

**THAILAND GOLDEN EGRET CEMENTED CARBIDE PRODUCTION BASE- PHASE II PROJECT  
DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
(TENDER ANNOUNCEMENT)**

泰国金鹭硬质合金生产基地二期项目  
降压站系统设计与施工承包工程  
(招标公告)

**APPLICATION PERIOD: FROM NOW UNTIL 8 April 2025**

报名时间：即日起至 2025年4月8日



**1. REQUIREMENTS OF TENDERER**

**投标单位要求**

- 1.1. The Company has relevant legal business license in Thailand.  
企业具有泰国法定相关营业执照。  
The company has the design and build substation project performance in Thailand for the past five years, with three or more voltage level 115KV or above substation projects.  
企业具备在泰国近五年降压站系统设计与施工承包工程项目业绩，115KV 及以上电压等级降压站项目三个或三个以上。
- 1.2. A qualified and experienced Project Director to be overall in charge of the whole site operation, who shall be a professional Engineer, having fifteen (15) years minimum relevant on site experience and assumed to be approx. 50 years old or above. He shall be fluent in spoken and written Chinese and English. (Non-mandatory requirement, for suggestion only)  
一名合格且经验丰富的项目总监，全面负责整个现场运营。项目总监应为专业工程师，具有至少十五（15）年的相关现场经验，假设年龄约为50岁或以上。他应精通英语口语和书面语。（非强制要求，仅供建议参考）
- 1.3. Qualified and experienced Project Managers, fifteen (15) years minimum relevant on site experience and assumed to be approx. 45 years old or above to manage each major Section of work. (Non-mandatory requirement, for suggestion only)  
合格且经验丰富的项目经理、至少十五（15）年的相关现场经验，假设年龄约为45岁或以上，可以管理每个主要工程部分。（非强制要求，仅供建议参考）
- 1.4. Qualified and experienced Design Director and Managers for design the whole Substation.  
合格且经验丰富的设计总监及经理，负责整个降压站系统设计。
- 1.5. The design scheme fully complies with Thai PEA standards and can effectively meet project requirements. It is feasible, reasonable, and advanced.  
设计方案完全符合泰国 PEA 标准，能有效满足项目需求，可行、合理、先进。



- 1.6. The construction organization design is scientifically reasonable, the construction technology is advanced, the construction process is clear, and the resource allocation is sufficient, which can effectively ensure the quality and progress of the project.  
施工组织设计科学合理，施工工艺先进，施工流程清晰，资源配置充足，能够有效保证工程质量和进度。
- 1.7. Reasonable selection of key equipment, advanced technology, reliable performance, can effectively meet project needs, and after-construction service guarantee is perfect.  
关键设备选型合理，技术先进、性能可靠，可有效满足项目需求，且售后服务保障完善。
- 1.8. The proposed programme is scientifically reasonable, the critical path is clear, the time arrangement is compact, and the resource allocation is sufficient, which can effectively ensure that the project is completed on schedule with quality and quantity guaranteed.  
进度计划科学合理，关键路径清晰，时间安排紧凑，资源配置充足，能够有效保证工程保质保量地按期完成。
- 1.9. The quality control system is perfect, the organizational structure is sound, the responsibilities are clear, and the quality control measures are scientific, which can effectively guarantee the quality of the project.  
质量管控体系完善，组织机构健全、职责明确，质量管控措施科学，能够有效保障工程质量。
- 1.10. The project management plan is scientifically reasonable, the organizational structure is sound, responsibilities are clear, and the management system is perfect, which can effectively ensure the smooth implementation of the project.  
项目管理方案科学合理，组织机构健全、职责明确，管理制度完善，能够有效保障项目顺利实施。
- 1.11. The Company does not have adverse records ( not incurred in bribery crime event, no major illegal records, not fraudulently won the tender, or seriously breached the contract) in the past three years.  
企业近三年无不良记录(未被列入行贿犯罪档案, 无重大违法记录, 无骗取中标或严重违约问题)。
- 1.12. Financial capability is sound, with no huge debts.  
财务能力健全, 无巨额负债。
- 1.13. The Company shall not have any affiliation or other interest relationship with the Employer, Designer, Construction Management Consultant, or Cost Consultant.  
参与单位不得与建设单位、设计单位、监理单位、造价单位有隶属关系或其它利益关系。

## 2. PROJECT LOCATION

### 项目位置

The proposed project is located in Block D61, WHA Eastern Seaboard Industrial Estate 1, Chonburi, Thailand.

项目位于泰国春武里 WHA 东海岸工业区1号 D61地块。

## 3. PROJECT INFORMATION

### 项目信息

The overall project development involves the development of the Build to Suit Factory GECC Production Base (Phase 2) including Factory area, Powder workshop, RTP workshop, Alloy workshop, Composite station (Utility station), Alcohol warehouse, hazardous waste and solid waste station, Sewage station, Composite building, Fencing, Carport, Main gate, Four-sided Buddha, Fitting out, Landscape, etc.

整个泰国金鹭硬质合金生产基地二期项目的开发, 包括厂区, 粉末车间, RTP 车间, 合金车间, 综合站房, 酒精库, 危废固废站, 污水处理站, 综合楼, 围墙, 车棚, 大门, 四面佛, 装饰装修, 景观绿化等。

The Contractor's design and Build part comprises Substation permanent works generally as described in the Section 4 of Tender Documents "Design Intent Specification and Drawings" including all and those work elements necessary to compliment the General and Special system for mechanical and electrical works, structural & architectural works and related works.

承包商的设计和建造部分包括招标文件第4节“设计意向规范及图纸”中所述的变电站永久性工程, 包括所有机电工程通用和专用系统、土建工程及相关工程。

#### 4. INSTRUCTIONS FOR SUBMISSION OF INFORMATION

##### 提交资料说明

##### 4.1. Information to be submitted:

需提交的资料:

- Commercial Package - Please refer to Instructions to Tenderer  
商务标 - 请参阅投标人须知。
- Technical Package - Please refer to Instructions to Tenderer  
技术标 - 请参阅投标人须知。

The above shall include Section 2 "Returnable Schedules" of Tender Documents (RS1 to RS6)  
上述包含招标文件第2节“需交回的附表”(RS1 to RS6)

Remarks:

备注:

- Language of the documents is bilingual (Chinese & English).  
文件语言为双语(中英文)。
- The above submitted documents should be bound separately (1 copies each), sealed in envelopes, and labeled with the project name and document name on the front of the envelopes.  
以上需提交文件需分开装订(各1份), 密封在信封中并在信封正面标明项目名称、文件名称。
- Also provide an electronic version stored on a USB drive.  
另提供存储在U盘的电子版。

