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UTP THERMAL POWER PLANT 4TH PHASE PROJECT

THERMAL MECHANICAL SPECIALITY

VOLUME NO. 1 SECTION NO. 1

机务部分

第 1 卷 第 1 册

General information of the Detailed design  
Drawing and Volume Content List  
施工图总说明及卷册目录



Shandong Jinshuo Yangguang Energy Technology Co., Ltd.

山东金硕阳光能源科技有限公司

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**Approved by 批准:**

**Checked by 审核:**

**Verified by 校对:**

**Prepared by 编写:**

# 1 Outline 概述

## 1.1 Design considerations 设计依据

1.1.1 Designing contract and technical agreement with United Paper Public Co. Ltd

与泰国联合纸业有限公同的设计合同和技术协议；

1.1.2 United Paper Public Co. Ltd and Jinan Boiler Group Co., LTD. Signed “1x70t/h CFB Boiler and Auxiliary Equipment Technical Agreement”

泰国联合纸业有限公同与济南锅炉集团有限公司签订的《1x70t/h 循环流化床锅炉及辅助设备技术协议》；

1.1.3 MOM on site with United Paper Public Co. Ltd

与泰国联合纸业有限公同在现场的会议纪要；

1.1.4 Designing materials and referred documents about the project

本工程的设计资料及依据性文件；

1.1.5 Basic design document of the project

本工程的初步设计文件

1.1.6 Ralated national and sector standards and specifications

有关的国家标准、规范及行业标准、规范；

1.1.7 Product drawing and documents supplied by mainframe producer and auxiliary machine producers

主机厂、辅机厂提供的产品图纸、文件；

1.1.8 Letters sent and received by relevant departments.

与有关部门的来往文函。

## 1.2 设计范围 Design scope

1.2.1 Thermal system, combustion system 、 service water system and ignition oil system design as well;

全厂热力系统、燃烧系统、工业冷却水系统、锅炉燃油系统等的的设计；

1.2.2 Installation design of 1 × 70t/h CFB and its attachments, and the auxiliary equipments as well;

1×70t/h 循环流化床锅炉及其附属设备和辅机的安装设计；

1.2.3 Layout of the boiler area;

锅炉区域的布置设计；

1.2.4 Steam and water pipes, flue gas/air/pulverized coal pipes, boiler igniting oil pipes a in the boiler area;

锅炉区域内汽水管道、烟风煤粉管道、锅炉点火油管道的安装设计;

1.2.5 Selection and installation of the lifting equipment in the boiler area;

锅炉区域内起吊设备的选型安装设计;

1.2.6 Design of the insulation and paint of the installed auxiliary machines, steam and water pipes, flue gas/air/pulverized coal pipes, air pipes, oil pipes and platform staircases ,not include the insulation and paint of boiler body, and ESP. The manufactures are responsible for the insulation and paint design of turbine body and ESP. Materials are supplied by Jinan Boiler according to the list.

除锅炉本体、除尘设备本体保温外的所有安装的辅机及汽水管道、烟风煤粉管道、空气管、油管和平台扶梯的保温油漆设计。锅炉本体、除尘设备本体保温设计由制造厂负责，材料由济南锅炉根据清单供货。

### 1.3 Specifications of Main Components 主机规范

#### 1.3.1 Boiler 锅炉

Type:Sub-high temperature sub-high pressure circulating fluidized bed coal-fired boiler.

型号: YG-70/5.29-MT 型次高温次高压循环流化床燃煤锅炉.

Rated evaporating capacity of boiler 额定蒸发量: 70t/h

Superheated steam pressure 额定蒸汽压力: 5.29MPa(g.)

Superheated steam temperature 额定蒸汽温度: 485℃

Feed-water temperature 给水温度: 150℃

Primary air temperature after air preheater 一次热风温度: 150℃

Secondary air temperature after air preheater 二次热风温度 : 150℃

Gas exhaust temperature 排烟温度: 140℃

Guaranteed efficiency 热效率: 89%

Manufactory 生产厂家: JINAN BOILER GROUP CO.,LTD 济南锅炉集团有限公司

### 1.4 Fuel 燃料

#### 1.4.1 Fuel source 燃料来源

The fuel for this project is the coal of owner.

