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PT SHANGHAI BAOYE INDONESIA

上海宝冶印度尼西亚有限公司

EXCAVATION AND CONSTRUCTION METHOD OF BOILER FOUNDATION

锅炉基础土方开挖及施工方法说明

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编制依据

（1）Boiler foundation design drawings and design technical documents；

锅炉基础设计图纸及设计技术文件；

（2）Construction survey data;

施工调查资料；

（3）Current construction design standards;

现行施工设计标准；

（4）Current construction safety technical standards.

现行施工安全技术标准。

一、Project Overview

工程概况

1.1 Hydrogeological Overview

水文地质概况

The Indonesian Batam Energy Power Plant Project site is located on Setoko Island, Batam City, Riau Islands, Indonesia. Batam City is about 860 kilometers away from Jakarta and about 20 kilometers away from Singapore. Its coordinates are 0°57′22″N and 103°03′04″E. The site was originally a hill, but has now been leveled. During the initial survey, the site had a large elevation difference, with the maximum being about 40M.

印尼巴淡岛能源动力电厂工程场地位于印尼廖内群岛巴淡市西托科岛，巴淡市距离

雅加达约 860 公里，距离新加坡约 20 公里，其坐标分别为北纬 0°57′22″和东经 103°03′04″。该场地原为丘陵，现已将此场地进行整平。初步勘察时场地地势高差较大，最大处在 40M 左右。

1.2 Meteorological and hydrological conditions

气象及水文条件

Batam has an average annual rainfall of 2,600mm (about 105 inches). The rainy season is from November to April/May, and the dry season is from June to October. However, the rainy season and the dry season are relative. It is possible to encounter rainy weather during the dry season (June to October), but the frequency of rain is not high. Most of the rainy weather is concentrated from December/November to May. The dry season is mainly sunny, and the weather is very warm and comfortable from March to September. The rainy season from October to April is often alternating between tropical rain and sunny days.

巴淡的年平均降雨量为 2,600mm (大约 105inches)雨季为每年的十一月到四月/五月，干季为六月到十月，但是雨季和干季也只是相对的，在干季（六月到十月）的时候，也可能碰到下雨的天气，只是下雨的频率不高，降雨的天气大多聚中在十二月/十一月到 5 月。干季以晴天为主，在三月到九月之间天气是非常温暖舒适的。十月到四月的雨季，常常是热带雨与晴天交替变换着。

Temperature: The Power Plant is located in a tropical rainforest climate.

Annual average temperature	30.3℃
Average temperature of the hottest month (May)	31.2℃
Average temperature of the coldest month (January)	29.3℃

气温：本厂区所在地属热带雨林气候。

年平均气温	30.3℃
最热月份平均气温（5 月）	31.2℃
最冷月份平均气温（1 月）	29.3℃

1.3 Project Conditions Overview

工程条件概况

This project is the excavation and construction project of boiler foundation, according to the design drawings:Foundtion of Boiler HouseT0202

Foundation design level: Class B

The design service life of the structure of this project is 50 years.

Building structure safety level: Class II

Seismic fortification category: Standard fortification category (Class C).

General site where construction can be carried out, site category: Class II.

During construction, excavation, concrete pouring and subsequent maintenance are carried out according to design requirements. The location is shown in the figure below.

本工程为锅炉基础土方开挖及施工工程，依据设计图纸 备料图：锅炉基础图：

地基基础设计等级:乙级

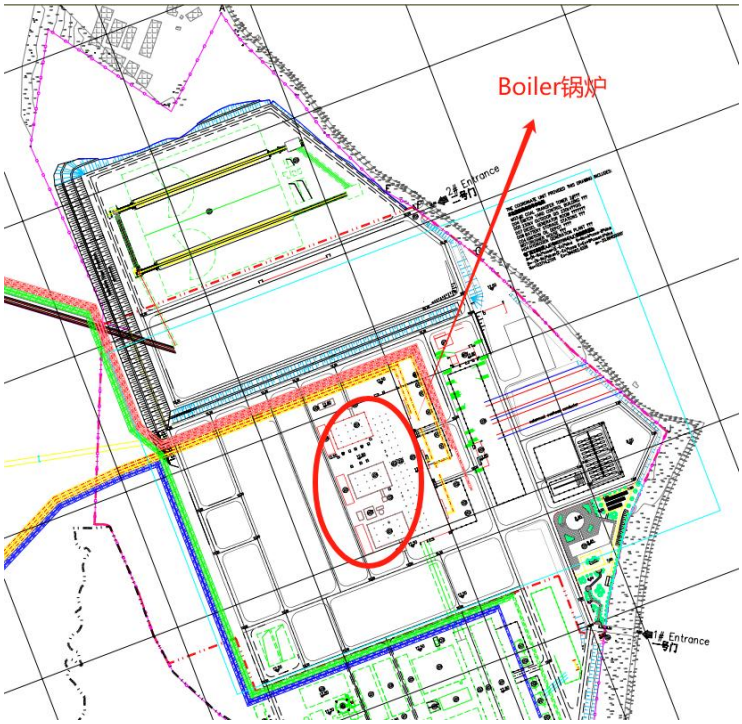
本工程结构的设计工作年限为 50 年。

建筑物结构安全等级 二级

抗震设防类别为 标准设防类(丙类)。

可进行建筑的一般场地，场地类别为II类。

施工时，按照设计要求进行开挖、混凝土浇筑及后续养护等工作。位置如下图。



Drawing Name Factory General Plan Layout FC012312S-Z0102-001

图纸名称 厂区总平面布置图 FC012312S-Z0102-001

This project adopts natural foundation, the foundation bearing layer is fully weathered sandstone④, the foundation bearing capacity characteristic value fak=230kPa, or strongly weathered sandstone⑤, the foundation bearing capacity characteristic value fak=340KPa; if the bearing layer is not seen after excavation to the design elevation, According to the soil investigation report, the excavation area is strongly weathered sandstone and strongly weathered sandstone, which has met the foundation bearing capacity. If over-excavate to the bearing layer and backfill with k200 plain concrete to the design elevation.Relevant tests must be conducted to determine the bearing capacity of the bearing layer.

The base elevation of this project is: -4.500m (INAGEOID2020 elevation system)

Ground beam elevation: -3.500m

本工程采用天然基础,基础持力层为全风化砂岩④,地基承载力特征值 fak=230kPa,或强风化砂岩⑤，地基承载力特征值 fak=340KPa；根据地勘报告，该开挖区域为强风化砂岩及强风化砂岩，已满足地基承载力。若开挖至设计标高未见持力层,则需超挖至持力层,并用 K200 素混凝土回填至设计标高。需进行相关测试检测持力层承载力。

本工程基底标高为：-4.500m(INAGEOID2020 高程系）

地梁标高：-3.500m

二、Construction Preparation

施工准备

2.1 Technical Preparation

技术准备

Organize construction personnel to familiarize themselves with relevant design drawings, check whether the drawings and materials are complete. Check the plane dimensions and pit bottom elevation, and check whether there are errors and contradictions between the drawings. Master the design content and various technical requirements, and understand the project scale, structural form, characteristics, and engineering quantity and quality requirements.

组织施工人员熟悉相关设计图纸，检查图纸和资料是否齐全。核对平面尺寸和坑底标高，图纸相互间有无错和矛盾。掌握设计内容及各项技术要求，了解工程规模、结构形式、特点、工程量质量要求。

Be familiar with soil geology and hydrological survey data. Study the excavation procedures, clarify the coordination relationship of various professional processes, and the requirements for the construction period.

熟悉土层地质、水文勘察资料。研究好开挖程序，明确各专业工序的配合关系、施工工期的要求。

Prepare a construction plan and conduct technical disclosure to the construction personnel at all levels.

编制施工方案，并向参加施工人员层层进行技术交底。

2.2 Material preparation

材料准备

1.Prepare enough concrete according to the drawings (the requirements for cushion concrete: cushion is C15 (fcu,k=15MPa), foundation, foundation beam, column: C30 (fcu,k=30MPa); reinforcement: BiTS 420A.). The strength standard value of the structural concrete should have a guarantee rate of not less than 95%.Concrete will be tested for chloride ion content and alkali ion content.

依据图纸，准备足够的混凝土（垫层混凝土要求:垫层为 C15(fcu,k=15MPa),基础、基础梁、柱:为 C30(fcu,k=30MPa);钢筋:为 BjTS 420B.）。结构混凝土的强度标准值应具有不小于 95%的保证率。混凝土将测试氯离子含量及碱离子含量。

At present, the standard cube of 150mm x 150mm x 150mm is used for concrete strength testing and compressive strength test. The Slump test and temperature test frequency can be taken every first track and it will be test randomly depends on the owner arrived the site.

目前混凝土强度检测使用的是标准立方体，尺寸为 150mm × 150mm × 150mm 进行抗压强度试验检测,每第一辆混凝土搅拌车都会进行坍落度测试和温度测试，之后业主也可以随机进行抽验。

2.Steel bar: HRB400E (indicated by C), fy=360N/mm2 The standard value of steel bar strength should have a guarantee rate of not less than 95%.

钢筋:HRB400E(BjTS420B,用 C 表示),fy=360N/mm^2 钢筋的强度标准值应具有不小于 95%的保证率。

2.3 Site preparation

现场准备

Clean up the construction area, measure and lay out the lines to ensure the excavation size is accurate. Additional control points will be established and verified. Positioning and

layout will be double-checked by two personnel using cross-verification, and elevation will be controlled using closed-loop leveling with a leveling instrument.Set the benchmark points according to the design drawings to control the axis and elevation. Organize construction personnel and mechanical equipment to enter the site, including excavators, vibrators, formwork support systems, etc.

清理施工区域，测量放线,增设并复核控制点，定位放线实行双人交叉复核，高程采用水准仪闭合测量，保证开挖尺寸准确。按照设计图纸设置基准点，控制轴线与标高。组织施工人员和机械设备进场，包括挖掘机、振动棒、模板支撑系统等。

Slope displacement monitoring: Horizontal displacement monitoring points will be installed at intervals of 40 meters.

边坡位移监测：设置水平位移监测点，每 40 米布设一个

Settlement monitoring: Settlement monitoring points will be set up simultaneously at the same locations as the displacement monitoring points.

沉降监测：沉降监测点，与位移监测点同步设置

For various types of building materials piled in the foundation pit and slope, they should be piled at the specified distance. The distance between various types of construction machinery and the foundation pit and slope should be determined according to the weight of the equipment, the support of the foundation pit and slope, and the soil conditions, and shall not be less than 2m. The control measurement and verification of the positioning axis of the building should be carried out. Determine the soil transportation route and unloading point.

基坑、边坡堆置各类建筑材料的，应按规定距离堆置。各类施工机械距基坑、边坡的距离，根据设备重量、基坑、边坡的支护、土质情况确定，并不得小于 2m 对建筑物应做定位轴线的控制测量和校核。确定运土路线及卸土地点。

The geological condition of the boiler foundation area mainly consists of strongly weathered sandstone. Excavation is carried out primarily through mechanical breaking and digging. Due to the strong integrity of the rock mass, dust generation is relatively low, and the

actual risk of dust emission is minimal.

本锅炉基础区域地质主要为强风化砂岩层，在基坑开挖过程中以机械破碎、挖掘为主，因岩体整体性较强，粉尘生成量相对较小，实际扬尘风险较低。

A 1.2-meter-high steel pipe safety railing will be installed around the perimeter of the foundation pit

基坑周边搭设 1.2m 高钢管防护栏杆

A ladder with handrails will be installed inside the pit to provide safe access for personnel.

坑内设置供人员上下的爬梯，并设置扶手

Lighting shall be provided at night, and the illumination at the working surface shall be no less than 100 lux.

夜间应设照明，作业面照度 ≥100 Lux

Adaptation to bad weather:

We will pay attention to the weather forecast in advance, and take measures such as rainproof, windproof and drainage when there is strong wind or heavy rain. If necessary, we will suspend construction to ensure safety and quality.