#### 5. ADDRESS OF TENDER RETURN

##### 回标地址

- WT Partnership (Thailand) Ltd.  
Unit 1802, Level 18, S-Metro, 725 Sukhumvit Rd., Klongton Nua, Wattana,  
Bangkok 10110, Thailand.  
务腾(泰国)有限公司  
泰国曼谷市瓦他那区素逸坤路725号 S-Metro 18楼1802号
- Employer Representative:  
业主方联系人:  
Khun Chan Kok Siong / Li Yanhui/Zuo Suli  
082-291-7224 / 0660401750
- chankoks@wtpthailand.com /li.yanhui@cxtc.com/zuo.suli@cxtc.com



**GECC PRODUCTION BASE (PHASE 2) PROJECT**  
**泰国金鹭硬质合金生产基地二期项目**

**AT CHONBURI, THAILAND**  
**于泰国, 春武里**

**DESIGN AND BUILD SUBSTATION SYSTEM**  
**CONTRACT WORKS**  
**降压站系统设计与施工承包工程**

**TENDER DOCUMENT**  
**招标文件**

REF: GECCPH2/SUB/TD/001

**MARCH 2025**  
**2025 年 3 月**

Employer  
雇主

**GOLDEN EGRET CEMENT CARBIDE**  
**(THAILAND) CO., LTD.**  
金鹭硬质合金(泰国)有限公司  
700 Tambon Ta Sit, Si Racha  
District, Chon Buri 20110, Thailand.

Cost Consultant  
造价师

**WT PARTNERSHIP (THAILAND) LIMITED**  
务腾(泰国)有限公司  
725 S-Metro, Floor 18, Unit 1802,  
Sukhumvit Road, Klongton Nuea,  
Wattana, Bangkok, 10110



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**SECTION 1**  
第 1 节  
**INSTRUCTIONS TO TENDERER**  
投标人须知

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# INSTRUCTIONS TO TENDERER

## 投标人须知



### INSTRUCTIONS TO TENDERER

#### 投标人须知

The Tenderer is invited to submit their tender for the proposed Design and Build Substation System to GECC Production Base (Phase 2) Project at Block D61, WHA Eastern Seaboard Industrial Estate 1, Chonburi, Thailand all in accordance with the conceptual drawings, general specifications, and Statement of Requirement/ Design requirement.

请投标人按照概念图、规范和要求声明/设计要求，为泰国春武里府 WHA 伟华东海岸工业区 1 号 D61 区块的泰国金鹭硬质合金生产基地二期项目建议的变电站系统设计与施工承包工程提交投标书。

#### 1.1 Scope of Works

##### 工程范围

- 1.1.1 This Tender document specifies the minimum purpose, scope, technical, operational and performance requirements for the Works that the Contractor shall satisfy to fulfil obligations under the Contract.  
本招标文件规定了承包商为履行合同义务而应满足工程的最低目的、范围、技术、操作和性能要求。
- 1.1.2 This tender document pertains to the work required through the design, construction, testing, power transmission and commissioning phases. Contractual requirements for the Works are defined in the Contract which shall be read in conjunction with this document.  
本招标文件涉及设计、施工、验收、送电和调试阶段所需的工作。合同中规定了工程的合同要求，应结合本文件阅读。
- 1.1.3 The Contractor shall take a holistic approach to the design and construction of the Works. The Contractor shall consider all elements as a whole, taking into account how they are coordinated with, interact with, and affect other parts of the Works and the existing infrastructure in, or surrounding, the Site.  
承包商应对工程的设计和施工采取整体方法。承包商应将所有要素视为一个整体，考虑它们如何与工程的其他部分以及现场或周围的现有基础设施协调、相互作用和影响。
- 1.1.4 The Contractor shall carry out any work, tasks and activities (including satisfying additional design criteria if this is necessary and handling relevant government procedures and documents) additional to that contemplated by this document to ensure that the Contractor's obligations under the Contract and the intent of the Condition of Contract requirements are satisfied.  
承包商应执行除本文件规定外的任何工作、任务和活动（包括在必要时满足额外的设计标准及办理相关政府手续文件），以确保满足承包商在本合同项下的义务和合同条件要求的意图。
- 1.1.5 The Contractor shall not depart from the requirements of this document other than:  
除以下情况外，承包商不得偏离本文件的要求：
- a. As necessary to comply with the requirements of the condition of Contract including Supplementary Agreement,  
为满足合同条款包括补充协议的要求，
  - b. In accordance with the provisions for variations to work under the Contract, or Statement of Requirement / Design Requirement  
根据合同或要求声明/设计要求规定下的工程变更
  - c. As otherwise agreed with the Employer  
与雇主另有约定



# INSTRUCTIONS TO TENDERER

## 投标人须知



- 1.1.6 In any case, prior written acceptance of the Employer is required in order to depart from the requirements of this document.  
在任何情况下，都需要事先获得雇主的书面认可，才能偏离本文件的要求。
- 1.1.7 Reference to any work includes any additional activities or temporary works necessary for the satisfactory completion and performance of that work and full compliance with these requirements.  
提及的任何工作包括圆满完成和执行该工作以及完全遵守这些要求所需的任何额外工作或临时工程。
- 1.1.8 Unless the context otherwise requires, terms which have a defined meaning in the Contract have the same meaning where used in this tender document.  
除非上下文另有要求，否则合同中具有明确含义的术语与本招标文件中使用的术语具有相同的含义。
- 1.2 THE EMPLOYER**  
**雇主**
- 1.2.1 Golden Egret Cement Carbide (Thailand) Co., Ltd. ('Employer').  
金鹭硬质合金(泰国)有限公司（“雇主”）
- 1.3 THE SITE**  
**现场**
- 1.3.1 GECC Production Base (Phase 2) Project at Block D61, WHA Eastern Seaboard Industrial Estate 1, Chonburi, Thailand.  
泰国春武里 WHA 伟华东海岸工业区 D61 区块泰国金鹭硬质合金生产基地二期项目。

# INSTRUCTIONS TO TENDERER

## 投标人须知



### 1.4 THE PROJECT

#### 项目

- 1.4.1 The project involves the development of the Build to Suit Factory GECC Production Base (Phase 2). Scope includes Factory area, Powder workshop, RTP workshop, Alloy workshop, Composite station (Utility station), Alcohol warehouse, hazardous waste and solid waste station, Sewage station, Composite building, Fencing, Carport, Main gate, Four-sided Buddha, Fitting out, Landscape, etc.

本项目涉及泰国金鹭硬质合金生产基地二期项目的开发。

范围包括厂区, 粉末车间, RTP 车间, 合金车间, 综合站房, 酒精库, 危废固废站, 污水处理站, 综合楼, 围墙, 车棚, 大门, 四面佛, 装饰装修, 景观绿化等。

The project design will be carried out by the contractor as summarized below and detailed in full under Definitions and Section 4 “Design Intent Specification and Drawings”.

项目设计将由承包商进行, 摘要如下, 并在第 4 节“设计意向规范及图纸”中定义和详细说明。

### 1.5 CONTRACTOR’S DESIGN AND BUILD PART

#### 承包商的设计和建造部分

- 1.5.1 The Contractor’s design and Build part comprises Substation permanent works generally as described in the Section 4 “Design Intent Specification and Drawings” including all and those work elements necessary to compliment the General and Special system for mechanical and electrical works and structural & architectural works that are provided to the Contractor for information.