本工程燃料为业主提供的煤质资料。

#### 1.4.2 Coal composition data 煤质成分资料

According to Owner's report, the Coal Quality Analysis as following

根据业主提供的煤质分析报告，本工程煤质分析资料如下表：

表 1.1 燃煤煤质资料 Coal Quality Analysis

NO.	PARAMETER		UNIT	Mean
1	Total Moisture	a.r	%	32.73
2	Ash Content	adb	%	8.01
3	Volatile Matter	adb	%	41.0
4	Fixed Carbon	adb	%	40.88
5	Total Sulfur	adb	%	0.67
6	Gross Calorific Value	adb	Kcal/kg	5850

#### 1.4.3 Coal consumption of boiler 锅炉燃料消耗量

表 1.4 calculated coal consumption 计算燃煤量

NO. 序号	Item 项 目	Unit 单 位	CFB boiler 1×70t/h CFB 锅炉
1	consumption per hour 每小时耗煤量	T	13.74
2	onsumption 1 day 每日耗煤量	T	302.28
3	Onsumption 1 year 每年耗煤量	T	103050

注：① 1day contains 22 hours 日耗煤量按每日 22 小时计算。

② 1year contains 7500 hours 年耗煤量按每年 7500 小时计算。

③ Boiler rated operating conditions 锅炉额定工况。

## 2 The main dsigning principles of designing drawings 施工图主要设计原则

### 2.1 Combustion system(see JSYG-F2301S-J0102-02)

燃烧系统（见 JSYG-F2301S-J0102-02 图纸）

#### 2.1.1 Combustion system and auxiliary equipments choosing 燃烧系统及辅机选择

The boiler's capacity is 70t/h, secondary temperature and pressure CFB. There are 3 coal feeding pipes before the boiler, through which coal goes to combustion chamber. Separate device lies at the outlet of the furnace, and there is Loop sealer lies under the separator. The

separated fly ash return to furnace through the loop sealer, in order to reduce the carbon content of fly ash, then the heat efficiency is advanced. Primary and secondary air both heated through the air preheater. The primary air is from the two sides of water cooled air chamber and through the air distribution chamber. The secondary air is sent by two layers from the grid height direction. The flue gas goes outside atmosphere through economizer, air preheater, ESP, and ID fan in turn.

本锅炉为 70t/h 次高温、次高压循环流化床锅炉。锅炉炉前布置了三根给煤管，煤通过给煤管送入燃烧室燃烧。分离装置布置在炉膛出口，在分离器下部布置了返料装置。分离下来的飞灰经返料装置送回炉膛继续燃烧，以降低飞灰的含碳量，从而提高了锅炉的热效率。一二次风均经过空预器加热。一次风从炉膛水冷风室二侧进入，经布风板风帽进入燃烧室。二次风在布风板上高度方向分二层送入。二次风燃烧完成后的烟气经锅炉尾部烟道，依次经过省煤器、空气预热器、经电除尘器除尘后由引风机送入烟囱排入大气。

### 2.1.2 Auxiliary equipments of combustion system

#### 燃烧系统辅助设备

##### (1) Raw coal bunker 原煤斗

The boiler is equipped with a steel coal hopper with an effective volume of  $103\text{m}^3$ , which can supply 7.5h coal consumption.

该锅炉设有一个有效容积为  $103\text{m}^3$  的钢煤斗，可供锅炉约 7.5 小时的用煤量。

##### (2) Primary air fan 一次风机

1 set primary air fan, fan model: JG865/13.1KNO16D , flow:  $51900\text{m}^3/\text{h}$  , head:  $13100\text{Pa}$  ; motor type: YXKK355-4-315KW, motor power: 315KW, motor voltage: 10KV; RPM: 1450 r/min; right  $90^\circ$  。

该锅炉设一次风机 1 台，型号为 JG865/13.1KNO16D,  $Q=51900\text{m}^3/\text{h}$ ,  $P=13100\text{Pa}$ ; 电动机型号: YXKK355-4-315KW, 电动机功率为 315KW, 电动机电压: 10KV; 转速为 1450 r/min, 右旋  $90^\circ$  。

##### (3) Secondary air fan 二次风机

1 set Secondary air fan, fan model: JG865/12KNO14.5D , flow:  $51900\text{m}^3/\text{h}$  , head:  $12000\text{Pa}$ ; motor type: YXKK355-4-280KW, motor power: 280KW, motor voltage: 10KV; RPM: 1450 r/min; right  $90^\circ$  。

该锅炉设二次风机 1 台，型号为 JG865/12KNO14.5D,  $Q=51900\text{m}^3/\text{h}$ ,  $P=12000\text{Pa}$ ;

电动机型号：YXKK355-4-280KW，电动机功率为 280KW，电动机电压：10KV；转速为 1450 r/min；左旋 90°。

#### (4) ID fan 引风机

1 set ID fan, fan model: JY2916/4.2KNO19.8D, flow: 175000m<sup>3</sup>/h, head: 4400Pa; motor type: YXKK450-4-355KW, motor power: 355KW, motor voltage: 10KV; RPM: 960 r/min, right 180°。

该锅炉设引风机 1 台，型号为 JY2916/4.2KNO19.8D，Q=175000m<sup>3</sup>/h，P=4400Pa；电动机型号：YXKK450-4-355KW，电动机功率为 355KW，电动机电压：10KV；转速为 960 r/min，右旋 180°。

