Foreword

This code is modified by Capital Engineering and Research Incorporation Limited (CERI) in conjunction with other relevant organizations according to the requirements of Document JIANBIAO [2013] No. 169 issued by the Ministry of Housing and Urban-Rural Development, P. R. China (MOHURD) – " Notice on Printing' the *Development and Revision Plan of National Engineering Construction Standards in* 2014' ".

The modification includes the following contents:

(1) According to the requirements of related laws, regulations, policies and standards newly issued by the state, the basic requirements of GB 50405–2007 *Code for Design of Comprehensive Utilization of Iron and Steel Industry Resources* (hereinafter referred to as original code), and the related contents of comprehensive utilization design of sources in each procedure of iron and steel industry is modified and detailed.

(2) According to the current national industries classification, the rare earth metal production belongs to nonferrous metal industry, and the GB 50988–2014 *Code for Design of Environment Protection Engineering of Nonferrous Metals Industry* has been issued. The related contents of comprehensive utilization design of rare earth resources are deleted.

(3) In the design of comprehensive utilization of ore mining resources, the comprehensive utilization of waste rocks, tailings and slag produced in the mineral resource development and utilization process is used as the main design content.

(4) The design content of comprehensive utilization of waste heat, waste pressure, combustible gases and other regenerated resources in the production process of each procedure are modified and detailed.

This code comprises 4 chapters with the main contents including general provisions, terms, basic requirements and design of comprehensive utilization of procedure resources.

The provisions printed in bold type in this code are compulsory and must be enforced strictly.

MOHURD is in charge of the administration of this code and the explanation of the compulsory provisions. China Metallurgical Construction Association takes responsibility for routine management, and CERI is responsible for explaining the technical details. All relevant organizations are kindly requested to sum up experiences and accumulate the data during the process of implementing this code. If any amendment and addition is found necessary, please mail your comments and suggestions to the Code Administration Office of CERI (Address: No. 7 Jiananjie, Beijing Economic and Technical Development Area; Postcode: 100176) for references in future revision.

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1 General provisions

1.0.1 The code is established to fully implement the national laws and regulations on energy conservation and emission reduction and resource comprehensive utilization and the development strategy of iron and steel industry, develop circular economy, promote clean production, conserve resources, protect ecological environment, increase economic benefits of enterprises, and take the sustainable development path.

1.0.2 The code is applicable to the design of construction project of iron and steel industry. The iron and steel industry includes iron ore, manganese ore and chromium ore mining and dressing, sintering, pelletizing, coking, ironmaking, steelmaking, steel rolling, ferroalloy, carbon, refractory materials, metal product and other auxiliary processes. The resource comprehensive utilization of iron and steel industry includes the comprehensive utilization on waste rocks and tailings produced in the development and utilization process of ore resources, and comprehensive utilization of ores, various waste slag, wastewater, waste liquid, waste gas, waste heat, waste pressure and combustible gas produced in the production process of iron and steel industry.

1.0.3 The design of resource comprehensive utilization of construction project of iron and steel industry shall meet the code, and also meet the related requirements of current national standards.

2 Terms

2.0.1 Comprehensive utilization of iron and steel industry resources

The resource comprehensive utilization of iron and steel industry mainly includes the comprehensive utilization of waste rock and tailings in the development and utilization process of ore resources, and comprehensive development and utilization of slag, waste slag, wastewater, waste liquid, waste gas, waste heat, waste pressure, and combustible gas in the production process of iron and steel enterprise.

2.0.2 Secondary energy

The primary energy is directly or indirectly processed or converted to other kinds and types of energy.

2.0.3 Waste heat

The waste heat is the heat energy which is not utilized in the hot process and is exhausted into surrounding environment. The waste heat can be classified into waste heat of solid carrier, waste heat of liquid carrier and waste heat of gas carrier according to carrier types.