不良天气应对：

我方将提前关注天气预报，遇强风或暴雨天气时采取防雨、防风、排水等措施，必要时暂停施工，确保安全与质量。

Vehicle traffic guarantee:

We will harden the construction road, clear obstacles and arrange special personnel to direct to ensure the smooth passage of concrete tank trucks and other vehicles.

车辆通行保障：

我方将对施工道路进行硬化处理，清理障碍，安排专人指挥，确保混凝土罐车等车辆顺利通行。

2.4 Allocacion For Personal

人员配置

No 序号	Job Category 工种	Number 人数	Working Content 工作内容
1	Management 管理人员	3	On-site management coordination 现场管理协调
2	Driver 司机	6	Mechanical excavation 机械开挖
3	Surveyor 测量员	2	Layout,elevation control 放线，标高控制
4	Steelworker 钢筋工	10	Reinforcing Steel Binding 钢筋绑扎
5	Woodworker 木工	15	Formwork Installation 模板安装
6	Concrete worker 混凝土工	8	Pouring, Vibrating 浇筑，振捣
7	Normal Worker 普工	10	Trough cleaning, auxiliary work 清槽，辅助工作
8	Electrotechnical 电工	1	Temporary electricity safety 临时用电安全

Remark：Dynamically adjust construction personal based on actually progress.
注:根据施工进度动态调整施工人数。

三、Mechanical equipment and large tools management

机械设备及大型工器具管理

3.1 Demand plan and description of machine equipment and large tools

机型设备、大型工器具需求计划及说明

Construction Machinery Program

施工机械计划

No. 序号	Equipment Name 设备名称	Specification Model 规格型号	Quantity 数量	Remarks 备注
1.	Insert concrete vibrator 履带式挖掘机	220	2 台	
2.	Plate vibrator 自卸车	8m³	4 台	
3.	Wooden spatula, iron spatula 木抹、铁抹刮杠		10 把	
4.	Chute 溜槽		1 个	
5.	Cord 线绳		100m	
6.	Circular saw 圆盘锯		2 台	
7.	Woodworking Planer 木工平刨		2 台	
8.	Cutting Machine 切割机		1 台	
9.	Steel bar thread rolling machine 钢筋滚丝机		2 台	
19.	Steel bar bending machine 钢筋弯曲机		2 台	
11.	Steel bar straightening machine 钢筋调直机		1 台	
12.	Insertion vibration pump 插入式振动泵		2 台	
13.	Rammer 打夯机		1 台	
14.	Electric welding machine 电焊机		3 台	
15.	Handheld woodworking cutting machine 手持木工切割机		3 台	
16.	Truck crane 汽车吊	25 tons 25 吨	1 台	

Note: Various machines should be deployed according to the actual situation on site.

注：各种机械应根据现场实际进行调配。

Equipment and Instruments

设备仪器

No. 序号	Equipment Name 设备名称	Specification Model 规格型号	Quantity 数量	Remarks 备注
1.	Total Station 全站仪	TZ08	1 台	
2.	Electronic level 电子水准仪	ZDL700	1 台	
3.	GPS Receiver GPS 接收器	Zenith45	1 台	
4.	GNSS Receiver GNSS 接收器	Zenith45	1 台	

四、Construction process and construction points

施工工艺流程及施工要点

4.1 Construction process

施工工艺流程

Construction preparation → Surveying and setting out → Trench excavation → Base trench inspection → Pad concrete construction → Rebar binding → Formwork support → Concrete pouring → Formwork removal → Concrete curing → Backfill → Secondary grouting of foundation

施工准备 → 测量放线 → 沟槽开挖 → 基底验槽 → 垫层混凝土施工 → 钢筋绑扎 → 模板支设 → 混凝土浇筑 → 拆模 → 混凝土养护 → 回填土 → 基础二次灌浆

4.2 Earth excavation and backfill compaction

土方开挖及回填压实

4.2.1 Trench excavation

沟槽开挖

All the earth excavated in each foundation pit is transported to the unloading point designated by the owner.

每开挖一处基坑土方均全部运至业主指定卸土地点。

Using sloped excavation, the geological conditions in the boiler area consist of strongly weathered sandstone or completely weathered sandstone. In accordance with the Code for Construction of Building Foundation Engineering (GB 51004-2015), the slope ratio is set at 1:0.75.

采用放坡挖土，锅炉区域地质为强风化砂岩或全风化沙岩，参考 GB51004-2015 建筑地基基础工程施工规范，边坡按 1:0.75 放坡。

土的类别	性　　状		坡高 5m 以内	坡高 5m～10m
砂土	—		自然休止角	—
碎石土	密实	（充填物为硬塑～坚硬状态的黏性土）	1∶0.35～1∶0.50	1∶0.50～1∶0.75
	中密		1∶0.50～1∶0.75	1∶0.75～1∶1.00
	稍密		1∶0.75～1∶1.00	1∶1.00～1∶1.25
碎石土	密实	（充填物为中密～密实状态的砂土）	1∶1.00	—
	中密		1∶1.40	—
	稍密		1∶1.60	—
硬质岩石	微风化		1∶0.10～1∶0.20	1∶0.20～1∶0.35
	中等风化		1∶0.20～1∶0.35	1∶0.35～1∶0.50
	强分化		1∶0.35～1∶0.50	1∶0.50～1∶0.75
	全风化		1∶0.50～1∶0.75	1∶0.75～1∶1.00
软质岩石	微风化		1∶0.35～1∶0.50	1∶0.50～1∶0.75
	中等风化		1∶0.50～1∶0.75	1∶0.75～1∶1.00
	强分化		1∶0.75～1∶1.00	1∶1.00～1∶1.25
	全风化		1∶1.00～1∶1.25	1∶1.25～1∶1.50

A ring-shaped drainage ditch and a sump pit are installed at the bottom of the foundation

pit to enable open drainage of collected water. The pit walls are covered with rainproof fabric. The working surface around the top edge of the pit is widened to 800 mm, and a water-blocking curb is installed.

坑底设置环形排水沟+集水井，进行集水明排，坑壁四周采用防雨布进行覆盖。基坑顶部工作面四周加宽至 800mm，并设置挡水坎。

Before digging, the site should have "three connections and one leveling", that is, water, electricity, access and a leveled site.

挖土前，应做到场地“三通一平”，及通水、通电、通路和场地平整。

The excavation of foundation pit should follow the construction procedure of deep first and shallow later or both at the same time, and the excavation should be carried out in layers from top to bottom.

基坑开挖应遵循先深后浅或同时进行的施工程序，挖土应自上而下分层进行。

The foundation base consists of natural ground, so large-scale manual trimming is not required; manual assistance may be used for local cleaning as needed.

基底为天然地基，无需人工大面积清底，人工可配合局部清理。

During construction, the requirements for excavation of the foundation should be followed. It should be noted that mechanical excavation should not over-excavate and disturb the original soil quality. Therefore, construction surveyors must always pay attention to measuring height and correctly guide excavation by excavators and manual excavation. If over-excavation is inadvertent, the over-excavated part should be filled with graded sand and gravel or concrete.

施工时，按地基基础挖土的规定要求。须注意机械挖土不能超挖扰动原有土质，因此要求施工测量人员必须时刻注意测量高度，正确指导挖机挖土和人工挖土，如果不慎超挖，对超挖部分用级配砂石或混凝土进填筑。

When digging to the designed elevation, surveyors are required to track the entire process and control the elevation of the upper surface of the cushion layer.

挖土至设计标高时，需要测量员全程进行跟踪，控制好垫层上表面标高控制。

After the foundation excavation is completed, please ask the owner to inspect the foundation pit in time and prepare the engineering data for the foundation pit inspection.

基础挖土完成后及时请业主对基坑进行验槽，做好基坑验槽的工程资料。

4.2.2 Backfill

土方回填

Backfilling should be carried out in layers, the thickness of each backfill layer should be constructed according to the drawing, and compacted layer by layer. The backfill material should be original soil, The thickness of the virtual paving needs to be constructed according to the drawing; before construction, horizontal marks should be made to control the height or thickness of the backfilling. Strictly control indicators such as material bulk density.

土方回填应分层进行，每层回填厚度应按图施工，并逐层夯实。回填料采用原土回填，虚铺厚度需按图施工；施工前，应做好水平标志，以控制回填的高度或厚度。严格控制材料容重等指标。

Strengthen weather monitoring during backfilling, understand the weather forecast for the day, stop outdoor backfilling construction on rainy days, and take appropriate measures to deal with the damp backfill soil layer.

回填时加强对天气的监测，了解当天的天气预报，做到雨天停止室外回填施工，并采取相应措施对受潮回填土层进行处理。

Backfill soil should preferably be filled with original soil. Silt, humus soil, and cultivated soil should not be used as backfill soil. Before backfilling, check whether the moisture content of the backfill soil is optimal (the inspection method is: squeeze the ash into a ball with your hands, and it will break when you squeeze it lightly with two fingers). If the moisture content is high, you can use measures such as loosening, drying, or evenly mixing dry soil; if the moisture content is low, use measures such as pre-watering and wetting. Copy the elevation well and strictly control the thickness, elevation, and flatness of the backfill soil.

回填土优先选择原土回填，对淤泥、腐殖土、耕植土，不得作为回填土，回填前检验回填土的含水率是否最优（检验方法为：用手将灰紧捏成团，两指轻捏即碎）。若含水率偏高，可采用翻松、晾晒或均匀掺入干土等措施；若含水率偏低，采用预先洒水润湿等措施。抄好标高，严格控制回填土厚度、标高和平整度。

4.2.3 Compacting process

夯实工艺

A vertical rammer is a compaction device that transmits the ramming force vertically downward. It is usually driven by an electric motor and compacted concrete or backfill material through the rapid reciprocating motion of the ram head.

“立式打夯机”是一种将夯击力垂直向下传递的夯实设备，通常由电动机驱动，通过快速往复运动的夯头对混凝土或回填材料进行夯实。

The fill soil will be initially leveled before manual tamping. Tamping is carried out in a certain direction, with one tamping pressing half a tamping. The tamping is connected to each other, rows are connected, and tamping is done in two passes in a cross-direction and layered manner. Mechanical compaction is also used at the same time.

人力打夯前将填土初步整平，打夯按一定方向进行，一夯压半夯，夯夯相接，行行相连，两遍纵横交叉，分层夯打，同时采用机械夯实。

When compacting the foundation trench and the ground level, the compaction route starts from the four sides and then compacts towards the middle. The compaction machine uses a vertical tamping machine with a tamping frequency of 140 to 150 times/min, a tamping height of 145mm, and a productivity of 12.5M3/h.

夯实基槽及地平时，夯实路线由四边开始，然后再夯向中间。夯实机具采用立式打夯机，夯击次数为 140～150 次/min，夯实起落高度为 145mm，生产率为 12.5M3/h。

The thickness of mechanically compacted backfill soil must be constructed according to the drawing.The backfill soil shall be preliminarily leveled between tamping. The tamping machine shall tamp in sequence and distribute the soil evenly without leaving any gaps.

机械夯实回填土厚度需按图施工，打夯之间对填土进行初步平整，打夯机依次夯打，均匀分布，不留间隙。

4.3 Steel bar engineering

钢筋工程

4.3.1 Steel bar joints and anchorage

钢筋的接头、锚固

①Overlap of steel bars:

Lap joints should be staggered. The length of the connection section of the steel bar binding lap joint is 1.3 times the lap length. The midpoint of the connection joint belongs to the same lap section within the length of the connection section. The percentage of the tensile steel bar lap joint area: for beams, slabs, walls, and columns, it should not be greater than 50%. When it is necessary to increase the percentage of the tensile steel bar lap joint area in the project, it should not be greater than 50% for beam components.

①钢筋搭接：

搭接接头宜互相错开，钢筋绑扎搭接接头连接区段的长度为 1.3 倍搭接长度,连接接头中点位于连接区段长度内均属同一搭接区段。受拉钢筋搭接接头面积百分率:对梁类、板类及墙类、柱类构件不宜大于 50%。当工程中确有必要增大受拉钢筋搭接接头面积百分率时,对梁类构件,不宜大于 50%。

② Mechanical connection of steel bars:

Mechanical connection joints should be staggered. The connection sections of mechanical connection joints are shown in the table below (d is the larger diameter of the longitudinal tension reinforcement). The percentage of the longitudinal tension reinforcement joint area should not be greater than 50%.