承包商的设计和建造部分包括第 4 节“设计意向规范及图纸”中所述的变电站永久性工程, 包括向承包商提供的机电工程通用和专用系统及土建工程所需的所有和这些工作要素。

- 1.5.2 The Contractor’s design part must ensure following the Section 4 of “Design Intent Specification and Drawings” as follows:

承包商的设计部分必须确保遵循第 4 节的“设计意向规范及图纸”, 如下所示:

- a. Substation system works and including Supply and installation of all equipment and structural and architectural works and shall comply with local regulations and standards.  
变电站系统工程, 包括所有设备的供应和安装及土建工程, 应符合当地法规和标准。
- b. M&E service complies with Employer requirements with local regulation and EIT standard.  
机电工程符合雇主主要求和当地法规 EIT 标准。
- c. Compliance with PEA Standards  
符合 PEA 标准
- d. Compliance with all local Authority building codes and regulations including any additional requirements specified in the Tender Documents.  
遵守所有地方当局建筑规范和规定, 包括招标文件中规定的任何附加要求。

Any deviation from the above deemed necessary or of potential interest to the Employer must be approved by the Employer prior to implementation.

与上述内容有必然或对雇主有潜在利益的任何偏差, 都必须在实施前得到雇主的批准。

- 1.5.3 No aspect of the Contractor design part shall be designed to in any way impact or change the statement of requirement / Design requirement without prior written approval from the Employer. The Contractor is to ensure compatibility and coordination with the design requirement.

未经雇主事先书面批准, 承包商设计部分的任何方面均不得以任何方式影响或改变要求/设计要求声明。承包商应确保与设计要求的兼容性和协调性。

# INSTRUCTIONS TO TENDERER

## 投标人须知



### 1.6 CONTRACTOR'S MANAGEMENT DOCUMENT SUBMISSIONS 承包商提交的管理文件

1.6.1 The Contractor shall prepare the following management documents for submission to the Employer for review and comment during tender return and post-contract period. The preparation and submission of these reports shall be in accordance with the specific requirements of the Employer which may be amended throughout the Contract:

承包商应编制以下管理文件，在回标时及合同期间提交给雇主审查和评论。这些报告的编制和提交应符合雇主的具体要求，这些要求在整个合同期间可能会被修改：

- a. Organization chart for this project  
本项目的组织结构图
- b. CV and Key personnel (at least Project Manager and safety officer) Please note that proficiency in Chinese and English in mandatory skill for the key positions.  
简历和关键人员（至少有项目经理和安全主任）请注意关键人员需熟练中英文。
- c. Designed Drawings and specification (Compliance with PEA Standards "If applicable")  
设计图纸和规范（符合 PEA 标准“如适用”）
- d. Working schedule and S-Curve  
工程时间表和进度曲线图
- e. Construction method (Showing how to finish work in time with milestones)  
施工方法（显示如何在重要阶段日期的情况下及时完成工程）
- f. Safety Control  
安全控制
- g. Schedule of works with clearly quoted price.  
工程进度表，明确的报价
- h. List of material and equipment for this project (specify brand and supplier name)  
本项目材料设备清单（注明品牌和供应商名称）

# INSTRUCTIONS TO TENDERER

## 投标人须知



### 1.7 PROJECT REQUIREMENTS 项目要求

- 1.7.1 The Project Requirements are mentioned in Appendix 1 of Section 4.  
项目要求于第 4 节的附件 1 内描述。

### Schedules of Works (Schedule of Quantities and Rates) 工程数量及单价表

The Schedules of Works are a guide only. It is the responsibility of the Tenderer to measure and satisfy themselves of the accuracy of the quantities for works requiring payment. The descriptions provided herein are for a guide only as to the required scope of Works which form part of this Contract and should be cross-referenced with all drawings and specifications. The format provided in these Schedules should be followed in order to assist in tender evaluation. Within each trade or section of works space is provided for Tenderer to insert additional works items which require payment. 工程数量及单价表仅供参考。投标人有责任测量并确保需要付款的工程量的准确性。本文提供的说明仅作为本合同所需工程范围的指南，应与所有图纸和规范交叉引用。应遵循这表中提供的格式，以协助评标。在每个分项或工程部分内，为投标人提供了插入需要付款的额外工程项目的空间。

### Programme 计划进度表

- 1) The Contract Period is 365 calendar days (from and including the Commencement Date stated in the Employer's Instruction).  
合同工期为 365 日历天（自开工令签发之日起计）。
- 2) Key Milestone Date:  
关键节点：
  - Approval of construction drawings: within 120 days after signing contract/ Letter of Acceptance  
施工图审批通过：合同/ 中标通知书签订后 120 日内
  - Main structure capping: within 180 days after signing contract/ Letter of Acceptance  
主体结构封顶：合同/ 中标通知书签订后 180 日内
  - Equipment installation completed: within 270 days after signing contract/ Letter of Acceptance  
设备安装完成：合同/ 中标通知书签订后 270 日内
  - System integration commissioning completed: within 330 days after signing contract/ Letter of Acceptance  
系统联调完成：合同/ 中标通知书签订后 330 日内

# INSTRUCTIONS TO TENDERER

## 投标人须知



### Tender Submission Requirements

#### 投标要求

Each Tenderer will submit with one (1) copy of the Tender Documents separate sealed Envelop-1 “Technical package” and Envelop-2 “Commercial package”

每个投标人将提交一（1）份单独密封的投标文件，信封 1“技术标”和信封 2“商务标”

“Commercial package” includes Letter of Tender and Schedule of Works.

“商务标”包含投标函、工程数量及单价表。

“Technical package” includes the documents listed in previous clause 1.6.1.

“技术标”包含之前 1.6.1 的内容。

One (1) original hard copy and One (1) duplicate copy and One (1) flash drives of the tender, fully completed, computer typed, submitted in a sealed envelope marked "Private and Confidential – the proposed Design and Build Substation System works to GECC Production Base (Phase 2) Project at Block D61, WHA Eastern Seaboard Industrial Estate 1, Chonburi, Thailand". The location, recipient, date and time of tender return are detailed below -

一（1）份原件、一（1）份副本和一（1）份闪存盘的已完成、电脑打印的投标文件，装在密封的信封中提交，信封上标有“私人 and 机密 — 泰国春武里府 WHA 伟华东海岸工业区 1 号 D61 区块的泰国金鹭硬质合金生产基地二期项目的建议变电站系统设计与施工承包工程”。回标地点、收件人、日期及时间详见下文-

WT PARTNERSHIP (THAILAND) LIMITED

务腾(泰国)有限公司

725 S-Metro, Floor 18, Unit 1802,

Sukhumvit Road, Klongton Nuea,

Wattana, Bangkok, 10110

For the attention of:

致:

Khun Chan Kok Siong

And submitted on or before:

并于以下日期或之前提交:

02:00 pm on XXX XXXXXXX 2024.

