique of Automatic Steam Traps*.

14.1.8 The design of water supply and drainage facilities of production line and auxiliary facilities shall meet the relevant requirements specified in the current national standard GB 50506 *Code for Design of Water Saving for Iron and Steel Enterprises*.

14.1.9 The design of energy measuring instruments shall meet the relevant requirements specified in the current national standard GB/T 21368 *Specification for Equipping and Managing of Measuring Instrument of Energy in the Iron and Steel Industry*.

14.2 Environmental protection

14.2.1 Pollution prevention and control facilities of cold-rolled electrical steel strip project shall be designed, constructed and put into use in parallel with main project.

14.2.2 The principles of cleaner production and recycling economy shall be followed in the design of cold-rolled electrical steel strip plant; the selected raw materials, materials and fuel shall be toxic-free and hazard-free or low in toxicity and hazard; technically feasible and cost-effective new process,

technology and equipment without pollution or generating less pollution, and characterized by no necessity of using water or less water consumption shall be used.

14.2.3 The design of general layout and transportation, process equipment selection and the design of auxiliary facilities shall meet the relevant requirements specified in the current national standard GB 50406 *Code for Design of Environmental Protection of Iron and Steel Industry*.

14.2.4 The emission concentration limits of air pollutants in waste gas, such as particles, nitrogen oxides, sulfur dioxide, chromic acid fume, hydrogen chloride, alkali-laden fume, etc. shall meet the relevant requirements specified in the current national standard GB 28665 *Emission Standard of Air Pollutants for Steel Rolling Industry*.

14.2.5 The pH value, pollutant emission concentration limits of waste water and benchmark effluent volume per unit product, such as suspended solids, chemical oxygen demand, hexavalent chromium, total iron and total chromium, etc. shall meet the relevant requirements specified in the current national standard GB 13456 *Discharge Standard of Water Pollutants for Iron and Steel Industry*.

14.2.6 The noise emission limits at plant boundary shall meet the relevant requirements specified in the current national standard GB 12348 *Emission Standard for Industrial Enterprises Noise at Boundary*.

14.2.7 The storage and disposal of solid waste shall meet the relevant requirements specified in the current national standard GB 18599 *Standard for Pollution on the Storage and Disposal Site for General Industrial Solid Wastes*. The control, supervision and management of pollution resulted from hazardous waste storage shall meet the relevant requirements specified in the current national standard GB 18597 *Standard for Pollution Control on Hazardous Waste Storage*. The construction, operation, supervision and management of landfill site for hazardous wastes shall meet with the relevant requirements specified in the current national standard GB 18598 *Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes*.

15 Safety and fire fighting

15.1 Safety and industrial hygiene

15.1.1 The design of cold-rolled electrical steel strip plant shall comply with national, professional and provincial laws, policies and regulations concerning safety and occupational health. The principles of safety, precaution and combination of prevention and treatment shall be followed in the design. Safety facilities shall be designed, constructed and put into use synchronously with main project, and various safety and occupational health design in the ongoing projects shall meet the requirements in current national standard.

15.1.2 The transportation, production and storage design involving in hazardous chemical devices shall meet the national regulations on hazardous chemicals.

15.1.3 Site selection and general layout arrangement shall be in accordance with the following requirements:

1 Apart from meeting the relevant requirements of the current professional standard AQ 2003-2004 *Safety Regulations for Steel Rolling*, the selection of plant site shall be in line with the requirements in the site selection conclusion of occupational hazards and safety pre-assessments and the approval comments given by the competent administration authority.

2 The layout of plant and workshop shall meet the relevant requirements specified in the current national standard GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise* and AQ 2003-2004 *Safety Regulations for Steel Rolling*.

15.1.4 The safety design shall be in accordance with the following requirements:

1 Fire protection and explosion-proof design shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings*, GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*, AQ 2003-2004 *Safety Regulations for Steel Rolling* and GB 6222 *Safety Code for Gas of Industrial Enterprises*.

2 Electrical safety design shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings*, GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*, GB 50057 *Code for Design Protection of Structures against Lightning*, GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres* and AQ 2003-2004 *Safety Regulations for Steel Rolling*.