#### (5) Returning back fan 返料风机

2 sets returning back fan, fan model: NSR150 II, flow: 25m<sup>3</sup>/min, head: 20000Pa, motor power: 30Kw, RPM: 1620 r/min。

该锅炉设返料风机 2 台，型号为 NSR150 II，Q=25m<sup>3</sup>/min，P=20000Pa；电动机功率为 30Kw，转速为 1620 r/min。

#### (6) Weighing type belt coal feeder 称重式皮带给煤机

3 sets weighing type belt coal feeder, model: NJGC-30, output: 8.5t/h, motor power: 5.245Kw, frequency conversion control, Transport distance: 3.484m。

该锅炉设称重式皮带给煤机 3 台，型号为 NJGC-30，Q=8.5t/h；电动机功率为 5.25Kw，变频控制，输送距离：3.484m。

#### (7) ESP 静电除尘器

The ESP contains 4 electric fields, type: DBK-70-4, area 70 m<sup>2</sup>, Treated air volume: 170000m<sup>3</sup>/h (140℃), The efficiency can be above than 99.77%

电除尘器采用四电场除尘器，型号：DBK-70-4，面积 70 m<sup>2</sup>，处理风量：170000m<sup>3</sup>/h (140℃)，除尘效率可达到 99.77% 以上。

#### (8) Chimney 烟囱

Use of original chimney 利用原烟囱

## 2.2 Major Thermal Systems 主要热力系统

### 2.2.1 Main steam system 主蒸汽系统

Main steam system adopts piping-main scheme, the main steam pipe is drawn out from



the superheater outlet header, the pipe diameter is  $\phi 273 \times 11$ , and the main steam pipe is connected to the main steam master pipe.

The material of the main steam pipe is 15CrMoG.

主蒸汽系统采用母管制, 主蒸汽管道由锅炉过热器出口集箱引出, 管径为 $\phi 273 \times 11$ , 接入主蒸汽母管。

主蒸汽管道的材质为 15CrMoG。

### 2.2.2 Feed water system 给水系统

The main feed water system adopts common-piping scheme.

The feed water system is equipped with a 100% capacity electric feed pump, which is matched with two electric feed pumps in the third phase. When the 3# and 4# boiler are running at the same time, the feed pump can be used for two purposes and one standby operation. The high and low pressure water supply pipeline of this phase is connected with the high and low pressure water supply pipeline of the third phase, which adopts the mother pipe.

Feed water operation station is supplied by the boiler factory. Regulating range for the main circuit is 30%~100% to adapt regulating range under diversity load work condition.

主给水系统采用母管制系统。

给水系统设置 1 台 100%容量的电动给水泵, 与三期 2 台电动给水泵配合, 3#和 4#锅炉同时运行时, 给水泵可以两用一备运行。本期高低压给水管道与三期高低压给水管道相连, 采用母管制。

给水操作台由锅炉厂提供, 主路调节范围为 30%~100%, 以适应不同负荷工况下给水的调节要求。

### 2.2.3 Cooling Water System 冷却水系统

The cooling water for the auxiliary equipments shaft bearing of boiler is from industrial cooling water and backwater is to the backwater pipe of the industrial cooling water.

锅炉房辅机设备轴承冷却用水, 由工业水管道提供, 回水至工业水回水管。

### 2.2.4 All Plant Exhaust Steam Piping and Noise Absorption System 全厂排汽系统及噪声

The drum safety valve outlet of boiler, header safety valve outlet of superheater and boiler start-up exhaust outlet are all equipped with silencers and directed to top of the roof of boiler.

锅炉的汽包安全阀排汽、过热器出口集箱的安全阀排汽、锅炉启动排汽出口全部设置了消音器, 并引到锅炉轻型屋顶上方。

## 2.2.5 Selections of Auxiliary Equipments 辅机设备选择

### 2.2.5.1 Feed water pump 给水泵

One 100% capacity constant speed feed water pumps is installed in this phase project.

本期工程共安装 1 台 100%容量的电动定速锅炉给水泵。

Technical data of feed water pumps are as follows:

给水泵技术数据如下：

Model 型号	QDG95-770
Capacity 流量	85m <sup>3</sup> /h
Head 扬程	7.2MPa
Model of electric motor 电动机型号	YXKK355-2-355KW
Motor power 电动机功率	355KW
Motor voltage 电动机电压	10KV
RPM 转速	2980r/min
Quantity 台数	1

### 2.2.5.2 Deaerator 除氧器

1 set Spin membrane deaerator are installed in this phase project.