2.0.4 Waste pressure

The waste pressure is the pressure of fluid drained in the pressurizing process, i.e. difference with standard atmosphere pressure. The waste pressure can be classified into gas waste pressure and liquid waste pressure according to fluid types.

2.0.5 Comprehensive energy consumption of unit product

Various energy consumed by the unit product of enterprise within the report period; the recycled energy of the procedures are deducted, and the actually consumed energy are converted into the standard total amount of coal.

3 Basic requirements

3.0.1 The design document of construction project shall cover the applicable design contents of resource comprehensive utilization.

3.0.2 The design of resource comprehensive utilization shall not utilize the process, technology and equipment which are clearly eliminated and prohibited by the state.

3.0.3 The resource comprehensive utilization facility shall be simultaneously performed with main works in design, construction and running.

3.0.4 When the main work is constructed by phases, the resource comprehensive utilization facility shall be planned according to the overall plan.

3.0.5 The water-saving process, technology and equipment with less water consumption and no water consumption shall be adopted in construction project.

3.0.6 The municipal middle water shall be used for the water source of water utilization in design of construction project as whole or part of water supply source.

3.0.7 The construction project shall be designed with the applicable circulating water system according to the water treatment system of each production procedure and the water amount and water quality of drained water. On the basis, the cascade water utilization system between procedures and the centralized sewage treatment plant of whole factory shall be established so as to furthest recycle the wastewater resources.

3.0.8 The combustible gas, waste heat and waste pressure in the production process shall be fully recycled in the design of construction project.

3.0.9 The large and medium comprehensive iron and steel enterprise shall establish the energy source management center.

4 Design of comprehensive utilization of procedure resources

4.1 Ore mining

4.1.1 The stripped tillage layers and mellow soil at the open mining yards, waste dumps and industrial sites shall be separately and properly stored, and used for greening and land reclamation.

4.1.2 The low-grade ores and refractory ores shall be singly and properly stacked in the site which is suitable for secondary loading and transportation. After the conditions are fulfilled, the resources shall be utilized.

4.1.3 The poisonless waste rock shall be used to fill the exposed mining pits, underground goafs, and mining collapsing pits, or as building material.

4.1.4 After mine water of open pit and underground mine are collected and treated, the purifying clarified water and precipitated sludge shall be recycled.

4.1.5 The leaching water produced at the waste dump shall be purified and recycled.

4.1.6 The waste open mining yard and waste dump shall take land reclamation measures, and the land shall be reutilized according to local conditions.

4.2 Ore dressing

4.2.1 The comprehensive recycling of tailings after ore dressing shall be designed according to the ore processing test and study report submitted by the ore processing test and study department. The test method and test scale of comprehensive recycling of tailings shall be determined by the design unit and study department.

4.2.2 The heavy medium ore dressing process shall be equipped with medium recycling facility, and the separated dilute-phase waste liquid shall be recycled.

4.2.3 The concentrate filtrate of wet ore dressing, flushing water of concentrate conveying pipeline, concentration overflow water of tailing slurry, and clarified water of tailings pond shall be recycled; the seepage water in front of tailing warehouse dam shall be collected and utilized.

4.2.4 After the ore dressing wastewater, dedusting wastewater, and floor flushing wastewater are collected and treated, the purifying clarified water shall be recycled; the precipitated sludge can be recycled according to ore grade and practical conditions.

4.2.5 The dust collected by the dedusting system of ore dressing procedure, and the ore slurry discharged under the emergency and overhauling conditions in the ore grinding, sorting and dewatering procedures shall be returned back into process system to be recycled.

4.2.6 The waste heat of high-temperature flue gas produced in the roasting rotary kiln and vertical furnace shall be utilized.

4.2.7 The tailings containing valuable metals and other components with high added value in the ore dressing process shall be dressed again. The tailings which cannot be re-dressed shall be separately and properly stored in the tailing ponds or tailing stack yard, and cannot be recycled until the technical and economic conditions are fulfilled.

