

Foreword

According to the requirements of Document JIANBIAO [2011] No.17 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 in 2011' ". Letter of Standard Quota Department of the Ministry of Housing and Urban-Rural Development of the People's Republic of China on conducting the revision of Code for Design of Coal preparation Engineering, the drafting group of standard developed this standard through extensive investigation and study, careful summarization of practical experience and reference to relevant foreign standards and on the basis of widely soliciting for opinions.

The code consists of 18 chapters, covering: general provisions; basic requirements; raw coal receive and storage; screening, impurity extraction and crushing; coal preparation; dewatering, freeze-proofing and drying; coal slurry processing; storing and loading for coal production; general utilization of reject and coal slurry; measure and examination of coal; repairing for electro-mechanical; general layout; surface transportation; electric; water supply and drainage; heating and ventilation; buildings and structures; techno-economy, etc.

The main technical contents of this standard revision are:

1. Principle regulations on extra-large scale coal preparation plant, the model and parameter selection of new equipment and the arrangement of processes under special circumstances were added.
2. The working hour system, unbalance coefficient of equipment selection, and employee coefficient were revised.
3. Requirements on the selection of plant sites were added.
4. The chapter "Standard gauge rail transport" was replaced by "Surface hauling". In the meantime, the regulations on the selection of transportation, out-plant transportation and other types of transportation were added.
5. Detailed regulations on the power supply load classification of the coal preparation plant were added.
6. Relevant provisions concerning fire prevention in coal preparation plants were deleted.

The provisions printed in bold type are mandatory ones and must be implemented strictly.

This code is under the jurisdiction of the Ministry of Housing and Urban-Rural Development of the People's Republic of China, and BHEC is in charge of the explanation of technical specifications. In case of opinions and suggestions during implementation, please post them to BHEC (Address: No.67, Ande Road, Xicheng District, Beijing, PRC., Post code: 100120).

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Contents

1	General provisions	(1)
2	Basic requirements	(2)
3	Raw coal receive and storage	(4)
3.1	Receive coal	(4)
3.2	Raw coal storage	(4)
4	Screening, impurity extraction and crushing	(6)
4.1	Screening	(6)
4.2	Impurity extraction	(6)
4.3	Crushing	(7)
5	Coal preparation	(8)
5.1	General requirements	(8)
5.2	Jigging	(10)
5.3	Dense medium separation	(11)
5.4	Froth flotation	(12)
5.5	Other coal preparation methods	(13)
6	Dewatering, freeze-proofing and drying	(15)
6.1	Dewatering	(15)
6.2	Freeze-proofing and drying	(17)
7	Coal slurry processing	(19)
7.1	Coal slurry conveying and coarse slime hydraulic classification	(19)
7.2	Settling and thickening for slimes slurry	(20)
7.3	Accident slurry processing	(22)
8	Storing and loading for coal production	(24)
9	General utilization of reject and coal slurry	(25)
10	Measure and examination of coal	(26)
11	Repairing for electro-mechanical	(27)
12	General layout	(28)
13	Surface transportation	(32)
13.1	General requirements	(32)
13.2	Selection of transportation modes	(32)
13.3	Railway transportation	(33)
13.4	Road transportation	(35)
13.5	Other transportation modes	(35)
14	Electric	(36)
14.1	Power supply	(36)
14.2	Power distribution	(37)
14.3	Lighting	(38)
14.4	Lightning protection and grounding	(39)
14.5	Control	(40)

14.6	Automation	(42)
14.7	Monitoring and protecting	(42)
14.8	Communication	(43)
14.9	Industrial television system	(43)
14.10	Control network and computer information management system	(43)
15	Water supply and drainage	(45)
15.1	Source of water	(45)
15.2	Outdoor water supply and drainage	(45)
15.3	Indoor water supply and drainage	(49)
16	Heating and ventilation	(50)
16.1	Heating	(50)
16.2	Ventilation and dust extraction	(54)
16.3	Heat-supply pipeline in outdoor	(55)
17	Buildings and structures	(56)
17.1	General requirements	(56)
17.2	Main buildings	(57)
17.3	Ancillary buildings	(59)
18	Techno-economy	(60)
18.1	General requirements	(60)
18.2	Manpower quota	(60)
18.3	Investment estimation and budget estimation	(61)
18.4	Economic evaluation	(61)
18.5	Technical and economic comprehensive evaluation	(62)
Appendix A	Index of ancillary building area for coal preparation plant	(63)
	Explanation of wording in this code	(64)
	List of quoted standards	(65)

1 General provisions

1.0.1 This code is prepared with a view to implement the national technical and economic policies in the design of coal preparation engineering, unify and standardize the standards of coal processing and utilization technology and engineering construction, improve the quality of coal utilization, utilize resources reasonably, and meet requirements of energy saving, environmental protection and safety production.

1.0.2 This code is applicable to new construction, extension and renovation of coal cleaning, coal storage and blending projects of the preliminary feasibility study, feasibility study and design.

1.0.3 The coal preparation engineering shall be spread with the clean coal technology. Steam coal shall be sales after processing.

1.0.4 In addition to the requirements stipulated in this code, those stipulated in the current relevant standards of the nation shall be complied with in the process of preliminary feasibility study, feasibility study and design of coal preparation engineering.

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2 Basic requirements

2.0.1 The scale and designed capacity of coal preparation plants should be in accordance with those specified in Table 2.0.1.

Table 2.0.1 Scale and designed capacity

Scale	Designed capacity (Mt/a)
Super-large	10.00, 12.00, ≥ 15.00
Large-scale	1.20, 1.50, 1.80, 2.40, 3.00, 4.00, 5.00, 6.00, 8.00
Medium scale	0.45, 0.60, 0.90
Small scale	≤ 0.30

Note: Contents of raw coal is calculated in dry basis.

2.0.2 The working hours for coal preparation plants shall be 330d per year. The daily working hours shall be delimited by raw coal storage facilities. For the facilities after raw coal storage facilities, the daily working hours should be 16h. For the facilities before raw coal storage such as coal mine shaft and related coal preparation plant the working hours shall be in accordance with the mine shaft lifting hours. The daily working hours for other type coal preparation plants may be 16h.

2.0.3 The service life of coal preparation plants shall meet the requirements of provisions:

- 1 The service life for it shall be the same as that of the mine's.
- 2 The service life of group-mine's coal preparation plants shall be the same as that of the mine with the longest service life.
- 3 The service life of user's coal preparation plants shall be the same as that of the main projects.
- 4 The service life of other types of coal preparation plants shall be reasonably determined according to actual circumstances.

2.0.4 The unbalanced coefficient selection for processing capacity in sub-processes of a coal preparation plant shall meet the following provisions:

1 For the raw coal storage facilities shall be selected according to the following provisions on the basis of rated hourly capacity:

- 1) In case of the raw coal coming from mine shaft, the capacity of facilities between the mine mouth and the raw coal storage shall be consistent with the maximum lifting capacity of the mine.
- 2) In case of the raw coal supplied from standard gauge vehicles, the unbalanced coefficient of facilities from receiving pit to the raw coal storage should not be greater than 1.50. In case of using a dumper to unload coal, the processing capacity of facilities before raw coal storage facility shall be compatible with the capacity of the dumper.
- 3) In case of the raw coal supplied by vehicles, the capacity of facilities before raw coal storage facility shall be compatible with the capacity of coal receiving or coal unloading of the vehicle.

2 The raw coal storage facilities shall be selected according to the following provisions on the basis of rated hourly capacity:

1)The dense medium suspension system shall be 1.15;the coal slurry system shall be 1.35, and the reject system shall be 1.50.

2)The coal flow system, when lump coal and fine coal are selected, it shall be 1.25; otherwise it shall be 1.15.

2.0.5 The scarcity and specificity of coal resources shall be evaluated in the consulting and design stage of coal preparation engineering. All scarce and special coal shall be preparation. Scarce and special coal resources shall be used according to usage priority, and shall be restricted being used as fuel directly.

2.0.6 The power, heat source, water source and public facilities of group-mine's coal preparation plants and coal preparation plants shall be designed in union with the mine.

2.0.7 The closed circulation of washing water must be implemented in coal preparation plants.

2.0.8 The environmental protection, labor safety, industrial health, fire protection, energy-saving facilities and other projects shall be designed, constructed and put into operation at the same time with the main project.

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3 Raw coal receive and storage

3.1 Receive coal

3.1.1 The design of coal receiving pit or receiving vessel shall be in line with the following provisions:

1 The effective length of coal receiving pit/vessel, for the narrow gauge side and side bottom dumping car may be $1/3-1/2$ of the car length. The standard gauge for coal feeding may be confirmed based on the actual dumping requirement.

2 For the coal feeding for standard rail train, the effective volume of coal pit may be the net loading of wagon. There is no requirement on the storage capacity of shallow coal trough which may meet the coal receiving requirements.

3 The traction facilities shall be equipped on the coal pit or shallow coal trough for coal feeding with standard rail.

4 The unloading facilities shall be equipped for the vehicles with standard gauge, except for the hopper wagon.

5 It should not directly dump the coal transported by truck to the storage yard. It may use receiving pit. The effective volume for each receiving pit should not be lower than two times of truck transportation capacity.

6 A static grizzly with the size of $300\text{mm} \times 300\text{mm}$ should be equipped on the pit. In case of the lump coal feeding is bigger than 300mm , the specific lump material processing facilities shall be provided.

3.1.2 For the tippler with standard gauge, the receiving pit capacity shall not be lower than two times of net loading weight of dumping vehicle at one time.

3.2 Raw coal storage

3.2.1 There shall be set up raw coal storage facilities for coal preparation plant. Normally, the type of the storage facility is determined based on the capacity, coal feeding manner, topography, engineering geological condition and others after technological and economical comparisons. In case of processing with many seams and variations on the coal quality, the coal blending yard or other homogenization facilities should be set.

3.2.2 The total capacity of the raw coal storage and homogenization facilities shall be determined based on the design production capacity, transportation and marketing conditions, together with the coal product bunker size. It should be capacity of raw coal storage plus product storage to reach 3d to 7d of design capacity, and the capacity of raw coal storage shall not less than 1d of coal mine production.

3.2.3 In case of the bypass design adopted for the raw coal storage facility with large capacity, it should be set up an on-line raw coal storage bunker with the capacity no lower than 8h the design production capacity. The location of raw coal storage bunker should be between the pithead mouth feeder and raw coal preparation workshop.

3.2.4 There shall be less open-air raw coal storage for coal preparation plant and storage yard. For the coal preparation plant/storage yard closer to the town with denser population, the enclosed type raw coal storage shall be adopted. For other coal preparation plants in the open-air raw coal storage, the wind prevention and dust suppression methods shall be adopted.

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4 Screening, impurity extraction and crushing

4.1 Screening

4.1.1 The size for final screening shall be determined based on the requirement of coal quality, coal preparation process and user requirement after technological and economical comparisons, and shall be in line with GB/T 17608 *Division of Variety and Grading for Coal Products*. The size and efficiency for pre-screening and preparatory screening shall be confirmed based on process requirements.

4.1.2 The processing capacity of screening machinery of coal preparation plant may be referred in Table 4.1.2, or referred to the guarantee value of manufacturer.

Table 4.1.2 The processing capacity of screening machinery

Screen description	Screening method	Screening efficiency η (%)	Processing capacity[t/(m ² ·h)]										
			Aperture size (mm)										
			200	150	100	80	50	25	13	6	1.5	1	0.5
Circular vibrating screen	Dry method	>85	150-240	120-150	100-120	80-90	40-50	-	-	-	-	-	-
Inclined linear vibrating screen	Dry method	>85	-	-	-	-	40-50	30-40	15-25	7-10	-	-	-
		>60	-	-	-	-	40-50	20-30	10-15	10-15	-	-	-
	Wet method	>85	-	-	-	-	-	-	-	14-20	12-18	10-15	7-10
Horizontal linear vibrating screen	Dry method	>85	-	-	-	-	30-40	15-20	7-10	4-6	-	-	-
		>60	-	-	-	-	-	20-30	10-15	7-10	-	-	-
	Wet method	>85	-	-	-	-	-	-	-	12-16	10-14	9-12	6-8

Notes:1 It would be better that the relatively smaller value be selected for the processing capacity of dry method screening, when the moisture is bigger the or equal to 7%. Otherwise the bigger value could be selected.

2 The screening efficiency is inversely proportional to processing capacity, the higher the screening efficiency, the lower the processing capacity.

4.2 Impurity extraction

4.2.1 The hand-picking of gangues should not be coal preparation plant.

4.2.2 The setting of control hand picking shall be in line with the following rules:

1 The speed of hand-picked belt conveyor shall be lower than 0.3m/s.

2 The hand-picked belt conveyor should be arranged horizontally. In case of the inclined arrangement, the angle of inclination shall be lower than 12°.

4.2.3 Any requirements on the dirt percentage from the user, the mechanical removal and de-ironing facility should be provided.

4.3 Crushing

4.3.1 The crushing process shall be determined according to the upper limit of raw coal particle size, the upper limit of separation feed size and the crushing ratio of the selected crusher. Refer to Table 4.3.1 for Crusher processing capacity or for the guarantee value of the manufacturer.

Table 4.3.1 Crusher processing capacity

Equipment type	Tooth roller diameter (mm)	Maximum feeding size (mm)	Output size (mm)	Processing capacity/roller length [t/(m·h)]
Sizing crusher	500	<300	50-150	50-100
	650	<300	50-150	60-120
	800	<300	50-150	80-150
	1000	<350	50-150	100-200
Double-gear roller crusher	450	<200	50-100	40-80
	600	<300	50-150	50-100
	900	<300	50-150	70-140
Ring hammer crusher	650	<200	20	40-80
	800	<250	20	60-120
	1100	<250	30	100-200
	1100	<250	30	100-200

Notes: 1 Attention shall be that the crushing processing capacity is influenced by factors like feeding property (hardness, particle size and size composition), crushing ratio together with crusher tooth shape and other factors.

2 The crusher listed in Table 4.3.1 is for second-stage crusher, for one stage crusher refer to the guarantee value of manufacturer.

4.3.2 The de-ironing facility must be set up before the crusher feeding position.

4.3.3 In case there is no lump coal processing facilities in underground mine, the processing of lump coal (size: +300mm) may be provided before the raw coal storage.

5 Coal preparation

5.1 General requirements

5.1.1 The raw coal shall be separated and processed according to coal quality characteristics, user needs, economic benefits and environmental protection requirements. The quality of prepared products shall conform to the current national standard GB/T 17608 *Division of Variety and Grading for Coal Products*. The ash content of scarce coal products may be higher than other coal types. The utilization direction of scarce and special coal resources shall conform to the current national standard GB/T 26128 *Classification and Utilization of Scarce and Special Coal Resources*.

5.1.2 The top size of raw coal to be processed may be determined according to the coal preparation method and the permissible upper size of separation equipment.

5.1.3 The lower size for washing of scarce coking coal should be 0; for the non-scarce coking coal and blast furnace injection coal, the lower size for washing may be 0 if necessary; for the chemical and power coal the lower size for washing may be determined according to coal quality and comprehensive benefit.

5.1.4 The washability grade of raw coal shall be classified according the current national standard GB/T 16417 *Method for Evaluation the Washability of Coal*.

5.1.5 In case of the same separation density of each coal, while the difference of elementary ash and sulfur content is large or the coal type is different, the coal should be processed separately.

5.1.6 In Feasibility study and preliminary design, the representativeness of screening and float-and-sink test data shall be evaluated. When the data of screening and float-and-sink tests are not representative enough, they shall be adjusted according to the following provisions:

- 1 It may be adjusted based on the data from neighboring coal mine and coal preparation plant;
- 2 According to the factors such as geological report of coal field, mining method, transportation and lifting mode, the ash content of raw coal shall be predicted first, and then the data be adjusted.

3 When difference between the predicted ash content of raw coal and the ash content of screening data is less than 2%, the ash coefficient method may be used to correct the screening data. When the difference is greater than 2%, the ash content of each size fraction shall be adjusted according to the trend of ash distribution and the characteristics of gangue in the screening data.

5.1.7 The coal preparation method shall be determined according to the related factors such as the nature of raw coal, product requirements, separation efficiency, sales price, production cost and capital expenditure, and finally determined after comprehensive technical and economic comparison.

5.1.8 The calculation of coal preparation process products shall comply with the following provisions:

1 The actual distribution rate should be used in calculation of gravity separation product if the rate could be acquired, otherwise the normal distribution approximation method may be used.

2 The imperfection (I value) of air pulsating jig and moving sieve jig may be selected according to Table 5.1.8-1 or to the guaranteed value provided by the manufacturer.

3 The ecart probable moyen (E_p value) of dense medium separator and wind separator may be selected according to Table 5.1.8-2 or to the guaranteed value provided by the manufacturer.