本期安装一台旋膜除氧器。

Technical data of deaerator are as follows:

除氧器技术数据如下：

Model 型号	GCM-85
Working pressure 工作压力：	0.49MPa (a)
Operating temperature 工作温度：	150℃
The effective volume of deaeration tank 除氧水箱的有效容积：	35m <sup>3</sup>
Chemical make-up water temperature 化学补给水温度：	30℃
Heat steam parameter 加热蒸汽参数：	0.785MPa(a), 285℃

### 3.3 Layout of the Main Building 主厂房布置

#### 3.3.1 Layout of the Boiler Room and behind Boiler 锅炉房及炉后布置

The boiler is laid in the open air. The width of main column of the boiler is 4.75m. The passage width in front of the boiler is 4.5m which can satisfy overhaul demand of boiler and auxiliary equipment.

One primary air fan and one secondary air fan are laid in 0m flat.

ESP, induced-draft fan are laid out in sequence outside the boiler room.

锅炉为半露天布置，锅炉主柱宽度 7.7m，炉前通道 4.6m，可满足锅炉及附属设备检修的需要。

在锅炉间内，0m 布置有一台一次风机、一台二次风机和两台返料风机。

在锅炉房外依次布置有静电除尘器、引风机。

#### 3.3.2 Layout Data of Main Building 主厂房布置数据

Item 项 目		Data 数据	Remarks 备 注
Column space 柱距 (m)		6×2=12	6a to 8 axis pitch 6a 到 8 轴间距
Elevation of the operating layer 运转层标高 (m)		7.0	
Deaerator and coal-bunker 除氧煤仓间	Span 跨距 (m)	8.5	
	Elevation of the pipe and cable interlayer 管道、电缆夹层标高	4.0	
	Elevation of the deaerator layer 除氧层标高 (m)	12.5	
	Elevation of the coal handling belt layer 输煤皮带层标高 (m)	21.5	
	Space between C Column of coal 煤仓间 C 列柱距锅炉 K1 (m)	4.6	
Boiler room 锅炉	Platform of boiler operating layer 锅炉运转层平台 (m)	7.0	

	From real-line column of boiler to centerline of chimney 锅炉后排柱距烟囱中心线 (m)	33.26	Mark the chimney position according to the first phase drawing 按一期图纸标注烟囱位置
	B Column to centerline of chimney B 列柱距烟囱中心线 (m)	59	
	Boiler span (K1 Column to K4 Column) 锅炉跨度 (K1 柱距 K4 柱) (m)	12.64	
	Width of boiler (vertical) 锅炉宽度 (纵向尺寸) (m)	7.7	

#### 4 Explanations on relevant items in the design 设计中有关事项的说明

The Detailed design drawing should follow the thermal machine chapter of the Design “Code of Detailed design drawings of fossil fuel power plants” issued by provincial/regional electric power design institute union in 1988. Printing manner and charting method should follow the “Standard for electric power engineering drawings DL/T 5028-2015” which is issued on July, 01, 2015.

施工图成品深度原则上按 88 年省（区）电力设计院联合会《火力发电厂施工图设计守则》热机篇，出图方式和制图方法按 2015-07-01 发布的《电力工程制图标准 DL/T 5028-2015》。

##### 4.1 About steam/water pipes 汽水管道部分

4.1.1 The fascicule drawing generally includes the first page drawing (system drawing), layout drawing, summary table of materials, list of brackets and hangers, summary table of materials of brackets and hangers and production drawing for those non-standard parts.

分册图纸一般有首页图（系统图）、布置图、管道安装材料汇总表、支吊架明细表、支吊架材料汇总表及非标准零部件制作图。

4.1.2 The first page drawing (System drawing) usually shows the design limitation of this volume, which includes the system and pipes, water feeding and exhausting, and air exhausting as well. Pipe radius and material code are also illustrated.

首页图（系统图）一般标明本卷册设计界限，包括系统和管道、疏放水及放气，并注明管径、材料编号。

4.1.3 On the layout drawing, it usually shows the pipe radius, gradient, the water feeding

and exhausting points, forms and positions as well as numbers of brackets and hangers, and the measurement position of the thermal engineering control.

布置图上一般均注明管径、坡度、疏放水点、支吊架形式、位置和数值、热控测点位置。

4.1.4 There must be layout drawings for all the pipes whose outer diameters are larger than DN50. For those outer diameters smaller than DN50, it is usually not necessary to give the layout drawing except for a few important pipes. It only requires showing the layout requirement, listing pipes, and bracket materials.

外径 DN50 以上的管道均出布置图。DN50 及以下的管道除少数重要管道出布置图和示意图外，均未出布置图，只对布置要求做出说明，开列管材及支架材料。

4.1.5 The brackets and hangers used for steam/water pipes should follow the “Design Manual of Brackets and Hangers for steam/water pipes in fossil fuel power plants” issued by the northwest electric power design institute in 1983.