②钢筋机械连接：

机械连接接头宜互相错开，机械连接接头连接区段见下表(d 为纵向受力钢筋较大直

径)，其纵向受拉钢筋接头面积百分率不宜大于 50%。

Table 1: Minimum anchorage length L_{aE} of longitudinal tension reinforcement (mm)

Earthquake resistance	Level 1 and 2	Level 3			Level 4 and non-seismic design				
Concrete strength grade	C25	C30	C35	C25	C30	C35	C25	C30	C35
HPB300	39d	35d	32d	36d	32d	29d	34d	30d	28d
HRB400（d≤25mm）	46d	40d	37d	42d	37d	34d	40d	35d	32d

表一：纵向受拉钢筋的最小锚固长度 L_{aE}（mm）

抗震等级	一、二级			三级			四级及非抗震设计		
混凝土强度等级	C25	C30	C35	C25	C30	C35	C25	C30	C35
HPB300	39d	35d	32d	36d	32d	29d	34d	30d	28d
HRB400（d≤25mm）	46d	40d	37d	42d	37d	34d	40d	35d	32d

Table 2: Minimum lap length L_{LE} of longitudinal tensile reinforcement (mm)

Earthquake resistance	Level 1 and 2						Level 3						Level 4 and non-seismic design					
Percentage of longitudinal reinforcement lap joint area	≤25			50			≤25			50			≤25			50		
Concrete strength grade	C25	C30	C35	C25	C30	C35	C25	C30	C35	C25	C30	C35	C25	C30	C35	C25	C30	C35
HPB300	47d	42d	38d	55d	49d	45d	43d	38d	35d	50d	45d	41d	41d	36d	34d	48d	42d	39d
HRB400（d≤25mm）	55d	48d	44d	64d	56d	52d	50d	44d	41d	59d	52d	48d	48d	42d	38d	56d	49d	45d

表二：纵向受拉钢筋的最小搭接长度 L_{lE}（mm）

抗震等级	一、二级						三级						四级及非抗震设计					
纵向钢筋搭接接头面积百分率	≤25			50			≤25			50			≤25			50		
混凝土强度等级	C25	C30	C35	C25	C30	C35	C25	C30	C35	C25	C30	C35	C25	C30	C35	C25	C30	C35
HPB300	47d	42d	38d	55d	49d	45d	43d	38d	35d	50d	45d	41d	41d	36d	34d	48d	42d	39d
HRB400	5	4	4	6	5	5	5	4	4	5	5	4	4	4	3	5	4	4

（d≤25mm）	5d	8d	4d	4d	6d	2d	0d	4d	1d	9d	2d	8d	8d	2d	8d	6d	9d	5d

Note: d is the diameter of the longitudinal tensile reinforcement

注：d 为纵向受拉钢筋直径

③ Steel bar welding: Welding should be staggered, and the welding joint connection section should be 10d (d is the larger diameter of the longitudinal force-bearing steel bar) and not less than 500mm, and the percentage of the longitudinal tensile steel bar joint area should not be greater than 50%.

③钢筋焊接：

焊接应互相错开，焊接连接接头连接区段 10d（d 为纵向受力钢筋较大直径）且不小于 500mm 内，其纵向受拉钢筋接头面积百分率不应大于 50%。

④ Anchorage length of steel bars: The anchorage length of steel bars shall not be less than the requirements in Table 1, and shall not be less than 200mm in any case.

④钢筋的锚固长度：钢筋的锚固长度不小于表一中要求，且任何情况下不小于 200mm。

⑤ The lap length of steel bars: The lap length of steel bars shall not be less than the requirements in Table 2, and shall not be less than 300mm (under tension) and 200mm (under compression).

⑤钢筋的搭接长度:钢筋的搭接长度不小于表二中要求，且不得小于 300mm（受拉）200mm（受压）。

4.4 Template Engineering

模板工程

4.4.1 General technical measures

一般技术措施

(1) Carpenters prepare the formwork at the prefabrication site according to the foundation design dimensions. After the formwork is prepared, it is numbered and stacked

according to the foundation of each model; the formwork must be cleaned before it is used and then transported to the construction site for assembly.

(2) The formwork is made of wood, with stiffening ribs on the back. The support and reinforcement system all use fastener-type steel pipe scaffolding, and the short columns are reinforced with tension bolts. The tension bolts are M12, with a two-way vertical spacing of 500mm.

(3) Template joints: Gap width is less than 1mm, and the flatness of adjacent boards is less than 0.2mm (no unevenness when touched).

(4) In order to ensure that the formwork is easy to separate from the concrete and the concrete surface is smooth, a release agent should be applied before the formwork is supported.

(5) The formwork can be removed at least twelve hours after the concrete has been poured.

（1）木工根据基础设计尺寸在预制场配模，模板配制好后按各型号基础进行编号、堆放；模板周转使用前必须清理干净再运至施工现场进行拼装。

（2）模板采用木模板，背部设加劲楞。支撑及加固系统全部采用扣件式钢管脚手架,短柱采用对拉螺栓进行加固。对拉螺栓选用 M12，双向垂直间距 500mm。

（3）模板拼缝：缝隙宽度小于 1mm，相邻板平整度小于 0.2mm（手摸无不平感）。

（4）为了保证模板与混凝土易于脱离和混凝土表面光滑,模板支设前应涂刷脱模剂。

（5）当混凝土成型至少十二小时后可拆模。

4.4.2 Anchor bolt installation

地脚螺栓安装

(1) The embedded bolts and fixing brackets (steel positioning molds) are supplied by the manufacturer and installed according to the installation drawings during construction.

(2) Bolt installation: After the bolt fixing bracket is installed, insert the bottom of the anchor bolt into the positioning bracket, put it into the fixing bracket, and then put the nut and steel positioning mold on the top for temporary fixation.

(3) Hang the cross wire and correct the plane position and elevation: First, use the level to measure and adjust the top elevation of the anchor bolt by tightening the nut; then, accurately locate the suspended cross wire according to the measurement, determine the plane position of the anchor bolt, and reinforce the top steel positioning mold.

(4) Column mold installation: After the bolts are reinforced in place, install the column mold. Do not touch the anchor reinforcement bracket to prevent the anchor bolt from shifting.

(5) Before, during and after concrete pouring, remeasure and correct the position of the bolts to ensure the accuracy of the bolt position and elevation, and wrap the turnbuckles with plastic cloth.

（1）预埋螺栓及固定支架(钢定位模)均由厂家供货,施工时根据安装图安装。

（2）螺栓安装：螺栓固定支架安装完后,将地脚螺栓底部穿入定位支架中,放入固定支架内部,再在其顶部套上螺母及钢定位模做临时固定。

（3）悬挂十字钢丝线，校正平面位置、标高：首先利用水准仪进行测量，通过拧螺母来调整地脚螺栓的顶标高；然后，根据经测量精确定位悬挂的十字钢丝线,确定地脚螺栓的平面位置,加固顶部钢定位模。

（4)柱模安装:螺栓加固到位后安装柱模板,禁止碰触地脚加固支架,防止地脚螺栓移位。

（5）在混凝土浇筑前、中、后复测校正螺栓的位置保证螺栓的位置与标高准确并将螺丝扣用塑料布包扎。

4.4.3 Installation of the core mold for the reserved hole of the short column shear groove

短柱剪力槽预留洞模芯安装

(1) Mold core making: Use wooden boards and wooden squares to prepare the body-shaped wooden mold, and wrap it with 20mm thick foam board with sealing tape.

(2) Mold core placement and cross line hanging: After placing the prepared mold core into the template according to the drawing requirements, use a plumb line to lead the foundation axis to the column top template and hang the cross line.

(3) Correct the plane position and elevation: Use two steel pipes to clamp and reinforce

the two sides of the mold core in the length direction of the top of the column template. Use wooden squares to limit the upper and lower parts of the steel pipes to control the bottom elevation of the mold core to reach the design elevation. Then move the mold core according to the cross line to adjust its plane position, and connect it to the column mold for reinforcement. The specific reinforcement is shown in the figure on the following page:

（1）模芯制做:用木板和木方配制体形木模,并用封箱带外包 20mm 厚泡沫板。

（2）模芯入模、悬挂十字线：将配制好的模芯按图纸要求放入模板后，然后用线坠将基础轴线引到柱顶模板上并悬挂十字交叉线。

（3）校正平面位置及标高:在柱模板顶部模芯长度方向两侧用两钢管夹紧加固,钢管上下用木方限位,以此控制模芯底标高达到设计标高,然后按十字交叉线移动模芯以调整其平面位置,并与柱模连接加固。具体加固如下页图：

4.4.5 Formwork removal

模板拆除

When removing the formwork and brackets, they should be removed and placed with care, and the formwork and brackets should not be damaged. When removing the formwork, care should be taken to protect the foundation surface and keep the edges and corners intact.

模板和支架拆除时，应轻拆轻放，不得损坏模板及支架。模板拆除应注意保护基础表面、棱角完好。

4.5 Concrete Engineering

混凝土工程

4.5.1 Concrete pouring

混凝土浇筑

During the pouring process, K≥35MPa concrete should be constructed in layers continuously. The thickness of each layer should not exceed 500mm. The layered vibration method should be adopted, and the depth of insertion into the lower layer of concrete should

be not less than 50mm to avoid missed vibration, under-vibration and over-vibration.And the height of fresh concrete drop is maximum 2 m when it is discharged.

浇筑过程中采用 K≥35MPa混凝土应分层连续施工，每层浇筑厚度不超过 500mm，并采用分层振捣的方法，插入下层混凝土的深度不少于 50mm，以避免漏振、欠振和超振现象。混凝土自由倾落高度不超过 2m。

According to the requirements of construction specifications, concrete should be sprinkled within 12 hours after pouring, and covered with plastic film or linen cloth and other materials for moisture conservation. The curing time shall not be less than 7 days.

根据施工规范要求，混凝土浇筑完成后应在 12 小时内及时洒水，并覆盖塑料薄膜或麻布等材料保湿养护。养护时间不得少于 7 天。

General description of reinforced concrete:

钢筋混凝土一般说明：

Thickness of the protective layer of concrete (outermost steel bar) This project Environmental category above ±0.000 is - Category: Environmental category below ±0.000 is Category II (b) Foundation bottom: 40mm, top and side: 40mm; Equipment foundation: 40mm:

Below ±0.000 Beams, columns: 35mm; Plates, walls: 25mm.

混凝土(最外层钢筋)保护层厚度：

本工程±0.000 以上环境类别按一类:±0.000 以下环境类别按二(b)类

基础底部:40mm，顶面和侧面:40mm;

设备基础:40mm；

±0.000 以下 梁、柱:35mm;板、墙:25mm

Environmental category 环境类别	Maximum water-cement ratio 最大水胶比	Minimum concrete strength grade 最低混凝土强度等级	Maximum water-soluble chloride ion content (%) 水溶性氯离子最大含量（%）	Maximum alkali content (Kg/m3) 最大碱含量（Kg/m^3）
一	0.60	C25	0.3	不限制

二（b）	0.50	C30	0.15	3.0

After pouring, thermal insulation and moisture maintenance for no less than 7 days is required.

浇筑完成后，需及时进行不少于 7 天的保温保湿养护。

4.6 Secondary grouting of foundation

基础二次灌浆

4.6.1 Construction preparation

施工准备

① Be familiar with the drawings and select grouting materials that meet the design requirements. Calculate the grouting volume according to the drawings and make a material plan.

② Construction machinery and tools: grouting material container (iron bucket, etc.), grouting material mixing tools (electric mixer, iron rod), grouting material vibrating tools (bamboo pieces, small vibrating rods, cables, chains), chiseling tools (iron chisels, hammers), cleaning tools (brooms, vacuum cleaners) and 15mm thick plywood templates.