Table 5.1.8-1 Imperfection of air pulsating jig and moving sieve jig

Size range of separation (mm)	Working conditions		Imperfection <i>I</i>
50 (100)–0.5	Primary jigging	Refuse section	0.14–0.16
		Middling section	0.16–0.18
	Jigging for secondary	–	0.18–0.20
50 (200)–13	Primary jigging	Refuse section	0.11–0.13
		Middling section	0.14–0.16
13–0.5	Primary jigging	Refuse section	0.18–0.20
		Middling section	0.20–0.22
	Jigging for secondary	–	0.22–0.25
300–50	Moving sieve jigging	Reject	0.09–0.11

Table 5.1.8-2 Possible deviation of dense medium separator and wind separator

Name of device	Working conditions	Possible deviation E_p
Dense-medium separator with inclined wheel, vertical wheel and scraper	Size range of separation > 13mm	0.02–0.04
Two-product dense-medium cyclone	(Primary) size range of separation > 0.5mm	0.03–0.05
	(Secondary) size range of separation > 0.5mm	0.04–0.06
Three-product dense-medium cyclone	Single-stage (primary) size range of separation > 0.5mm	0.03–0.05
	Two-stage (secondary) sorting grain size > 0.5mm	0.05–0.07
Slurry dense medium cyclone	Size range of separation 1.5mm–0.5mm	0.08–0.12
Wind separator	Size range of separation 80mm–6mm	0.23–0.28

4 The yield of flotation clean coal may be selected according to the test results of current national standard GB/T 4757 *Method for the Batch Flotation Testing of Fine Coal* or MT/T 144 *Method for Coal Preparation Laboratory Timed-Release Flotation Analysis*. It may also be selected according to the actual production flotation data of similar coal quality.

5 The imperfection (*I* value) of shaking table and spiral separator may be selected according to Table 5.1.8-3 or to the guaranteed value by manufacturer.

Table 5.1.8-3 Imperfection of table and spiral separator

Name of device	Size range of separation (mm)	Imperfection <i>I</i>
Shaking table	6–0	0.20–0.22
Spiral separator	3–0	0.20–0.25

6 The Ecart Probable Moyen (E_p value) of the teeter bed separator may be selected according to 0.11–0.14 or to the guaranteed value of manufacturer.

7 The percentage of secondary slime in the raw coal may be determined by the sliming test of

coal and refuse, or referred by the actual production index of the adjacent coal preparation plant.

5.1.9 The selection of process equipment shall comply with the following requirements:

- 1 It shall be advanced in technology and reliable in performance.
- 2 It shall be economical and practical, and shall integrate the factors of energy saving, lifetime and spare parts.
- 3 Noise should be less than 85dB.

5.1.10 The thickener underflow pump shall be installed by 100% standby on line, other types of pumps may not be standby, or spare one of the same type in storehouse.

5.1.11 The process layout shall comply with the following requirements:

- 1 The layout shall be compact and reasonable, and the functional zoning shall be clear.
- 2 It shall facilitate the maintenance of equipment and leave necessary space and passage.
- 3 It shall be convenient for production operation and management.

5.2 Jigging

5.2.1 The processing capacity of jig may be selected according to Table 5.2.1 or to the guaranteed value of the manufacturer.

Table 5.2.1 Jig handling capacity

Operating conditions		Unit width processing capacity [t/(m·h)]	Unit area processing capacity [t/(m ² ·h)]
Air pulsating jig	Preparation of unsized feed	80-100	13-18
	Lump coal feed	90-110	14-20
	Fine coal feed	50-70	10-14
	Re-washing	50-70	10-14
Refuse discharge by moving screen jig		80-110	40-70

Notes: 1 In case of single-stage jig is used for refuse discharge, the handling capacity may be determined according to the unit width index.

2 For the handling capacity of jig per unit width (area) index, bigger value should be taken for easy-to-wash coal and smaller value for difficult-to-wash coal.

5.2.2 Whether or not the buffer bin is set before the feeding moving sieve jig shall be determined according to the coal quality and system configuration. When the raw coal feeding system can ensure the continuous and stable feeding of the jig, the buffer bin may be canceled. When the raw coal feeding system could not guarantee the continuous and stable feeding of the jig, the buffer bin shall be set up, and its effective capacity shall be the processing capacity of the jig for 5 minutes to 10 minutes. Whether or not the buffer bin is set before the feeding moving sieve jig shall be determined according to the coal quality and system configuration.

5.2.3 The circulating water quantity for jig should meet the requirements of Table 5.2.3.

Table 5.2.3 Water consumption quantity for jig separation

Operating conditions	Air pulsating jig				Moving screen jig
	Unsized coal	Lump coal	Fine coal	Re-washing	Refuse discharge
Circulating water quantity (m ³ /t)	2.5-3.0	3.0-3.5	2.0-2.5	3.0-3.5	10m ³ /(m ² ·h)-20m ³ /(m ² ·h)

5.2.4 The working air pressure and air volume of jig should meet the requirements of Table 5.2.4.

Table 5.2.4 Working air pressure and air volume of jig

Operating conditions	Air pressure (MPa)	Air volume [$\text{m}^3/(\text{m}^2 \cdot \text{min})$]
Unclassified coal	0.035-0.050	4-6
Lump coal	0.040-0.050	5-7
Fine coal	0.035-0.050	3-5
Re-washing	0.035-0.050	3-5

Note: When the column slide valve is used for separating lump coal, the air volume index may be increased by $1.5\text{m}^3/(\text{m}^2 \cdot \text{min})$.

5.3 Dense medium separation

5.3.1 The processing capacity of inclined (vertical) wheel dense-medium separator and H.M vessel may be selected according to Table 5.3.1 or to the guaranteed value provided by manufacturer.

Table 5.3.1 Processing capacity of inclined (vertical) wheel dense-medium separator and heavy medium (H.M) vessel

Sorter	Unit processing capacity per meter bath width [$\text{t}/(\text{m} \cdot \text{h})$]	Suspension circulation quantity per meter bath width [$\text{m}^3/(\text{m} \cdot \text{h})$]
Inclined (vertical) wheel dense-medium separator	70-100	80-100
H.M vessel	70-100	175-200

5.3.2 The feed height difference of raw coal for non-pressurized dense-medium cyclone should not be less than 1.5m. Pump or head tank may be used to feed raw coal for pressurized heavy medium cyclone. The feeding pressure, processing capacity and suspension circulation quantity of dense-medium cyclone may be selected according to Table 5.3.2 or guaranteed by manufacturer.

Table 5.3.2 Standard feeding pressure, processing capacity and suspension circulation quantity of dense-medium cyclones

Parameter	Condition	Index	Remarks
Feed pressure (m slurry column)	Raw coal dense medium cyclone	$9D-15D$	D is the diameter (m) of the cylinder section of cyclones
	Slurry dense medium cyclone	$30D-45D$	
Dry coal processing capacity [$\text{t}/(\text{m}^2 \cdot \text{h})$]	Raw coal dense medium cyclone	200-320	Processing capacity per unit time, unit cylinder cross section (m^2) of cyclones
Slurry treatment capacity [$\text{m}^3/(\text{m}^2 \cdot \text{h})$]	Slurry dense medium cyclone	1000-1500	
Heavy medium circulation per ton of coal (m^3)	Raw coal dense medium cyclone	2.5-4.5	Take max value for three-product dense-medium cyclone

Notes: 1 Take bigger value for the non-pressure feeding pressure cyclone, and the smaller value for the pressure feed cyclone.

2 When the content of heavy products is high, take smaller value for processing capacity.

3 When producing low ash products, the medium circulation quantity is taken for higher value.

5.3.3 The upper size of feed shall be controlled in the separation process of heavy medium cyclone. The density of heavy medium suspension shall be measured and adjusted automatically.

5.3.4 In addition to the heavy products of lump coal dense medium separation, the products processed by dense medium separation should be preliminary H.M-drained by fixed or sieve bend before entering H.M drain screen; water spraying device shall be installed above the H.M drain screen, and double-deck screen should not be used. The handling capacity, spray water volume and pressure on H.M drain screen may be selected according to Table 5.3.4 or to the guaranteed value provided by the manufacturer.

Table 5.3.4 Processing capacity, spray volume and spray pressure of H.M drain screen

Name	Screen aperture (mm)	Processing capacity [t/(m ² ·h)]		processing capacity [t/(m ² ·h)]		Sprinkler volume		Sprinkler pressure (MPa)
		Deslimed	Undeslimed	Deslimed	Undeslimed	(m ³ /t)	(m ³ /m)	
Lump coal	0.5 (1.5)	10-18	-	60-90	-	0.5-1.0	23-33	0.15-0.30
Mixed coal and fine coal	0.5	5-9	4-7	30-45	24-36	1.0-2.0	35-50	
	1.0	8-14	6-11	45-55	36-48			
	1.5	9-16	7-13	50-65	42-55			

5.3.5 The magnetite recovery of magnetic separator shall not be less than 99.8%.

5.3.6 When magnetite powder is used as aggravating material, its magnetic content shall not be less than 95%, and its density shall not be less than 4.5t/m³. The size of magnetite powder shall conform to the following provisions:

1 The particle size of magnetite powder for separating lump coal by inclined (vertical) wheel and H.M vessel separator shall be that its 0.074mm content shall account for more than 90%.

2 The particle size of magnetite powder used in the separation of heavy medium cyclone shall be that its 0.045mm content shall account for more than 85%.

5.3.7 A coal preparation plant adopting dense medium coal preparation process shall have magnetite powder storage, whose effective capacity may be determined according to market and transportation conditions, or according to the following provisions:

1 0.5 month to 1 month magnetite powder consumption in general.

2 1.5 months to 2 months magnetite powder consumption in inconvenient transportation areas.

3 4 months to 5 months magnetite powder consumption in cold area.

5.3.8 The technical consumption of magnetite powder for separating every ton of coal shall be less than 0.8kg for lump coal and less than 2.0kg for mixed coal and fine coal.

5.4 Froth flotation

5.4.1 The processing capacity of flotation equipment should be tested by unit flotation rate test as per GB/T 4757 *Method for the Batch Flotation Testing of Fine Coal* and calculated by 2.5 times of the flotation time determined by the test. When there is no test data, its processing capacity may be determined by Table 5.4.1 or by the guaranteed value provided by manufacturer, and checked by the actual flotation time of the same kind of coal.

Table 5.4.1 Processing capacity of flotation equipment

Equipment type	Processing capacity	
	Flotation cell	Dry coal [t/(m ³ ·h)]
Coal slurry throughput [m ³ /(m ³ ·h)]		7–12
Flotation column	Dry coal [t/(m ² ·h)]	1.5–2.5
	Coal slurry throughput [m ³ /(m ² ·h)]	20–30

Notes: 1 The processing capacity of flotation cell is the capacity per unit volume calculated by the total volume of flotation machine.

2 The capacity of flotation column is calculated by the area of cylindrical section, and that of rectangular column (flotation bed) is calculated by the area of its inner tangential circle.

3 When the feed slurry concentration is below 80g/L, the slurry treatment capacity may be used as the selection index, and the slurry capacity on dry coal basis should be used as the check index.

4 For easy-to-float coal feed, take bigger value and lower feed concentration take bigger value.

5.4.2 The capacity of flotation reagent box in workshop may be determined according to the consumption of 0.5d to 1.0d. The volume and layout requirements of flammable flotation reagent box shall conform to the current regulations of coal industry on fire prevention.

5.4.3 Flotation reagent station may be composed of reagent storage tank and oil pump, and bulk reagent pool shall be set up if necessary. The capacity of reagent storage tank should not be less than 15 days of reagent consumption. When using standard gauge tanker to transport reagent, the total capacity of reagent storage tank shall be larger than that of two tanker trucks.

5.4.4 Before the flotation machine, the mixing and mineralization facilities or devices shall be set up.

5.4.5 The dosage of flotation reagent may be selected according to the test results of flotation reagent ratio in laboratory or the actual production dosage in similar coal preparation plants.

5.5 Other coal preparation methods

5.5.1 The shaking table or spiral separator may be used for the removal of pyrite and ash from coarse coal slime with easy-to-wash and medium-to-wash coal. Dry separation (pneumatic cleaning) or drum separator may be used for coal washing projects in water-deficient areas, or in dealing with dirty and miscellaneous coal or in pre-de-ashing of high ash raw coal. The processing capacity of shaker, spiral and compound dry separator may be selected according to Table 5.5.1 or to the guaranteed value provided by manufacturer. The processing capacity guaranteed by the manufacturer of the drum separator may be used.

Table 5.5.1 Processing capacity of shaker, spiral and compound dry separator

Name	Size (mm)	Feed concentration (%)	Surface moisture (%)	Processing capacity [t/(m ² ·h)]
Shaker	0–6	30–40	–	0.5–1.0
	0–1	30–35	–	0.25–0.40
Spiral separator	0–3	30–40	–	2.5–4.0
Compound dry separator	0–50 (80)	–	<7	8–10

Notes: 1 The processing capacity of shaking table is single deck per unit area.

2 The processing capacity of spiral separator is the processing capacity of single head unit projection area.

5.5.2 Teeter bed separator (TBS) may be used for the separation of coarse slime. Its processing capacity and circulating water quantity may be selected according to Table 5.5.2 or the guaranteed value provided by manufacturer.

Table 5.5.2 Processing capacity and circulating water consumption of teeter bed separator (TBS)

Feed concentration (%)	Unit area processing capacity [t/(m ² ·h)]	Circulating water consumption per unit area [m ³ /(m ² ·h)]
40-60	15-20	15-20

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6 Dewatering, freeze-proofing and drying

6.1 Dewatering

6.1.1 Dewatering screen may be used for product dewatering, and sieve bend or fixed screen may be set before dewatering screen for pre-dewatering. The desliming screen may be used for desliming of fine cleaned coal, and water spraying device should be installed above the desliming screen. The processing capacity of dewatering and desliming screens and the moisture content of the sieves may be selected according to Table 6.1.1 or the guaranteed value provided by manufacturer.

Table 6.1.1 Processing capacity for dewatering screen and desliming screen and the oversize moisture

Aperture of screen (mm)	Parameters	Indicators		
		Dewatering and classification for clean coal	Dewatering and desliming of fine coal	Dewatering of coarse slime
13	Processing capacity[t/(m ² ·h)]	14-20	-	-
	Moisture content of oversize (M_t , %)	8-10	-	-
1.0	Processing capacity[t/(m ² ·h)]	-	9-15	-
	Moisture content of oversize (M_t , %)	-	12-15	-
0.75	Processing capacity[t/(m ² ·h)]	-	8-13	-
	Moisture content of oversize (M_t , %)	-	12-16	-
0.5	Processing capacity[t/(m ² ·h)]	-	6-10	3-5
	Moisture content of oversize (M_t , %)	-	13-18	18-23
0.35	Processing capacity[t/(m ² ·h)]	-	-	1.5-2.5
	Moisture content of oversize (M_t , %)	-	-	23-28

6.1.2 The centrifuge shall be used for final dewatering of fine clean coal and fine middling. Centrifuge processing capacity and product moisture may be selected according to Table 6.1.2 or to guaranteed by the manufacturer.

Table 6.1.2 Processing capacity of centrifuges and product moisture

Equipment type	Specifications	Feed size (mm)	Processing capacity (t/h)	Product moisture (M_t , %)
Discharge of vertical scraper	φ700	0.5-13	30-50	5-7
	φ900	0.5-13	50-70	5-7
	φ1000	0.5-25	70-100	5-7
	φ1150	0.5-25	100-150	5-7
Horizontal vibration	φ1000	0.5-25	60-100	6-8
	φ1200	0.5-13	140-160	6-8
		0.5-50	160-180	5-7

Table 6.1.2(continued)

Equipment type	Specifications	Feed size (mm)	Processing capacity (t/h)	Product moisture (M_f , %)
Horizontal vibration	φ1400	0.5-13	180-200	6-8
		0.5-50	200-240	5-7
	φ1500	0.5-13	240-290	6-9
		0.5-50	280-350	5-9

Note: The moisture content of the product is related to the feeding conditions such as feeding quantity, moisture content and particle size.

When the content of fine grain is higher, the moisture content of the product should be on the high side.

6.1.3 The handling capacity of dewatering basket shall be calculated according to the type of transport materials, filling coefficient and lifting speed adopted. It may also be selected according to Table 6.1.3.

Table 6.1.3 Processing capacity and product moisture of dewatering bucket elevator

Job category	Lifting speed (m/s)	Dewatering time (s)	Filling coefficient	Processing capacity [t/(m·m·h)]	Angle of inclination (degree)	Product moisture (M_f , %)
Final dewatering	0.16	45-50	0.50-0.75	60-120	<65	22-27
Pre-dewatering	0.27	20-25	0.50-0.75	100-200	<70	28-30

Note: The processing capacity of dewatering basket indicates the processing capacity of unit time, unit bucket width and unit bucket spacing. Pre-dewatering takes a larger value, and final dewatering takes a smaller value.

6.1.4 The coal slime products may be dewatered by pressure filter, sedimentation filter centrifuge, coal slurry centrifuge, quick-opening diaphragm filter press, box filter press, belt filter press, high-frequency vibration screen and other equipment. The processing capacity and product moisture of filters, filter presses, centrifuges and other equipment should be selected according to the test values of the treated materials, and also according to Table 6.1.4-1-Table 6.1.4-3 or to the guaranteed value provided by manufacturer. High frequency vibrating screen may be selected according to Table 6.1.1 of this specification or to the guaranteed value provided by manufacturer.