3 Fuel gas safety design shall meet the relevant requirements specified in the current national standards GB 6222 *Safety Code for Gas of Industrial Enterprises*, GB 50028 *Code for Design of City Gas Engineering*, GB 16912 *Safety Technical Regulation for Oxygen and Relative Gases Produced with Cryogenic Method* and GB 50177 *Design Code for Hydrogen Station*.

4 The seismic design of buildings and structures shall meet the relevant requirements specified in the current national standard GB 50011 *Code for Seismic Design of Buildings*.

5 The design of pedestrian passageway, stair/ladder, platform, protection railing, protection shield and protection cover shall meet the relevant requirements specified in the current national standards AQ 2003-2004 *Safety Regulations for Steel Rolling*, GB 4053. 1 to GB 4053. 3 *Safety Requirements for*

Fixed Steel Ladders and Platform and GB/T 8196 *Safety of Machinery-Guards-General Requirements for the Design and Construction of Fixed and Movable Guards*.

6 The setting of safety signs shall meet the relevant requirements specified in the current national standard GB 2894 *Safety Signs and Guideline for the Use*.

7 The safety technical measures for transportation, loading/unloading and lifting shall meet the relevant requirements specified in the current national standards GB 6067. 1 *Safety Rules for Lifting Appliances–Part 1*:*General* and AQ 2003–2004 *Safety Regulations for Steel Rolling*.

15.1.5 Industrial health design shall be in accordance with the following requirements:

1 Technical measures for dust prevention, anti-toxicity and anti-asphyxiation shall meet the relevant requirements specified in the current national standard GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*. The permissible concentration of propylene, acrylic acid, hydrogen chloride and hydrochloric acid, sodium hydroxide, chromate, dust, biological factors in workplace air shall meet the relevant requirements specified in the current national standard GBZ 2.1 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 1*:*Chemical Hazardous Agents*.

2 Noise control shall meet the relevant requirements specified in the current national standard GB/T 50087 *Code for Design of Noise Control of Industrial Enterprises*, and noise occupational exposure limits shall meet the relevant requirements specified in the current national standard GBZ 2. 2 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 2*:*Physical Agents*.

3 The design of hand-transmitted vibration and whole body vibration control shall meet the relevant requirements specified in current national standard GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*. The occupational exposure limits for hand-transmitted vibration shall meet the relevant requirements specified in current national standard GBZ 2. 2 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 2*: *Physical Agents*, and occupational exposure limits for whole body vibration shall meet the relevant requirements specified in current national standard GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*.

4 The design of protection against ionizing radiation and the safety of radiation sources shall meet the relevant requirements specified in current national standard GB 18871 *Basic Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*.

5 The design of non-ionizing radiation protection shall meet the relevant requirements specified in current national standard GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*. Occupational exposure limits shall meet the relevant requirements specified in the current national standard GBZ 2.2 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 2*: *Physical Agents*.

6 The heatstroke prevention and heating against coldness shall be designed in compliance with the relevant requirements specified in current national standards GB 50019 *Design Code for Heating Ventilation and Air Conditioning of Indutsrial Buildings* GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*. Occupational exposure limits shall meet the relevant requirements specified in the current national standard GBZ 2.2 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 2*:*Physical Agents*.

7 The day-lighting design shall meet the relevant requirements specified in current national standards GB/T 50033 *Standard for Daylighting Design of Buildings* and GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*.

8 The lighting design shall meet the relevant requirements specified in current national standards GB 50034 *Standard for Lighting Design of Buildings* and GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises.*

9 The auxiliary rooms in the plant area shall be arranged in a way that they can avoid the effects of occupational hazardous factors such as hazardous substances, radiation and high temperature, etc., and their design shall meet the relevant requirements specified in current national hygienic standards for the design of industrial enterprises.

10 The design of emergency rescue organization, staffing and facilities shall meet the relevant requirements specified in current national standard GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises.*

11 Hygiene protection facilities such as shower and eye washer shall be designed in workplace where acid, alkali and toxic hazards exist, and in the dosing room of waste water treatment station. The service coverage radius of these facilities shall be less than 15m.

15.2 Safety and fire fighting

15.2.1 The fire hazard classification and fire resistance rating of main buildings in cold-rolled electrical steel strip plant shall be in accordance with those specified in Table 15.2.1.