2024 年 XXXXXXX 下午 02 点。

Tenders should be submitted in Thai Baht.

投标书应以泰铢提交。

# INSTRUCTIONS TO TENDERER

## 投标人须知



### Tender Documentation Charge

#### 招标文件费

Each Tenderer is required to submit a Tender deposit in the amount of [100,000 THB] Thai Baht in the form of “Cashier cheque”.

每位投标人都需要以“银行本票”的形式提交金额为[100,000 泰铢]的投标保证金。

The Tenderer is to note that the Tender Bond will not be refunded if the Tenderer:  
投标人应注意，如果投标人出现以下情况，投标保证金将不予退还：

- (i) Fails to submit a bona fide tender; (a blank submission or non-conforming tender shall not be regarded as bona fide).  
未能提交真实的投标书；（空白提交或不符合要求的投标书不应被视为真实的）。
- (ii) Submits a late tender.  
迟交的标书。
- (iii) Withdraw from tendering after submission of their Tender.  
在提交投标书后撤回投标。

The Tender document charge of winning tenderer will be exchanged for a lithography and documentation fee in the amount of [100,000 THB] Thai baht for each awarded project in the form of a “cashier cheque” form the successful tenderer.

中标保证金(中标人的银行本票 100,000 泰铢) 将转为招标过程文件、合同等文件印刷费用，不予返还。

The Tender Documentation Charge shall be refunded without interest to each unsuccessful tenderer subject to the receipt of a bona-fide tender.

在收到真实的投标书后，招标文件费应无息退还给每个未中标的投标人。

### Acceptance of Tenders

#### 投标书的接受

The Employer reserves the right not to accept the lowest or any Tender, and in no case will any expenses incurred in the preparation of the Tender be entertained.

雇主保留不接受最低或任何投标书的权利。在任何情况下，投标书编制过程中产生的任何费用都不会受理。

# INSTRUCTIONS TO TENDERER

## 投标人须知



### Returnable Schedules

#### 需交回的附表

The Tenderer must submit with their Tender all completed Returnable Schedules as fully compliant with the Tender Documents. The Tenderer may supply supplementary information such as brochures and descriptive literature with their Tender to assist the assessment of their Tender.

投标人必须随标书提交所有完成的投标文件，以完全符合招标文件的要求。投标人可在投标书中提供补充信息，如资料手册和商品说明书，以协助评估其投标书。

For the avoidance of doubt the Returnable Schedules comprise all documents in Section 2 of the Tender Documents (See Content Page).

为避免疑义，需交回的附表（投标文件）包括招标文件第 2 节中的所有文件(见目录)。

Under no circumstances may the Tenderer make any amendments or changes to the Returnable Schedules other than to complete the information required.

除填写所需信息外，投标人在任何情况下均不得对投标文件进行任何修改或更改。

### Site Visit

#### 现场考察

The Tenderer acknowledges their attendance at the site visit shall be raised to Cost Consultant via email: [chankoks@wptthailand.com](mailto:chankoks@wptthailand.com) to Employer approval before going to site.

投标人确认将通过电子邮件向造价师提出其参加现场考察的情况：[chankoks@wptthailand.com](mailto:chankoks@wptthailand.com) 在前往现场之前，应获得雇主的批准。

### Questions

#### 疑问

The Tenderer must only communicate through the approved process outlined below. No other form of communication with any involved parties, including the Employer and Employers Consultant Team will be entertained.

投标人只能通过以下列出的批准流程进行沟通。不接受与任何相关方（包括雇主和雇主顾问团队）进行其他形式的沟通。

All queries shall be raised to Cost Consultant at least 5 days before tender return via email:

所有疑问应在回标前至少 5 天通过电子邮件向造价师提出：

[zuo.suli@cxtc.com](mailto:zuo.suli@cxtc.com)

[li.yanhui@cxtc.com](mailto:li.yanhui@cxtc.com)

[chankoks@wptthailand.com](mailto:chankoks@wptthailand.com)

The responses to all queries, unless otherwise specifically requested by a Tenderer, shall be circulated to all Tenderers. 除非投标人另有特别要求，否则对所有疑问的答复应分发给所有投标人。

Responses will not be provided to queries received less than one (1) week prior closing tender date.

对于在投标截止日期前一（1）周内收到的疑问，将不予回复。

# INSTRUCTIONS TO TENDERER

## 投标人须知



### Soft Copy of Tender Documentation 招标文件软件

An editable soft copy of the following documentation has been provided with the tender documents to assist the Tenderer prepare their submission:

投标文件中提供了以下文件的可编辑软件，以协助投标人准备提交文件：

### Section 2 - Returnable Schedules 第 2 节 - 需交回的附表





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**SECTION 2**  
第 2 节  
**RETURNABLE SCHEDULES**  
投标文件  
**RS1 LETTER OF TENDER**  
RS1 投标函

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# LETTER OF TENDER

## 投标函

NAME OF CONTRACT: GECC PRODUCTION BASE (PHASE 2) – DESIGN AND BUILD SUBSTATION SYSTEM  
CONTRACT WORKS AT BLOCK D61, WHA EASTERN SEABOARD INDUSTRIAL ESTATE 1,  
CHONBURI, THAILAND

合同名称：泰国金鹭硬质合金生产基地二期项目 - 降压站系统设计与施工承包工程

**Golden Egret Cement Carbide (Thailand) Co., Ltd.**

金鹭硬质合金(泰国)有限公司

with registered office located at

注册办事处位于

700 Tambon Ta Sit, Si Racha

District, Chon Buri 20110, Thailand.

We have examined the Conditions of Contract, Specifications, Drawings, Schedule of Works (BOQ), the other Schedules, the Appendix to Tender, the Particular Conditions, and the Tender Addendum No. \_\_\_\_\_ for the execution of the above-named Works. We offer to execute and complete the Works and remedy any defects herein in conformity with this Tender which includes all these documents, for the Lump Sum of Thai Baht (THB).

我们已经检查了合同条件、规范、图纸、工程数量及单价表（SOW）、其他附表、投标书附录、专用条款和第\_\_\_\_\_号投标补编，以执行上述工程。我方愿意按照本投标书（包括所有这些文件）执行和完成工程，并修补其中的任何缺陷，总价为泰铢（THB）。

### 1. Basic Tender (Fully conforming Tender):

基本标书（完全符合要求的标书）：

Time for Completion (Contract Period) for ‘buildings Substation’ is **365 calendar days** (from and including the Commencement Date stated in the Employer’s Instruction).

“降压站的竣工时间(总工期)为 **365 日历天**（自开工令签发之日起计）。

THAI BAHT \_\_\_\_\_

泰铢 \_\_\_\_\_

\_\_\_\_\_ (THB \_\_\_\_\_).