Table 6.1.4-1 Processing capacity and product moisture of filters and presses

Name of device	Material handled	Feed concentration (g/L)	Processing capacity	Product moisture (M_f , %)	Working pressure (MPa)
Press filter	Cleaned coal	200-250	0.4t/(m ² ·h)-0.8t/(m ² ·h)	16-18	0.35-0.50
	Coal slurry	350-500	0.3t/(m ² ·h)-0.6t/(m ² ·h)	18-22	0.35-0.50
Box filter press	Tailing coal	350-500	0.01t/(m ² ·h)-0.02t/(m ² ·h)	22-26	0.25-0.35
	Coal slurry	350-500	0.02t/(m ² ·h)-0.03t/(m ² ·h)	20-24	0.25-0.35
Quick-opening diaphragm filter press	Cleaned coal	200-250	0.05t/(m ² ·h)-0.07t/(m ² ·h)	18-23	0.5-0.7
	Coal slurry	350-500	0.03t/(m ² ·h)-0.06t/(m ² ·h)	20-24	0.5-0.7
Belt pressure filter	Cleaned coal	>100	3.0t/(m·h)-4.5t/(m·h)	23-28	-
	Coal slurry	>100	1.5t/(m·h)-3.5t/(m·h)	25-30	-

Table 6.1.4-2 Processing capacity and product moisture of settlement filter and settlement centrifugal

Equipment specification	Material handled	Feed concentration (%)	Processing capacity (t/h)	Product moisture (M_f , %)
$\phi 900 \times 1800$	<1mm coal slurry	25-35	5-10	15-24
$\phi 900 \times 2400$	<1mm coal slurry	25-35	7-12	15-24
$\phi 1100 \times 2600$	<1mm coal slurry	25-35	13-15	15-24
$\phi 1100 \times 3400$	<1mm coal slurry	25-35	20-25	15-24
$\phi 1400 \times 1800$	<1mm coal slurry	25-35	25-30	15-24
$\phi 1800 \times 4000$	<1mm coal slurry	25-35	40-50	14-20

Table 6.1.4-3 Processing capacity and product moisture of slurry centrifuge

Specification	Material handled	Feed concentration (%)	Processing capacity (t/h)	Product moisture (M_f , %)
$\phi 700$	<3mm coal slurry	>35	8-13	15-22
$\phi 900$	<3mm coal slurry	>35	13-20	15-22
$\phi 1000$	<3mm coal slurry	>35	20-30	15-22
$\phi 1200$	<3mm coal slurry	>35	30-50	15-22

6.1.5 A Pressure filter shall be equipped with air compressors and other supporting equipment. Air compressor outlet pressure and air consumption should meet the relevant requirements of the manufacturer, and it may also be selected according to Table 6.1.5.

Table 6.1.5 Air pressure and air consumption for pressure filter

Pressure filter	
Air compressor outlet pressure (MPa)	Air consumption [$\text{m}^3/(\text{m}^2 \cdot \text{min})$]
0.45-0.60	0.8-1.2

6.2 Freeze-proofing and drying

6.2.1 When the external moisture of clean coal may not meet the user's requirements, it is necessary to set up facilities for air drying or drying. When the external moisture of clean coal is greater than 8% and the total moisture of slime is greater than 28%, in cold or bitter cold areas, product drying or freeze-proof measures treatments shall be selected according to the flow direction and transport distance of clean coal.

6.2.2 In cold or bitter cold areas, the product shall be loaded with antifreeze spray as an antifreeze measure, the dosage of antifreeze reagent should be 0.9kg to 1.2kg per ton of coal. The reserve of antifreeze reagent may be determined as 10 days to 15 days of consumption.

6.2.3 Automation and centralized control shall be adopted in the thermal control system for the drying workshop.

6.2.4 The exhaust waste gas emission concentration of drying workshop shall meet the relevant provisions of the current national standards GB 20426 *Emission Standard for Pollutants of Coal Industry* and GB 13271 *Emission Standard of Air Pollutants for Boiler*.

6.2.5 The airtight cover must be installed at the transportation and transfer places of dried products, and corresponding dust removal measures should be taken.

6.2.6 According to the characteristics of drying equipment, corresponding safety measures must be taken in drying workshop such as fire prevention and explosion protection.

6.2.7 The processing capacity of dryer should be selected according to Table 6.2.7 or to the guaranteed value provided by manufacturer.

Table 6.2.7 Dryer processing capacity

Type of dryer	Evaporation intensity [kg/(m ³ ·h)]	Drying medium temperature (°C)	Feed moisture (%)	Processing capacity	Product moisture (M _f , %)
Drum type	80-90	700-750	27-30	0.35t/(m ³ ·h)-0.45t/(m ³ ·h)	8-12
Crusher and dryer	-	450±50	25-28	10t/(m·h)-12t/(m·h)	<13

Notes: 1 The processing capacity of drum dryer is the volume per drum in unit time.

2 The processing capacity of the slime crusher and dryer is the amount of processing per unit width of perforating mesh plate in a unit time.

6.2.8 Corresponding anti-freezing measures may be taken in the pipeline network for outdoor liquid transportation in severe cold areas as per needs.

7 Coal slurry processing

7.1 Coal slurry conveying and coarse slime hydraulic classification

7.1.1 The transportation of coal slurry shall comply with the following provisions:

1 Transport method may be pressure flow method or gravity flow method, and gravity flow method shall be adopted when conditions permit.

2 The flow velocity of coal slurry shall be greater than the critical flow velocity and less than the maximum flow velocity. The slope of the gravity flow tube or canal with steady flow rate should not be less than 15‰. The slope of the gravity flow tube or canal without steady flow rate shall be greater than 15‰.

7.1.2 The model selection of pump and pipeline layout of coal slurry system shall comply with the following requirements:

1 The model selection of circulating water pump and clarified water pump shall be carried out separately, according to the difference of separation system or water supply pressure.

2 All kinds of pumps should be adopted as pressurized water suction method, the suction pipes of pumps should be set separately. In the suction pipes of pumps, eccentric reducing pipes shall be used and the discharge pipes controlled by valves shall be set up.

3 Valves shall be installed in the suction pipes of pump, and the suction valves of pumps shall not be used to regulate the flow rate of the pump. The valves or check valves installed in the outlet pipes of pump, may be determined according to the specific conditions.

4 The outlet pipes of underflow pump of thickener and flushing drainage pump should be laid overhead. When buried settings is adopted, inspection wells shall be set on elbows, tees or four links and straight lines at 25m intervals.

7.1.3 The layout of circulating pond and clarifying pond shall be carried out in a unified way combining the layout of thickening pond and coal slurry settling pond, and is better to be designed as two divisions which are interconnected and should be used independently. The effective capacity of circulating pond and clarifying ponds shall be determined according to the regulating volume and other factors, and the effective capacity should be the amount of 10 minutes to 15 minutes of the pump flow rate.

7.1.4 The selection of valve opening mode in various pipelines shall comply with the following provisions:

1 In case of high degree automation is needed, the valves used for centralized control system shall be selected as electric-driven valves or electronically controlled pneumatic (hydraulic) valves.

2 The valves with nominal diameter greater than or equal to 250mm, or which need frequent on-off, or installed in higher position and inconvenient for operation, should be selected as electric-driven valves or electronically controlled pneumatic (hydraulic) valves.

3 When nominal diameter is less than 250mm and installed in higher position, inconvenient to operate, or automation is required, electric valves or electronically controlled pneumatic (hydraulic) valves may be used.

7.1.5 The processing capacity of hydraulic cyclone classifier may be selected according to Table 7.1.5-1,

or to the guaranteed value provided by manufacturer. The processing capacity of dredging sump, spitzkasten, inclined plate depositing tank may be selected according to Table 7.1.5-2, or to the guaranteed value provided by manufacturer.

Table 7.1.5-1 The processing capacity of hydraulic cyclone classifier

Diameter (mm)	150	200	250	300	350	500
Feed pressure (MPa)	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
Cone angle (°)	15	20	20	20	20	20
Feeding size (mm)	<3	<3	<3	<3	<3	<3
Classification size (mm)	0.03-0.07	0.035-0.100	0.04-0.15	0.05-0.15	0.06-0.20	0.1-0.5
Processing capacity (m ³ /h)	10-25	15-40	20-50	30-80	40-100	80-200

Table 7.1.5-2 The processing capacity of dredging sump, spitzkasten, inclined plate depositing tank

Name of facility	Materials	Processing capacity[m ³ /(m ² ·h)]	Classification size (mm)
Dredging sump	Fine cleaned coal	15-20	0.3-0.5
Spitzkasten	Coarse slime	15-20	0.3-0.5
Inclined plate depositing tank	Coarse slime	30-40	0.3-0.5

7.1.6 The production waste water of coal preparation plant shall be collected into slurry system, and be recycled after settling treatment.

7.1.7 The treatment of indoor flushing drainage shall comply with the following provisions:

- 1 When there is coal cleaning system, it should enter the coal slurry processing system of the coal cleaning system.
- 2 When there is no coal cleaning system, it may enter underground drainage purification station for treatment, or separated water treatment facilities set up independently.
- 3 When conditions permit, the indoor flushing water supply and drainage system of the whole plant shall be an independent closed-circuit circulation system by oneself.

7.1.8 The rainwater around the open stockpile shall be collected and be reused or discharged to the outside after settling treatment.

7.2 Settling and thickening for slimes slurry

7.2.1 For settling and thickening for slime, slime thickener shall be the first choice. When meeting the requirements of environmental protection, slime settling pond may also be used.

7.2.2 Mixed reaction facilities may be set up before settling and thickening for coal slime. The mixing reaction time of slurry with flocculating agent or agglomerating agent may be determined by test or similar operation data.

7.2.3 The selection of thickener or settling tower shall be determined according to the falling speed of slime, combining with argillization and hydrophobicity characteristics. The effective settling area may be determined by surface hydraulic loading rate method or classification size method. The effective utilization coefficient of the settling area for thickener or settling tower may take 0.90-0.95.

7.2.4 When selecting the thickener or settling tower according to the surface hydraulic load rate, the calculation shall be based on the minimum falling speed and safety factor derived from the test. In the

absence of relevant information, the following provisions should be followed:

1 For coal slurry with medium falling speed, the values of the surface hydraulic load rate may be taken according to Table 7.2.4.

Table 7.2.4 The values of the surface hydraulic load rate for slime with medium falling speed

Name of facility	The surface hydraulic load rate [m ³ /(m ² ·h)]	
	Primary coal slurry	Flotation tailing
Ordinary thickener	2.0-3.0	0.8-1.2
Settling tower	3.0-4.5	1.2-1.8
Inclined tube and inclined plate thickener	4.0-6.0	1.6-2.4
Deep cone thickener	5.0-7.5	2.0-3.0

Note: The values of the surface hydraulic load rate in the table is the data of adding flocculating agent or agglomerating agent.

2 For the coal slurry which is easy to fall, its surface hydraulic load rate may be calculated as 1.20 times to 1.50 times of the coal slurry with medium falling speed.

3 For the coal slurry which is difficult to fall, its surface hydraulic load rate may be calculated by 25%-75% of the coal slurry with medium falling speed, and may also be determined by similar actual operation data.

7.2.5 When selecting the thickener according to the classification size method, the equipment selection shall conform to the following provisions:

1 For coal slurry with medium falling rate added by flocculating agent or agglomerating agent, the thickening area index of ordinary thickener may be selected by Table 7.2.5 according to the actual classification size.

Table 7.2.5 The thickening area index of ordinary thickener

Feed solid-liquid ratio	Classification size (0.05mm/0.10mm)									
	Thickening area index[m ² /(t·h)]									Overflow concentration (g/L)
	Underflow solid-liquid ratio									
	1:10	1:8	1:6	1:5	1:4	1:3	1:2	1:1		
1:100	85.4/21.4	87.6/22.0	89.5/22.4	90.5/22.6	91.4/22.8	92.3/23.1	93.3/23.3	94.2/23.6	1.05/4.20	
1:75	62.5/15.6	64.4/18.0	66.3/16.5	67.3/16.8	68.3/17.0	69.2/17.3	70.2/17.5	71.2/17.8	1.04/4.17	
1:50	38.8/9.8	40.8/10.3	42.7/10.7	43.7/11.0	44.6/11.2	45.6/11.5	46.6/11.7	47.6/12.0	1.03/4.10	
1:40	29.7/7.4	31.7/7.9	33.7/8.4	34.6/8.7	35.6/8.9	36.6/9.1	37.6/9.4	38.6/9.6	1.01/4.05	
1:25	15.5/3.9	17.5/4.4	19.6/4.9	20.6/5.2	21.6/5.4	22.7/5.8	23.7/5.9	24.8/6.2	0.97/3.88	
1:20	10.5/2.6	12.6/3.2	14.7/3.7	15.8/4.0	16.8/4.2	17.9/4.5	19.0/4.8	20.0/5.0	0.95/3.78	
1:15	5.6/1.4	7.8/2.0	10.0/2.5	11.7/2.8	12.2/3.1	13.3/3.4	14.4/3.6	15.6/3.9	0.95/3.68	
1:12	2.3/0.6	4.7/1.2	7.0/1.8	8.1/2.1	9.4/2.4	10.5/2.6	11.7/2.9	12.9/3.2	0.85/3.42	
1:10	-	2.5/0.6	4.9/1.2	6.2/1.6	7.4/1.9	8.7/2.2	9.9/2.5	11.1/2.8	0.81/3.24	

Table 7.2.5(continued)

Feed solid-liquid ratio	Classification size (0.05mm/0.10mm)								
	Thickening area index[m ² /(t·h)]								Overflow concentration (g/L)
	Underflow solid-liquid ratio								
	1:10	1:8	1:6	1:5	1:4	1:3	1:2	1:1	
1:9	-	1.3/0.3	3.9/1.0	6.15/1.3	6.4/1.6	7.7/2.0	9.0/2.3	10.3/2.6	0.78/3.10
1:8	-	-	2.7/0.7	4.0/1.0	5.4/1.4	6.7/1.7	8.1/2.0	9.4/2.4	0.75/2.98
1:7	-	-	1.5/0.4	2.9/0.7	4.3/1.1	5.7/1.5	7.2/1.8	8.6/2.2	0.70/2.78
1:6	-	-	-	1.6/0.4	3.2/0.8	4.7/1.2	6.3/1.6	7.9/2.0	0.63/2.54
1:5	-	-	-	-	1.8/0.5	3.7/0.9	5.3/1.4	7.4/1.8	0.54/2.13
1:4	-	-	-	-	-	2.5/0.6	4.9/1.2	7.3/1.1	0.41/1.64

2 For the coal slurry which is easy to fall or difficult to fall with flocculating agent or agglomerating agent, the thickening area index of ordinary thickener may be adjusted on the basis of the coal slurry with medium falling speed according to test data or similar actual production conditions.

7.2.6 In severe cold or serious wind and sand areas, the thickener or settling tower should not be installed in open air.

7.2.7 The buffer facilities may be installed before the thickener feedings. The volume of feeding buffer facilities shall be able to meet the requirements for stable feeding pressure and stable feeding flow, and shall have the functions of degassing and debris removal.

7.2.8 The clearance of the supporting grid of inclined tube or inclined plate in inclined tube or inclined plate thickener, should not be less than the diameter of aperture of inclined tube or the spacing of inclined plate.

7.2.9 Triangular weir shall be used for overflow of thickening pond, and broad crested weir must not be used.

7.2.10 Flushing water pipes shall be installed on the underflow pipes of the thickener or settling tower, and the outlet pressure shall not be less than 0.3MPa. The flushing water shall be directed from the circulating water or the flushing pump, and a back-pressure valve shall be equipped.

7.2.11 When flocculating agents or agglomerating agents are added, reagent preparation and storage facilities shall be set up. The reagent storage facilities shall be able to store drug consumption for 7 days to 15 days.

7.3 Accident slurry processing

7.3.1 Coal preparation plant must set up the treatment link of coal slurry system accident.

7.3.2 The selection of coal slurry system accident treatment facilities shall comply with the following provisions:

1 The emergency thickener should be selected, or the emergency slurry settling pond may be selected also.

2 The emergency thickener shall be of the same type as the largest working thickener, and they may be used as standby for each other. When the conditions are limited, the emergency thickening pond without thickener may also be used.

3 When choosing the emergency slurry settling pond, its effective volume shall be 1.2 times to 1.5 times that of the largest coal slurry equipment in the coal preparation plant. The clarifying pond may not be set up for the emergency slurry settling pond.

4 The coal slurry in accidental thickener shall be returned to the slurry system in time after the accident has been solved.

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8 Storing and loading for coal production

8.0.1 Coal bunkers or closed coal storage yards shall be used for storage of selected products. The storage and loading of products shall be determined according to the terrain, engineering geology, transportation volume, transportation mode and product variety, after technical and economic comparison.

8.0.2 The capacity and loading mode of product coal bunker and closed coal storage yard shall comply with the following provisions:

1 The selection of available capacity of product coal bunker and closed coal storage yard shall comply with the following provisions:

1) For the large and medium-scale coal preparation plants, it should adopt 1.0d selected product quantity.

2) It should adopt 0.5d to 1.0d selected product quantity for super large coal preparation plant.