Table 15.2.1 Fire hazard classification and fire resistance rating of main buildings in cold-rolled electrical steel strip plant

No.	Workshop & item	Production category	Fire resistance rating	Example of normal structure
1	Main workshop building	D/E	Grade 2	Steel structure
2	Operation room in main workshop building	D	Grade 2	Lightweight steel structure
3	Small room in main workshop building	E	Grade 2	Lightweight steel structure/brick-concrete structure
4	Electrical room of the production line	D	Grade 2	Reinforced concrete frame structure
5	Power substation and switchgear station	C	Grade 2	Reinforced concrete frame structure
6	Cable floor	C	Grade 2	Reinforced concrete frame structure
7	Electrical room and basement	C	Grade 2	Reinforced concrete frame structure
8	Rubber-lined roll and blade grinding shop and packaging material processing room	E	Grade 2	Steel structure
9	Circulating water pump house	D	Grade 2	Reinforced concrete frame structure
10	Waste water treatment station	E	Grade 2	Reinforced concrete frame structure
11	Acid regeneration plant	E	Grade 2	Reinforced concrete frame structure
12	Scheduling building	E	Grade 2	Reinforced concrete frame structure
13	Air compressor station	D	Grade 2	Reinforced concrete frame structure
14	Boiler roomt	D	Grade 2	Reinforced concrete frame structure and bent structure
15	Steam pressure and temperature reducing station	D	Grade 2	Reinforced concrete frame structure and bent structure

Table 15.2.1(Continued)

No.	Workshop &. item	Production category	Fire resistance rating	Example of normal structure
16	Demi water station	E	Grade 2	Reinforced concrete frame structure and bent structure
17	Gas and nitrogen booster station	A	Grade 2	Reinforced concrete frame structure
18	Refrigeration station	D	Grade 2	Reinforced concrete frame structure
19	Office building	–	Grade 2	Reinforced concrete frame structure
20	Staff canteen and shower room	–	Grade 2	Reinforced concrete frame structure

15.2.2 The number of main building floor and the maximum allowable building area and fire separation distance of fire compartment shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises.*

15.2.3 The arrangement of fire lane shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*.

15.2.4 The design of building's emergency exit shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*.

15.2.5 The design of fire fighting water supply and fire extinguishing facilities shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*.

15.2.6 The location of automatic fire extinguishing system shall meet the relevant requirements specified in the current national standard GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*. Water mist fire extinguishing system or gas automatic fire extinguishing system should be arranged in the oil cellar of cold-rolling mill.

15.2.7 The design of water spray extinguishing system shall meet the relevant requirements specified in the current national standard GB 50219 *Technical Code for Water Spray Fire Protection Systems.*

15.2.8 The design of gas fire extinguishing system shall meet the relevant requirements specified in the current national standards GB 50370 *Code for Design of Gas Fire Extinguishing Systems* and GB 50193 *Code of Design for Carbon Dioxide Fire Extinguishing Systems.*

15.2.9 The design of foam extinguishing system shall meet the relevant requirements specified in the current national standard GB 50151 *Code of Design for Foam Extinguishing Systems.*

15.2.10 The extinguisher distribution shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50140 *Code for Design of Extinguisher Distribution in Buildings.*

15.2.11 Indoor fire hydrant may not be arranged in starting coil storage, finished product storage and after-rolling coil storage.

15.2.12 The design of automatic fire alarm system shall meet the relevant requirements specified in

the current national standards GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises* and GB 50116 *Code for Design of Automatic Fire Alarm System*.

15.2.13 The fire protection design for electrical part of cold-rolled electrical steel strip plant shall meet the relevant requirements specified in the current national standards GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*, GB 50016 *Code for Fire Protection Design of Buildings* and GB 50217 *Standard for Design of Cables of Electric Power Engineering*.

15.2.14 The design of building's heating, ventilation, air conditioning and smoke control systems shall meet the relevant requirements specified in the current national standards GB 50016 *Code for Fire Protection Design of Buildings* and GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*.

15.2.15 Fire damper shall be designed for oily fume exhaust pipe, and shall be interlocked with automatic fire alarm system. The exhaust fan shall be started/stopped automatically.

15.2.16 Fire damper also shall be designed for ventilation systems of underground hydraulic station and lubrication station, and shall be interlocked with automatic fire alarm system.