汽水管道的支吊架采用西北院 83 年编制的《火力发电厂汽水管道支吊架设计手册》。

4.1.6 Parts of steam/water pipes should be selected following the “Design Manual of parts of steam/water pipes in fossil fuel power plants (GD2000)” issued by Northeast Electric Power Design Institute. The orifice plate for flow measurement should be order by personnel in thermal engineering control.

汽水管道零部件按东北电力设计院编制的《火力发电厂汽水管道零件及部件典型设计手册（GD2000）》选用。流量测量孔板及由热控专业订货。

## **4.2 About flue gas/air/pulverized coal pipes 烟风煤管道部分**

4.2.1 The fascicule drawing generally includes layout drawings of pipes, summary table of materials, list of brackets and hangers, summary table of materials of brackets and hangers and production drawing for those non-standard parts.

分册图纸一般有管道布置图、材料汇总表、支吊架明细表、支吊架材料汇总表及非标准零部件制作图。

4.2.2 The design of flue gas/air/pulverized coal pipes should follow the “Design Manual of brackets and hangers used for flue gas/air/pulverized coal pipes in fossil fuel power plants” issued by East power electric design institute of Ministry of Water Resources and Electric Power in Jul, 1997.

烟风煤管道支吊架按水利电力部华东电力设计院编制的《火力发电厂烟风煤粉管道支吊架设计手册》（试行本）（1977 年 7 月）进行设计。

4.2.3 The parts of flue gas/air/pulverized coal pipes should be selected following the “Design Manual of parts of flue gas/air/pulverized coal pipes in fossil fuel power plants (74DD)” issued by East China Electric Power Design Institute. The motor-drive mechanisms in flue gas/air pipes should be ordered in C&I.

烟风煤管道零部件参考华东电力设计院编制的《烟风煤粉管道零部件典型设计手册（74DD）》选用。烟风道上的电动执行机构由热控专业订货。

4.2.4 Non-standard part on the pipe part and root part of brackets and hangers of steam/water pipes and flue gas/air/pulverized coal pipes should be designed according to requirements and those information will be attached to relevant chapters.

汽水管道及烟风煤管道支吊架管部、根部非标准件根据需要设计，附在有关卷册内。

### **4.3 General Regulation 一般规定**

4.3.1 Specifications, provisions and technical regulations complies by this design (The following are performed according to the latest standards)

- (a) Code for design of small fossil fired power plant (GB50049-2011)
  - (b) Code for design of thermal power plant steam/water piping (DL/T 5054-2016)
  - (c) Technical code for stress calculation of steam/water piping in fossil fuel power plant (DL/T5366-2006)
  - (d) Code for design of thermal power plant gas/air/pulverized coal piping (DL/T 5121-2000)
  - (e) Technical code for design and calculation of pulverized coal preparation system in fossil-fired power plant (DL/T 5145-2002)
  - (f) Code for oil/gas piping design of fossil fuel power plant (DL/T 5204-2016)
  - (g) Technical regulation for design of steel made staircases in fossil fuel power plant (DLGJ158-2001)
  - (h) Technical specification for execution and acceptance of electric power construction
  - (i) Code for designing of insulation and painting of fossil fuel power plant (DL/T 5072-2007)
  - (j) Standard for electric power engineering drawings (DL/T 5028-2015)
  - (k) Typical legal measurement units and conversions between them
- 设计遵守的规范、规程及技术规定（以下均按最新标准执行）
- (1) 小型火力发电厂设计规范（GB50049-2011）

- (2) 火力发电厂汽水管道设计技术规定 (DL/T 5054-2016)
- (3) 火力发电厂汽水管道应力计算技术规定 (DL/T5366-2006)
- (4) 火力发电厂烟风煤粉管道设计技术规定 (DL/T 5121-2000)
- (5) 火力发电厂制粉系统设计计算技术规定 (DL/T 5145-2002)
- (6) 发电厂油气管道设计规程 (DL/T 5204-2016)
- (7) 火力发电厂钢制平台扶梯设计技术规定 (DLGJ158-2001)
- (8) 电力建设施工及验收技术规范
- (9) 火力发电厂保温油漆设计规程 (DL/T 5072-2007)
- (10) 电力工程制图标准 (DL/T 5028-2015)
- (11) 常用法定计量单位及其换算

## **5 Precautions and Problems in Construction and Operation 施工运行注意事项及存在问题**

### **5.1 Precautions in construction 施工注意事项**

5.1.1 Please carefully read drawings and technical documents supplied by producers before the installation of the equipment. Before pouring the foundation, please verify that the models, configurations and sizes of delivered equipments are all consistent with the design drawings of our company, then the foundation could be poured after confirmation.