3) In areas where transportation is inconvenient, it should adopt take 1.0d–2.0d of post-election product volume; the effective total capacity of coal product bunker and closed coal storage yard shall meet the net load of 1.2 times to 1.5 times designed train set.

2 The product storage bunker and closed coal storage yard shall be set up according to the product variety and meet the loading requirements.

3 Single-point loading or multi-point loading may be used for the loading of product coal, and loading-unloading coal facilities and flatting car facilities shall be set up near track scale or truck scale as required.

4 Dewatering device should be installed in product warehouse after washing, and thermal insulation and freeze-proof measures shall be adopted in cold areas.

5 When the selected loading area is far from the main plant area, product warehouse (yard) and loading warehouse (yard) should be set up separately. Product warehouse (yard) shall meet production needs and loading warehouse (yard) shall meet loading needs.

8.0.3 When standard gauge vehicles are used to transport coal, the loading equipment capacity shall meet the requirements of loading a train in a specified time. The time required from empty train alignment to full train filling and metering should not exceed 2.0h.

8.0.4 Anti-clogging or air cannon measures should be adopted in coal bunkers, and anti-crushing measures shall be taken in lump coal bunkers.

8.0.5 The effective volume of gangue silo should not be less than 8.0h operation.

8.0.6 Quick quantitative loading device may be used in large-scale coal preparation plant.

9 General utilization of reject and coal slurry

9.0.1 Coal gangue may be used for fuel, building materials, roadbed fillers, chemical raw materials, agricultural production and backfilling based on the as-received calorific value and other physical, chemical and technological properties, according to the relevant provisions of the current national standard GB/T 29163 *Technical Guidance for the Utilization of Gangue*. Project for comprehensive utilization of gangue shall be planned, constructed and put into operation at the same time.

9.0.2 The gangue and ash without utilization value shall be treated, and the treatment effect must meet local environmental protection requirements.

9.0.3 Permanent gangue field should not be set up in coal preparation plant. The location and requirements of temporary gangue field shall conform to the relevant provisions of the current national standard GB 50215 *Code for Design of Mine of Coal Industry*. Trucks, belt conveyors, skips, narrow rails, ropeways and standard rails can be selected for gangue discharge and transportation, which are determined after comprehensive comparison.

9.0.4 Coal slurry should be used to produce coal-water slurry or blend with by-products such as gangue and middling for inferior coal power plants.

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10 Measure and examination of coal

10.0.1 Coal preparation plant shall be equipped with measuring instruments, for measurement of raw coal quantity, product coal quantity, power consumption, water consumption, dense medium consumption, reagent consumption, etc. The allocation and management of energy measuring instruments shall conform to the relevant provisions of the current national standards GB 17167 *General Principle for Equipping and Managing of the Measuring Instrument of Energy in Organization of Energy Using*, GB/T 29453 *Specification for Equipping and Managing of the Measuring Instrument of Energy in Coal Enterprise*. The measuring device should have the functions of real-time recording, statistics and communication.

10.0.2 The coal preparation plant shall set up a coal sampling and a laboratory. The coal sampling room shall include a production coal sampling room and a sales coal sampling room. The production coal sampling rooms and laboratory of mine type and group mining type coal preparation plant should be combined with the production coal sample rooms and laboratories of the mines and set up in coal preparation plants. The sales coal sample room may be set separately or combined with production coal sample rooms according to the general layout of coal preparation plant or other specific conditions.

10.0.3 The coal shall conduct measurement for ash, sulfur, volatile matter, moisture and calorific value of the coal and the unit test related to the process system according to the type of coal preparation plant and the use of the product. The following items may also be added as needed:

- 1 The coking coal preparation plant shall carry out the measurement for bonding ability of coal;
- 2 The heavy medium coal preparation plant shall measure the magnetic content and the viscosity of the suspension.

10.0.4 Screening, float-and-sink test, preparation of coal samples for analysis shall be carried out in coal sampling room.

10.0.5 The laboratories and coal sampling rooms shall be equipped with cold-proof, dust-proof and harmful gases emitting facilities.

10.0.6 The coal preparation plant should set up a rapid float-and-sink test room, which may be located in the main building.

10.0.7 The metrology, sample taking and sample preparation of the coal preparation plant should be mechanized or partially automated. The capable coal preparation plant may be equipped with on-line detection instruments such as online ash analyzers and moisture meters, and automatic sampling devices.

11 Repairing for electro-mechanical

11.0.1 Overhaul of mechanical and electrical equipment in coal preparation plant, medium repair of pithead and group mine coal preparation plant shall be undertaken by mine repair plant or professional and fixed point cooperation plant; minor repair of mine type and group mining type coal preparation plant shall be undertaken by mine repair workshop.

11.0.2 Pithead and group mine coal preparation plants shall set up daily maintenance workshops, and may undertake daily maintenance tasks of coal preparation plants. The main equipment and building area in the repair workshop can be selected by the owner, and the building area of the repair workshop may also be selected according to Table 11.0.2. Material warehouse (shed) area may be the same as workshop area.

Table 11.0.2 Construction area of repair workshop for pithead and group mine's coal preparation plant

Design production capacity of coal preparation plant (Mt/a)	0.45-0.60	0.90-1.50	1.8-2.4	≥3.0
Building area of repair workshop (m ²)	100-150	200-250	300-350	400-450

11.0.3 The center and mine area type coal preparation plant shall have a repair workshop, which may undertake medium and small-type repair tasks. The repair workshop may be equipped with electro-mechanical maintenance group, forging rivet group, tool equipment room, etc. The main equipment and workshop construction area in the workshop may be selected by the owner, and the construction area of the workshop may also be selected according to Table 11.0.3. The material library (shed) area may be the same as the workshop area.

Table 11.0.3 Construction area of repair workshop for center and mine coal preparation plant

Design production capacity of coal preparation plant (Mt/a)	0.45	0.60	0.90	1.20	1.50	1.80	2.40	3.0	4.0	≥5.0
Building area of repair workshop (m ²)	450	450	600	700	700	800	1000	1200	1400	1500

12 General layout

12.0.1 The layout of the industrial site shall have the recently measured topographic maps and necessary engineering geological, hydrological and meteorological data. The scale of topographic map shall be determined according to topographic conditions, enterprise scale and project nature, which may be 1:1000 or 1:2000 in the feasibility study stage, 1:500 or 1:1000 in the preliminary design stage, and 1:500 in the construction drawing.

12.0.2 The site selection of coal preparation plant shall meet the following provisions:

1 It shall be carried out according to the requirements of the state's industrial layout, town (township) 's master plan, overall planning of land uses and mining-area master plan, and the relevant provisions of the pre-construction work of the project.

2 The site shall be close to the raw material base with convenient and economical transportation conditions, shall be easily connected with the railway and highway outside the plant, and shall be of a small amount of construction work.

3 The plant site shall have water and power sources necessary for production, living and development. The pipeline connection between water source and power supply and plant site should be short and convenient.

4 The site shall have engineering geological conditions and hydrogeological conditions that meet the needs of the construction. In earthquake zones with seismic fortification intensity of 6 degrees or more, seismically unfavorable sections should be avoided. When it is impossible to avoid, ground treatment and seismic measures should be taken.

5 The site shall have the necessary site area and suitable topography for the near future construction, and shall leave appropriate space according to the needs of the long-term development plan of the coal preparation plant.

6 The plant site shall have suitable terrain gradient, avoid the areas with complex natural terrain and large slope, and avoid basins and catchment depressions as the plant site.

7 When constructing a plant in a mountainous area and the site is located at a hillside or at the foot of the mountain, a geological hazard risk assessment report shall be made for the stability of the site, etc.

8 The site of the plant shall occupy not or less occupy farmland, forest land and basic farmland, and shall not or less overlay coal and mineral resources of mining value.

9 The following sections and areas shall not be selected as the construction site of coal preparation plant:

1) Seismic dangerous areas.

2) There are unfavorable geological phenomena such as mudslides, landslides, sand damage, karst caves, goafs, Class IV self-weight collapsible loess or other adverse geological phenomena, and the investment in mitigation measures is huge.

3) The environmental geological problems of the site area may be caused after mining.

4) Within the blasting hazard range, within the external hazard distance of the ground explosive store.

- 5) Threatened by flood, and the construction investment in flood control projects is especially huge.
- 6) Within the legal scope of cultural relics protection areas, scenic spots, nature reserves, and water source sanitation protection zones.
- 7) Within the scope of influence of aviation, communications, meteorological and seismic observation, military facilities and other important facilities.

12.0.3 The flood control standards for industrial sites of mine area, centers and user type coal preparation plants shall comply with the relevant provisions of the current national standard GB 50465 *Code for General Planning of Mining Area of Coal Industry*; flood control standards, vertical layout and in-site transportation of industrial sites in mine and group-mine coal preparation plants shall comply with the relevant provisions of the current national standard GB 50215 *Code for Design of Mine Coal Industry*.

12.0.4 The general layout of the industrial site in a coal preparation plant shall comply with the following provisions:

- 1 The site area shall be divided into subarea according to the function and characteristics of the building (structure).
- 2 The topography shall be fully utilized and the amount of earthwork and rock work should be reduced as possible. Gravity-flowing pipes and ditches are recommended for slurry transportation.
- 3 The layout of the building (construction), roads and pipelines shall be compact, reasonable, coordinated, neat and beautiful.
- 4 Major buildings (structures) shall be located in areas with good engineering geological conditions.
- 5 Joint buildings shall be arranged according to requirements of process, fire protection, environmental protection, sanitation, safety, etc.
- 6 The construction projects by stages shall facilitate the connection between the early and late stages, and the reserved sites shall be located outside the recent construction sites. When it is closely related to the recent engineering production process, it may be reserved in the construction sites; no permanent buildings (structures) or pipelines can be built in the reserved sites.
- 7 Reconstruction and expansion of coal preparation plants shall make full use of existing sites, buildings (structures) and facilities.
- 8 The relationship between the location and direction of the building (structure) and the direction of the wind shall be handled.
- 9 The spacing between the buildings (structure), the location and width of the sanitary protection plant belt shall be reasonably determined according to the influence degree of the pollution source.
- 10 The general layout of industrial sites of pithead and group mine coal preparation plants shall be coordinated with the overall planning of mines.

12.0.5 Auxiliary production buildings (structures), administrative public buildings and utilities of group mines, pithead or user type coal preparation plants may be set up jointly with mines or users, or separately when mines (users) and factories are managed separately.

12.0.6 The air compressor station shall be arranged in the place where the air is clean and less polluted by dust and exhaust gas according to the annual wind direction frequency. The distance between air compressor suction port and dump room, loading bin, coal pit and coal storage yard should not be less

than 30m, and shall not be less than 50m in adverse wind direction.

12.0.7 Coal storage yard and emergency slurry sedimentation pond shall be arranged in the position with less pollution to industrial site according to the annual wind direction frequency. The distance between them and hoisting machine room, office building should not be less than 30m, and should not be less than 50m in unfavorable wind direction position.

12.0.8 The location of the boiler room shall be convenient for coal supply, slag discharge and backwater, and shall be close to the load center. Boiler rooms or drying workshops with coal combustion furnaces shall be arranged at locations less polluting to the intake wellhead, air compressor station, substation, office building and laboratory according to the annual wind direction frequency, and the distance of them should not be less than 30m. When conditions permit, the drying workshop can be set up jointly with the boiler room.

12.0.9 The location of power substation shall be convenient for access to the high-voltage transmission line and close to the power load center, and shall be placed at a location where it is less polluted by dust according to the annual wind direction frequency. The distance between the outdoor substation and the dump room, loading bin, coal pit, coal storage yard and other dust sources should not be less than 30m, and should not be less than 50m in the unfavorable wind direction.

12.0.10 The repair shop shall be located centrally with the material turnover store (shed) and shall be placed in a convenient location. The open repair operation site shall not be more than 2 times to 3 times the building area. It should be shared with the mine when conditions permit, and not be set separately.

12.0.11 The coal quality laboratory shall be set up in conjunction with the administrative office building and shall be placed in a clean, quiet place with separate entrances and exits.

12.0.12 Dense medium preparation workshop shall be located close to the main workshop.

12.0.13 The flotation reagent station and the lubrication store may be jointly set up, and a wall with a height of 2.2m or more shall be provided around the reagent station. The flotation reagent station shall be located at the edge of the industrial site with low terrain and convenient transportation. It shall be arranged in the area which is least affected by frequent sparks and open-fire buildings and has the smallest impact on important buildings according to the annual wind direction frequency and wind speed.

12.0.14 The garage shall be laid out to facilitate the access of cars and avoid the intersection of traffic flow and main passenger flow. There shall be car return and parking space outside the garage. In cold and frigid areas, the orientation of garage doors shall avoid leading wind in winter. The number of automobiles shall be determined according to production and living needs.

12.0.15 The front area of the plant shall be located at the location of the mine (plant) industrial site with convenient transportation and less interference and pollution. When conditions permit, the main building (structure) of the coal preparation plant shall be placed in the center of the plant landscape, and the building group space shall be properly designed.

12.0.16 Plant greening shall be carried out in accordance with the general layout, vertical design, road and process pipeline layout, and comply with the following requirements:

1 The greening arrangement shall be based on the requirements of environmental protection, plant feature and landscape, combined with local natural conditions, plant ecological habits, pollution resistance and seedling sources, and be tailored to local conditions. Greening configuration shall reasonably choose the greening plant species, according to different greening functions and requirements.

2 The green area rate of the plant shall be controlled at 15% and shall not exceed 20%.

12.0.17 The width of the road within the site shall be determined according to the enterprise scale, process requirements, road properties, pipeline layout, greening, and vertical layout, and shall comply with the current national standards for fire prevention, sanitation, safety, etc. The width of the main road should be 20m to 40m, and the width of the less important path should be 12m to 20m.

12.0.18 The industrial site of the mining area and the central coal preparation plant should be equipped with a wall, and the coal preparation plant disposed in the mine industrial site may not have a wall. Special fences may be set for flotation stations, substations, etc. The minimum distance from the wall to the building (structure), road, railway and drainage open channel shall comply with the requirements of Table 12.0.18.

Table 12.0.18 Minimum clearance from wall to building (structure), road, railway and drainage open channel (m)

Name	Minimum clearance to wall
Building	5.0
Road	1.0
Standard railway (central line)	5.0
Narrow railway (central line)	3.5
Edge of drainage ditch	1.5

Notes: 1 Except as indicated in the table, the minimum clearance to wall is calculated for the wall from the center line and the building from the outermost axis; when the road is the model of urban, it counts from the road shoulder edge.

2 The clearance from the wall to the building may be appropriately reduced when the conditions are difficult; when the fireproofing exit is provided, the spacing shall not be less than 6m.

3 There is no limit to the clearance between the communication room, the guard room and the wall.

4 In case of difficult conditions, the clearance between the quasi-railway and the wall may be 3.5m when there is a shunting operation, and 3m when there is no shunting operation. The spacing between the narrow-gauge railway and the wall may be divided into 3.0m and 2.5m according to the corresponding conditions of the quasi-rail railway.

12.0.19 The land area for administrative office and living service facilities of coal preparation plants shall not exceed 7% of the total land area of the plant.

12.0.20 The design of the roads in the plant shall comply with the relevant provisions of the current national standard GBJ 22 *Code for Design of Roads in Factories and Mining Areas*.

12.0.21 The design of narrow-gauge railway transportation in the factory may be carried out in accordance with the relevant provisions of the current national standard GB 50215 *Code for Design of Mine of Coal Industry*.

13 Surface transportation

13.1 General requirements

13.1.1 Internal and external transportation of coal preparation plant shall be unified designed and comprehensive planned, including loading and unloading, transportation equipment selection, material transportation line selection, minimum inventory, etc.

13.1.2 The external transportation of coal preparation plant should adopt single transportation mode. When combined mode of transportation is adopted, the connection between different modes of transportation shall be coordinated. Many modes may be used for internal transportation.

13.1.3 The corresponding material measurement facilities shall be set up in coal preparation plant.

13.1.4 Railway, busy road and aerial ropeway are not allowed to pass through industrial sites, residential districts or main entrances and exits of enterprises.

13.1.5 When various transportation lines cross, they shall be consistent with the relevant provision of current national standards GB 4387 *Safety Regulation for Railway and Road Transportation in Plants of Industrial Enterprises* and GBJ 22 *Code for Design of Roads in Factories and Mining Areas*.

13.1.6 The rooms for transportation system management and living of a coal preparation plant shall be unified planned and combined built.

13.2 Selection of transportation modes

13.2.1 External transportation mode of coal preparation plant shall be determined after economic and technological comparison according to the transportation conditions, the nature, volume and flow direction of goods and other factors in the area where the enterprise is located.

13.2.2 Coal preparation plants with railway connect conditions should adopt standard-rail railway transportation, and medium and small coal preparation plant can use road transportation.

13.2.3 Coal preparation plants near navigable rivers may be transported by water or combined water and land.

13.2.4 When the main materials are transported by railway, waterway, belt conveyor, aerial ropeway or pipe trough, road transportation shall be supplemented and local transportation capacity shall be fully utilized.