4.2.8 The tailings without recycling value shall be used for filling the mine underground goaf and open

mining pits, be used as production building materials, or be used for other comprehensive utilization purposes.

4.2.9 After the tailing warehouse or tailing stack yard for storing waste tailings is closed, the land reclamation measures shall be taken, and the land shall be reutilized.

4.3 Raw material yard

4.3.1 The iron-containing dust sludge, coal-containing dust sludge and limestone powder produced in the raw material yard shall be recycled according to types.

4.3.2 The raw material yard shall be equipped with dust sludge storage, blending and transportation facilities. The sludge shall be dewatered and then sent into raw material yard.

4.3.3 The indirect cooling water of equipment shall be recycled after cooling. The flushing wastewater and other turbid wastewater shall be recycled after treatment.

4.3.4 In the areas with higher wind speed, the closed type storage process or other material reduction measures shall be taken for the dust prone raw material yards.

4.4 Sintering and pelletizing

4.4.1 The dust recycled by the dedusting facilities of raw material system, mixture system, sintering machine, grate-rotary kiln, traveling grate pelletizing machine, shaft furnace, cooling machine, finished product granulating system, and finished product storage and transportation system shall be returned back into the process system to be recycled as raw material.

4.4.2 The dustdust of third and fourth electric fields of electric precipitator of sintering machine head shall be singly collected, and comprehensively utilized.

4.4.3 The dust sludge contained in the floor flushing water of sintering and pelletizing plants (workshops) and the water of wet scrubber shall be returned back into the production system to be recycled.

4.4.4 The wastewater of circulating water system in sintering and pelletizing production processes and wet scrubbing system shall be utilized in cascade and recycling ways after treatment.

4.4.5 The flue gas circulating technology shall be adopted in the sintering production, and the sensible heat of flue gas is recycled, so as to reduce the consumption of solid fuel. The sensible heat of sinter shall be recycled, and be utilized in cascade.

4.4.6 The waste heat of hot flue gas and hot blast produced in the pelletizing shall be comprehensively recycled.

4.4.7 The flue gas cleaning technology shall be adopted for the roasting flue gas in the sintering and pelletizing and byproducts should be comprehensively utilized.

4.5 Coking

4.5.1 The automatic coal blending coking should be adopted for coking plant.

4.5.2 The new coke oven shall be built with coke dry quenching device at the same period.

4.5.3 The large coke dry quenching device should be equipped with boilers with high-temperature and high-pressure natural circulation.

4.5.4 The coal dust trapped by the dust collector of coal crushing machine shall be returned back to the coal charging system.

4.5.5 Dust collected by the dedusting ground stations of coke treatment system, coal charge, coke discharge and coke dry quenching shall be sent into the sintering plant as the fuel.

4.5.6 The coke powder produced by the wet coke quenching should be dewatered, and then sent into the sintering plant as the fuel.

4.5.7 The waste heat of the flue gas of coke oven can be recycled.

4.5.8 The gas cleaning device shall be equipped with tar and ammonia water separation unit, and gas desulfurization, decyanation, denitrifying and debenzolization units.

4.5.9 For the waste liquid produced by the desulfurization and decyanation units, the following chemical engineering products shall be recycled according to the different processes:

1 Extract the thiocyanate and thiosulfate products.

2 Mix with the recycled sulfur, and incinerate, so as to prepare sulfuric acid.

4.5.10 The tar residues discharged by gas cleaning device and tar processing device, and acid tar, and acid tar exhausted by ammonia sulfate unit shall be mixed into the coking coal to be recycled.

4.5.11 The oil washing regenerated residues of crude benzene, and the solvent regeneration residues of solvent dephenolization unit shall be mixed into tar to be recycled.

4.5.12 The distillation residues in phenol refining and pyridine refining processes shall be directly prepared into fuel oil or other oil products.