### 2. Alternative Tender (detailed in Schedule of Deviations):

备选标书（详见偏差表）：

Time for Completion is \_\_\_\_\_ days from and including the Commencement Date,

竣工时间为自开工日期起\_\_\_\_\_天，包括开工日期在内，

THAI BAHT \_\_\_\_\_

泰铢 \_\_\_\_\_

\_\_\_\_\_ (THB \_\_\_\_\_).

We agree to abide by this Tender for a period of 90 (Ninety) calendar days from the final date of submission of Tenders and it shall remain binding upon us and may be accepted at any time before that date. We acknowledge that the Appendix forms part of this Letter of Tender.

我方同意自投标书最终提交之日起 90（九十）个日历日内遵守本投标书，本投标书对我方具有约束力，并可在该日期前的任何时间被接受。我方确认附录构成本投标函的一部分。



# LETTER OF TENDER

## 投标函

If this offer is accepted, we will provide the specified Performance Security, commence the Works as soon as is reasonably practicable after the Commencement Date, and complete the Works in accordance with the above-named documents within the Time for Completion.

如果接受此投标书，我们将提供规定的履约保证金，在开工日期后合理可行的情况下尽快开工，并在竣工时间内按照上述文件完成工程。

Unless and until a formal Agreement is prepared and executed this Letter of Tender, together with your written acceptance thereof, shall constitute a binding contract between us.

除非正式协议已准备并签署，否则本投标函连同贵方的书面接受函应构成我们之间具有约束力的合同。

We understand that you are not bound to accept the lowest or any tender you may receive.

我们理解，您不一定接受您可能收到的最低价格或任何投标。

Signature \_\_\_\_\_ in the capacity of \_\_\_\_\_

签名: \_\_\_\_\_

duly authorized to sign tenders for and on behalf of \_\_\_\_\_

正式授权代表以下人员签署投标书 \_\_\_\_\_

Address: \_\_\_\_\_

地址: \_\_\_\_\_

Date: \_\_\_\_\_

日期: \_\_\_\_\_



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**SECTION 2**  
第 2 节  
**RS2 TENDERER'S PROPOSED SCHEMATIC DRAWINGS & TECHNICAL DETAILS**  
RS2 投标人的建议方案图纸及技术细节

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## TENDERER'S PROPOSED SCHEMATIC DRAWINGS & TECHNICAL DETAILS 投标人的建议方案图纸及技术细节

### 1. Programme 计划

A detailed programme is to be submitted as part of the Tender which must show the critical path analysis, intended work methods, their duration and the relative phasing of the various activities including associated test piles and working hours proposed. All key dates including those for the ordering of major plant and materials provided under this Contract or Employer supplied items must also be indicated.

作为投标书的一部分，将提交一份详细的计划，其中必须显示关键路径分析、预期的工作方法、持续时间和各种活动的相对阶段，包括相关的测试桩和拟议的工作时间。还必须注明所有关键日期，包括订购本合同项下提供的主要设备和材料或雇主提供的物品的日期。

The provision of a detailed programme will be a condition precedent to the acceptance of any Tender. The final programme will be subject to the approval of the Employer and will be adjusted in accordance with the construction programme after the appointment of the Main Contractor for the whole of the Works.

提供详细的计划将是接受任何投标的先决条件。最终计划将经雇主批准，并在任命整个工程的总承包商后根据施工计划进行调整。

The programme must be in the form of a critical path network or link bar-chart. The appropriate durations of activities should be clearly indicated.

该程序必须采用关键路径网络或链接条形图的形式。应明确指出工作的适当持续时间。

### 2. Proposed Schematic Drawings 建议方案图纸

The Tenderer shall provide a set of their proposed substation schematic design drawings for the employer's approval. The proposed substation schematic design drawings by the Tenderer must comply with the requirements of the substation work described in Section 1 "Instruction to Tenderer" and Section 4 "Design Intent Specification and Drawings". The Schematic Drawings provided by the Employer in Section 4 are for reference only.

投标人应提供一份建议的变电站方案设计图纸，供雇主审批。这份投标人建议的变电站方案设计图纸必需符合第 1 节“投标人须知”及第 4 节“设计意向规范及图纸”中所述的变电站工程的要求。第 4 节中雇主提供的方案图纸仅供参考。

### 3. Method Statement/ Construction Methodology 施工方案

The Tenderer shall include a detailed method statement/construction methodology indicating how the Works will be executed to the levels of quality and within the time frames required within the Contract.

投标人应包括一份详细的施工方案，说明如何在合同要求的时间范围内按质量水平执行工程。

The Tenderer should include a proposed site layout plan indicating access/ egress to the site, location of main plant item(s), material storage and site offices.

投标人应包括一份拟议的现场布局图，说明现场的进出口、主要设备项目的位置、材料储存和现场办公室。



**TENDERER'S PROPOSED SCHEMATIC DRAWINGS & TECHNICAL DETAILS (Cont'd)**  
投标人的建议方案图纸及技术细节（续）

4. **Project Management Statement**  
项目管理方案

The Tenderer shall provide details of the proposed project management to be implemented.

投标人应提供拟实施的项目管理的详细信息。

5. **Safety Policy**  
安全政策

The Tenderer shall provide details of the proposed safety policy to be implemented.

投标人应提供拟实施的安全政策的详细信息。

6. **Quality Assurance (QA)**  
质量保证 (QA)

The Tenderer shall provide details of their proposed Quality Assurance procedures to be implemented on site.

投标人应提供拟在现场实施的质量保证程序的详细信息。

7. **Key Power Distribution Equipment List**  
关键配电设备表

Please refer to “Recommended Brands” List for Details of Main Equipment.

主要设备详见“主要设备及系统品牌清单”。

The Tenderer shall provide details of the key power distribution equipment list.

投标人应提供关键配电设备表的详细信息。



**TENDERER'S PROPOSED SCHEMATIC DRAWINGS & TECHNICAL DETAILS (Cont'd)**  
投标人的建议方案图纸及技术细节（续）

8. Material Confirmation  
材料确认

The Contractor shall indicate below particulars of all materials and equipment which he proposes to use in the Works.

承包商应在下文中注明其拟在工程中使用的所有材料和设备的详细信息。

The Contractor shall attach copies of brochures, or other literature relating to the particular material or equipment.