13.2.5 When the construction of standard-rail railway is difficult, the road, narrow gauge railway or other modes of transportation may be adopted for the group-mine's coal preparation plant with large transportation capacity.

13.2.6 The belt conveyor shall be preferred to be used for the transportation when size of the feed coal and washed coal are less than 300mm, the transportation direction is single, the transportation distance is suitable, the terrain rolling and change should adapt to the climbing ability of the belt conveyor, and the annual transportation is more than 1.0Mt.

13.2.7 In case of the local topography shape fluctuates greatly or crosses the river or valley, and the engineering geological condition is complex, and difficult road transportation, aerial ropeway may be used for external transportation of coal preparation plant.

13.2.8 For internal and external transportation of coal preparation plant which is in modification or expansion, the original transportation system should be used. In case of the original transportation system cannot meet the transportation requirements, new transportation mode may be adopted.

13.3 Railway transportation

13.3.1 The design of standard gauge railway transportation shall comply with the following provisions:

1 It shall comply with the provisions of current railway technical policies, railway lines planning and current national standards. The agreements shall be reached for transportation and connection of tracks with railway departments.

2 It shall be combined with the general planning of mining area. The railway facilities shall lie on the area under which no coal deposit or on the coal pillar reserved for mine, and shall not overlaid on coal reserved area or reduced to overlay on coal reserved.

3 The initial mining area of the mine shall be avoided, and required technical and safety measures shall be taken when it is necessary to arrange in the area to be mined or unstable goaf.

4 It shall occupy less farmland as possible, avoid or lessen relocation of villages, and construct farmland combined with the project; water and power supply shall be used reasonably, and existing facilities such as urban-rural traffic, flood control, drainage and irrigation shall be utilized and reconstructed comprehensively.

13.3.2 The location of loading and unloading stations shall be determined after comprehensive analysis and comparison according to the location of pithead or coal preparation plant and process layout, and combined with the surface production system, the general layout and the possibility of railway line selection.

13.3.3 The type of loading and unloading station shall be designed according to such factors as transportation volume, quantity of products, flow organization, operation mode of pickup and delivery carriages, terrain, geological conditions and general layout of the industrial district, and shall leave the possibility of development. When the daily volume is large or the railway has special requirements on the loading time, it is advisable to adopt the station type suitable for the quantitative loading system, and adopt the design of "railway-enterprise direct through".

13.3.4 Scattered small coal preparation plant should set central loading station which should be introduced into the road network connection, constitute the "railway-enterprise direct" transportation.

13.3.5 The special railway lines and stations shall be designed for a mine coal preparation plant according to the restricted slope, traction quality, locomotive traction type, pickup and delivery operation mode of the railway and the specific conditions of the designed plant area.

13.3.6 In loading and unloading stations, the operation of pickup and delivery may be chosen from the followings: empty delivery and weight pickup, single pickup and delivery, waiting for loading etc., which shall be determined by comprehensive analysis and comparison based on terrain, geological conditions, pickup and delivery times, distance from the distribution station and other factors.

13.3.7 The number of loading and unloading lines in stations shall be determined after comprehensive analysis and comparison, under the conditions of meeting the needs of coal preparation plant production and railway transportation, according to the number of loading and unloading vehicles, time, and switching mode.

13.3.8 The number of arrival-departure lines of loading and unloading stations shall be determined

after calculation based on the number of loading-unloading trains and passing trains per day and night, combined with the type of station, the way of pickup and delivery vehicles, the number of loading and unloading vehicles, the type of weighing apparatus and shunting mode in loading and unloading stations.

13.3.9 In loading and unloading stations, material line, coal slurry line, pull line, flotation agent line, medium line and other lines may be set up according to the needs. When conditions are met, flotation agent line and coal slurry line may also be combined.

13.3.10 In the case of loading-unloading stations handle commuter trains for workers, basic platforms shall be set up to get on and off. When the middle arrival and departure line is used as the commuter line, the middle platform overpass and tunnel may be set up.

13.3.11 The effective length of loading and unloading station line shall conform to the following provisions:

1 When using network railway vehicles, the average converted length of the vehicles shall be calculated according to the vehicle data stipulated by the railway department, and the loading coefficient of coal transport vehicles shall be 1.00.

2 The effective length of the arrival-departure lines shall be the train length adopted in the design, including the locomotive length plus the additional distance of 15m to 30m.

3 The effective length of loading line shall be calculated according to the length of pickup and delivery trains or train groups designed for empty and heavy sections with additional distance of 10m–20m, and the distance between the dividing points of empty and heavy sections shall be calculated.

4 The calculation method of effective length of coal unloading line shall be the same as that of loading line.

5 The effective length of material line shall be determined according to the freight volume, the goods type, the way of pickup and delivery vehicle, the unloading site, the unloading way and other factors combined with the general layout.

6 The effective length of drawing line shall be determined according to the length of train or train group used in shunting operation, including locomotive length plus additional distance of 10m to 20m. When the traffic volume of the interval is small and the shunting operation volume of the station is relatively small, no drawing line is required. The main line of the interval shall be used for shunting operation, but its horizontal, vertical and lookout conditions shall meet the requirements of operation. For the station where the arrival signal is installed, the position of the signal shall be shifted outward according to the requirements of shunting operation, but the distance between the position of the signal and the tip of the outermost inbound switch rail (in the direction of which is the warning impact mark) shall not exceed 400m.

13.3.12 It is advisable to use tractor to pull or push the vehicles for loading and unloading movement. It is not allowed to hang endless rope on hooks of awning to pull a carriage.

13.3.13 The design of signal, communication and electric power of loading-unloading station shall conform to the relevant provisions of the current national standard GBJ 12 *Code for Design of Class III、IV Railway*.

13.3.14 The signal, communication and electrical equipment of railway sidings and loading-unloading stations designed by railway-enterprise direct shall be in line with the standards of railway owner's equipment.

13.3.15 The interlock between the station signal and tractor shall be realized in the loading and

unloading station using tractor.

13.4 Road transportation

13.4.1 The construction of factory-out roads shall conform to urban-rural planning or local transportation planning, and the existing national highways and urban roads shall be reasonably used. When the factory-out road is connected with national highway or urban road, the route shall be short and fast, as well as construction work shall be small.

13.4.2 The design of factory-out road shall conform to the current national standard GBJ 22 *Code for Design of Roads in Factories and Mining Areas* and other relevant standards of highway design.

13.4.3 The grade and main technical standards of factory-out roads shall be determined by comprehensive analysis according to road nature, requirements, traffic volume, type and model of the vehicles. Roadbed and road surface may be widened in areas with mixed traffic and more pedestrians. For the road with the function of local road network, it shall comply with the current provisions of the relevant traffic professional standards.

13.4.4 The vehicle load of bridge design shall comply with the relevant provisions of the current industry standard JTG B01 *Technical Standard of Highway Engineering*.

13.5 Other transportation modes

13.5.1 Other transportation outside the factory may adopt the belt conveyor, the pipeline, the aerial ropeway, the waterway transportation and so on.

13.5.2 The layout of belt conveyors and aerial ropeways shall conform to the following provisions:

1 The terrain should be fully utilized, the route design shall be short and fast, and intermediate turns shall be reduced. The necessary channels of maintenance and inspection should be provided along the line.

2 When belt conveyor across the railway or road, the intersection layout is appropriate to use orthogonal. If must skew, the intersection angle should not be less-than 45°, and shall conform to the relevant provisions of the current national standard GB 146.2 *Gauge for Standard Gauge Railways-Part 2:Structure Gauge*.

3 The aerial ropeway lines shall avoid the bad engineering geological area and the affected area of mining caving, such as landslide, collapse, swamp, debris flow and karst. When restricted by conditions, protection measures shall be taken for the station and bracket.

4 The aerial ropeway lines shall not be arranged across the factory and residential areas, nor across railways, highways, waterways and aerial power lines. Protection shall be provided when freight ropeways cross railways, highways, waterways and aerial power lines.

5 The included angle between ropeway line and prevailing wind should be reduced in windy areas as possible.

6 The minimum clearance between the aerial ropeway line and relevant facilities shall conform to the relevant provisions of the current national standard GB 50127 *Technical Standard for Aerial Ropeway Engineering*.

14 Electric

14.1 Power supply

14.1.1 Electric load classification of coal preparation plant shall comply with the relevant provisions of the current national standard GB 50052 *Code for Design Electric Power Supply Systems*, the following systems or equipment shall be Class II loads and the rest shall be Class III loads.

- 1 Raw coal systems that affect mine production or railway transportation.**
- 2 The loading system that affect railway transportation.**
- 3 Boiler room.**
- 4 Rake lifting equipment of thickener.**
- 5 Fire control power supply.**
- 6 Control system power supply.**

14.1.2 The voltage rank of power supply for coal preparation plant should be 10kV or 6kV. When the power load is large or long distance from power supply, and the technical and economic comparison is reasonable, 35kV or higher grade voltage may be used. Two or more power supply lines shall be adopted for power supply, and shall be drawn from different generatrix segments. When a primary circuit interrupts power supply, the other circuits shall be able to bear all the load. Central or mine coal preparation plants with small load or difficult power supply conditions may be powered by one special overhead line of 10 (6)kV and above.

14.1.3 In the main wiring of 10 (6) kV and 35kV side for coal preparation plant power station it should adopt single bus sectioned configuration. Circuit breakers should be used for the incoming switch and bus couple switch.

14.1.4 Power load calculation should adopt the demand coefficient method, which shall meet the requirements of Table 14.1.4.

Table 14.1.4 Demand coefficient

Name of equipment	Calculation basis	
	K_c	$\cos\phi$
Receive coal system	0.55	0.70
Raw coal screening and crushing system	0.60	0.70
Gravity cleaning, dewatering, loading system	0.60-0.65	0.72
Froth flotation system	0.70-0.75	0.75
Drying system	0.60-0.65	0.72
Fan, pump, air compressor	0.70-0.80	0.80
Railway loading system	0.45	0.72
Filter system	0.55	0.72
Equipment of coal sample room	0.40	0.75

Table 14.1.4(continued)

Name of equipment	Calculation basis	
	K_c	$\cos\phi$
Equipment of laboratory	0.35	0.85
Tippler	0.30	0.50
Crane	0.35	0.50
Mechanical workshop	0.25	0.50
Air conditioning	0.45	0.80
lighting	0.85	0.90

14.1.5 For reactive power compensation of the power load, the compensation devices of 10 (6) kV, 660V and 380V electrostatic capacitor bank should be centralized compensation, after compensation, the power factor $\cos\phi$ of the whole plant shall meet the following requirements:

- 1 When the power supply is drawn from the user's last substation, it should not be lower than 0.9.
- 2 When the power supply is drawn from the common connection point of the grid, it shall not be lower than 0.9.

14.1.6 35kV and below the electrical installation should be adopt indoor layout. The design of high voltage electrical installation shall comply with the relevant provisions of the current national standard GB 50060 *Code for Design of High Voltage Electrical Installation(3-110kV)*.

14.1.7 For 10kV or 6kV distribution room it shall reserve 10% to 25% spare positions of the number of switchgear cabinet installed, and should not be less than 2 spaces, and should be equipped with not less than 2 spare high-voltage switchgears.

14.1.8 Transformer selection shall meet the following requirements:

- 1 The load of the same process system should be supplied by the same transformer. When the load is large, two or more transformers may be selected.
- 2 Design load rate should not be more than 85%, and should not be less than 60%.
- 3 The transformer shall be close to the load center.

14.1.9 A substation equipped with two or more transformers, when one of the transformers stops operating, the capacity of the remaining transformers shall meet the requirements of the Class II load.

14.2 Power distribution

14.2.1 Distribution voltage levels shall meet the following requirements:

- 1 The high voltage level should take 10kV or 6kV. For new coal preparation plant it should adopt 10kV.
- 2 The low voltage level should be take 660V, 380V. For medium and above newly-built coal preparation plant it should be take 660V.
- 3 Lighting and control voltage should be 220V/380V.

14.2.2 When the 660V electrical installation is selected, the neutral point on the 660V side of the transformer shall be grounded through resistance, and the leakage protection device shall be selected as the single-phase grounding protection of the system. The resistance shall be selected so that the single-phase grounding current generated by the system is compatible with the selected leakage protection device, and its reliability and sensitivity shall be taken into account.

14.2.3 The raw coal and loading system, which directly affect the production of coal mine and railway transportation, shall be equipped with two power supply, and the bus may be split. The thickener shall have a backup power supply. When selecting 2 or more transformers in the workshop with concentrated power load, main bus should adopt single bus split wiring.

14.2.4 The secondary side of transformer in the workshop substation should be led to the low voltage distribution room by bus, and the bare bus should not enter the production workshop.

14.2.5 The low voltage electrical installation in the main distribution room shall have more than 15% spare circuit, and more than 1 panel to 2 panels or cabinets shall be reserved.

14.2.6 The low voltage power distribution design shall meet the relevant provisions of the current national standard GB 50054 *Code for Design of Low Voltage Electrical Installations* and GB 50055 *Code for Design of Electric Distribution of General-Purpose Utilization Equipment*.

14.2.7 The main workshop shall be equipped with adequate maintenance power supply, and shall be installed maintenance power box or socket.

14.2.8 The selection and laying of cables shall comply with the relevant provisions of the current national standard GB 50217 *Standard for Design of Cables of Electric Power Engineering*.

14.2.9 All production sites of coal preparation plant shall use waterproof and dustproof electrical equipment, the protection level should not be lower than IP55; for explosive atmospheres, the electrical design shall comply with the relevant provisions of the current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

14.2.10 Switch cabinets equipped with vacuum contactor circuit should be used in 10kV, 6kV motor electrical installations.

14.2.11 The protection and control circuit design of 10kV, 6kV motors shall comply with the relevant provisions of the current national standard GB 50062 *Code for Design of Relaying Protection and Automatic Device of Electric Power Installations*.

14.2.12 The location of substation and distribution room shall be determined according to the general layout and workshop layout of coal preparation plant after technical and economic comparison. The general layout shall comply with the following provisions:

- 1 It should be close to the load center.
- 2 It should be away from vibration source.
- 3 It should not be set under water storage device or place with much water area.
- 4 The incoming and outgoing lines shall be convenient.
- 5 It is strictly forbidden to pass through pipelines unrelated to transformer or distribution room.
- 6 Do not stride on settlement joints.
- 7 Avoid exposure under the sunshine from western.

8 It shall comply with the relevant provisions of the current national standard GB 50016 *Code for Fire Protection Design of Buildings* and GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*, and meet the requirements of the current fire prevention code of coal industry.

14.3 Lighting

14.3.1 Transformer for lighting should be set separately from power transformer. In case of lighting and powered by the same transformer, the cables shall be separated. In case of more scattered users, it may also share one power supply.

14.3.2 The lighting of the main production workshop shall be provided with two independent power sources. Power distribution room and central control room shall be equipped with emergency lighting, and the main entrance and exit, stairwell of production workshop shall be equipped with evacuation lighting. The illuminance value of emergency lighting in each place shall comply with the provisions of the current national standard GB 50016 *Code for Fire Protection Design of Buildings*, and GB 17945 *Fire Emergency Lighting and Evacuate Indicating System*, and shall comply with the provisions of the current fire prevention code in coal industry.

14.3.3 The lighting standard value of coal preparation plant should conform to the provisions of Table 14.3.3.

Table 14.3.3 The lighting standard value of coal preparation plant

Room or place	Reference plane	The lighting standard value (lx)
Production workshop	Ground	100
Bunker	Ground	75
Tunnels, belt conveyor trestle, stairwells	Ground	30
Mechanical workshop	0.75 horizontal plane	200
Pump room	Ground	100
Control room	0.75 horizontal plane	400
Electrical installation room	0.75 horizontal plane	200
Transformer room	Ground	100
Coal sample room laboratory	0.75 horizontal plane	300
Warehouse	Ground	50
Open stockpile	Ground	10
Capped thickener	Passage around the pool	50
Uncapped thickener	Passage around the pool	10

14.3.4 All the lighting equipment in coal preparation plant shall be waterproof and dustproof, the protection level should not be lower than IP55; for explosive hazard sites, the lighting design shall comply with the relevant provisions of the current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

14.3.5 High efficiency, long life and easy maintenance products should be used as lighting equipment.

14.3.6 The power used as lighting and control shall comply with the relevant provisions of the current national standard GB 50034 *Standard for Lighting Design of Buildings*.

14.4 Lightning protection and grounding

14.4.1 The classification, measures and devices of lightning protection in coal preparation plant buildings shall conform to the relevant provisions of the current national standard GB 50057 *Code for Design Protection of Structures against Lightning*, and the following provisions:

1 In areas where lightning strike may occur, the following buildings shall be classified as Class II lightning protection structures:

1) Bunker for storing raw coal and dry coal products, closed stockpile, screening and crushing

workshops and other structures;

2) Flotation reagent tank;

3) Structures with expected number of lightning strikes greater than 0.25 times/a.

2 In areas where lightning strike may occur, the following buildings shall be classified as Class III lightning protection structures:

1) Structures with expected number of lightning strikes greater than or equal to 0.05 times/a and less than or equal to 0.25 times/a;

2) In areas where the thunderstorm days are greater than 15d/a, tall isolated buildings such as chimneys and water towers are 15m or above in height;

3) In areas where the thunderstorm days are less than or equal to 15d/a, tall isolated buildings such as chimneys and water towers are 20m or above in height.