4.5.13 The sublimed naphthalene trapped by flaking and package of industrial naphthalene distillation unit and naphthalene refining device shall be returned back into process system.

4.5.14 The carbon dioxide decomposing process shall be adopted for the phenol salt decomposing unit. The produced sodium carbonate-containing wastewater shall be sent into phenol-cyanogen wastewater treatment station as the make-up alkaline source.

4.5.15 Various emptying liquids of equipment and pipeline are respectively collected into emptying tanks, and are returned into process system to utilize.

4.5.16 The collected steam condensate shall be recycled.

4.5.17 The pretreatment deoiling facility of phenol-cyanogen wastewater treatment station shall recycle the oil in wastewater, and the oil shall be sent into the tar and ammonia water separation equipment to recycle.

4.5.18 The wastewater reaching standard after biochemical treatment can be used for steelmaking slag soaking, sintering mixture humidifying, and ironmaking granulation. Under the condition of failure in complete digestion, the wastewater shall be deeply treated, and be used as the make-up water of circulating water system.

4.5.19 The domestic sewage should be used as the process water of phenol-cyanogen wastewater treatment station.

4.5.20 The coal tar shall be centrally processed; the unit treatment capacity of new coal tar processing device shall reach 150000t and above of anhydrous tar per year.

4.5.21 The hydrorefining technology shall be adopted in crude benzene refining. The unit treatment capacity of new crude benzene hydrorefining device shall reach 100000t and above of crude (light) benzene per year.

4.5.22 The coke oven gas shall take the gas bleeding measures, and the coke oven gas shall be comprehensively utilized.

4.6 Ironmaking

4.6.1 The ironmaking process shall take the clean production technical measures to reduce the consumption of coke. The nut coke under the sieve shall be recycled for ironmaking.

4.6.2 The ironmaking gas shall be cleaned and utilized as the secondary energy; the gas holder shall be installed, and the remaining gas shall be converted into electric energy or steam for utilization.

4.6.3 All furnace slag shall be comprehensively utilized, the water quenching technology shall be adopted and used for producing slag micropowder or used as mixture of cement.

4.6.4 The waste heat of granulating water shall be recycled.

4.6.5 After the iron element in the slag is recycled, the ironmaking dry slag shall be used as the building material.

4.6.6 The iron-containing dust shall be recycled as raw material.

4.6.7 The iron-containing dust with higher content of zinc, lead, potassium and sodium shall be recycled as raw material.

4.6.8 The indirect cooling wastewater and turbid wastewater shall be respectively equipped with circulating water systems, and the cascade blowdown type shall be adopted, so as to improve the repeated utilization rate of water.

4.6.9 The high pressure top operation process shall be adopted for the ironmaking, and also the gas waste pressure utilization device is built.

4.6.10 The gas shall be cleaned by dry gas cleaning system, and the dry type blast furnace top gas recovery turbine device (TRT) or axial compressor, and energy recycling turbine coaxial unit (BPRT) shall be selected for the gas waste pressure utilization device.

4.6.11 The hot stove shall be equipped with flue gas waste heat recovery device, and the combustion air and gas preheating process shall be adopted the gas with low calorific value is used for replacing the high-quality gas fuel.

4.7 Steelmaking and continuous casting

4.7.1 All slag shall be comprehensively utilized. The slag shall be pelletized by hot soaking and drum treatment process. The slag magnetic dressing and sorting line shall be installed, and the sorted metal shall be returned back to production; the tail slag shall be deeply processed and utilized as resource.

4.7.2 The dust produced in the converter smelting, refining and hot metal pretreatment and the dust sludge of converter gas cleaning shall be recycled and utilized.

4.7.3 The wastewater of converter gas wet cleaning shall be recycled after treated.

4.7.4 The secondary cooling water of continuous casting shall be recycled after treated, and the collected scale shall be comprehensively utilized.