设备安装前请认真查阅制造厂的图纸和技术文件，在基础浇灌前请务必核对到货设备的型号和外形尺寸是否与我公司的设计图纸相符,核对无误后方可浇灌。

5.1.2 The setting spring is selected to be the spring component of spring brackets of steam/water pipes. Therefore in the list of brackets and hangers of this Detailed design drawing, the amount of compression of the spring installation means the amount of installation compression with the spring's minimal permitted distorted amount as the zero point, i.e., the pre-compressed value of the spring is not included. Please note this point when install equipment in field. At the time when springs are ordered, their working load, structural load and installation compression value should also be labeled at the same time. An "A" behind the model of the spring means the diameter of the spring rod is one grade larger than the standard value, whereas two "A" means the diameter of the spring rod is two grades larger than the standard value and so on. This should be specially notified when order springs. Before being installed, the setting springs of pipes should be verified according to the

installation drawing of pipes to check the names or codes of pipes and numbers of hangers marked on the spring component to prevent improper using.

After the setting spring component is installed, the positioning pin can not be removed before the hydraulic test of pipes. During hydraulic test, the spring hanger is temporarily used as rigid hanger to ensure the performance of the spring because of positioning pin's locking.

汽水管道弹簧支吊架弹簧组件选用整定弹簧，故本期施工图中的支吊架明细表中弹簧安装压缩量是指以弹簧允许最小变形量为零点的安装压缩量，即不包含弹簧的预压缩值，请现场安装时注意。弹簧订货时，应同时标注弹簧工作荷载、结构荷载、安装压缩值。弹簧号后加注一个“A”即表示弹簧吊杆直径（d）应比标准值大一级，弹簧号后加注两个“A”即表示弹簧吊杆直径（d）应比标准值大两级，以此类推，订货时应向厂家特别说明。管道的整定弹簧在安装前根据管道安装图核对弹簧组件上标明的管道名称或代号及吊架编号，谨防用错。

整定弹簧组件安装后在管道水压试验之前不得将定位销取出。水压试验时由于定位销锁定，使弹簧吊架暂时成为刚性吊架使用，以保证弹簧的工作性能。

5.1.3 For those pipes which need to be prestretched, it is necessary to comprehensively consider shortening or lengthening tubing according to tightening and sloping requirements when installing them. For prestretching, people should follow the prestretching drawing to prestretch the upper and lower end to designated positions along X, Y, and Z directions, and then solder them. The weld junctions of pressure bearing pipes should not be rudely forced jointing to prevent introducing accessional stress except for those weld junctions that need to be prestretched according to the design regulation.

有冷紧的管道，安装配管时需综合考虑冷紧需要割短（或加长）以及放坡需要割短（或加长）的要求。冷紧应按管道冷紧错口图将上、下口沿 X、Y、Z 三个方向冷拉到指定位置后焊接，除设计规定的冷拉焊接接口外，其它承压管道的焊口，应避免用强力对口，以免引起附加应力。

5.1.4 For those brackets and hangers with high heat displacement, their roots and ducts should be installed using the offset method according to the drawing requirements.

对热位移较大的支吊架应按图纸要求进行根部或管部偏装。

5.1.5 For those pipes with diameter smaller than 50 ( $DN \leq 50$ ), they should be disposed by constructor on their own according to the system drawing and the circumstance in field. The instances among brackets and hangers should follow the “Technical regulation for design of steam/water pipes in fossil fuel power plants” (DL/T 5054-2016). For small pipes bearing



high temperature, it is necessary to consider the compensate for thermal expansion or applying spring brackets and hangers, and their bend radiuses should follow the “Design Manual of parts of steam/water pipes in fossil fuel power plants (GD2000)” issued by Northeast Electric Power Design Institute.

对于  $DN \leq 50$  的管道原则上由施工单位根据系统图和现场情况自行布置，其支吊架间距应满足《火力发电厂汽水管道设计技术规定》DL/T5054-2016。对于温度高的小管道需适当考虑热膨胀的补偿和弹簧支吊，其弯曲半径应满足东北电力设计院编制的《火力发电厂汽水管道零件及部件典型设计手册（GD2000）》的规定。

5.1.6 For easy operation, the feed water valves in header tanks of boilers should be disposed concentratedly.

锅炉各集箱的疏水一、二次阀门应集中布置，以便于操作。

5.1.7 The applied high-pressure bearing pipes should accord with the standard of boiler used high pressure seamless steel tubes (GB5310-2017). For #20 steel tubes with  $PN < 10$ , its standard should accord with boiler used seamless steel tubes (GB3087-2022).

凡采用高压管件，其标准应符合锅炉用高压无缝钢管（GB5310-2017）； $PN < 10$  的 20 号钢管，其标准应符合锅炉用无缝钢管（GB3087-2022）。

5.1.8 When choosing piping materials, it needs to be avoided to use pipes with negative allowance. When pipes need to be heated and bended, those pipes with positive allowance need to be used.