14.4.2 In addition to concrete bunker, other buildings equipped with lightning protection may make use of reinforced concrete columns and the reinforcement in the foundation as the leading down wire and grounding device. The components shall be connected into electrical conductivity pathways.

14.4.3 The lightning grounding device shall be shared with electrical equipment grounding devices, the grounding resistance should be the smallest.

14.4.4 The grounding type of the of low voltage system shall comply with the following provisions:

1 The 660V system should adopt the neutral point grounding system through high resistor.

2 TN-C-S grounding system should be used in 380V system, TN-S system shall be used in explosive atmospheres.

14.4.5 Grounding and equipotential design shall comply with the relevant provisions of the current national standard GB/T 50065 *Code for Design of AC Electrical Installations Earthing*, GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres* and GB 50057 *Code for Design Protection of Structures against Lightning*.

14.5 Control

14.5.1 Main process equipment in coal preparation plant should be all integrated into the central control system. The control system should be composed of the following subsystems:

1 Coal system.

2 Separation system.

3 Slurry system.

4 Drying system.

5 Loading system.

14.5.2 The central control system design shall meet the following provisions:

1 The design shall meet the process technological requirements, the system shall be reliable, flexible and easy to operate.

2 **The design of central control system must have two control modes: central (interlocking) and local (unlocking), and the two modes shall achieve undisturbed conversion.**

3 In the central control mode the system shall start in reverse coal flow and stop in forward coal flow.

4 The start and stopping warning signals shall be set, and the starting warning signals shall be set separately for each sub-system.

5 The stop button of device side shall be effective in any control mode; the stop button shall be choose as self-locked type.

6 Emergency stop button shall be set in the control system.

7 All kinds of mechanical and electrical equipment related safety measures shall be included in the control system.

8 The control room shall be able to display equipment operation, failure and other working conditions, as well as signals such as flap, gate position, level of various bunker, main pool (bucket) level, and other signals acquired by the system.

14.5.3 In central control of production system, it should use Programmable Logic Controller (PLC) to complete the functions of signal acquisition and devices linkage, starting or stopping. Programmable Logic Controller (PLC) configuration should conform to the following regulations:

1 The CPU of Programmable Logic Controller (PLC) used in medium and above coal preparation plant should be for redundant configuration.

2 The CPU of Programmable Logic Controller (PLC) used in small coal preparation plant should be non-energized standby.

3 Discrete input and output module and analog input module should have 5%–10% spare respectively, and shall not be less than 1 module.

14.5.4 Central control system shall be equipped with data storage device and the storage time shall conform to the following provisions:

1 The real-time monitoring data for methane, carbon monoxide and other important points shall be stored for more than 7d.

2 The records of analog quantity statistics, various fault alarms and recovery time shall be kept more than 1a.

14.5.5 The configuration of the power supply for central control system shall meet the following regulations:

1 The central control room shall adopt double circuit power supply which may be mutual exchange, and shall be equipped with no less than 0.5h online UPS standby power.

2 The remote station should be equipped with double circuit power supply and purification power supply device.

14.5.6 The central control design of coal preparation plant shall adopt mature and proven technology and equipment with high reliability, good performance and easy maintenance, and equipment selection shall also meet environmental requirements. New products and technologies shall be tested by trial and verified qualification before being used in project.

14.5.7 The operation, maintenance, operation site and passageway of the cabinet, panel and platform shall meet the needs of normal operation of equipment, working of monitoring personnel and safety.

14.5.8 Central control room should be located in separate buildings, or may be located inside main workshop when restricted by condition, but shall meet the following requirements:

1 It is strictly forbidden to pass through pipelines unrelated to central control room.

2 It shall be away from vibration source.

3 It should not be set under water storage device or place with much water.

4 Do not cross settlement joints of building.

14.6 Automation

14.6.1 The following systems or individual machine should realize automatic parameter adjustment or automatic control in coal preparation plant:

- 1 Dense medium separation system.
- 2 Parameter adjustment of flotation system.
- 3 Filter system.
- 4 Drying system.
- 5 Fast loading system.
- 6 Jig.
- 7 Hyperbaric filter.
- 8 Air compressor.
- 9 Thickener.

14.6.2 Automatic control system or automatic device shall have manual and automatic operation mode, the two modes shall achieve undisturbed conversion, and may be connected with the central control system. The automatic device shall be composed of advanced technology and equipment.

14.7 Monitoring and protecting

14.7.1 The system operation should be monitored in coal preparation plant, the monitoring signal shall be input to the control host, the monitoring items shall include the following contents:

- 1 Quantity and quality of raw coal and products.
- 2 Power consumption.
- 3 Water and oil consumption.
- 4 The level of main bunker, the level of the main pool and water tank.
- 5 Position of gate, valve and flap.
- 6 Current of important equipment and motors with 55kW and above.
- 7 Temperature for stator winding and bearing of high voltage motor.
- 8 Power cable temperature concentrated in cable tray and cable trench.
- 9 Parameters of the dense medium separation system.
- 10 Flow rate and concentration of flotation feed.
- 11 Methane and carbon monoxide concentrations in upper and lower bunkers for high-gas coal

and other places where gas and coal dust tend to gather.

- 12 Operating condition of process equipment.

14.7.2 In coal preparation plant the following protection shall be set and the signal shall enter the centralized control system:

1 Reverse/forward running equipment shall be equipped with electrical lock-out protection, and the mobile devices shall be set electrical and mechanical lock-out protection.

2 The belt conveyor shall be provided with pull rope, sway and slipping protection, the longitudinal tear protection may be set for important belt conveyor, and the smoke temperature protection can be set for important belt conveyor transporting dry coal.

- 3 The chain conveyor shall be set up chain break protection.

4 The pulley chute for belt conveyor, chain conveyor and other chute easy to blockage shall be

equipped with coal blocking protection.

14.8 Communication

14.8.1 The central and mine coal preparation plant shall set up administrative telephone exchange and production dispatching telephone switchboard respectively. Production dispatching telephone switchboard shall be set up in pithead, group mine's and user's coal preparation plant. Administrative telephone should be merged with switches of mines or main project.

14.8.2 The administrative telephone exchange shall adopt SPC telephone exchange, the capacity of which may be determined according to the recent number of users, and the reserve quantity of 20% to 30% shall be reserved. Production dispatching telephone switchboard made should use SPC telephone, and shall be located in the main control room.

14.8.3 The reserve quantity of 20%–30% shall be reserved for the lines and wiring equipment of the communication trunk.

14.8.4 Direct telephone should be set up between the following places:

- 1 Between the high voltage distribution room and the upper substation of coal preparation plant.
- 2 Between operation posts which contact frequently.

14.8.5 In coal preparation plant it should be equipped with wireless telephone, the number of set should meet the use by a patrol inspection personnel of one shift.

14.8.6 The equipment selection of communication system shall meet the environmental requirements and the following regulations:

- 1 Anti-noise equipment shall be used in places where noise exceeds 85 dB.
- 2 The equipment selection of communication system in explosive hazardous environment shall conform to the relevant provisions of the current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

14.9 Industrial television system

14.9.1 Industrial television system should be set up in coal preparation plant.

14.9.2 The installation position of TV camera shall meet the requirements of monitoring the main production equipment running.

14.9.3 The equipment selection of industrial television system shall meet the environmental requirements, the configuration shall be determined according to the actual situation, and the reserve quantity of 15% to 30% should be reserved.

14.9.4 Industrial television systems shall be equipped with image storage equipment. The storage capacity shall not be less than 30d image information.

14.10 Control network and computer information management system

14.10.1 Central control system and automation network shall use industrial equipment supporting multiple network topologies and multiple redundancy modes.

14.10.2 Automatic subsystems of coal preparation plant should use ethernet interface based on TCP/IP standard to access the network switch of central control system.

14.10.3 Central control and automation network shall be connected with computer information management network of coal preparation plant, physical isolation facilities shall be adopted and

appropriate network security strategies shall be formulated.

14.10.4 Computer information management network based on TCP/IP standard and ethernet technology should be built for medium and above coal preparation plants.

14.10.5 Star topology structure should be used in computer information management network, and two core switches or one twin-engine core switch should be configured with standby each other. The transmission rate of backbone network should be 1000Mb/s.

14.10.6 The computer information management network shall be connected with the network of the superior mine or the computer center of the group company, security facilities shall be adopted and appropriate network security strategies shall be formulated.

14.10.7 Computer information management system should include production technology management, production statistics management, production scheduling, coal quality laboratory management, production marketing management, mechanical and electrical equipment management, personnel salary management, material supply management, office automation and information management such as comprehensive query module, and shall establish office automation system and application software module.

14.10.8 The generic cabling shall be used in computer network. The system design shall comply with the relevant provisions of the current national standard GB 50311 *Code for Engineering Design of Generic Cabling System*.

15 Water supply and drainage

15.1 Source of water

15.1.1 Water source of pithead coal preparation plant, group-mine's coal preparation plant and user's coal preparation plant should be solved by mine or user. Other coal preparation plants that need to solve their own water sources shall obtain the consent of the local water resources administration department and obtain a "water intake permit". The hydrogeological data needed to determine the water source shall conform to the relevant provisions of the current national standard GB 50215 *Code for Design of Mine of Coal Industry* and GB 50810 *Code for Design of Water Supply and Drainage of Coal Industry*.

15.1.2 When choosing the source of water, it shall ensure that the quantity of water is sufficient and reliable, and the water quality shall conform to the relevant provisions of the current national standard GB 5749 *Standard for Drinking Water Quality* and GB/T 18920 *The Reuse of Urban Recycling Water-Water Quality Standard for Urban Miscellaneous Use*. When groundwater or surface water is used as water source and there is little difference in technology and economy, groundwater shall be used as drinking water source. In the ecologically fragile areas such as drought and desertification, the deterioration of the ecological environment caused by the exploitation of water resources shall be prevented. The treated underground drainage, open-pit mine dredging drainage, domestic sewage reuse water and power plant cooling water shall be used for production water. In areas with severe water shortages, rainwater may be utilization.

15.1.3 The water supply may be carried out divided quality, divided zone and divided user, based on different requirements of users for water quality, water pressure and water quantity. The recirculating ratio and recycle ratio of water shall be improved, and a water reuse system may be set up if necessary.

15.1.4 The daily water supply capacity of conventional water sources shall conform to the relevant provisions of the current national standard GB/T 18916.11 *Norm of Water Intake-Part 11: Coal Cleaning*. The daily water supply capacity of unconventional water sources could be determined by 1.2 times to 1.5 times of the maximum daily water consumption of water supply objects.

15.2 Outdoor water supply and drainage

15.2.1 Water for coal preparation plant shall include main production water, assistant production water and subsidiary production water. Norm of water intake of conventional water sources for coal preparation plant shall conform to the relevant provisions of the current national standard GB/T 18916.11 *Norm of Water Intake-Part 11: Coal Cleaning*. When water is supplied from unconventional water sources, the primary production water norm should not be greater than $0.15\text{m}^3/\text{t}$ (feed raw coal), the assistant production water norm should not be greater than $0.05\text{m}^3/\text{t}$ (feed raw coal) and the subsidiary production water norm may not be greater than $0.05\text{m}^3/\text{t}$ (feed raw coal).

15.2.2 The maximum daily domestic water consumption norm, water consumption time and hourly variation coefficient of administrative welfare buildings and industrial enterprises buildings in coal

preparation plants, shall conform to the relevant provisions of the current national standard GB 50015 *Standard for Design of Building Water Supply and Drainage* and the provisions of Table 15.2.2-1. The water consumption norm for the greening and road spraying, shall conform to the relevant provisions of the current national standard GB 50015 *Standard for Design of Building Water Supply and Drainage* and the provisions of Table 15.2.2-2.

Table 15.2.2-1 The maximum daily domestic water consumption norm, water consumption time and hourly variation coefficient of building

No.	Water consumption item		Unit	Maximum daily domestic water consumption norm	Water consumption time	Hourly variation coefficient
1	Water for workshop workers		L/(person·shift)	30-50	8 (h/shift)	2.5-1.5
2	Water for managers		L/(person·shift)	30-50	8 (h/shift)	2.5-1.5
3	Bath water for industrial enterprises	shower water	L/(person·times)	40	1 (h/shift)	1.0
		Bath water	-	-	-	-
4	Water for dining room for staff		L/(person·meal)	20-25	20h	1.5
5	Water for laundry		L/(kg·dry clothes)	40-80	12h	1.5-1.2

Notes : 1 The norm of shower water for industrial enterprises may also be calculated according to $300L/(h \cdot \text{individual}) - 540L/(h \cdot \text{individual})$. The maximum daily water consumption shall be calculated according to 2.5 times of the maximum shift shower water consumption. When the shower is supplied entirely by the roof water tank, the filling time of the water tank may be taken as 2 hours, and the hourly variation coefficient may be taken as 1.0.

2 The effective volume of the bathing pool in industrial enterprises shall be equal to the bathing pool area multiplied by the water depth of 0.7m. The maximum daily water consumption of the bathing pool shall be calculated by use of three times a day, and the filling time of the bathing pool not exceed 2 hours each time.

3 The maximum daily water consumption in the dining room shall be calculated according to the daily total number on duty at two meals per person.

4 The amount of dry clothes in the laundry may be calculated according to twice a week per person and 1.2kg-1.5kg once per person.

Table 15.2.2-2 The water consumption norm for the greening and road spraying

No.	Water consumption item	Water consumption norm [L/(m ² ·d)]	Water consumption frequency (once/daily)
1	Greening watering	1.0-3.0	1-2
2	Road watering	2.0-3.0	1-2

Notes: 1 The greening water norm in arid areas may be $3.0L/(m^2 \cdot d) - 4.0L/(m^2 \cdot d)$.

2 Each water consumption time may be determined according to the actual situation.

15.2.3 He main production water of coal preparation plant shall be determined according to factors such as coal preparation process flow, and the assistant production water consumption norm shall meet the requirements of Table 15.2.3.

Table 15.2.3 The auxiliary production water consumption norm

No.	Water consumption item		Unit	Water consumption norm (%)	Water consumption time (h/d)	Hourly variation coefficient
1	Cooling water for vacuum pumps, air compressors and other equipment requiring cooling		As per circulating water discharge	10	16	1.0
2	Boiler supplementary water (when central heating is available)	Steam boiler supplementary water	As per boiler total rated evaporation	20-40	16	1.0
		Supplementary water for hot water boiler	According to total circulating water discharge of the system	2-4	16	1.0
3	Steam boiler supplementary water (without central heating)		As per boiler total rated evaporation	60-80	16	1.0
4	Pump seal and cooling water		m ³ /(h·individual)	-	16	1.0
5	Water for indoor wet dust extraction		L/(min·individual)	-	16	1.0
6	Water for sprinkling and dust extraction in outdoor stockpile		m ³ /(h·individual)	-	-	1.0

15.2.4 The water consumption norm for indoor floor flushing of raw coal and dry coal products (except refuse) production system may be 4L/(m²·times) to 6L/(m²·times), for other production systems, it may be 2L/(m²·times) to 3L/(m²·times). The number of rinses may be calculated once per shift and twice a day.

15.2.5 The unanticipated water consumption and water leakage of pipeline network may be considered as 10%–15% of the sum of water consumption of main production water, auxiliary production water and subsidiary production water.

15.2.6 Fire water consumption shall be determined in accordance with the regulations of the relevant current fire protection code of the coal industry.

15.2.7 The quality of drinking water in coal preparation plant shall conform to the relevant provisions of the current national standard GB 5749 *Standard for Drinking Water Quality*. The quality of toilet flushing water, fire water, road spraying water and greening water shall conform to the relevant provisions of the current national standard GB/T 18920 *The Reuse of Urban Recycling Water-Water Quality Standard for Urban Miscellaneous Use*.

15.2.8 The water quality index of equipment cooling water in coal preparation plant shall meet the requirement of Table 15.2.8.

Table 15.2.8 The water quality index of cooling water

Name	Index
pH value	6.5–9.0
Suspended solids content (mg/L)	≤50
Temporary hardness (mg/L) (in CaCO ₃)	≤214 (When the inlet temperature is low, it can be increased)
Oil content (mg/L)	5
Organic content (mg/L)	25
Inlet and out water temperature difference (°C)	≤25
Drainage temperature (°C)	≤40

15.2.9 The water quality index of coal preparation technology shall meet the requirement of Table 15.2.9.

Table 15.2.9 The water quality index of coal preparation technology water

Name		Index
Suspended solids content	Production clear water (mg/L)	≤50
	Circulating water (g/L)	≤80
Particle size of suspended solids (mm)		≤0.3 (sprinkling water and dedusting)
		≤0.7 (Rest)
pH value		6-9
Total hardness (mg/L) (in CaCO ₃)		≤500 (wet cleaning)
		≤143 (coal flotation)

15.2.10 The effective volume of production and domestic water pool shall be calculated according to the sum of accident water consumption and adjusted water consumption. The accident water consumption may be measured according to the maximum hourly water consumption for production and domestic water in 3 hours. The adjusted consumption shall be determined according to the relationship curve between water supply and water use, if there is no relevant data, it may be determined according to Table 15.2.10.