承包商应附上与特定材料或设备有关的资料手册和商品说明书的副本。

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Material/ Equipment 材料/设备	Manufacturer's Name 制造商名称	Product Name 产品名称	Specification Details 规格详细信息
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**TENDERER'S PROPOSED SCHEMATIC DRAWINGS & TECHNICAL DETAILS (Cont'd)**  
投标人的建议方案图纸及技术细节（续）

9. Any Supplementary information such as brochures and descriptive literature with their tender to assist in the assessment of tenders.  
投标书中的任何补充信息，如资料手册和商品说明书，以协助评估其投标书。
  
10. Any other details and information required by these Documents.  
本文件要求的任何其他细节和信息。

TENDERER  
投标人

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TENDERER'S SIGNATURE  
投标人签名

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DATE \_\_\_\_/\_\_\_\_/\_\_\_\_  
日期





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**SECTION 2**  
第 2 节  
**RS3 PERSONNEL**  
RS4 人员

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**PERSONNEL**

**人员**

The Contractor is to list out on a separate sheet, but in the format below, the names, qualifications, years of experience and function of the Project Director/Manager (Construction), Design Director/Manager and Site Supervisory Personnel he proposes to use during the execution of the Works, using the attached forms. The Employer's Representative may request, and the Contractor shall comply with such request, additional information regarding the Personnel and Function listed by the Contractor.

承包商应使用随附表格单独列出其在工程执行期间拟使用的项目总监/ 经理（施工）和设计总监/ 经理的姓名、资格、经验年限和职能，但格式如下。雇主代表可要求，承包商应遵守此类要求，提供有关承包商所列人员和职能的额外信息。

**A. Project Director/ Manager (Construction) (Refer to Specification Preliminaries Clause 5.01)**

项目总监/ 经理（施工）（详见基本措施项目第 5.01 条）

**Names (s):**

姓名 :

**Position (s):**

职位 :

**Qualifications**

资质

**& Experience:**

&经验 :

**Names (s):**

姓名 :

**Position (s):**

职位 :

**Qualifications**

资质

**& Experience:**

&经验 :

**Names (s):**

姓名 :

**Position (s):**

职位 :

**Qualifications**

资质

**& Experience:**

&经验 :



**PERSONNEL (Cont'd)**  
人员（续）

**B. Design Director/ Manager**  
设计总监/ 经理

**Names (s):**  
姓名 :

**Position (s):**  
职位 :

**Qualifications  
& Experience:**  
资质  
&经验 :

**Names (s):**  
姓名 :

**Position (s):**  
职位 :

**Qualifications  
& Experience:**  
资质  
&经验 :

**TENDERER**  
投标人

-----  
**TENDERER'S SIGNATURE**  
投标人签名

-----  
**DATE** \_\_\_\_/\_\_\_\_/\_\_\_\_  
日期



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**SECTION 2**  
第 2 节  
**RS4 PROJECT EXPERIENCE**  
RS6 项目经验

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**PROJECT EXPERIENCE**

**项目经验**

The Contractor shall indicate below particulars of projects on which he is presently engaged or projects completed within the past five (5) years.

承包商应在下面注明其目前参与的项目的详细信息或过去五（5）年内完成的项目。

The Contractor shall attach copies of contract agreement and work completion & handover record/report of the past engaged projects, brochures, company profiles or other literature which indicate project experience and other general information.

承包商应附上过去参与项目的合同协议书及竣工验收证明/报告、说明项目经验和其他一般信息的资料手册、公司简介或其他商品说明书的副本。

Project	Value	Percentage of work completed	Name of Architect Engineer or Project Manager/Contact No.
项目	价值	完成的工作百分比	建筑师，工程师或项目经理姓名/联系电话

**SUBSTATION PROJECT (WITH VOLTAGE LEVEL 115KV OR ABOVE)**

降压站项目（115KV 及以上电压等级）

**OTHER PROJECT**

其他项目

**TENDERER**

投标人

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**TENDERER'S SIGNATURE**

投标人签名

-----

**DATE** \_\_\_\_/\_\_\_\_/\_\_\_\_

日期



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**SECTION 2**  
第 2 节  
**RS5 FINANCIAL CAPACITY, INSURANCE & LICENSE**  
RS8 财务能力、保险及执照

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**FINANCIAL CAPACITY, INSURANCE & LICENSE**  
财务能力、保险及许可证

**1. FINANCIAL CAPACITY**  
财务能力

**1.1. The Tenderer shall attach on separate sheets copies of the following**  
投标人应在单独的纸张上附上以下文件的副本

- (i) **Audited Financial Statements for the last three years**  
最近三年的经审计财务报表
- (ii) **References from bank and accountants/auditors**  
银行和会计师/审计师的推荐信

The Tenderer shall attach in the same format as below summary of details of company's turnover and financial statements for the last three years;  
投标人应按照以下格式附上过去三年公司营业额和财务报表的详细摘要；

**1.2 Turnover**  
营业额

Turnover for year 年营业额	2024	2023	2022

**1.3 Summary of Financial Statements**  
财务报表摘要

Financial Statement for year 年度财务报表	2024	2023	2022
1. Total Assets 总资产			
2. Current Assets 流动资产			
3. Total Liability 总责任			
4. Current Liability 流动负债			
5. Net worth 净值 (1 - 3)			
6. Working Capital 营运资金 (2 - 4)			



**FINANCIAL CAPACITY, INSURANCE & LICENSE (cont'd)**  
财务能力、保险及许可证（续）

2. **INSURANCE**  
保险

The Tenderer shall provide below particulars of levels of public liability, works and professional indemnity insurances (if any) currently held.

投标人应提供以下目前持有的公共责任、工程和职业责任保险（如有）的详细信息。

3. **LICENSE**  
执照

The Tenderer shall provide a copy of Thailand Contractor's license (Registered in Thailand for more than 2 years), any required registration certificate, other relevant qualification, etc.

投标人应提供泰国承包商执照（在泰注册时间 2 年以上）、任何所需的登记证、其他相关资质等的副本。

The tenderer shall provide copies of the identity documents of the tendering representative and the certificate of authorization of the tenderer's representative.

投标人应提供投标代表身份证件、投标人授权代表证明的副本。

4. **DECLARATION OF NO ADVERSE RECORDS**  
无不良记录申明

The Tenderer shall provide a declaration of no adverse record (bribery crime, major illegal activities, tender fraud, serious breach of contract, arbitration/ legal proceedings, major safety accidents, or major construction problems).

投标人应提供无不良记录申明（行贿犯罪、重大违法、骗取中标、严重违约、仲裁/法律程序、重大安全事故、或重大工程问题）。

**TENDERER**  
投标人

-----  
**TENDERER'S SIGNATURE**  
投标人签名

-----  
**DATE** \_\_\_\_/\_\_\_\_/\_\_\_\_  
日期



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

Prepared by: PP  
Checked by: TC,KC  
Distribute to:GECC

SCHEDULE OF WORKS (SOW) - SUMMARY  
工程数量及单价表 - 汇总表

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述		AMOUNT 金额 (THB)
	<b>TRADE COST</b>	<b>各章节费用</b>		
1	BILL NO.1: PRELIMINARIES	表1: 基本措施项目		-
2	BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS	表2: 土建、结构、建筑工程		-
3	BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS	表3: 机电和管道系统工程		-
4	<b>TOTAL (EXCL. TAX)</b>	总计 (不含税)		-
5	OVERHEAD AND PROFIT (MARGIN) 6%	管理费用和利润 (利润率) 6%	6%	-
6	<b>TOTAL (EXCL. TAX) AFTER OVERHEAD AND PROFIT</b>	包含管理费用和利润后的总额 (不含税)		-
7	VAT 7%	增值税7%	7%	-
8	<b>GRAND TOTAL CONSTRUCTION COST (INCL. VAT)</b>	总建造费用 (含增值税)		-

**Note:** - Based on Time for Completion of ..... calendar days from and including the Commencement Date.  
竣工时间为自开工日期起 (包括开工日期) ..... 日历天。

- Tender Validity is 90 (Ninety) days from latest date of Tender Submission.  
投标有效期为自投标截止日期起90 (九十) 天。

Tenderer Company Name:.....  
投标人公司名称

.....  
Signature 签名

Company stamp  
公司印章

Full Name 全名 .....