4.7.5 The converter steelmaking shall be built with the gas recycling system at the same period.

4.7.6 The converter gas shall be cleaned by the dry cleaning process; the recycling index of converter gas shall be no less than $90N \cdot m^3/t(steel)$; the calorific value shall be no less than $1800kcal/(N \cdot m^3)$.

4.7.7 The converter shall be equipped with evaporative cooling device to recycle the waste heat of converter flue gas, and the recycling amount of waste heat steam of uncombustion method shall be no lower than 80kg/t(steel).

4.7.8 The electric arc furnace shall be equipped with waste heat recycling facility with furnace internal

smoke exhausting function.

4.7.9 The melting slag and the metal waste of flame cutting machine and flame scarfing machine of continuous casting shall be sent into steelmaking and ironmaking to comprehensively use.

4.8 Steel rolling and metal products

4.8.1 The hot charging and hot delivery technology of the continuous casting billet shall be adopted for new section, wire, and thin slab rolling production line, and the hot charge rate and hot charge temperature shall be increased. The hot charging and hot delivery technology of the continuous casting billet shall be adopted for the new medium-thickness sheet production line.

4.8.2 The recycling and utilization device of flue gas waste heat of rolling reheating furnace shall be arranged according to the related requirements of current national standard, e.g. GB 50486 *Code for Design of Industrial Furnaces in Iron and Steel Works*.

4.8.3 The rolling cooling water shall be recycled after treated.

4.8.4 The waste acid produced in the pickling of rolling and metal products shall be recycled and regenerated or comprehensively utilized.

4.8.5 The large and medium rolling enterprise shall be equipped with oil cleaning facility, and the impurities in oil shall be removed on line, so as to reduce the production amount of waste oil. For the produced waste oil, it shall be firstly used by self, and the remaining waste oil shall be disposed according to the related requirements of hazardous waste management method.

4.8.6 The rolling turbid circulating horizontal flow tank and oil depot water suction well shall be equipped with floating oil recycling machines.

4.8.7 The crop ends and wastes produced in the rolling shall be recycled, and sent to the steelmaking to utilize.

4.8.8 The furnace slag of reheating furnace, melting slag of flame scarfing machine and flame cutting machine, and sawing chip shall be sent into the steelmaking and ironmaking production lines to comprehensively utilize.

4.8.9 The dust and iron-containing dust sludge shall be comprehensively utilized.

4.8.10 The scale shall be used for the production of ferrosilicon alloy, production of reduction iron powder, and comprehensive utilization of chemical engineering industry in a high-added value way.

4.8.11 The iron oxide powder produced in the acid regeneration process shall be sent to other industries to comprehensively utilize after recycled. The high-quality iron oxide red product shall be deeply processed.

4.8.12 The zinc dust and zinc slag produced in the hot galvanizing production process shall be recycled to extract the zinc.

4.8.13 The cooling water of wire withdrawal machine shall be recycled after firstly cooled. The cooling blowdown water can be used for flushing steel wires in pickling procedure.

4.8.14 The ferrous sulfate and zinc sulfate-containing wastewater shall be recycled after neutralized and coagulated for cooling the wire withdrawal machine and the flushing of steel wires.

4.8.15 Part or all of high-pressure flushing water of pickling workshop and steel wire flushing water of continuous unit shall be recycled for pre-cleaning or pre-flushing the steel wires.

4.8.16 The produced phosphated slag in the phosphatation process of steel wires shall be recycled.

4.9 Metallurgical lime and refractory material

4.9.1 The raw limestone material shall be respectively calcined according to the particle size and property, and the fine particles can be used for steelmaking, sintering or other industries.

4.9.2 The washing water of raw limestone material shall be recycled after treated. The measures shall be taken to comprehensively utilize sludge.

4.9.3 The fine-particle limestone can be pressed into balls for steelmaking or prepared into fine powders as desulfurizers, and can also be sintered or utilized by other industries.