③ Grouting material: Use high-strength non-shrinkage grouting material and meet the requirements of the specification.The strength of the grout must be at least equal to that of the concrete.

④ The equipment installation is qualified, the foundation oil and debris have been cleaned during the installation process, and the grouting material has a qualified test report.

①熟悉图纸，选用符合设计要求的灌浆料。按图纸计算出灌浆方量，做出材料计划。

②施工机具:灌浆材料容器(铁桶等)、灌浆料搅拌工具(电动搅拌器、铁棍)、灌浆料振捣工具(竹片、小振动棒、电缆、链条)、凿毛用具(铁钎、锤子)、清理工具(扫把、吸尘器）及 15mm 厚胶合木模板。

③灌浆料:采用高强无收缩灌浆料，并符合规范要求。灌浆料强度需至少与混凝土一

致。

④设备安装验收合格，安装过程中基础油污和杂物已清除干净，灌浆料有合格的检测报告。

4.6.2 Operation points

操作要点

①Process flow: roughening the foundation surface → cleaning the foundation surface and bolt holes → equipment installation → secondary cleaning → template support → cleaning the foundation surface and bolt holes → grouting → maintenance

② Roughening the foundation surface: Before grouting, the surface of the equipment foundation should be roughened comprehensively, and the loose concrete and oil on the surface should be removed, and then rinsed with water.

③ Grouting surface cleaning: After the equipment installation is accepted, before grouting, the foundation surface and bolt holes should be cleaned again to remove the oil and garbage left during the equipment installation process. Since the equipment has been installed at this time, the cleaning mainly uses an air compressor to blow away the dust and garbage on the foundation surface, and then rinse with water.

④ Formwork support: After cleaning, the formwork can be supported. The formwork is generally configured with wooden formwork. The formwork should be supported firmly and tightly to ensure that there is no leakage. Before grouting, the concrete surface and formwork should be moistened with water in advance to prevent them from absorbing moisture in the grouting material. The heel of the formwork can be made into an eight-shaped foot with cement mortar to prevent leakage.

⑤ Pouring: After the grouting material is mixed, it should be used immediately. The grouting should be carefully compacted. First, the anchor bolt holes should be filled, and then pouring from one end or from the middle to both ends. Do not pour from all sides to the middle. During the pouring process, the gaps should be stirred to ensure that the gas is drawn

out and the grouting is dense. The grouting should be completed continuously at one time.

⑥ Maintenance: After grouting is completed, it should be covered and maintained in time to keep the surface of the grouted body wet. Wet jute bags can be used to cover the surface to maintain humidity and prevent water from evaporating too fast and causing dry cracking of the grouted body.It is recommended to cover with plastic film or similar covering for moisture conservation.

①工艺流程：基础表面凿毛→基础表面及螺栓孔清洗→设备安装→二次清洗→模板支设→基础表面及螺栓孔清洗→灌浆→养护。

②基础表面凿毛:灌浆前要将设备基础表面全面凿毛，清除表面疏松的混凝土、油污，开用水冲洗干净。

③灌浆面清理:在设备安装验收合格后，进行灌浆之前，要再次对基础表面和螺栓孔进行清理,清除设备安装过程中留下的油污和垃圾，因此时设备已安装，所以清理主要使用空压机吹去基础表面的灰尘和垃圾，然后再用水进行冲洗。

④模板支设:清理干净后，可进行模板的支设。模板一般采用木模配置。模板的支设应牢固、紧密，确保不漏浆。在灌浆前要将混凝土面和模板提前用水润湿，防止其吸收灌浆料中的水分。模板跟部可用水泥砂浆作成八字脚，以防漏浆。

⑤浇灌:灌浆料搅拌好后，要立即使用。灌浆应认真捣实，先灌地脚螺栓孔，然后从一端开始顺向浇灌或从中间向两端进行，不得自四面向中间浇灌。在浇灌过程中，要对空隙处进行搅动，以确保气体引出，灌注密实。灌浆应一次连续完成。

⑥养护:灌浆完成后应及时覆盖养护，保持灌浆体表面湿润。可以采用湿麻袋覆盖，保持湿度，防止水分蒸发过快导致灌浆体干裂。建议塑料薄膜覆盖或类似覆盖物进行保湿养护。

4.6.3 Quality Standards

质量标准

① The equipment installation has been accepted and the oil stains and debris on the foundation have been cleaned during the installation process.

② The composition of the grouting material meets the design requirements.

③ The strength of the grouting material meets the design requirements.

④ Roughen the foundation surface completely, clean up the loose concrete on the surface, and moisten it in advance before grouting.

⑤ Grouting and maintenance meet the design requirements of the specifications.

⑥Implement inspection management for mixing plant and have corresponding inspection and test plans（ITP）.

①设备安装验收合格,安装过程中基础油污和杂物已清除干净。

②灌浆料组成符合设计要求。

③灌浆料强度达到设计要求。

④基础表面全面凿毛,表面疏松混凝土清除干净,灌浆前提前润湿。

⑤灌浆及养护符合规范设计要求。

⑥对搅拌站实行检测管理，并有相应的检查和试验计划。

4.7 Construction joint method

施工缝做法

Before construction, construction joints can be set according to the construction organization design. Construction joints should be set at places where the shear force of the structure is small.

When pouring concrete at the construction joints, the following treatments should be performed:

施工前可根据施工组织设计设置施工缝，施工缝应设置在结构受剪力较小处。

施工缝处继续浇筑混凝土时，应作如下处理：

① The compressive strength of poured concrete should not be less than 1.2N/mm2.

①已浇筑的混凝土其抗压强度不应小于 1.2N/mm^2。

② On the hardened concrete surface, the cement film, loose stones and weak layers

should be removed, and the surface should be fully moistened and rinsed, and no water should be accumulated.

②在已硬化的混凝土表面上，应清除水泥薄膜和松动石子以及软弱层，并加以充分湿润和冲洗干净，且不得积水。

③ When pouring concrete, it is advisable to first moisten the construction joints with water.

③在浇筑混凝土，宜先在施工缝处晒水湿润。

④ The concrete should be carefully compacted to make the new and old concrete tightly combined.

④混凝土应细致捣实，使新旧混凝土紧密结合。

⑤The location is usually determined according to the actual construction progress and site conditions, not necessarily fixed

⑤施工缝是为了施工方便和结构施工工艺安排而设置的，位置通常根据实际施工进度和现场条件确定，不一定是固定的

五、Construction progress management

施工进度管理

5.1 Construction schedule

施工进度计划

No.	Construction content	Start	Finish
1	1# boiler foundation excavation, steel bar binding, formwork construction, concrete construction, earth backfilling	May 25, 2025	Oct 11, 2025
2	2# boiler foundation excavation, steel bar binding, formwork construction, concrete construction, earth backfilling	Jul 25, 2025	Dec 11, 2025

3	3# boiler foundation excavation, steel bar binding, formwork construction, concrete construction, earth backfilling	Sept 25, 2025	Feb 11, 2026

序号	施工内容	开始时间	结束时间
1	1#锅炉基础开挖、钢筋绑扎、模板施工、混凝土施工、土方回填	2025 年 5 月 25 日	2025 年 10 月 11 日
2	2#锅炉基础开挖、钢筋绑扎、模板施工、混凝土施工、土方回填	2025 年 7 月 25 日	2025 年 12 月 11 日
3	3#锅炉基础开挖、钢筋绑扎、模板施工、混凝土施工、土方回填	2025 年 9 月 25 日	2026 年 02 月 11 日

5.1.1 Trench excavation (Days 1-90)

沟槽开挖（第 1-90 天）

(1)When grooving, the exposure time of the grooving should be shortened as much as possible. At the same time, waterproofing and drainage measures should be taken to prevent the bottom of the grooving from being soaked by water.

开槽时应尽量缩短开槽的暴露时间，同时开槽时应采取防水、排水措施，避免槽底受水浸泡；

(2)It is strictly forbidden to disturb the soil at the bottom of the trench. If over-excavation occurs, the original soil should be backfilled and compacted (rammed), and the compaction degree must meet the design requirements.

严禁扰动槽底土壤，如发生超挖，应用原土回填压(夯)实，压实度需满足设计要求。

5.1.2 Foundation and base plate construction (Day 30-110)

基础及底板施工：（第 30-110 天）

(1)Before backfilling, drain the water in the trench and remove wood chips, garbage and other debris in the trench..

回填土前应排干槽内积水，并清除槽内木屑、垃圾等杂物。

(2)Backfilling should be carried out from upstream to downstream, and the same soil as that around the structure should be used as backfilling soil. Silt, humus, expansive soil and organic matter shall not be backfilled.

回填土应自上游向下游进行，宜采用与构筑物周围同类土作回填土，不得回填淤泥、腐殖土、膨胀土及有机物质。

5.1.3 Formwork and steel bar binding (Day 40-175)

模板与钢筋绑扎（第 40-175 天）

(1)Formwork selection: The foundation slab formwork can be assembled on site using a combination steel formwork or a plywood formwork. For areas with many turnovers or special requirements (extension joints, post-casting strips, etc.), special processing or combined steel formwork and steel brackets can also be used to meet special needs.

模板选择：基础底板模板可采用组合钢模板或胶合板模板现场拼装。对于周转次数多或有特殊要求的部位(变形缝、后浇带等）,也可采用加工专用或组合式钢模板与钢支架，以适应特殊需要。

(2)When the steel bars are delivered to the site, they should be straight and undamaged, and there should be no cracks, oil stains, granular or flaky rust on the surface. The specifications and dimensions of the steel bars must be measured: the specifications must comply with the regulations.

钢筋进场时，应平直、无损伤、表面不得有裂纹、油污、颗粒状或者片状老锈，对钢筋规格尺寸进行实测：规格必须符合规定。

(3)Witness sampling and inspection: When steel bars are delivered to the site, test pieces should be taken for mechanical property inspection in accordance with current regulations, and their quality must comply with the relevant standards. The mechanical property inspection of steel bar raw materials includes yield stress, tensile strength, elongation, etc.

见证取样送检：钢筋进场时，应按照现行规定抽取试件做力学性能检验，其质量必须符合有关标准的规定。钢筋原材力学性能检测包括屈服应力、抗拉强度、伸长率等。

(4)When steel bars are delivered to the site, quality certification documents and sampling inspection shall be carried out by batch. For steel bars of the same manufacturer, same brand and same specification, every 60 tons is considered as one inspection batch, and less than 60 tons is considered as one batch.

钢筋进场时，应按批次检查质量证明文件及抽样检验。同一厂家、同一牌号、同一规格的钢筋，每 60 吨为一个检验批，不足 60 吨按一批计。

(5)The steel bars are tied on site, and the overlapping parts of the stirrup hooks should be staggered along the direction of the stressed steel bars. The intersections of the two rows of steel bars on the outer periphery of the steel mesh of the slab and the entire cast layer should be tied firmly at each point, and the intersections in the middle part can be staggered and tied firmly at intervals, but it must be ensured that the stressed steel bars will not be displaced.

钢筋绑扎采用现场绑扎，箍筋弯钩叠合处，应沿受力钢筋方向错开设置。板及整浇层的钢筋网外围两行钢筋交点应每点绑扎牢固，中间部分的相交点可相隔交错扎牢，但必须保证受力钢筋不致产生位移。

(6)Formwork removal: The side wall formwork can be removed about one day after concrete pouring, depending on the average day and night temperature. When removing the formwork, first loosen the internal and external supports, and then gently pull apart the internal and external formwork to prevent damage to the concrete surface and corners.