Position 职位.....

Date 日期 .....

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.1: PRELIMINARIES  
表1: 基本措施项目

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	AMOUNT 金额 (THB)
	<b>Collection</b>	<b>合计</b>	
1	Contract Fee and Insurance	合同费用和保险	-
2	Temporary Work	临时工程	-
3	Site Expenses	现场费用	-
4	Design & Engineering Fee	设计工程费	-
	<b>Bill No.1 carried to Summary</b>	<b>表1转入汇总表</b>	
<b>1</b>	<b>Contract Fee and Insurance</b>	<b>合同费用和保险</b>	
1.01	Advance Bond	预付保证金	-
1.02	Performance Bond	履约保证金	-
1.03	Maintenance Bond	维修保证金	-
1.04	Stamp Duty	印花税	-
1.05	CAR	工程一切险	-
	<b>Bill No.1 carried to Collection</b>	<b>表1转入合计</b>	
<b>2</b>	<b>Temporary Work</b>	<b>临时工程</b>	
2.01	Temporary fence	临时围栏	-
2.02	Temporary main entrance	临时主入口	-
2.03	Signage	标记	-
2.04	Access road and drainage, truck wheel pond	进场道路和排水系统、卡车车轮水池	-
2.05	Store	货仓	-
2.06	Site office (included equipment and work station)	现场办公室 (包括设备和工作站)	-
2.07	Labour camp	劳工住宿	-
2.08	Temporary toilet	临时厕所	-
2.09	Temporary electrical work (installation)	临时电气工程 (安装)	-
2.10	Temporary cold water work (installation)	临时冷水工程 (安装)	-
2.11	Others (if any)	其他 (如有)	-
	<b>Bill No.1 carried to Collection</b>	<b>表1转入合计</b>	
<b>3</b>	<b>Site Expenses</b>	<b>现场费用</b>	
3.01	Survey and Planning	调查与规划	-
3.02	Monthly Electrical usage (Site)	每月用电量 (现场)	-
3.03	Monthly Electrical usage (Camp)	每月用电量 (住宿)	-
3.04	Monthly Cold Water usage (Site)	每月冷水使用量 (现场)	-
3.05	Monthly Cold Water usage (Camp)	每月冷水使用量 (住宿)	-
3.06	Monthly Telephone, Internet and CCTV usage (Site)	每月电话、互联网和闭路电视使用情况 (现场)	-
3.07	Staffs' salary	员工工资	-
3.08	Document and Report	文件和报告	-
3.09	Overtime for consultant	顾问加班	-
3.10	Safety Equipment (Site and PPE) and Safety, Healthy and Environment report cost	安全设备 (现场和个人防护用品) 和安全、健康和环境报告成本	-
3.11	Security (Site)	安全 (现场)	-
3.12	Transportation for Equipment	设备运输	-
3.13	Transportation for Manpower	人力运输	-
3.14	Rental of Machinery and Equipment	机械设备租赁	-
3.15	Shop Drawing and As-Built Drawing	施工图和竣工图	-
3.16	Material and Equipment Testing	材料和设备测试	-
3.17	Site cleaning (between construction and before handover)	现场清理 (施工期间和移交前)	-
3.18	Dust protection and scaffolding	防尘和脚手架	-
3.19	Site preparation for ceremony	仪式现场准备	-
3.20	Material mockup	材料模型	-
	<b>Bill No.1 carried to Collection</b>	<b>表1转入合计</b>	

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.1: PRELIMINARIES  
表1: 基本措施项目

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	AMOUNT 金额 (THB)
4	<b><u>Design &amp; Engineering Fee</u></b>	<b>设计工程费</b>	
4.01	Design fee	设计费	-
4.02	Construction Permit fee	施工许可费	-
4.03	Occupation Permit fee	职业许可费	-
4.04	Road Connection fee	道路连接费	-
4.05	Drainage Connection fee	排水连接费	-
4.06	Wastewater Connection fee	废水连接费	-
4.07	Electrical Application fee	电气申请费	-
4.08	Water Supply Application fee	供水申请费	-
4.09	Liaise with all subcontractor or Government's expenses	与所有分包商或政府费用联络	-
	<b><u>Additional items that the Tenderer considers to be necessary</u></b>	投标人认为必要的其他项目	
	<u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出。如果在回标之前未包含在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。	
	<b>Bill No.1 carried to Collection</b>	<b>表1转入合计</b>	

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS  
表2: 土建、结构、建筑工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
	<b>Collection</b>	<b>合计</b>							
	<u>Structural Works</u>	<u>结构工程</u>							
1	Landfill Works	土方填埋工程							-
2	Piling Works	打桩工程							-
3	Foundation works	基础工程							-
4	Super structure works	上部结构工程							-
5	Steel structure works	钢结构工程							-
	<u>Architectural Works</u>	<u>建筑工程</u>							
6	Wall and Partition	墙壁和隔墙							-
7	Internal Wall Finishes	室内墙饰面							-
8	Internal Floor Finishes	室内地板饰面							-
9	Internal Ceiling Finishes	室内天花板饰面							-
10	Door and Windows	门面							-
11	External Wall Finishes	外墙饰面							-
12	External Floor Finishes	室外地板饰面							-
13	Sanitary Fittings	洁具							-
	<b>Bill No.2 carried to Summary</b>	<b>表2转入汇总表</b>							-

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS  
表2: 土建、结构、建筑工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	数量 Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
	<b>STRUCTURAL WORKS</b>	<b>结构工程</b>							
1	<b>LANDFILL WORKS</b>	<b>土方填埋工程</b>							
	<u>The Contractor shall include for all costs that will be incurred in carrying out works in this section and in compliance with the drawings and specifications.</u>	<u>承包商应包括根据图纸和规范开展本节工程所产生的所有费用。</u>							
1.01	Compact soil	压实土	m2	652					-
1.02	Site clearance and remove off site	现场清理和场外拆除	m2	652					-
	<u>Additional items that the Tenderer considers to be necessary</u>	<u>投标人认为必要的其他项目</u>							
	<u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下图明确描述和列出。如果在投标返回之前未包含在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。</u>							
Add Add									
	Bill No.2 carried to Collection	表2转入合计							-