4.9.4 The collected limestone powder in each production step shall be mixed into the fine-particle limestone, and the lime powder shall be mixed into fine-particle lime.

4.9.5 When the lime is calcined in the metallurgical lime kiln, the gas with low calorific value shall be used.

4.9.6 The tail gas produced by the metallurgical lime kiln shall be comprehensively utilized.

4.9.7 The waste heat of tail gas produced by the refractory materialkiln shall be recycled.

4.9.8 When the metallurgical lime and refractory material enterprise builds new kiln or rebuilt the kiln, the energy-saving and environment-friendly unshaped refractory material shall be preferably used.

4.9.9 The fine powder and dust collected in the calcining process of magnesium sand and dolomite by gas or liquid fuel shall be recycled, and can be pressed into balls for steelmaking.

4.9.10 The waste billets in the production process of refractory products shall be returned back into melting procedure according to ratio.

4.9.11 The waste brick in the refractory product production process and the replaced and detached refractory materials of metallurgical kiln shall be recycled for unshaped refractory material, cement or brick-making particle raw materials.

4.9.12 During carbon burying heat treatment of refractory products, the coke breeze recycling device shall be installed.

4.9.13 The cooling water of equipment shall be recycled or utilized in cascade way by taking measures.

4.9.14 The resource comprehensive utilization produced by light-burnt dolomite can be designed according to the lime part in Article 4.9 of the code.

4.10 Ferroalloy

4.10.1 The totally-enclosed electric arc furnace gas shall be used as the synthesizing raw material and fuel in chemical industry, the gas bleeding shall be reduced, and the gas holder shall be built. The electric arc furnace gas shall be used by self, and the remaining part can be utilized for generating power.

4.10.2 The waste heat of semi-enclosed electric arc furnace gas shall be recycled for producing steam or generating power.

4.10.3 The waste heat of flue gas produced by the rotary kiln or sintering machine in the raw material pretreatment process shall be recycled.

4.10.4 The hot charge and hot mixing technology shall be adopted for the refining ferromanganese electric arc furnace, and the sensible heat shall be recycled.

4.10.5 The ferromanganese blast furnace gas shall be comprehensively utilized, and the blast furnace gas ash shall be used as the raw material for producing trimanganese tetroxide.

4.10.6 The waste liquid produced in the chromium hydroxide type metal chromium production process

shall be recycled.

4.10.7 The vanadium shall be recycled from the vanadium precipitation waste liquid produced in the wet vanadium pentoxide production process.

4.10.8 The flue gas with low concentration of sulfur dioxide produced by molybdenum ore roasting in the ferromolybdenum production process shall be recycled.

4.10.9 The recycled dust, smoke and powder in the production process of ferromanganese, ferrochrome and ferronickel shall be pelletized or directly returned into raw materials to prepare charge, and be comprehensively utilized.

4.10.10 The recycled furnace slag in the production process of ferromanganese, ferrochrome and ferronickel shall be used for building material industry.

4.10.11 The silicon dust produced in the production process of ferrosilicon by reduction electric arc furnace shall be comprehensively utilized.

4.10.12 The ferrotungsten dust produced in the smelting process of ferrotungsten shall be used as the tungsten resource and returned back into furnace to use, or be used for producing sodium tungstate.

4.10.13 The dust with high content of molybdenum produced in the smelting process of ferromolybdenum shall be returned back into furnace and be used as raw material.

4.10.14 The metal chromium extracting slag and vanadium pentoxide extracting slag can be respectively used as the raw materials for producing chromium and vanadium-containing pig iron.

4.10.15 After treating, the electrolytic manganese metal extracting slag shall be deposed or comprehensively utilized according to the related requirements of GB 18599 *Standard for Pollution Control on the Storage and Disposal Site for General Industrial Solid Wastes*.

4.10.16 The residues produced by scaling in the crude phosphor smelting process can be used for producing phosphoric acid and calcium superphosphate.