拆模：侧壁模板在砼浇筑后视昼夜平均气温情况 1 天左右方可拆模;拆模时应先松动内外支撑,然后轻轻拉拆内外模板,防止损坏砼表面和边角。

5.1.4 Concrete pouring (Day 85-207)

混凝土浇筑（第 85-207 天）

(1)When pouring concrete, do not hit the formwork or step on the steel bars. The formwork should not be used as a support when setting up a springboard. The free height of concrete when pouring from a height should not exceed 2m. All embedded parts in concrete (including wire pipes, sleeves, grounding bodies, embedded parts, etc.) shall be constructed in

strict accordance with construction drawings and relevant technical specifications

浇筑混凝土时，不得碰撞模板或踩踏钢筋。搭跳板不得以模板为支架。混凝土自高处倾灌时的自由高度不应超过 2m。混凝土中所有预埋件（包括电线管、套管、接地体、预埋件等）应严格按照施工图纸及相关技术规范进行施工

(2)Inserted vibrators should not collide with steel bars. The distance between the vibrator head and the template should not be less than 5cm. The insertion spacing should not exceed its effective radius. After vibration, it should be slowly lifted up to avoid leaving holes. When pouring concrete in layers, the vibrator head should be inserted into the next layer to make the layers integrated.

插入式振捣器不宜碰撞钢筋，振捣器机头距模板的距离不小于 5cm ，插入的间距不得超过其作用半径，振完后应徐徐上提，以免留下孔洞。分层浇筑混凝土时，应将振捣器机头插入到下一层，以使层间结合一体。

(3)During the concrete pouring process, the slump index is measured on site, and it can only be used when the slump is controlled within the range of 150-220mm. If the concrete slump is found to be not in compliance with the requirements and the workability is poor, it should be returned to the concrete mixing station for processing and is strictly prohibited from being used in the project.

混凝土浇注过程中，现场实测坍落度指标，坍落度控制在 150～220mm 范围内方可使用。发现混凝土坍落度不符合要求，和易性不好时，应退回混凝土搅拌站进行处理，严禁用于工程上。

(4)Two groups of test blocks (a total of 6 blocks) are retained for every 110m³ of the batch of concrete on the day. When the concrete exceeds 1,000 cubic meters, one group of test blocks is made for every 200 cubic meters. After 28 days of standard curing, a compression test is carried out to check the compressive strength of the concrete, thereby guiding the subsequent inspection and construction.

当天批次混凝土每 110m³留取两组试块（总计 6 块），混凝土超过 1000 立方时每

200 立方制作一组试块，标准养护 28d 后进行抗压试验，以检查混凝土抗压强度，进而指导后续的检测施工。

5.1.5 Concrete curing (Day 101-225)

混凝土养护(第 101-225 天)

Concrete curing: Concrete curing should avoid early dehydration and lack of water during curing. At room temperature, concrete is cured by covering and watering. The number of watering times per day should ensure that the concrete surface is always moist. The curing time for ordinary concrete should not be less than 7 days, and for other concrete with anti-seepage requirements, it should not be less than 14 days.

混凝土养护：混凝土的养护应避免混凝土早期脱水和养护过程中缺水。常温下，混凝土采用覆盖浇水养护,每天浇水次数应能保证混凝土表面始终处于湿润状态，养护时间对于普通混凝土不得少于 7d，其他有抗渗要求的混凝土不得少于 14d。

5.1.6 Backfill of foundation earthwork (Day 115-263)

基础土方回填(第 115-263 天)

Earthwork backfilling should be carried out in layers, with manual compaction not exceeding 500mm and mechanical compaction not exceeding 1m, and compaction should be carried out layer by layer. The type of backfill material, density requirements, virtual paving thickness and number of compaction times should meet the design requirements; before construction, horizontal marks should be made to control the height or thickness of the backfill. Strictly control indicators such as material bulk density and moisture content.

土方回填应分层进行，人工夯实不超过 500mm，机械夯实不超过 1m，并逐层夯实。回填的填料种类、密实度要求、虚铺厚度和压实遍数等应符合设计要求；施工前，应做好水平标志，以控制回填的高度或厚度。严格控制材料容重、含水率等指标。

六、Seasonal construction measures

季节性施工措施

6.1 Construction measures during rainy season

雨季施工措施

(1) Drainage measures: Drainage ditches are set up around the foundation pit, and a water collection pit is dug at each of the four corners of the foundation pit. When it rains, water is pumped to the designated drainage ditch in the factory area.

(2) When installing the formwork, a water outlet should be left to ensure that there is no water accumulation in the formwork.

(3) Mechanical and electrical equipment should take rain and flood prevention measures, and the safety grounding device, motorized switch box and leakage protection device should be reliable.

(4) Before pouring concrete, a drainage outlet should be reserved at the top of the formwork. When it rains, the seepage water should be scooped out manually and covered with colored strips in time after pouring.

(5) Concrete should be covered in time after pouring on rainy days to prevent rain from damaging the surface of the concrete structure.

(6) Avoid pouring concrete on rainy days.

(7) When backfilling the earth, the backfill area should maintain a certain horizontal slope, with a certain slope arch in the middle to facilitate drainage. The backfilled soil on the same day should be compacted and formed on the same day.

(8) After backfilling on rainy days, the soil should be covered with colored strips in time to prevent rain from soaking the soil. The new backfill soil should not be soaked within 3 hours.

(9) Avoid backfilling on rainy days.

（1）排水措施：基坑周围设排水沟，并在基坑的四角各挖一集水坑,遇雨时用水泵抽到厂区内指定排水沟排走。

（2）安装模板时要留出水口，保证模板内不积水。

（3）机电设备要采取防雨防淹措施，安全接地装置、机动电闸箱和漏电保护装置要可靠。

（4）混凝土浇筑前，应在模板顶部预留排水口，下雨时用人工将泌水舀除浇筑完后并及时用彩条布覆盖。

（5）雨天浇筑完混凝土应及时覆盖，防止雨水破坏混凝土结构表面。

（6）避免大雨天进行混凝土浇筑施工。

（7）土方回填时，填土区应该保持一定的横坡，中间带有一定的坡拱，以利排水。当天回填的土应在当天压实成形。

（8）雨天回填完应及时覆盖彩条布，防止雨水浸湿土体。新的回填土应保证 3 小时内不受浸泡。

（9）避免大雨天进行土方回填施工。

6.2 High temperature construction

高温施工

6.2.1 Concrete pouring project

混凝土浇筑工程

The factors that affect concrete in high temperature environments should be predicted and analyzed, and the listening to weather forecasts should be strengthened. Effective measures should be taken in a timely manner from the following aspects and implemented well:

对高温环境下影响混凝土的因素应进行预测分析，同时加强对天气预报的收听工作，从以下几个方面及时采取有效措施，并抓好落实：

(1) When the temperature exceeds 30℃, watering should be adopted to cool down the aggregates used in concrete mixing and night construction should be adopted.

(2) Concrete pouring should be avoided during high temperature periods under sunlight. When continuous construction is required, cooling measures such as watering and covering the formwork and delivery pump pipes should be taken.

(3) According to specific climatic conditions, when concrete is found to have the possibility of plastic shrinkage cracking, measures (such as spraying curing agents, etc.) should be taken to control the evaporation of water on the concrete surface.

(4) After the concrete is poured, it must be covered and moisturized within 12 hours. Assign a dedicated person to be responsible for the maintenance work so that the concrete surface is always moist to prevent cracking.

(5) Strengthen the maintenance of concrete and adopt the covering curing method. In hot weather, water should be sprinkled frequently to keep the concrete surface moist, and a dedicated person should be assigned to be responsible for and keep maintenance records.

(6) For the construction of large concrete components, appropriate amounts of admixtures should be added to the concrete and cement with low hydration heat should be used for construction.

（1）当气温超过 30℃时，对混凝土的拌和用骨料采取浇水降温措施及采用夜间施工的方法进行。

（2）应避开日照高温时间浇砼，必须连续施工时，对模板、输送泵管采取浇水、覆盖等降温措施。

（3）根据具体气候条件，发现砼有塑性收缩开裂的可能性时，应采取措施（如喷洒养护剂等），以控制砼表面的水分蒸发。

（4）混凝土浇筑完成后，在 12 小时内必须对其进行覆盖保湿养护。指派专人负责做好养护工作，使砼表面经常处于湿润状态，防止发生龟裂现象。

（5）加强对混凝土的养护，采取覆盖养生方法。炎热天气经常洒水，保持混凝土

表面湿润，并派专人负责，做好养护记录。

（6）对体积较大混凝土构件的施工，采取在混凝土内掺加适量外加剂以及采用低水化热的水泥进行施工。

6.2.2 Labor protection measures during hot seasons

高温季节劳动保护措施

(1) When construction is carried out in high temperature seasons, reasonable arrangements must be made and thermometers must be provided to measure the temperature at work points exposed to the sun. Open-air work is prohibited when the temperature is above 38°C (except for rushing construction projects or special processes, which must not be suspended, but heatstroke prevention and cooling must be done).

(2) For outdoor workers, work and rest time should be adjusted appropriately, and construction should be carried out in the morning and evening when the temperature is lower.

(3) In high-temperature summer conditions, necessary and effective measures should be taken to prevent heatstroke and cool down the workers, such as preparing "wind oil essence" and other anti-heatstroke medicines; at the same time, work hours should be adjusted to arrange to start get off work and leave work early in the morning, start get off work and leave work late in the afternoon, and extend the rest time at noon to ensure the safety of personnel.

(4) During high-temperature construction, the high-altitude working time of personnel should be controlled. Under high-temperature conditions, the continuous operation time of people working at high altitude should not exceed 2 hours.

（1）高温季节施工时，做到合理安排，并配备温度计在太阳暴晒的作业点进行测温，气温高于 38℃时禁止露天作业（赶工期及特殊工序不得暂停施工项目除外，但必须做好防暑降温）。

（2）露天作业人员，适当调整作息时间，尽量在早晚温度较低时段进行施工。

（3）夏季高温情况下对工人的防暑降温采取必要有效措施，如准备“风油精”等防中暑药品；同时调整工作时间，安排上午早上班、早下班，下午晚上班、晚下班，中午

延长休息时间等措施保证人员安全工作。

（4）高温施工期间控制人员的高空作业时间，高温情况下人在高空作业时间上连续操作时间不超过 2 小时。

七、Safety emergency plan

安全应急方案

In the industry we are engaged in, any paralysis and negligence may cause serious consequences. During the project, please be sure to comply with the following safety rules:

我们从事的行业，任何的麻痹和疏忽，将可能造成严重的后果，在从事本工程期间，请务必遵守以下安全通则：

1）Seriously implement the safety construction (production) policy of "safety first, prevention first", consciously abide by various safety construction (production) systems and regulations, and do not harm yourself, others, or be harmed by others.

认真执行“安全第一、预防为主”的安全施工（生产）方针，自觉遵守各项安全施工（生产）制度和规定，做到不伤害自己、不伤害他人、不被他人伤害。

2）Adhere to civilized construction and production. Do not give illegal commands, do not perform illegal operations, do not violate labor discipline, resist illegal commands, and correct illegal behaviors.

坚持文明施工、生产。做到不违章指挥，不违章作业，不违反劳动纪律，抵制违章指挥，纠正违章行为。

3）Dress according to regulations, wear labor protection equipment, and strictly abide by fire prevention, explosion prevention, vehicle safety and other regulations.

按规定着装上岗，穿戴好劳动防护用品，严格遵守防火防爆、车辆安全等规定。

4）Strictly implement the work permit management regulations and strictly prohibit unlicensed operations.

严格执行作业许可证管理规定，严禁无证作业。

5）Warning signs are hung in the construction area and non-construction personnel are strictly prohibited from entering.

施工区域悬挂警示标识，严禁非施工人员进入。

6）When pouring concrete, assign a dedicated person to direct and ensure safe operation of the machinery.

混凝土浇筑时，派专人指挥，确保机械操作安全。

7）When excavating the foundation pit, the drainage of the foundation pit should be strengthened and effective support measures should be taken to ensure the stability of the slope and the safety of the construction workers.

基坑开挖时，应加强基坑排水，采取有效支护措施，确保边坡稳定和施工人员的安全。

7.1 Safety Policy

安全方针

Implement the safety construction policy of "safety first, prevention first" and the regulations of "safety for production, production must be safe", fully implement "preventive control management", attach importance to it ideologically, support it in action, control and prevent the occurrence of personal injury accidents and property losses.