15.2.17 In addition to this code, fire protection design shall also meet the relevant requirements specified in the current national standards GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise* and GB 6222 *Safety Code for Gas of Industrial Enterprises*.

Explanation of wording in this code

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

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

List of quoted standards

GB 50007 *Code for Design of Building Foundation*
GB 50009 *Load Code for the Design of Building Structures*
GB 50010 *Code for Design of Concrete Structures*
GB 50011 *Code for Seismic Design of Buildings*
GB 50013 *Code for Design of Outdoor Water Supply Engineering*
GB 50014 *Code for Design of Outdoor Wastewater Engineering*
GB 50016 *Code for Fire Protection Design of Buildings*
GB 50017 *Code for Design of Steel Structures*
GB 50019 *Design Code for Heating Ventilation and Air Conditioning of Industrial Buildings*
GB 50028 *Code for Design of City Gas Engineering*
GB 50029 *Code for Design of Compressed Air Station*
GB/T 50033 *Standard for Daylighting Design of Buildings*
GB 50034 *Standard for Lighting Design of Buildings*
GB 50041 *Code for Design of Boiler Plant*
GB 50046 *Code for Anticorrosion Design of Industrial Constructions*
GB 50050 *Code for Design of Industrial Recirculating Cooling Water Treatment*
GB 50052 *Code for Design of Electric Power Supply Systems*
GB 50054 *Code for Design of Low Voltage Electrical Installations*
GB 50057 *Code for Design Protection of Structures against Lightning*
GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*
GB/T 50065 *Code for Design of AC Electrical Installations Earthing*
GB/T 50087 *Code for Design of Noise Control of Industrial Enterprises*
GB 50098 *Code for Fire Protection Design of Civil Air Defense Works*
GB 50108 *Technical Code for Waterproofing of Underground Works*
GB/T 50109 *Design Code for Softening and Demineralization of Industrial Water*
GB 50116 *Code for Design of Automatic Fire Alarm System*
GB 50140 *Code for Design of Extinguisher Distribution in Buildings*
GB 50151 *Code of Design for Foam Extinguishing Systems*
GB 50174 *Code for Design of Electronic Information System Room*
GB 50177 *Design Code for Hydrogen Station*
GB 50176 *Code for Thermal Design of Civil Building*
GB 50184 *Code for Acceptance of Construction Quality of Industrial Metallic Piping*
GB 50189 *Design Standard for Energy Efficiency of Public Buildings*
GB 50193 *Code of Design for Carbon Dioxide Fire Extinguishing Systems*
GB 50217 *Standard for Design of Cables of Electric Power Engineering*
GB 50219 *Technical Code for Water Spray Fire Protection Systems*
GB 50222 *Code for Fire Prevention in Design of Interior Decoration of Buildings*

GB 50223 *Standard for Classification of Seismic Protection of Building Constructions*

GB 50229 *Standard for Design of Fire Protection for Fossil Fuel Power Plants and Substations*

GB 50235 *Code for Construction of Industrial Metallic Piping Engineering*

GB 50264 *Code for Design of Industrial Equipment and Pipeline Insulation Engineering*

GB 50311 *Code for Engineering Design of Generic Cabling System*

GB 50316 *Design Code for Industrial Metallic Piping*

GB 50325 *Code for Indoor Environmental Pollution Control of Civil Building Engineering*

GB 50343 *Technical Code for Protection of Building Electronic Information System against Lightning*

GB 50345 *Technical Code for Roof Engineering*

GB 50352 *Code for Design of Civil Buildings*

GB 50370 *Code for Design of Gas Fire Extinguishing Systems*

GB 50406 *Code for Design of Environmental Protection of Iron and Steel Industry*

GB 50414 *Standard for Fire Protection Design of Iron and Steel Metallurgy Enterprises*

GB 50486 *Code for Design of Industrial Furnaces in Iron & Steel Works*

GB 50493 *Specification for Design of Combustible Gas and Toxic Gas Detection and Alarm for Petrochemical Industry*

GB 50506 *Code for Design of Water Saving for Iron and Steel Enterprises*

GB 50603 *Code for Design of General Layout and Transportation for Iron & Steel Enterprise*

GB 50629 *Code for Design of Rolling Process for Plate and Strip Mill*

GB 50632 *Code for Design of Energy Saving of Iron and Steel Industry*

GB 50713 *Code for Design of Finishing Process of Plate and Strip Steel*

GB 50721 *Code for Design of Water Supply & Drainage of Iron and Steel Enterprises*