管道材料的选择应限制管道壁厚负公差，火煨弯管弯制时应挑选壁厚正公差的管子。

5.1.9 The water discharge valve of equipment or pipes should connect to the channel to discharge water to underground drain.

设备或管道的放水阀，均引至地沟，使排水有组织排至地沟下水道。

5.1.10 During construction, it should be specially noticed that welding seams at roots and tubing of pipes and brackets as well as hangers should accord with requirements of manual standards. All the welding seam heights which are not specially marked on drawings should be the thinnest thickness of the part to be welded.

施工时应特别注意管道及支吊架根部、管部、连接件的焊缝应符合手册标准要求。所有图纸未标注的焊缝高度均为被焊件的最薄厚度。

5.1.11 To prevent the vibration of the flue gas/air pipe and fans, the followings must be satisfied:

为防止烟风道和风机振动，必须做到：

5.1.11.1 Install fastened ribs in the flue/air pipe with specifications, instances, support methods and joint welding seam according with requirements of drawings.

烟风道加固肋规格、间距、支撑形式以及接点焊缝要求，应严格按照图纸施工。

5.1.11.2 The rotation direction of the fan impeller should be installed seriously following drawings supplied by producers. 风机叶轮旋转方向应严格按照制造厂图纸安装。

5.1.11.3 For the heat compensation of the flue gas/air/pulverized coal pipes, their tightening prestretching, and tubing offset installation in front of compensators must be performed following compensator sizes shown in the drawing.

为满足烟风煤粉管道的热补偿，必须按图示补偿器尺寸进行配置和冷拉、冷压或补偿器前管道偏装。

5.1.12 When there are oil pipes above thermal pipes near the body of the turbine, the insulation layer of thermal pipes should be covered with sheet iron shelter to prevent oil to infiltrate into the insulation layer and burn after contacting with heat pipes which may cause fire. The sheet iron shelter must be installed at the flange joint of oil pipes near thermal pipes. 汽机本体附近的热力管道上方有油管时，热力管道的保温层外表面应包裹铁皮罩，以防止漏油渗入保温层与热管接触后燃烧，引起火灾。在热管附近的油管法兰接头，必须装铁皮罩壳。

5.1.13 The bumping posts on the side of beam and rail of lifting equipments for maintenance should be installed only after these lifting equipments are in their positions.

所有检修起吊设施的轨梁一端车档应在起吊设备就位后再安装。

5.1.14 Please be familiar with all relevant Detailed design drawings before pipe' installation to avoid unnecessary rework. When problems happen, please inform our institute in time and we will modify the design accordingly.

管道安装前请熟悉有关施工图纸，以免造成不必要的返工。若发现问题，请及时向我院工代提出，以便及时配合修改设计。

5.1.15 The underground direct buried pipes should be tamped with degree of compaction greater than or equal to 0.95. The corrosion protection of pipes should follow requirements in the volume of insulation and painting.

地下直埋的管道应垫土夯实，密实度 $\geq 0.95$ ，管道防腐按保温油漆卷册要求进行。

5.1.16 Those typical parts in the flue gas/air/pulverized coal pipes and steam/water pipes with notes like “refer to XXX” should accord with the corresponding standards when

manufactured or ordered.

烟风道及汽水管道中有一些典型零部件备注加“参考 XXX”在制造或定货时，要求应符合相应标准。

5.1.17 Areas with dense pipes. It is very important to ensure size accuracy during installation, otherwise collision between pipes or insulation layers may happen.

管道较密的区域，安装时应特别注意安装尺寸准确，如误差太大，将发生管道或保温碰撞。

5.1.18 The motor-drive mechanism on the steam/water pipe should be integrative when ordered. The specific requirement should be inquired from the thermal engineering control specialty of our institute to ensure whole control system safety.

汽水管道上电动执行机构，订货时要求“一体化”具体要求一定要同我院热控专业联系，以免影响整个控制系统。

5.1.19 All the flange shims in the steam/water/air pipes in this project must apply flexible graphite gasket (except steel shims), and asbestos rubber shims are not used any more.

本工程所有汽、水、空气等管道的法兰垫片设计均采用柔性石墨垫片(钢垫片除外)，不再使用石棉橡胶垫片。

5.1.20 The hoisting load of lifting mechanisms used to lift auxiliary equipments in the main house are all maximum hoisting capacity. Overload is definitely prohibited. Please note it during installation and maintenance.

主厂房辅助设备的起吊设施，起吊荷重均为最大起重量，不允许超载，请安装和检修时注意。

5.1.21 The operation and maintenance of auxiliary machines, throttles and valves, and the manufacture of steel platform staircase and handrails should accord with the new regulations issued in 2001 which are illustrated in detail in drawings.