贯彻执行“安全第一，预防为主”的安全施工方针和“安全为了生产，生产必须安全”的规定，全面实行“预控管理”，从思想上重视，行动上支持，控制并杜绝人身伤亡事故和财产损失的发生。

7.2 Hazard identification

危险识别

Serial No.	Item Description	Risk Sources	Potential Damages	Place of Accident	Time/Status	Control Measures
1	Unload of raw materia 原材下车	armored rope bond breaking 钢丝绳断裂	Physical injury 物体打击	Stack yard of rebar 钢筋原材堆场	Unloading process of rebar 钢筋原材下车过程中	Check the armored rope regularly,the broken armored rope should be replaced and never use again.对钢丝绳定期检查，对断丝的钢丝绳不得继续使用，立即更换
2	Construction Power 施工用电	Switch box, constructioncircuit 配电箱、施工用线路	Electricshock 电　击	Rebar fabricating workshop,Concrete casting location 钢筋加工房、 混凝土浇筑点	During rebar fabricating, concrete casting 钢筋制作、混凝土浇筑过程中	Check the circuitry for broken regularly 定期检查线路有无破损
3	Reba bending, straightening machine 钢筋弯曲、调直机械	Construction machinery 施工机械	Mechanical-injury 机械伤害	Rebar fabricating workshop 钢筋加工房	In rebar fabricating 钢筋加工过程中	Choose experienced steelworkers to operate, The newcomers must be guided by skilled workers. Do not loosen the clothes. Install protective cover on the rotating parts of the machine. 选择有经验的钢筋工进行操作，新手操作必须有技术工人旁边指导,不准松　衣解带.机械转动部位装防护罩
4	Rebar transportation 钢筋运输	Road traffic 道路交通	Mechanical Injury 机械伤害	In rebar transportation 钢筋运输过程中	In rebar fabricating 钢筋加工过程中	The driving speed should not exceed 15km/h and obey traffic rules 驾驶速度不得超过 15km/h ,遵守交通规则
5	Lashing platform 绑扎平台	The scaffolding is not firmly erected.脚手板搭设不牢 固	Falling from a height 高处坠落	Binding area of rebar 钢筋绑扎部位	In rebar binding 钢筋绑扎过程中	Before tying the steel bars, check whether the scaffolding is laid securely and whether the steel workers wear safety belts.钢筋绑扎之前，检查脚手板铺设是否牢靠，钢筋工系好安全带
6	Rebar installation 钢筋绑扎	Rebar fixed not well 钢筋绑扎不牢固	Rebar collapse 钢筋倒塌	Binding area of rebar 钢筋绑扎部位	In rebar binding 钢筋绑扎过程中	Rebar check during installation,check rebar fixer before binding 钢筋绑扎过程检查，固定架绑扎前进行检查

7	Casting platform 浇筑平台	Insecure scaffolding 脚手板搭设不牢固	Falling from a height 高处坠落	Casting position 混凝土浇筑部位	Work time 施工过程中	Before pouring concrete, check the concrete pouring operation platform. Strengthen or replace the unstable feet. The scaffolding platform must be inspected by safety officer.在混凝土浇筑之前，对混凝土浇筑操作平台进行检查，对不牢靠的脚进行加固或者更换脚手架平台必须检查，脚手架由安全员检查
8	High-altitude work 高空作业	Without safety belt 未系好安全带	Falling from a height 高处坠落	Work surface at height 高空作业面	During casting 混凝土浇筑过程中	Safety briefings were conducted before construction began, and on-site safety officers strengthened supervision. Safety belts must be worn when working at heights above 1.8 meters.Double hook double hanging 在施工前进行安全交底，现场安全员加强监管力度，1.8米以上高空作业必须佩戴安全带双钩双挂。
9	Foundation pit 基坑	Without protection 无保护	Falling of materials and personnel 物料及人员坠落	Around the foundation pit 基坑周围	During construction 施工期间	Provide Proper hard Barricade and adequate signage , sufficient Lighting for night activity 提供适当的硬质路障和广告标牌，施工人员应在施工前确认周围环境。
		Insufficient protection 保护不足	Falling of materials and personnel 物料和人员坠落	Around the foundation pit 基坑周围	During construction 施工期间	Provide Proper Barricade and adequate signage, supervisor in 提供适当的路障和足够的标志牌，主管应在施工前确保附近的状况。负责的主管人员应在施工前确认附近的状况工作
10	Machinery 机械	Construction machinery 工程机械	Mechanical Injury 机械损伤	Within the pit 坑内	During the course of excavation 在挖掘过程中	Strictly monitor the operators,and urge them operate in accordance with operation regulations 严格监控操作人员，督促其严格按照操作规程操作
11	Construction Power 建筑电力	Distribution box,construction circuit 配电箱， 施工电路	Electric shock 电击	Within the pit 坑内	During the course of construction 在施工过程中	No damage of circuit and mechanical circuit,no hot-line operation,and electrician must hold certificate 电路及机械线路无损坏，禁止带电作业，电工必须持证上岗。

12	**Road Traffic** **道路交通**	**Over speed and incident happend** **超速并发生事故**	**People Hurt** **人员受伤**	**Construction Site** **工地**	**Now/Normal** **现在/正常**	The driving speed must not exceed 15 km/h and local traffic regulations must be followed Add traffic coordinators **行驶速度不得超过 15 公里/小时且必须遵守当地交通法规** **增加交通协管员**
13	**Constructer without helmet** **未佩戴安全帽施工**		**Physical injury** **物体打击**	**Construction Site** **工地**	**During the course of construction** **在施工过程中**	Establish safety measures，and the safety officer shall check the condition of safety helmet **制定安全措施，安全员应检查安全帽的状况**

7.3 Emergency plan preparation

应急预案编制

In response to possible safety accidents that may occur in this project, we have prepared the following emergency response plan.

针对本工程可能会出现的安全事故，我们编制了以下应急响应预案。

Heat stroke emergency response plan

Project Name	Indonesia Batam Island Energy Power and Supporting Project				
Term	Until project completion	Responsible Person	Zhu Mou	Prepared	Yang Chen
Reviewer	Xu Zhijia	Approver	Zhu Mou	Date	May 9, 2025
I.Purpose This plan is formulated to help heat stroke personnel get rid of headaches, dizziness, fatigue, chest tightness, palpitations, collapse, and heat cramps as soon as possible, so that they can recover as soon as possible and devote themselves to work. II.The company established an emergency response command center to command and coordinate the work. Team leader: Zhu Mou Members: Zhou Honghui, Tang Huan, Yu Yang, Sun Zhongyue, Xu Zhijia, Yang Chen					

The specific division of labor is as follows:

1. Zhu Mou is responsible for the scene, and his task is to understand the accident situation and organize on-site rescue.

2. Zhou Honghui and Yu Yang are responsible for liaison. Their task is to arrange on-site rescue in a timely manner according to the command of the command team, and maintain communication with local construction administrative departments and labor departments.

3. Tang Huan and Sun Zhongyue are responsible for maintaining order on the scene and keeping records of inquiries of the parties and surrounding personnel.

4. Xu Zhijia and Yang Chen are responsible for properly handling the aftermath and maintaining communication with relevant local departments.

III.Emergency measures for heat stroke accidents

1. If a staff member is found to have heat stroke, the heat stroke personnel should be immediately helped to a cool place to rest.

2. Report to the superior leader immediately and give the patient anti-heat medicine under the guidance of the leader.

3. Organize personnel to perform physical cooling for the patient (ice water, ice packs for cold compresses on the head and armpits, etc.), and strengthen ventilation and heat dissipation.

4. For those with severe heatstroke, call the emergency center and hospital for help immediately, explain the accident location, severity and contact number of the department in detail, and send someone to the intersection to meet.

IV. Emergency supplies

Regular medicines: Regular medicines: Disinfection supplies, first aid items (bandages, sterile dressings) and various commonly used small splints, stretchers, hemostatic bags, oxygen bags, etc.

V. Communication

Hospital rescue center: 118 or 119

中暑事故应急响应预案

工程名称	印尼巴淡岛能源动力及配套项目				
期　限	至工程竣工	责任人	朱　谋	编制人	杨　晨
审核人	许志嘉	审批人	朱　谋	日　期	2025 年 5 月 9 日

一、目的

为了使中暑人员尽快地摆脱头痛、头晕、乏力、胸闷心悸、虚脱以及的热痉挛等病情的折磨，尽早康复身体全身心地投入工作，制定本预案。

二、组织机构及职责

由公司成立应急响应指挥部，负责指挥及协调工作。

组长：朱谋

成员：周红辉、唐欢、余洋、孙中岳、许志嘉、杨晨

具体分工如下：

1、朱谋负责现场，任务是掌握了解事故情况，组织现场抢救。

2、周红辉、余洋负责联络，任务是根据指挥小组命令，及时布置现场抢救，保持与当地建设行政主管部门及劳动部门等单位的沟通。

3、唐欢、孙中岳负责维持现场秩序，做好当事人、周围人员的问讯记录。

4、许志嘉、杨晨负责妥善处理善后工作，负责保持与当地相关部门的沟通联系。

三、中暑事故应急措施

1、发现工作人员中暑，应立即把中暑人员扶到阴凉处休息。

2、迅速报告上级领导，在领导指导下给患者服用解暑药品。

3、组织人员给患者进行物理降温（冰水、冰袋冷敷头及腋下等），加强通风及散热。

4、重症中暑者，因立即拔打急救中心与医院联系救助，详细说明事故地点、严重程度及本部门的联系电话，并派人到路口接应。

四、应急物资

常备药品：常备药品：消毒用品、急救物品（绷带、无菌敷料）及各种常用小夹板、担架、止血袋、氧气袋等。

五、通讯联络

医院抢救中心：118 或 119

Collapse accident emergency response plan

Project Name	Indonesia Batam Island Energy Power and Supporting Project				
Term	Until project completion	Responsible Person	Zhou Hongbin	Prepared	Zhu Mou
Reviewer	Wang Li	Approver	Yan Chao	Date	May 9, 2025

1. Purpose

This plan is specially formulated to enable the most effective method to rescue trapped people or self-rescue in the event of collapse and minimize economic losses.

2. Organizational structure and responsibilities

The project department shall set up an emergency response command team to be responsible for command and coordination.

Team leader: Zhou Hongbin

Deputy team leaders: Wang Li, Yan Chao

Team members: Zhu Mou, Zhang Yifan, Wang Zhaoqing, Tang Huan, Kong Wenlong, Mao Yuxuan, Sun Zhongyue, Xu Zhijia, Zhou Honghui

The specific division of labor is as follows:

1. Zhou Hongbin is responsible for the scene, and his task is to understand the accident situation and organize on-site rescue.

2. Wang Li is responsible for liaison, and his task is to arrange on-site rescue in a timely manner according to the command of the command team, and maintain communication with local construction administrative departments and labor departments and other units.

3. Yan Chao is responsible for maintaining order on the scene and keeping records of inquiries of the parties and surrounding personnel.

4. Wang Zhaoqing is responsible for properly handling the aftermath and maintaining communication with relevant local departments.

3. Emergency measures for scaffold collapse and collapse

1. Immediately report to the emergency rescue headquarters after the accident.

2. Perform simple bandaging, hemostasis or simple fracture fixation.

3. Perform cardiopulmonary resuscitation on the injured whose breathing and heartbeat have stopped

4. Contact the emergency center as soon as possible, explain the location and severity of the accident in detail, and send someone to the intersection to respond.

5. Organize personnel to remove the pressure of heavy objects as soon as possible to reduce the occurrence of crush syndrome in the injured and transfer them to a safe place.

8. If there is a fracture, it should be promptly fixed with a splint and sent to the hospital immediately.

9. Strengthen the scaffolding, formwork support and support plus pile board, etc., and reinforce the weak links of the slope;

10. Quickly transport heavy objects such as materials, machinery and equipment in the dangerous area;

11. In the case of no injuries, the person in charge on site should study remedial measures according to the actual situation, and organize the restoration of normal construction order on the premise of ensuring the safety of personnel.

12. The on-site safety officer shall analyze the causes of the collapse of construction equipment such as scaffolding, derricks, and tower cranes, formulate corresponding corrective measures, carefully fill out the casualty accident report form, accident investigation and other related handling reports, and report to the company's emergency rescue leadership team.