4.11 Carbon

4.11.1 The powder collected by dedusters in the raw material warehouse, secondary crushing proportioning and product processing procedures, and the crushed materials produced in the product processing process shall be returned back to proportion.

4.11.2 The recycled tar in the asphalt smoke in the asphalt melting, cooling, roasting and impregnating processes, and the coke breeze absorbing asphalt smoke can be mixed, kneaded and proportioned.

4.11.3 The coke and silicon carbide are separated from filling material of graphitizing furnace, and shall be comprehensively utilized.

4.12 Public and auxiliary facilities

4.12.1 The coal-fired boiler shall be designed according to the following requirements:

1 The fly ash and coal slag shall be comprehensively utilized according to the components, amount and market investigation results.

2 The coal-fired boiler using dry dedusting process shall be equipped with the original-form dry ash storage and transportation facilities with applicable scale according to the utilization path of fly ash.

3 The blast furnace gas shall be used for the self power plant of integrated iron and steel enterprise to generate power, and the full coal fire type power generation shall not be adopted.

4.12.2 The gas station shall be designed according to the following requirements:

1 The tar and tar residues recycled by gas station shall be comprehensively utilized.

2 The pulverized coal under sieve of gas station shall be recycled as fuel for boiler.

3 The furnace slag of gas generation furnace shall be utilized according to the specific conditions.

4 The gas cooling scrubbing water of gas station shall be recycled after firstly cleaned.

4.12.3 The large oxygenation unit shall be equipped with diluted gas recycling device.

4.12.4 The casting and machining shall be designed according to the following requirements:

1 The pickling waste liquid and waste oil produced by maintenance facilities shall be recycled.

2 The electroplating parts shall be rinsed by reverse cascade cleaning process; when the chromium-containing waste liquid and wastewater in the electroplating process are treated, the valuable components are firstly recycled.

3 The produced metal chips and leftovers produced by the maintenance facilities shall be stacked according to types; the large maintenance facilities with larger production amount of metal chips shall be equipped with baling or block pressing facilities.

4 The waste mold sand of large casting workshop shall be comprehensively utilized.

5 The furnace slag and dust sludge of casting steel smelting furnace and copula shall be comprehensively utilized after treated.

4.12.5 The carbide slag of acetylene generation station can be recycled according to local conditions.

4.12.6 The water treatment facility shall be designed according to the following requirements:

1 The circulating water shall be adopted for the cooling water of each procedure.

2 The whole factory shall build the production wastewater recycling station. The wastewater shall be comprehensively utilized after treated. The production wastewater deep treatment recycling facility shall be built.

3 The rainwater shall be recycled by the iron and steel enterprise. The rainwater utilization facility shall be installed according to the related requirements of current national standard, e.g. GB 50506 *Code for Design of Water Saving for Iron and Steel Enterprises*.

4.12.7 When the steam heating and heat medium of heating heat exchange station are used for steam heat exchange in the large workshops and auxiliary station, the condensate shall be recycled.

4.12.8 The solar energy and wind energy combined road lamps shall be installed for lighting on the factory roads.

4.12.9 Based on the demand of steam users on steam quality, the steam produced by waste heat recycling of whole factory shall be utilized according to the energy level matching principle, so as to reach the purposes of energy utilization by quality, temperature suitability, cascade utilization, and maximum utilization of heat.

4.12.10 Based on the demand of gas users on gas characteristics, the coke oven, blast furnace and converter gas shall be comprehensively utilized, so as to reach the purposes of high-level utilization with high quality, energy level matching, stable and order utilization, and high-efficiency coupling.

4.12.11 The oil-containing sewage of fuel warehouse, and the oil drained by residual oil shall be centrally collected, and then the water and oil shall be separated. The separated oil shall be recycled.

4.12.12 When a larger amount of water-containing waste oil is produced by the whole factory, the centralized waste oil regeneration station shall be installed.

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

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

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