Table 15.2.10 The adjusted capacity of high pool, high water tank and water tower

The maximum daily water consumption (m ³ /d)	The adjusted capacity (%)
<300	30-25
300-500	25-20
500-1000	20-15
1000-5000	15-8
>5000	8-5

Note: The adjusted capacity value is the proportion of maximum daily water consumption(%).

15.2.11 The sprinkling water and dust suppression facilities shall be set up in the open stockpile, and should be set up in closed stockpile when the surface moisture of raw coal is less than 7%. In small scale stockpile it should be adopt sprinkler or sprayer and other sprinkling water and dust suppression facilities. In large and medium scale stockpile it should be use spraying gun or the sprinkling water and dust suppression method with spraying gun as the main method.

15.2.12 The diffluent system should be designed for domestic sewage in coal preparation plant. The treatment level of the domestic sewage shall be determined by technical and economic comparison according to the quantity and nature of sewage, sewage discharge location, sewage discharge standard, sewage recovery, and utilization requirement. The water quality of sewage discharged from the industrial site of coal preparation plant shall conform to the relevant provisions of the current national standards GB 8978 *Integrated Wastewater Discharge Standard* and GB 20426 *Emission Standard for Pollutants of Coal Industry*. The domestic sewage from pithead coal preparation plant, groupmine's coal preparation plant and user's coal preparation plant should be treated in a unified way with domestic

sewage from mines or main projects. The domestic sewage from central coal preparation plant and mine coal preparation plant shall be treated and reused separately.

15.2.13 Drainage ditches shall be used for ground drainage in the industrial sites of coal preparation plant, drainage pipelines should not be used.

15.3 Indoor water supply and drainage

15.3.1 When wet dedusting is installed, indoor flushing water supply facilities shall be set up for all production links of raw coal and dry coal products (except refuse) in coal preparation plant. When wet dedusting is not installed, indoor flushing water supply facilities shall be set up. The indoor flushing water supply facilities shall be set up in all production links of wet process. Each workshop equipped with the indoor flushing water supply facilities shall have a separate indoor flushing drainage system, which shall first be assembled into the catchment pit with initial sedimentation function at the bottom floor of the building, and then discharged directly or indirectly into the treatment facilities in the way of pressure drainage.

15.3.2 When the normal water pressure in the water supply network cannot meet the requirements of individual high pressure water use points, it should be take local pressurization measures.

15.3.3 The shower facilities in the bathroom should be adopt single-pipe hot water supply system with temperature control facilities, or may adopt double-pipe hot water supply system. Solar energy should be used for heat medium under conditions.

15.3.4 Drainage facilities shall be installed in the dumper room, coal receiving pits, semi-underground coal bunkers, the basements of underground structures and other structures.

15.3.5 The unbalanced coefficient of domestic water and production clean water should be 1.25.

15.3.6 The drinking water and boiled water supply shall be carried out in accordance with the relevant provisions of the current national standard GB 50015 *Standard for Design of Building Water Supply and Drainage*, and electric heated boilers should be adopted.

15.3.7 The amount of domestic sewage should be calculated according to 85%–95% of the corresponding amount of domestic water supply.

16 Heating and ventilation

16.1 Heating

16.1.1 The heat medium of central heating system shall be determined by technical and economic comparison according to local climate characteristics and heating conditions, and comply with the following regulations:

1 Hot water should be used as heat medium when supply heating is unique heat source or the main one in the plant area.

2 Steam may be used as heat medium, when the production technology needs steam as heat source and the heating load is smaller, without violating the requirements of hygiene, technique and energy saving.

3 The heating medium may be determined according to the specific conditions when using waste heat or natural heat source for heating.

4 For reconstructed or expanded buildings and the newly increased buildings connected with the original heating network, the heating medium should be the same as the original heating medium.

16.1.2 The outdoor air parameters for heating should adopt the meteorological data of lately 30 years provided by local meteorological stations. For those less than 30 years, it may be adopted in actual years, but must not less than 10 years. In the absence of local meteorological data, the relevant data of the current national standard GB 50736 *Design Code for Heating Ventilation and Air Conditioning of Civil Buildings* may be used. For those not listed in the relevant data, the data of cities with similar geographical conditions may be used.

16.1.3 The division of heating areas shall comply with the following regulations:

1 The area where the number of days, in which the average daily temperature is steadily lower than or equal to 5°C for years in succession, is greater than or equal to 90 days, shall be the heating region.

2 The following areas shall be transitional heating areas:

1) Where the number of days, in which the average daily temperature is steadily lower than or equal to 5°C for years in succession, is 60 days to 89 days.

2) Where the number of days, in which the average daily temperature is steadily lower than or equal to 5°C for years in succession, is less than 60 days, but the number of days, in which the average daily temperature is steadily lower than or equal to 8°C for years in succession, is greater than or equal to 75 days.

3 Areas other than those specified in Item 1 and Item 2 of this Article, shall be non-heating areas.

16.1.4 The buildings with central heating shall comply with the following provisions:

1 The buildings where people often work and rest or buildings with certain requirements for room temperature, shall be heating areas.

2 Cold machine processing, wet work, and important light workshops, bathrooms, dressing rooms, single dormitories, dining room and other similar buildings, shall be transitional heating areas.

3 The bathrooms, dressing rooms and buildings not required for room temperature, shall be non-heating areas.

16.1.5 The indoor calculated temperature in the heating, shall conform to Table 16.1.5.

Table 16.1.5 The indoor calculated temperature in the heating

Name of buildings	Indoor temperature (°C)
Office building, laboratory, centralized control room, duty room, dormitory building	18
Main building, filter press workshop, flotation workshop, machine repair workshop	16
Preparation workshop, water pump room, weighbridge room, coal sample room, water treatment workshop	15
Coal pit, transfer point, coal bunker, medium depot, oil pump room, grease depot, garage, air compressor room, dumper room, drying workshop	10
Conveyor trestle, coal conveying tunnel, closed thickening pool	8
Hot processing workshop	10-12
Cold processing workshop	14-16
Bathroom, dressing room	25

Notes: 1 When using radiation heating, the temperature may drop 2 to 3°C from that in the table.

2 When operator stays for a short time and there is only need to ensure that the equipment and apparatus are not frozen, the heating on duty shall be set at 5 to 8°C.

3 When the technology or use conditions have special requirements, the indoor temperature of all kinds of buildings can be implemented according to the relevant provisions of the current national standard GB/T 50466 *Design Standard for Heating Ventilation and Air Conditioning of Coal Industry*.

16.1.6 In the stage of feasibility study and preliminary design, thermal load for building heating may be estimated according to the following formula:

$$Q_h = q_h V_c (t_n - t_{wn}) \quad (16.1.6)$$

Where: Q_h —Design thermal load for building heating (W);

q_h —Thermal load index of building heating [$W/(m^3 \cdot ^\circ C)$], may be selected according to Table 16.1.6;

V_c —Building volume of heating buildings (m^3);

t_n —Heating indoor calculated temperature ($^\circ C$);

t_{wn} —Heating outdoor calculated temperature ($^\circ C$).

Table 16.1.6 Recommended value of thermal load index of building heating

Name of buildings	Volume ($\times 1000m^3$)	Thermal load index of heating [$W/(m^3 \cdot ^\circ C)$]
Preparation workshop	3.0-4.5	1.2-1.5
	4.5-6.0	0.9-1.2
	>6.0	0.8-0.9
Loading bunker	<5.0	1.4-1.7
	5.0-10.0	0.8-1.4
	>10.0	0.6-0.8
Transfer point	<0.5	2.8-3.7

Table 16.1.6(continued)

Name of buildings	Volume ($\times 1000\text{m}^3$)	Thermal load index of heating [$\text{W}/(\text{m}^3 \cdot ^\circ\text{C})$]
Transfer point	0.5-1.5	1.7-2.8
	>1.5	1.3-1.7
Conveyor trestle	-	3.3-4.1
Dense media preparation workshop	-	1.7-2.0
Filter press workshop flotation workshop	<7.0	1.1-1.2
	7.0-8.0	0.7-1.1
	>8.0	0.6-0.7
Thickening workshop	0.5-1.0	2.1-2.5
	1.0-2.0	1.4-2.1
	>2.0	0.8-1.4
Drying workshop	5.0-10.0	0.9-1.0
	10.0-15.0	0.7-0.9
	>15.0	0.5-0.7
Main building	20.0-30.0	0.8-1.0
	>30.0	0.6-0.8
Garage	<0.5	1.9-2.5
	0.5-2.0	1.7-1.9
	2.0-3.0	1.5-1.7
	>3.0	1.4-1.5
Coal sample room	≤ 0.5	0.8-2.1
	>0.5	1.3-1.8
Material bank	-	2.0-2.3
Flotation reagent station oil pump room, grease depot	≤ 0.2	2.1
	>0.2	1.6-2.1
Water pump room	<0.1	2.9-3.5
	0.1-0.4	2.0-2.9
	>0.4	1.2-2.0
Machine repair workshop	<1.5	0.6
	1.5-3.0	1.4-1.6
	3.0-5.0	1.2-1.4
	5.0-7.0	0.9-1.2
	7.0-10.0	0.8-0.9
Air compressor room	<0.5	1.9-2.3

Table 16.1.6(continued)

Name of buildings	Volume (×1000m ³)	Thermal load index of heating [W/(m ³ ·°C)]
Air compressor room	0.5-1.0	1.6-1.9
	>1.0	1.2-1.6
Ventilator room	<0.5	1.9-2.1
	0.5-1.0	1.5-1.9
	>1.0	1.2-1.5
Office building laboratory	<2.0	2.1-2.3
	2.0-5.0	1.4-2.1
	5.0-10.0	0.9-1.4
	>10.0	0.7-0.9
Bathroom	<3.0	1.5-1.7
	3.0-5.0	1.2-1.5
	5.0-7.0	1.1-1.2
	7.0-10.0	0.9-1.1
Dining room	<1.5	1.3-1.5
	1.5-3.0	1.1-1.3
	>3.0	0.8-1.1

16.1.7 For large space buildings, when it is difficult to install radiators in the layout, should adopt heating mode combined with hot air heating. For factories with per capita floor area exceeding 100m², should install local heating at fixed working place. When the work-place is not fixed, the heating room shall be set up.

16.1.8 For production workshop located in a frigid region, where have no door bucket and front room and have frequently opened outer doors, hot air curtain should be set.

16.1.9 The air supply mode of hot air curtain shall comply with the following provisions:

1 The hot air supply from top to bottom should be adopted in public buildings.

2 In industrial buildings, when the width of the outer door is less than 3m, unilateral hot air supply should be adopted. When the width of the outer door is more than 3m, it should adopt bilateral air supply or air supply from top to bottom. When side air supply is used, the outer door shall not be opened inward.

16.1.10 Coal preparation plant shall utilize thermal power plant or regional boiler room as heat source. When building heating boiler room by oneself, the design of boiler plant shall be carried out in accordance with the relevant provisions of the current national standard GB 50041 *Code for Design of Boiler Plant*. The heat medium of heating system should be selected according to the provisions of Article 16.1.1 of this code.

16.1.11 When the total exhaust air volume of a centralized heating room exceeds 3 times ventilation capacity per hour, the supplementary air heating device shall be installed. The hot air volume may be calculated by 50%-70% of the exhaust air volume.

16.2 Ventilation and dust extraction

16.2.1 Natural ventilation should be adopted in buildings that generate a lot of surplus heat or residual humidity. When natural ventilation cannot meet the requirements of hygiene or production, mechanical ventilation shall be set up.

16.2.2 Local exhaust air system should be set up in the area where surplus heat, residual humidity and harmful substances are generated. When local exhaust air fail to meet the hygienic requirements, full exhaust air shall be supplemented or be adopted.

16.2.3 Frequency converter chamber and current converter chamber which produce more heat shall adopt cooling measures.

16.2.4 Air conditioning facilities shall be installed in production dispatching centers and centralized control rooms.

16.2.5 When raw coal comes from high gas mine and coal and gas outburst mine, ventilation design shall conform to the regulations of the relevant current fire protection code of the coal industry. When raw coal comes from gas mines, ventilation design shall comply with the following requirements:

1 The natural exhaust air devices shall be installed in raw coal bunkers, cleaned coal bunkers, middling bunkers and closed stockpile. When the natural exhaust air device does not meet the requirements, mechanical exhaust air device shall be installed. The exhaust air volume of the exhaust air device in the coal bunker shall be calculated according to the volume of the coal bunker, and the ventilation times should be 0.5 time/h to 1.0 time/h. The exhaust air volume of the closed stockpile should be calculated according to the number of ventilation not less than 0.5 time/h to 1.0 time/h.

2 The mechanical ventilation devices shall be installed in coal pits and coal conveying tunnels, ventilation volume shall be calculated according to the number of ventilation not less than 12 times per hour, and the direction of air flow should be the same as that of conveyor movement.

3 The ventilation of coal pits and coal conveying tunnels should be guaranteed together by frequently used ventilation system and emergency ventilation system. The exhaust air volume of frequently used ventilation system shall comply with the following provisions:

1) When the equipment is hermetic and dust-proof, dust-reducing and dust suppression measures are adopted, the exhaust air volume may be calculated according to the number of ventilation not less than 6 times/h;

2) When the equipment is not hermetic, the exhaust air volume shall be calculated according to the number of ventilation not less than 12 times/h.

16.2.6 When the mechanical air supply system is set up, the setting of the air intake shall comply with the following provisions:

1 The air inlet shall be located in a place where the outdoor air is cleaner.

2 The lower edge of the air inlet should not be less than 2m away from the outdoor terrace, and it should not be less than 1m when it is located in the green zone.

16.2.7 When the surface moisture of raw coal is less than 7%, for the equipment or production links of dust generation, dust-proof, dust-reducing or dust suppression devices shall be set up.

16.2.8 Dust extraction fan and supplementary air heating device shall be electrically interlocked with process equipment, and start earlier and stop later than process equipment.

16.3 Heat-supply pipeline in outdoor

16.3.1 The design flow rate of thermal pipeline shall be calculated and determined according to thermal load. The thermal load shall include the demand amount of recent development.

16.3.2 Steam heating pipe network should adopt branch arrangement.

16.3.3 Hot water heating pipe network should be adopted branch arrangement of different distance pattern, and the pipe diameter of the corresponding section of hot water supply and return pipe should be the same.

16.3.4 The nominal diameter of outdoor thermal pipes shall not be less than 25mm.

16.3.5 The condensate water of steam heating system shall be recycled, and the recovery rate of condensate water shall not be less than 70%. When recovery of the condensate water is really difficult, its heat should be utilized.

16.3.6 The laying method of heating pipeline shall be determined according to meteorological, hydrological, geological, topographic conditions, construction, operation, maintenance convenience and other factors. When the conditions are satisfied, the direct burial method should be adopted to lay the heating pipeline. In accordance with one of the following circumstances, overhead method should be adopted to lay the heating pipeline.

- 1 High groundwater level or high annual rainfall.
- 2 Soil has relatively strong corrosiveness.

3 When there are overhead technology pipes or other power pipes in outside and the heating pipeline may be laid on the common bracket together with them.

16.3.7 The insulation work of heating pipelines shall comply with the relevant provisions of the current trade standard CJJ 34 *Design Code for City Heating Network*. The directly buried heat supply pipeline shall comply with the relevant provisions of the current trade standard CJJ/T 81 *Technical Specification for Directly Buried Hot-Water Heating Pipeline in City* and CJJ/T 104 *Technical Specification for Directly Buried Steam Heating Pipeline in City*.

16.3.8 In passing ditches and semi-passing ditches, the better natural ventilation shall be adopted. The spacing of manholes in passing ditches should not be more than 200m, and it should not be more than 100m when laid with steam pipeline. The spacing of manholes in semi-passing ditches should not be more than 100m, and it should not be more than 60m when laid with steam pipeline. The manhole shall not be less than 0.15m above the ground.

16.3.9 The ditch should be set above the highest groundwater level, and measures shall be taken to prevent surface water from seeping into the ditch. The longitudinal gradient should be found at the bottom of the ditch, which is consistent with the gradient of the ground. And soil should be covered on the cover of the ditch.

16.3.10 The thermal pipelines shall not be laid in the same ditch as pipelines conveying volatile, explosive, harmful and corrosive media, and pipelines conveying flammable liquids, combustible gases and inert gases.

17 Buildings and structures

17.1 General requirements

17.1.1 The original data of recent actual measured topographic drawings, weather and corresponding stage of geotechnical engineering investigation reports shall be provided for design of buildings and structures.

17.1.2 Reconstruction and extension project shall make use of existing buildings and structures. The reliability evaluation, checking calculation of structural elements or redesign shall be made for existing structure, reconstruction, and when reconstruction and extension project designed the existing production operation shall be taken into account.

17.1.3 The energy conservation design of buildings and structures shall meet the requirements of building functions and quality in use.

17.1.4 The structural style of main buildings and structures shall be selected in accordance with importance of production, durability of structure, requests for utilization, source of materials, construction conditions and techno-economic comparison.