IV. Emergency supplies

Standard medicines: disinfectants, first aid items (bandages, sterile dressings) and various commonly used small splints, stretchers, blood bags, oxygen bags and other supplies.

5. Communication contact

Hospital rescue center: 118 or 119

Project department head phone:

Project manager: Zhou Hongbin 082321982020

Project chief engineer: Wang Li 082321982156

Project general manager: Yan Chao 085283836908

Project department rescue team member phone:

Safety and Environmental Protection Department: Zhou Honghui 085355801535

Zhu Mou 082321982021; Zhang Yifan 085282296626; Wang Zhaoqing 085282296627; Tang Huan

082321982160;

6. Precautions

1. Stop construction immediately.

2. Pay attention to the buildings or equipment around the scaffolding.

3. Artificial external chest compression and artificial respiration cannot be easily abandoned and must be persisted to the end.

坍塌事故应急响应预案

工程名称	巴淡岛能源动力项目及配套工程				
期　限	工程竣工	责任人	周洪斌	编制人	朱谋
审核人	王力	审批人	严超	日　期	2025 年 04 月 10 日

一、目的

为使发生坍塌时能采取最有效的方法抢救被困人员或者自救，最大限度减小经济损失，特制定本预案。

二、组织机构及职责

由项目部成立应急响应指挥小组，负责指挥及协调工作。

组长：周洪斌

副组长：王力、严超

组员：朱谋、张一帆、王钊庆、唐欢、孔文龙、毛宇轩、孙中岳、许志嘉、周红辉

具体分工如下：

1、周洪斌负责现场，任务是掌握了解事故情况，组织现场抢救。

2、王力负责联络，任务是根据指挥小组命令，及时布置现场抢救，保持与当地建设行政主管部门及劳动部门等单位的沟通。

3、严超负责维持现场秩序，做好当事人、周围人员的问讯记录。

4、王钊庆负责妥善处理善后工作，负责保持与当地相关部门的沟通联系。

三、脚手架坍塌、倒塌事故应急措施

1、事故发生后应立即报告应急抢险指挥部。

2、进行简易包扎、止血或简易骨折固定。

3、对呼吸、心跳停止的伤员予以心脏复苏

4、尽快与急救中心取得联系，详细说明事故地点、严重程度，并派人到路口接应。

5、组织人员尽快解除重物压迫，减少伤员挤压综合症的发生，并将其转移到安全地方。

8、若有骨折时应及时用夹板等简易固定后立即送医院。

9、加强脚手架、模板支护和支护加桩板等，对边坡薄弱环节进行加固处理；

10、迅速运走危险区域材料、机械设备等重物；

11、在没有人员受伤的情况下，现场负责人应根据实际情况研究补救措施，在确保人员生命安全的前提下，组织恢复正常施工秩序。

12、现场安全员应对脚手架、井架、塔吊等施工设备倒塌事故进行原因分析，制定相应的纠正措施，认真填写伤亡事故报告表、事故调查等有关处理报告，并上报公司应急抢救领导小组。

四、应急物资

常备药品：消毒用品、急救物品（绷带、无菌敷料）及各种常用小夹板、担架、制血袋、氧气袋等物资。

五、通讯联系

医院抢救中心：118 或 119

项目部负责人电话：

项目经理：　周洪斌 082321982020

项目总工：　王力 082321982156

项目总经： 严超 085283836908
项目部救援小组成员电话：
安全环保部：周红辉 085355801535
朱谋 082321982021；张一帆 085282296626；王钊庆 085282296627；唐欢 082321982160；
六、注意事项
1、应立即停止施工。
2、注意观察脚手架周边建筑物或设备。
3、人工胸外心脏挤压、人工呼吸不能轻易放弃，必须坚持到底。

Emergency response plan for electric shock accidents

Project Name	Indonesia Batam Island Energy Power and Supporting Project				
Term	Until project completion	Responsible Person	Zhou Hongbin	Prepared	Zhu Mou
Reviewer	Wang Li	Approver	Yan Chao	Date	May 9, 2025

1. Purpose

This plan is specially formulated to ensure that after an electric shock accident occurs, rescue work can be carried out quickly and effectively to minimize the risk of life safety of employees and related parties.

2. Organizational structure and responsibilities

The company shall set up an emergency response command team to be responsible for command and coordination.

Team leader: Zhou Hongbin

Deputy team leaders: Wang Li, Yan Chao

Team members: Zhu Mou, Zhang Yifan, Wang Zhaoqing, Tang Huan, Kong Wenlong, Mao Yuxuan, Sun Zhongyue, Xu Zhijia, Zhou Honghui

The specific division of labor is as follows:

1. Zhou Hongbin is responsible for the scene, and his task is to understand the accident situation and organize on-site rescue

2. Wang Li is responsible for liaison, and his task is to arrange on-site rescue in a timely manner according to the command of the command team, and maintain communication with local construction administrative departments and labor departments and other units.

3. Yan Chao is responsible for maintaining order on the scene and keeping records of inquiries of the parties and surrounding personnel.

4. Wang Zhaoqing is responsible for properly handling the aftermath and maintaining communication with local relevant departments.

3. Emergency measures for electric shock accidents

1. The first person to discover the accident should immediately cut off the power supply (close the circuit) as much as possible, or use insulating materials and other equipment obtained

on site to separate the person who was electrocuted from the charged body, and shout for help and report to the person in charge (or relevant management personnel on site).

2. Immediately remove the injured from the dangerous place, lie on the ground or on a flat board for simple diagnosis, and the emergency team will organize personnel to rescue.

3. If the person who was electrocuted is found to have "heartbeat but no breathing" or "breathing but no heartbeat" or "both breathing and heartbeat have stopped", immediately perform "mouth-to-mouth (nose) artificial respiration", "external cardiac compression", "both at the same time" cardiopulmonary resuscitation.

4. Immediately call 118 or 119 to contact the local emergency center (if the hospital is nearby, send it directly to the hospital), and explain in detail the location of the accident, the severity, the contact number of the department, and send someone to the intersection to meet.

5. Immediately report the accident to the emergency rescue leadership group of the affiliated company and the group company and seek support.

6. Maintain order at the scene and strictly protect the accident scene.

IV. Emergency supplies

1. Regular medicines: disinfectants, first aid items (bandages, sterile dressings) and various commonly used small splints and stretchers.

V. Communications

Hospital rescue center: 118 or 119

Police phone: 110 or 112

Project manager phone:

Project manager: Zhou Hongbin 082321982020

Project chief engineer: Wang Li 082321982156

Project general manager: Yan Chao 085283836908

Project rescue team member phone:

Safety and Environmental Protection Department: Zhou Honghui 085355801535

Zhu Mou 082321982021; Zhang Yifan 085282296626; Wang Zhaoqing 085282296627; Tang Huan 082321982160;

触电事故应急响应预案

工程名称	巴淡岛能源动力项目及配套工程				
期　限	工程竣工	责任人	周洪斌	编制人	朱谋
审核人	王力	审批人	严超	日　期	2025 年 04 月 10 日

一、目的

为确保我公司触电事故发生以后，能迅速有效地开展抢救工作，最大限度地降低员工及相关方生命安全风险，特制定本预案。

二、组织机构及职责

由公司成立应急响应指挥小组，负责指挥及协调工作。

组长：周洪斌

副组长：王力、严超

组员：朱谋、张一帆、王钊庆、唐欢、孔文龙、毛宇轩、孙中岳、许志嘉、周红辉

具体分工如下：

1、周洪斌负责现场，任务是掌握了解事故情况，组织现场抢救

2、王力负责联络，任务是根据指挥小组命令，及时布置现场抢救，保持与当地建设行政主管部门及劳动部门等单位的沟通。

3、严超负责维持现场秩序，做好当事人、周围人员的问讯记录。

4、王钊庆负责妥善处理善后工作，负责保持与当地相关部门的沟通联系。

三、触电事故应急措施

1、事故第一发现人应当机立断地尽可能地立即切断电源（关闭电路），也可用现场得到的绝缘材料等器材使触电人员脱离带电体，并大声呼救，报告责任人（或现场相关管理人员）。

2、将伤员立即脱离危险地方，仰卧在平地或平板上进行简单诊断，应急小组组织人员抢救。

3、若发现触电者“有心跳无呼吸”或“有呼吸无心跳”或“呼吸心跳均停止”，立即分别进行“口对口（鼻）人工呼吸”、“体外心脏挤压”、“两者同时进行”心肺复苏。

4、立即拨打 118 或 119 向当地急救中心取得联系（医院在附近的直接送往医院），应详细说明事故地点、严重程度、本部门的联系电话，并派人到路口接应。

5、立即向所属公司、集团公司应急抢险领导小组汇报事故发生情况并寻求支持。

6、维护现场秩序，严密保护事故现场。

四、应急物资

1、常备药物：消毒用品、急救物品（绷带、无菌敷料）及各种常用小夹板、担架。

五、通讯联络

医院抢救中心：118 或 119

警察电话：110 或 112

项目部负责人电话：

项目经理： 周洪斌 082321982020

项目总工： 王力 082321982156

项目总经： 严超 085283836908

项目部救援小组成员电话：

安全环保部：周红辉 085355801535

朱谋 082321982021；张一帆 085282296626；王钊庆 085282296627；唐欢 082321982160；

Emergency Preparedness and Response Plan for Mechanical Injury Accidents

Project Name	Indonesia Batam Island Energy Power and Supporting Project				
Term	Until project completion	Responsible Person	Zhou Hongbin	Prepared	Zhu Mou
Reviewer	Wang Li	Approver	Yan Chao	Date	May 10, 2025

1. Purpose

This plan is specially formulated to ensure that after a mechanical injury accident occurs, rescue can be carried out quickly and effectively, prevent the accident from expanding, reduce the risk of life of employees, and minimize economic losses.

2. Organizational structure and responsibilities

The project department shall set up an emergency response command team to be responsible for command and coordination.

Team leader: Zhou Hongbin

Deputy team leaders: Wang Li, Yan Chao

Team members: Zhu Mou, Zhang Yifan, Wang Zhaoqing, Tang Huan, Kong Wenlong, Mao Yuxuan, Sun Zhongyue, Xu Zhijia, Zhou Honghui

The specific division of labor is as follows:

1. Zhou Hongbin is responsible for organizing the on-site command rescue and immediately organizing personnel to rescue the injured.

2. Wang Li is responsible for organizing personnel to carry out necessary disposal of on-site mechanical equipment and protect the accident site.

3. Yan Chao is responsible for immediately contacting the hospital, safety supervision and other departments to explain the detailed accident location and accident situation, and send people to the intersection to meet.

4. Wang Zhaoqing is responsible for the dispatch of on-site materials and vehicles.

3. Emergency measures for mechanical injury accidents

1. Immediately report to the emergency response team after the accident occurs and organize on-site rescue.

2. Relevant personnel on site should immediately shut down the running machinery and turn off (or cut off) the power supply.

3. Quickly remove the injured from the danger zone in time, and perform simple bandages, hemostasis or simple fracture fixation on the injured.

4. Contact the 118 or 119 emergency center as soon as possible, explain the location and severity of the accident in detail, and send someone to the intersection to meet.

5. In the case of no injuries, the person in charge of the site should study remedial measures according to the actual situation, and organize the restoration of normal construction order on the premise of ensuring the safety of personnel.

6. Construction should be stopped immediately after the accident occurs, and the accident situation should be reported to the company's emergency preparedness and response leadership group in a timely manner.

7. The on-site safety officer should analyze the cause of the accident, formulate corresponding corrective measures, carefully fill in the casualty accident report form, accident investigation and other relevant processing reports, and report to the company's emergency preparedness and response leadership group.

IV. Emergency supplies

Standard medicines: disinfectants, first aid items (bandages, sterile dressings) and various commonly used small splints, stretchers, hemostatic bags, oxygen bags, tools and other supplies.