辅机及风门、阀门的操作维护钢平台扶梯、栏杆的制作按照 2001 年版的新规定，图纸中有详细说明。

5.1.22 The drilling of the main steam/feed water pipe should be completed on the ground with other specialties' cooperation before lifting and installing them.

主汽、主给水管道的吊装前请与其它专业配合，将开孔在地面上完成。

5.1.23 The valves used in this project include domestic adjusting valves and equipment producer supplied valves. Please check their configuration sizes during installation. If the lengths of valves do not accord with the design, please adjust the lengths of pipes. If the

diameters of joints are not matched with pipes, concentric reducers could be applied.

本工程所采用的阀门、国产调节阀、设备厂家配套供应的阀门，安装时请核对有关外形尺寸，若阀门长度与设计不符，可调整管道长度，若接口口径与接管有差异可现场加大小头解决。

## **5.2 Precaution in operation 运行注意事项**

5.2.1 Before the operation, the positioning pin of the setting spring component should be removed and bundled with iron wire and then hang on the spring component to be used when relock is needed. Check the dial plate to verify whether the indicator locates at the position of cold state sign. If not, the error should be recorded. Verify whether the spring component is overloaded, deformed or distorted during installation.

During operation, operator should check whether the spring component could move smoothly in pipes without block, and whether the indicator locates at the position of hot state sign and record it for future referencel.

整定弹簧组件在运行前应将定位销取出并用铁丝捆在一起挂在弹簧组件上，以备需要重新锁定时使用。检查指针板是否在冷态标记的位置，如有偏差应记录备案，检查弹簧组件在安装调整过程中有否过负荷、损伤或变形。

运行时应检查弹簧组件在管道位移过程中是否有升降不畅或卡涩现象，检查指针板是否在热态标记的位置，并记录备案。

5.2.2 Some non-metal compensators are applied in the flue gas/air/pulverized coal pipes. The quality of this kind of compensator varies in a large scale; therefore we must order them from those producers with good reputation.

烟风煤管道有些地方用了非金属补偿器，此种补偿器质量各厂相差很大，选购时应一定注意选购有业绩的正规厂家产品。

## **5.3 Problems 存在问题**

5.3.1 The delivered equipments must be verified according to drawings before installation in field.

5.3.1 现场安装前，图纸一定要与到货设备核对无误方可施工。

5.3.2 If any conflicts with other sections, please obey by contents in this volume.

5.3.2 各分册中若有与本说明不符之处，以本说明为准。

## 6 Catalogue of construction drawings 施工图卷册目录

NO. 序号	Volume NO. 卷 册 号	Name NO. 卷 册 名 称
1	JSYG-F2301S-J0101	Detail design description and volume list 施工图设计说明及卷册目录
2	JSYG-F2301S -J0102	Equipment list 设备清册
3	JSYG-F2301S -J0201	System and layout 系统与布置
4	JSYG-F2301S -J0301	Installation drawing of boiler auxiliary equipment 锅炉辅机安装图
5	JSYG-F2301S-J0401	Installation drawing of primary cold air duct 一次冷风道安装图
6	JSYG-F2301S-J0402	Installation drawing of secondary cold air duct 二次冷风道安装图
7	JSYG-F2301S-J0403	Installation drawing of flue gas duct 烟道安装图
8	JSYG-F2301S-J0404	Installation drawing of returning air pipe 返料风管道安装图
9	JSYG-F2301S-J0405	Installation drawing of seal air for coal feeder 给煤机密封风管道安装图
10	JSYG-F2301S-J0406	Installation drawing of fuel oil pipe 锅炉点火油管道安装图
11	JSYG-F2301S-J0501	Installation drawing of main steam piping 主蒸汽管道安装图
12	JSYG-F2301S-J0502	Installation drawing of HP feed water piping 高压给水管道安装图
13	JSYG-F2301S-J0503	Installation drawing of LP feed water and recirculation water piping 低压给水和再循环管道安装图
14	JSYG-F2301S-J0504	Installation drawing of auxiliary steam piping 厂用蒸汽管道安装图
15	JSYG-F2301S-J0505	Installation drawing of deaerator concerned piping 除氧器有关管道安装图
16	JSYG-F2301S-J0506	Installation drawing of drain tank concerned piping 疏水箱有关管道安装图
17	JSYG-F2301S-J0507	Installation drawing of blowdown and drain piping 锅炉排污及疏水管道安装图
18	JSYG-F2301S-J0508	Installation drawing of DM water piping 除盐水管管道安装图
19	JSYG-F2301S-J0509	Installation drawing of industrial water piping 工业水管管道安装图
20	JSYG-F2301S-J0510	全厂排汽管道安装图 Installation drawing of all plant exhaust steam piping
21	JSYG-F2301S-J0601	Design description of heat insulation and paint 保温油漆设计说明
22	JSYG-F2301S-J0602	Material list of heat insulation and paint 保温油漆材料清册