GB 536 *Liquefied Anhydrous Ammonia*

GB/T 1028 *Terms, Classification, Grade of Waste Heat in Industry and Calculating Method of Quantity of Waste Heat Resources*

GB/T 2521 *Cold-Rolled Grain-Oriented and Non-Oriented Electrical Steel Strip(Sheet)*

GB/T 2624.1 to GB/T 2624.4 *Measurement of Fluid Flow by Means of Pressure Differential Devices Inserted in Circular Cross-Section Conduits Running Full*

GB/T 2887 *General Specification for Computer Field*

GB 2893 *Safety Colors*

GB 2894 *Safety Signs and Guideline for the Use*

GB 3100 *SI Units and Recommendations for the Use of Their Multiples and of Certain Other Units*

GB 3101 *Quantities and Units–General Principles*

GB 3102.1 to GB 3102.13 *Quantities and Units*

GB/T 3486 *Technical Guides for Evaluating the Rationality of Heat Usage in Industrial Enterprise*

GB/T 3811 *Design Rules for Cranes*

GB 4053.1 to GB 4053.3 *Safety Requirements for Fixed Steel Ladders and Platform*

GB/T 4205 *Basic and Safety Principles for Human-Machine Interface (MMI), Marking and Identification - Actuating Principles*

GB/T 4272 *General Principles for Thermal Insulation Technique of Equipment and Pipes*

GB 6067.1 *Safety Rules for Lifting Appliances: Part One–General*

GB 6222 *Safety Code for Gas of Industrial Enterprises*

GB/T 8196 *Safety of Machinery-Guards-General Requirements for the Design and Construction of Fixed and Movable Guards*

GB/T 12712 *The Requirements for Supervision of Recovery of Condensate from Steam Heating System and Technique of Automatic Steam Traps*

GB 11174 *Liquefied Petroleum Gases*

GB 12348 *Emission Standard for Industrial Enterprises Noise at Boundary*

GB 12712 *The Requirements for Supervision of Recovery of Condensate from Steem Heating System and Technique of Automatic Steam Traps*

GB 13456 *Discharge Standard of Water Pollutants for Iron and Steel Industry*

GB 14050 *Types and Safety Technical Requirements of System Earthing*

GB/T 16157 *The Determination of Particulates and Sampling Methods of Gaseous Pollutants Emitted from Exhaust Gas of Stationary Source*

GB 16912 *Safety Technical Regulation for Oxygen and Relative Gases Produced with Cryogenic Method*

GB 17820 *Natural Gas*

GB/T 17951.2 *Cold-Rolled Non-Oriented Electrical Steel Strip Delivered in the Semi-Processed State*

GB 18597 *Standard for Pollution Control on Hazardous Waste Storage*

GB 18598 *Standard for Pollution Control on the Security Landfill Site for Hazardous Wastes*

GB 18599 *Standard for Pollution on the Storage and Disposal Site for General Industrial Solid Wastes*

GB 18871 *Basic Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*

GB/T 20801.1 to GB/T 20801.6 *Pressure Piping Code-Industrial Piping*

GB/T 21368 *Specification for Equipping and Managing of Measuring Instrument of Energy in the Iron and Steel Industry*

GB/T 22081 *Information Technology-Security Techniques-Code of Practice for Information Security Controls*

GB/T 25046 *High Magnetic Induction Cold-Rolled Non-Oriented Electrical Steel Strip and Sheet*

GB 28665 *Emission Standard of Air Pollutants for Steel Rolling Industry*

JGJ 64 *Standard for Design of Dietetic Buildings*

JGJ 67 *Design Code for Office Building*

CJJ/T 104 *Technical Specification for Directly Buried Steam Heating Pipeline in City*

AQ 2003–2004 *Safety Regulations for Steel Rolling*

YB/T 9256 *Specification for the Painting Work Technology of Steel Structure and Pipe*

GBZ 1 *Hygienic Standards for the Design of Industrial Enterprises*

GBZ 2.1 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 1: Chemical Hazardous Agents*

GBZ 2.2 *Occupational Exposure Limits for Hazardous Agents in the Workplace–Part 2: Physical Agents*