5. Communication contact

Hospital rescue center: 118 or 119
Project department head phone:
Project manager: Zhou Hongbin 082321982020
Project chief engineer: Wang Li 082321982156
Project general manager: Yan Chao 085283836908
Project department rescue team member phone:
Safety and Environmental Protection Department: Zhou Honghui 085355801535
Zhu Mou 082321982021; Zhang Yifan 085282296626; Wang Zhaoqing 085282296627; Tang Huan 082321982160;
6. Precautions
1. Stop construction immediately.
2. Artificial external chest compression and artificial respiration cannot be easily abandoned and must be persisted to the end.

机械伤害事故应急准备与响应预案

工程名称	巴淡岛能源动力项目及配套工程				
期　限	工程竣工	责任人	周洪斌	编制人	张一帆
审核人	王力	审批人	严超	日　期	2025 年 04 月 10 日

一、目的

为确保发生机械伤害事故后，能迅速有效地实施救护，防止事故扩大，降低员工生命危险，最大限度减小经济损失，特制定本预案。

二、组织机构及职责

由项目部成立应急响应指挥小组，负责指挥及协调工作。

组长：周洪斌

副组长：王力、严超

组员：朱谋、张一帆、王钊庆、唐欢、孔文龙、毛宇轩、孙中岳、许志嘉、周红辉

具体分工如下：

1、周洪斌负责组织现场指挥抢救，立即组织人员抢救伤员。

2、王力负责组织人员对现场机械设备进行必要的处置，并保护好事故现场。

3、严超负责立即同医院、安监等部门联系，说明详细事故地点、事故情况，并派人到路口接应。

4、王钊庆负责现场物资、车辆的调度。

三、机械伤害事故应急措施

1、事故发生后应立即向应急响应小组报告，组织现场抢救。

2、现场有关人员应立即关闭运转机械、关闭（或切断）电源。

3、迅速将伤员及时脱离危险区，对受伤人员进行简易包扎、止血或简易骨折固定等处理。

4、尽快与 118 或 119 急救中心取得联系，详细说明事故地点、严重程度，并派人到路口接应。

5、在没有人员受伤的情况下，现场负责人应根据实际情况研究补救措施，在确保人员生命安全的前提下，组织恢复正常施工秩序。

6、事故发生后应立即停止施工，及时将事故情况报告公司应急准备和响应领导小组。

7、现场安全员应对事故进行原因分析，制定相应的纠正措施，认真填写伤亡事故报告表、事故调查等有关处理报告，并上报公司应急准备和响应领导小组。

四、应急物资

常备药品：消毒用品、急救物品（绷带、无菌敷料）及各种常用小夹板、担架、止血袋、氧气袋、工具等物资。

五、通讯联系

医院抢救中心：118 或 119

项目部负责人电话：

项目经理： 周洪斌 082321982020

项目总工： 王力 082321982156

项目总经： 严超 085283836908

项目部救援小组成员电话：

安全环保部：周红辉 085355801535

朱谋 082321982021；张一帆 085282296626；王钊庆 085282296627；唐欢 082321982160;

六、注意事项

1、应立即停止施工。

2、人工胸外心脏挤压、人工呼吸不能轻易放弃，必须坚持到底。

Lifting Injury Emergency Response Plan

Project Name	Indonesia Batam Island Energy Power and Supporting Project				
Term	Until project completion	Responsible Person	Zhou Hongbin	Prepared	Zhu Mou
Reviewer	Wang Li	Approver	Yan Chao	Date	May 10, 2025

1. Purpose

This plan is specially formulated to ensure timely and effective rescue after a lifting injury occurs, reduce the risk of life of employees, and minimize economic losses.

2. Organizational structure

The project department shall set up an emergency response command and coordination work.

Team leader: Zhou Hongbin

Deputy team leaders: Wang Li, Yan Chao

Team members: Zhang Yifan, Zhu Mou, Wang Zhaoqing, Tang Huan, Kong Wenlong, Mao Yuxuan, Sun Zhongyue, Kong Wenlong, Xu Zhijia, Zhou Honghui

3. Specific division of labor

1. Zhou Hongbin is responsible for the overall launch and command of the emergency plan and coordinates the emergency response work of various departments.

2. Wang Li is responsible for assisting the project manager in formulating and

implementing the emergency plan, and supervising and inspecting the implementation of various prevention and control measures.

3. Yan Chao is responsible for immediately contacting local hospitals, police, fire departments and other departments.

4. Wang Zhaoqing is responsible for the dispatch of on-site materials and vehicles.

5. The remaining team members are responsible for on-site assistance.

IV. Emergency measures for hoisting injuries

1. Immediately report to the emergency response team after the accident occurs and organize on-site rescue.

2. Quickly perform simple bandaging, hemostasis or simple fracture fixation on the injured.

3. Contact the 118 or 119 emergency center as soon as possible, explain the location and severity of the accident in detail, and send someone to the intersection to respond.

4. Stop construction immediately after the accident occurs, and report the accident to the company's emergency preparedness and response leadership group in a timely manner.

5. The on-site safety officer should analyze the cause of the accident, formulate corresponding corrective measures, carefully fill in the casualty accident report form, accident investigation and other relevant processing reports, and report to the company's emergency preparedness and response leadership group.

V. Emergency supplies

Standard medicines: disinfectants, first aid items (bandages, sterile dressings) and various commonly used stretchers, hemostatic bags, oxygen bags, tools and other supplies.

VI. Communication contact

Hospital rescue center: 118 or 119

Police phone: 110 or 112

Project manager phone:

Project manager: Zhou Hongbin 082321982020

Project chief engineer: Wang Li 082321982156

Project general manager: Yan Chao 085283836908

Project rescue team member phone:

Safety and Environmental Protection Department: Zhou Honghui 085355801535

Zhu Mou 082321982021; Zhang Yifan 085282296626; Wang Zhaoqing 085282296627; Tang Huan 082321982160;

VII. Precautions

1. Stop construction immediately.

2. Artificial external chest compression and artificial respiration cannot be easily abandoned and must be persisted to the end.

起重伤害应急响应预案

工程名称	巴淡岛能源动力项目及配套工程				
期　限	工程竣工	责任人	周洪斌	编制人	朱谋
审核人	王力	审批人	严超	日　期	2025 年 04 月 10 日

一、目的

为确保发生起重伤害后，及时有效地进行救护，降低员工生命危险，最大限度减小经济损失，特制定本预案。

二、组织机构

由项目部成立应急响应指挥及协调工作。

组长：周洪斌

副组长：王力、严超

组员：张一帆、朱谋、王钊庆、唐欢、孔文龙、毛宇轩、孙中岳、孔文龙、许志嘉、周红辉

三、具体分工

1. 周洪斌负责总体负责应急预案的启动和指挥，协调各部门的应急响应工作。

2. 王力负责协助项目经理制定和实施应急预案，监督和检查各项防控措施的落实情况。

3. 严超负责立即同当地医院、警察、消防部门等部门的联系。

4. 王钊庆负责现场物资、车辆的调度。

5. 其余小组成员负责现场协助。

四、起重吊装伤害应急措施

1、事故发生后应立即向应急响应小组报告，组织现场抢救。

2、迅速对受伤人员进行简易包扎、止血或简易骨折固定等处理。

3、尽快与 118 或 119 急救中心取得联系，详细说明事故地点、严重程度，并派人到路口接应。

4、事故发生后应立即停止施工，及时将事故情况报告公司应急准备和响应领导小组。

5、现场安全员应对事故进行原因分析，制定相应的纠正措施，认真填写伤亡事故报告表、事故调查等有关处理报告，并上报公司应急准备和响应领导小组。

五、应急物资

常备药品：消毒用品、急救物品（绷带、无菌敷料）及各种常用担架、止血袋、氧气袋、工具等物资。

六、通讯联系

医院抢救中心：118 或 119

警察电话：110 或 112

项目部负责人电话：

项目经理： 周洪斌 082321982020

项目总工： 王力 082321982156

项目总经： 严超 085283836908

项目部救援小组成员电话：

安全环保部：周红辉 085355801535

朱谋 082321982021；张一帆 085282296626；王钊庆 085282296627；唐欢 082321982160;

七、注意事项

1.应立即停止施工。

2、人工胸外心脏挤压、人工呼吸不能轻易放弃，必须坚持到底。

附件一：

锅炉基础土方开挖及施工的检查和试验计划

（Inspection and Test Plans for Boiler foundation excavation and construction）

业主/客户	PT BATAMINDO
承包商	PT SHANGHAI BAOYE INDONESIA
项目名称	Batam Energy Power And Supporting Projects Site leveling

序号 No	工作项目 Work Project	检查方法 Inspection method	参考文档 Reference Documentation	接受标准 Acceptance criteria	见证人 Witness		
					BIC	PSM	SBC
1	**锅炉基础 Boiler Basics**						
1.1	**准备 Prepare**						
1.1.1	清理现场杂物 Clean up the debris on site	视觉的 Visual		区域清理干净，没有挖杂物 The area is clean and no debris is dug up	W	W	I
1.2	**挖掘 Digging**						
1.2.1	根据施工图和认可的基准设定位置 Positioning according to construction drawings and approved benchmarks	尺寸 Measurements		测量员检查 Surveyor inspection	W	I	X
1.2.2	开挖深度和宽度 Excavation depth and width	尺寸 Measurements		符合规格图纸 Meets specification drawings	W	I	I

1.2.3	按照批准的图纸进行线路、坡度 Carry out the route and grade as per the approved drawings	视觉的 Visual			W	I	I
1.3	**回填 Backfill**						
	准备 Prepare						
1.3.1	回填前清理质量 Cleaning quality before backfilling	视觉的 Visual		清除所有碎片和水 Remove all debris and water	W	I	I
1.3.2	回填材料质量 Backfill material quality	视觉的 Visual			W	W	W
1.3.3	填筑层厚度需按图施工。The thickness of the filling layer shall be constructed according to the drawing.	尺寸 Measurements		符合规格图纸 Meets specification drawings	W	S	1
1.3.4	最终成型面 Final molding surface	尺寸 Measurements		检查测量高程 Checking the measured elevation	W	W	I
1.4	**混凝土 Concrete**						
1.4.1	混凝土配合比 Concrete mix ratio	报告 Report			R	R	R
1.4.2	混凝土浇筑准备 Concrete pouring preparation	视觉的 Visual			W	W	I
1.4.3	混凝土浇筑前的清理 Cleaning before concrete pouring	视觉的 Visual			W	I	I

1.4.4	浇筑的方法和厚度 Casting method and thickness	视觉的 Visual		放置持续时间 Placement duration	W	S	I
1.4.5	混凝土修整 Casting method and thickness	视觉的 Visual			W	W	I
	测试 test						
1.4.6	混凝土坍落度试验 Concrete slump test	测试 test		样品测试 28 天强度 Sample test 28 days strength	W	S	X
1.4.7	混凝土抗压试验 Concrete compression test	测试、取样 Testing and sampling			W	W	W
1.5	**模板 Wooden board**						
1.5.1	材料的质量和形状 Material quality and shape	视觉与尺寸 Vision and Measurements		安装模板前 Before installing	W	W	I
1.5.2	模板制作 Wooden board Template making	视觉与尺寸 Vision and Measurements		安装模板前 Before installing	W	W	I
1.5.3	位置、尺寸、对齐、垂直和标高 Position, size, alignment, vertical and elevation	尺寸 Measurements		规格标准图、尺寸、对齐 Specifications, drawings, dimensions, alignment	W	W	I

NOTE:
H: "HOLD POINT" requires mandatory witness of inspection by Supervisor / OWNER 强制停顿检查
A：Grade "A" Inspections mandatorily require presence of Supervisor together with OWNER　强制（业主和监理
B： Grade "B" Inspections mandatorily require presence of Supervisor（必须有主管）
C： Grade "C" Inspections carried out by CONTRACTOR being subject to random witness by Supervisor / OWNER（承包商进行，业主或监理抽查）

X:　Execution 执行、实施

I:　Inspection 检查

T:　Test 试验

W:　Witness　　见证

S:　Surveillance　监视

R:　Review And Approval　　审查和批准

QR:　Certificate/Report Required 记录（提供证书和报告）