17.1.5 Fire risk classification for production, transport and storage in coalpreparation plant, fire resistance rating for workshops and warehouses shall conform to current national standard for GB 50016 *Code for Fire Protection Design of Buildings* and relevant current fire prevention rules in coal industry.

17.1.6 The settings for evacuation and emergency exit of buildings and structures shall conform to existing relevant fire prevention codes in coal industry.

17.1.7 The live loads distributed uniformly on floor for buildings and structures shall conform to current national standard for GB 50583 *Standard for Design of Buildings and Structures for the Coal Industry*.

17.1.8 The minimum net widths of indoor walkway for main workshops, trestle bridges and channels in tunnel chambers shall conform to Table 17.1.8 and existing relevant fire prevention codes in coal industry.

Table 17.1.8 The minimum net width for main workshops, trestle bridges and channels in tunnels (m)

Title of buildings	Net width of maintaining access	Net width of sidewalk		Remarks
		Distance to running part of equipment	Distance with fixed part of equipment	
Main workshop, preparing workshop, filter pressing workshop	0.7	1.0	0.7	-
Trestle bridge	0.5	-	1.0	Width of middle sidewalk for double belt conveyor trestle bridge
Tunnel	0.7	-	1.2	Exits should be at the two ends of tunnel
	1.1	-	1.1	End type

Note: Once cable bridge, water pipe, heating equipment and pipe network are arranged in trestle bridge and tunnel, their composite required widths will be added to corresponding widths of trestle bridge and tunnel.

17.2 Main buildings

17.2.1 The design of coal bunker (stockpile) shall conform to the following regulations:

1 Structure type shall be confirmed in accordance with service life, technological process requirements, engineering geology, construction conditions and technology comparison of coal preparation plant.

2 If the capacity of bunker is larger, reinforced concrete silo shall be used; if multiple coal is stored in different bunkers, reinforced concrete square bunker may be used; if the landform and foundation are suitable, gravity loading bunker may be used; if the foundation and technology are feasible, high bunker should be constructed; if the extra-large capacity of bunker is requested, semi-underground type bunker should be used.

3 Closed structure should be used for stockpile, light material shall be used for the enclosing structure and top cover of stockpile.

4 Protective handrail, perforated strainer or removable cover plate shall be installed on coal blending holes.

5 In cold area, insulation measures for bunker and anti-freezing measures for bunker opening shall be used, staircase should be closed.

6 The space impact on railway building clearance from foundation settlement shall be reserved for crossing rail bunker or gravity loading bunker, which shall conform to related regulations of railway clearance.

17.2.2 The design of main workshop, dense medium workshop, flotation workshop, drying shop, filter press workshop and preparation workshop shall conform to the following regulations:

1 The reasonable structural style of workshops shall be adopted in accordance with technology and equipment layout. The form and structure of workshop buildings should be simple and regular, and should avoid high and low dislocation, and concave protruding.

2 Staircase should be built in workshops. Toilets shall be built on the storey for operator working. Elevators for passengers and goods in main workshop may be built in accordance with the requests of workshop layout and maintenance.

3 The dynamic calculation shall be undertaken for structural elements born dynamic load. If the basis is sufficient, the load of mass or equipment may be calculated as static load that multiply by dynamic coefficient; the bracing structural stiffness of vacuum pump, centrifuge, large size screening and crushing equipment, and pulley of large size belt conveyor shall be increased in accordance with structural layout conditions.

4 The overfall shall be set around holes on every floor in workshops.

5 When drying shop is built with other workshops jointly, the fire partition shall be used in fire compartment.

6 Centralized control room should be arranged separately with major structure of main workshop; dustless building materials shall be used for ground of centralized control room and switching room. Air-tight door and double-deck soundproof window shall be used for control room.

7 Sound insulation and noise elimination measures shall be undertaken for noisy electromechanical equipment in workshop.

8 Ventilation measures shall be taken in flotation workshop.

17.2.3 The design of tippler room and coal receiving pit shall conform to the following regulations:

1 Reinforced concrete structure shall be taken for standard gauge tippler room and coal receiving pit, masonry or concrete structure should be used for narrow gauge tippler room and shallow coal receiving pit.

2 The top cover shall be used for coal receiving pit, which shall meet the need of motor vehicles through the pit. The enclosed height on two sides of bottom of coal receiving pit may be 1.2m–1.5m higher than ground. In severe coal area, when surface moisture of raw coal is more than 7%, hot insulation measures shall be taken for coal receiving pit.

3 Ventilation, dedusting and drainage measures shall be taken for underground buildings of coal receiving pit. The mounting holes, ventilation holes and at least two emergency exits shall be arranged in coal return tunnel. In coal receiving pit of single hopper or end type tunnel, the net widths of emergency exit and tunnel may be conformed to existing relevant regulations of fire protection codes in coal industry.

4 The lounge for workers shall be arranged in coal receiving pit or tippler room.

17.2.4 The design of building and structure in coal slurry system shall conform to the following regulations:

1 The reinforced concrete structure shall be used for overhead thickener; reinforced concrete structure, concrete structure and masonry structure may be used for semi-underground type thickener in accordance with actual conditions. If the diameter of thickener is above 30m (including 30m), and the temperature difference is bigger, temperature stress for tank structure should be calculated. If the diameter of thickener is above 45m (including 45m), reinforced concrete structure shall be used for sidewall of tank.

2 The reinforced concrete structure should be used for supporting structure of settling tower.

3 Reinforced concrete structure, concrete structure, or masonry structure may be used for slurry settling pond in accordance with height of pond, ground water level and environmental protection. When slurry is cleared by grab bucket, impact resistance measures shall be taken for bottom of the pond.

4 When the ground water level is higher, the anti-floating design for semi-underground type pond shall be implemented.

17.2.5 The design of the belt conveyor trestle and tunnel shall conform to the following regulations:

1 The structural style of supporting structure for trestle bridge shall be determined on the basis of supporting height of trestle bridge and the location of trestle bridge in general layout.

2 Reinforced concrete structure or steel structure shall be used for span structure of trestle bridge in accordance with seismic intensity, usage functions, span and height of trestle bridge.

3 If climate condition permits, the superstructure of the trestle bridge may be open type or semi-open type.

4 The support structure of trestle bridge should not be embedded in coal pile. If the condition is limited and it is inevitable, the brackets shall be decreased and the span shall be increased, and the round cross section should be used for trestle. In design, coal spontaneous combustion shall be prevented and the measures for collisions between loading & unloading machine and brackets shall be taken.

5 The net height for trestle bridge and tunnel perpendicular to bevel shall not be less than 2.2m, and the height of arch foot for arch structure shall not be less than 1.8m.

6 If the gradient of sidewalk and maintaining roadway is above 5°, foot grip shall be arranged; if

the gradient is above 8°, step shall be arranged.

7 The dam, water channel and floor drain shall be arranged in the gap of floors of trestle bridge for belt conveyor.

17.3 Ancillary buildings

17.3.1 The index of the administrative, public construction projects and construction area for coal preparation plant may be determined by the owner or selected as Appendix A in this code.

17.3.2 Construction area of coal sampling room and assay room may be determined by the owner or selected as Appendix A in this code.

17.3.3 The assay room may be constructed with plant office jointly and shall be arranged on the end of ground floor. The weighing room and calorific value measurement room should be arranged as the north orientation room. The coal sampling room should be arranged on the ground floor of main workshop.

17.3.4 The residential districts for pithead, group-mine's and user's coal preparation plant shall be planned and constructed together with residential districts of mine or main project; the residential districts for central coal preparation or mine coal preparation may be planned by owner or planned by mine uniformly.

17.3.5 The building area of dormitory should be 15m²–18m² per employee, the proportion of single employee and family ratio should be determined as practical situation. Residence and public utility shall be solved by society.

住房城乡 建设部 浏览专用

18 Techno-economy

18.1 General requirements

18.1.1 Investment estimation, economic evaluation and techno-economic comprehensive assessment shall be prepared in the preliminary feasibility study and feasibility study for coal preparation plant. Budget estimate shall be prepared in preliminary design and investment analysis shall be prepared, when necessary.

18.1.2 Techno-economy of coal preparation plant shall conform to this code and also execute related regulations of national or current industry sector's cost management and economic evaluation.

18.2 Manpower quota

18.2.1 The manpower quota shall be determined in accordance with designed production capacity, working system, mechanized equipment level, automation level, system link, management model, and organization structure. All production workers and administrative staffs shall be included in manpower quota which are needed for the coal preparation project achieving designed production capacity. Service staffs and other staffs may not be included in manpower quota, but can be adjusted as practical conditions. The number of manpower quota registration shall be determined as number of attendance multiplied by registration coefficient. Registration coefficient shall be determined in accordance with the factors of holiday and festivals, sick leave, casual leave, stagger holidays, so the following coefficients should be used:

- 1 Registration coefficient for administrative staffs: 1.0.
- 2 Registration coefficient for production workers: 1.4–1.5.

18.2.2 Production worker efficiency and whole employee efficiency shall be calculated in preliminary feasibility study, feasibility study and preliminary design for coal preparation plant. Production worker efficiency and whole efficiency may be calculated as the following formulas:

$$\text{Production worker efficiency} = \frac{\text{Designed daily output of raw coal}}{\text{The number of daily production worker attendance}} \quad (18.2.2-1)$$

$$\text{Whole employ efficiency} = \frac{\text{Designed daily output of raw coal}}{\text{The number of daily production employee attendance}} \quad (18.2.2-2)$$

18.2.3 Index of whole employee efficiency for coal preparation plant shall conform to the regulations of Table 18.2.3.

Table 18.2.3 Index of whole employee efficiency for coal preparation plant

Size of plant	Designed production capacity (Mt/a)	Type of coal preparation plant	Index of whole employee efficiency (t/person)
Oversize plant	>10.00	Pithead, group-mine's and user's coal preparation plant	≥100
		Mine, central coal preparation plant	≥80

Table 18.2.3(continued)

Size of plant	Designed production capacity (Mt/a)	Type of coal preparation plant	Index of whole employee efficiency (t/person)
Large size plant	3.00-8.00	And user's coal preparation plant	≥80
		Mine, central coal preparation plant	≥60
	1.20-2.40	Pithead, group-mine's and user's coal preparation plant	≥60
		Mine, central coal preparation plant	≥45
Medium size plant	0.45-0.90	Pithead, group-mine's and user's coal preparation plant	≥50
		Mine, central coal preparation plant	≥35
Small size plant	≤0.30	Pithead, group-mine's and user's coal preparation plant	≥20

18.3 Investment estimation and budget estimation

18.3.1 The deviation rate of project total investment for preliminary feasibility study of coal preparation plant shall be estimated within $\pm 20\%$. Investment estimation summary statement shall be prepared by divided production system and links during investment estimation process; the reasonability for investment shall be analyzed, when necessary.

18.3.2 The deviation rate of project total investment for feasibility study of coal preparation plant shall be estimated within $\pm 10\%$. Once approved, total investment estimated in feasibility study shall be as the basis of construction cost limit (calculated at comparable price).

18.3.3 The budget estimation of preliminary design for coal preparation plant shall be calculated and prepared in accordance with the design quantities, investment would be analyzed when necessary. The budget estimation of preliminary design shall be as the criterion for construction cost control.

18.3.4 During construction process of coal preparation plant, if construction conditions change and budget estimation needs to be adjusted, the adjustments of completed projects shall be calculated and listed on the basis of actual settlement, and that of the unfinished projects may be prepared in accordance with budget estimation requirements and comparative analysis for investment shall be made.

18.4 Economic evaluation

18.4.1 Investment allocation for coal preparation plant shall be determined on designed construction period and financing programs.

18.4.2 The total capital fund of coal preparation plant project shall be determined based on national current relevant regulations.

18.4.3 The methods and parameters for economic evaluation of coal preparation plant shall be executed based on national current relevant regulations.

18.5 Technical and economic comprehensive evaluation

18.5.1 In the preliminary feasibility study of coal preparation plant, the necessity and feasibility of project shall be evaluated comprehensively in accordance with raw coal resource situations, external construction conditions, market survey and analysis, enterprise development, main technical proposal, financing and investment effect.

18.5.2 In feasibility study stage, the external construction conditions shall be further surveyed, agreed and implemented in accordance with the resources condition provided by the exploration and geological report of mine field, the market situation of coal product, the detailed design schemes and the investment effect shall be further analyzed, and the feasibility and reasonability for construction of coal preparation plant should be evaluated comprehensively.

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Appendix A Index of ancillary building area for coal preparation plant

A.0.1 Index of administrative and public building area for coal preparation plant may be selected from Table A.0.1.

Table A.0.1 Index of administrative and public building area for coal preparation plant

No.	Title		Index	Remarks
1	Plant office		22m ² /person-24m ² /person	Administrative staffs, excluding test room, centralized control room, office automation network room and communication room
2	Shift room		50m ² /shift-70m ² /shift	3-4 production shift
3	Bathroom	Dressing room	1.05m ² /person-1.25m ² /person	Registered employee, female employee accounts for 40%
		Shower room	0.85m ² /person-1.00m ² /person	1.35 times the number of production staffs in big shift
		Subsidiary room	0.40m ² /person-0.45m ² /person	Registered employee
4	Dining hall		1.80m ² /person-2.00m ² /person	Registered employee
5	Guard room	Main entrance	50 m ² -60m ²	-
		Secondary entrance	25m ² /place	-
6	Public toilet		30m ² /place	1-2 places in accordance with requirements

A.0.2 Index of coal sampling room area and test room area may be selected in accordance with Table A.0.2.

Table A.0.2 Index of coal sampling room area and test room area

Designed production capacity (Mt/a)	<0.9	1.2-6.0	>8.0
Production coal sampling room (m ²)	80-110	120-160	150-180
Sale coal sampling room (m ²)	90	110	110
Test room (m ²)	70-140	130-220	150-320

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 50015 *Standard for Design of Building Water Supply and Drainage*
- GB 50016 *Code for Fire Protection Design of Buildings*
- GB 50034 *Standard for Lighting Design of Buildings*
- GB 50041 *Code for Design of Boiler Plant*
- GB 50052 *Code for Design Electric Power Supply Systems*
- GB 50054 *Code for Design of Low Voltage Electrical Installations*
- GB 50055 *Code for Design of Electric Distribution of General-Purpose Utilization Equipment*
- GB 50057 *Code for Design Protection of Structures against Lightning*
- GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*
- GB 50060 *Code for Design of High Voltage Electrical Installation(3-110kV)*
- GB 50062 *Code for Design of Relaying Protection and Automatic Device of Electric Power Installations*
- GB/T 50065 *Code for Design of AC Electrical Installations Earthing*
- GB 50127 *Technical Standard for Aerial Popeway Engineering*
- GB 50215 *Code for Design of Mine of Coal Industry*
- GB 50217 *Standard for Design of Cables of Electric Power Engineering*
- GB 50311 *Code for Engineering Design of Generic Cabling System*
- GB 50465 *Code for General Planning of Mining Area of Coal Industry*
- GB/T 50466 *Design Standard for Heating Ventilation and Air Conditioning of Coal Industry*
- GB 50583 *Standard for Design of Buildings and Structures for the Coal Industry*
- GB 50736 *Design Code for Heating Ventilation and Air Conditioning of Civil Buildings*
- GB 50810 *Code for Design of Water Supply and Drainage of Coal Industry*
- GBJ 12 *Code for Design of Class III、IV Railway*
- GBJ 22 *Code for Design of Road in Factories and Mining Areas*
- GB 146.2 *Gauge for Standard Gauge Railways-Part 2:Structure Gauge*
- GB 4387 *Safety Regulations for Railway and Road Transportation in Plants of Industrial Enterprises*
- GB/T 4757 *Method for the Batch Flotation Testing of Fine Coal*
- GB 5749 *Standard for Drinking Water Quality*
- GB 8978 *Integrated Wastewater Discharge Standard*
- GB 13271 *Emission Standard of Air Pollutants for Boiler*
- GB/T 16417 *Method for Evaluation the Washability of Coal*
- GB 17167 *General Principle for Equipping and Managing of the Measuring Instrument of Energy in Organization of Energy Using*
- GB/T 17608 *Division of Variety and Grading for Coal Products*
- GB 17945 *Fire Emergency Lighting and Evacuate Indicating System*
- GB/T 18916.11 *Norm of Water Intake-Part 11:Coal Cleaning*
- GB/T 18920 *The Reuse of Urban Recycling Water-Water Quality Standard for Urban*

Miscellaneous Use

GB 20426 *Emission Standard for Pollutants of Coal Industry*

GB/T 26128 *Classification and Utilization of Scarce and Special Coal Resources*

GB/T 29163 *Technical Guidance for the Utilization of Gangue*

GB/T 29453 *Specification for Equipping and Managing of the Measuring Instrument of Energy in Coal Enterprise*

CJJ 34 *Design Code for City Heating Network*

CJJ/T 81 *Technical Specification for Directly Buried Hot-Water Heating Pipeline in City*

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

JTG B01 *Technical Standard of Highway Engineering*

MT/T 144 *Method for Coal Preparation Laboratory Timed-Release Flotation Analysis*

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