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS  
表2: 土建、结构、建筑工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	数量 Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
2	<b>PILING WORKS</b>	<b>桩工程</b>							
2.01	<u>Substation piling</u> PC Pile or bored pile : 0.26 X 0.26 X 9 m.	<u>降压站桩</u> 预制混凝土桩或钻孔桩 : 0.26 X 0.26 X 9 m.	no	50					-
2.02	<b>PILES TEST</b> <u>Seismic test to the following pile as specified</u> Seismic test of piles	<u>桩试验</u> 按指定对以下桩进行抗震试验 桩基抗震试验	no	50					-
2.03	<u>Dynamic load test to the following pile as specified</u> Dynamic testing of piles	<u>按指定对以下桩进行动载荷试验</u> 桩的动态测试	no	1					-
	<b>Additional items that the Tenderer considers to be necessary</b> <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面详细描述和列出。如果在投标返回之前未在投标文件中，则应视为已包含在投标总价中，在最终结算中不予调整。							
Add Add									
	Bill No.2 carried to Collection	表2转入合计							-



ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
3	<b>FOUNDATION WORKS</b>	<b>基础工程</b>							
	Footings	基础							
3.01	Pile head cut and remove off site	桩头切割并移出场地	no.	50				-	-
3.02	Excavation works	开挖工程	m3	54				-	-
3.03	Back fill by excavated soil / suitable material	用挖出的土壤/合适的材料回填	m3	36				-	-
3.04	Remove excavated material off site	将开挖料运离现场	m3	18				-	-
3.05	100 mm sand compaction	100mm砂压实	m3	7				-	-
3.06	50 mm. Lean concrete	50mm素混凝土	m3	4				-	-
3.07	Concrete for footing	基础混凝土	m3	36				-	-
3.08	Formwork for footing	基础模板	m2	90				-	-
3.09	Reinforcement bars (120 kg/m3)	钢筋	kg	4,320				-	-
	<b>Additional items that the Tenderer considers to be necessary.</b>	<b>投标人认为必要的其他项目</b>							
	<i>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below, if they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum and no adjustment will be made in the final settlement.</i>	<i>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出。如果在投标返回之前未在投标书中，则应视为已包含在投标报价中，在最终结算中不予调整。</i>							
Add									
Add									
	Bill No.2 carried to Collection	表2转入合计							-



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程量及单价表 - 汇总表

BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS  
表2: 土建、结构、建筑工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
4	<b>SUPER STRUCTURE WORKS</b>	<b>上部结构工程</b>							
	<b>Ground Beam</b>	<b>地梁</b>							
4.01	Detail excavation and soil disposal	详细开挖和土壤处理	m3	18				-	-
4.02	100 mm sand compaction	100mm砂压实	m3	4				-	-
4.03	50 mm. Lean concrete	50mm素混凝土	m3	2				-	-
4.04	Concrete for ground beam	地梁混凝土	m3	32				-	-
4.05	Formwork for ground beam	地梁模板	m2	121				-	-
4.06	Reinforcement bars for ground beam (180 kg/m3)	地梁钢筋 (180kg/m3)	kg	5,760				-	-
	<b>RC Column Ground floor to roof</b>	<b>钢筋混凝土柱底层至屋顶</b>							
4.07	Concrete for Column	柱混凝土	m3	18				-	-
4.08	Formwork for column	柱模板	m2	240				-	-
4.09	Reinforcement bars for column (160 kg/m3)	柱钢筋 (160kg/m3)	kg	2,880				-	-
	<b>Ground Slab</b>	<b>地面板</b>							
4.10	100 mm sand compaction	100mm砂压实	m3	65				-	-
4.11	50 mm. Lean concrete	50mm素混凝土	m3	33				-	-
4.12	Termite Protection System	白蚁防护系统	m2	653				-	-
4.13	Plastic Sheet	塑料板	m2	653				-	-
4.14	Concrete for ground slab	底板混凝土	m3	196				-	-
4.15	Formwork for ground slab	地面板模板	m2	38				-	-
4.16	Reinforcement bars for ground slab (110 kg/m3)	楼板钢筋 (110 kg/m3)	kg	21,560				-	-
	<b>Upper floor structure</b>	<b>上层结构</b>							
	<b>Upper Floor Beam FL2</b>	<b>上层楼梁FL2</b>							
4.17	Concrete for beam	梁混凝土	m3	16				-	-
4.18	Formwork for beam	梁模板	m2	33				-	-
4.19	Reinforcement bars for beam (180 kg/m3)	梁用钢筋 (180kg/m3)	kg	2,880				-	-
	<b>Upper Floor Slab</b>	<b>上层楼板</b>							
4.2	Concrete for slab	混凝土板	m3	80				-	-
4.21	Formwork for slab	楼板模板	m2	678				-	-
4.22	Reinforcement bars for slab (110 kg/m3)	楼板钢筋 (110 kg/m3)	kg	8,800				-	-
	<b>Upper Floor roof beam</b>	<b>上层屋面梁</b>							
4.23	Concrete for beam	梁混凝土	m3	14				-	-
4.24	Formwork for beam	梁模板	m2	27				-	-
4.25	Reinforcement bars for beam (180 kg/m3)	梁用钢筋 (180kg/m3)	kg	2,520				-	-
	<b>RC Roof Slab</b>	<b>钢筋混凝土屋面板</b>							
4.23	Concrete water proof for Roof slab	屋面板混凝土防水	m3	71				-	-
4.24	Formwork for Roof slab	屋面板模板	m2	610				-	-
4.25	Reinforcement bars for Roof slab (110 kg/m3)	屋面板钢筋 (110 kg/m3)	kg	7,810				-	-
	<b>RC canopy beam</b>	<b>钢筋混凝土雨棚梁</b>							
4.26	Concrete water proof for beam	梁混凝土防水	m3	2				-	-
4.27	Formwork for beam	梁模板	m2	32				-	-
4.28	Reinforcement bars for beam (180 kg/m3)	梁用钢筋 (180kg/m3)	kg	360				-	-
	<b>RC canopy slab</b>	<b>钢筋混凝土雨棚板</b>							
4.26	Concrete water proof for canopy	雨棚混凝土防水	m3	13				-	-
4.27	Formwork for canopy	雨棚模板	m2	71				-	-
4.28	Reinforcement bars for canopy (110 kg/m3)	雨棚钢筋 (110 kg/m3)	kg	1,560				-	-
	<b>Staircase</b>	<b>楼梯</b>							
	<b>RC Stair</b>	<b>混凝土楼梯</b>							
4.29	Concrete for Stair	楼梯混凝土	m3	11				-	-
4.3	Formwork for Stair	楼梯模板	m2	91				-	-
4.31	Reinforcement bars for stair (120 kg/m3)	楼梯钢筋 (120 kg/m3)	kg	1,320				-	-
4.32	Allow for small detail have not design yet, but necessary to complete work and/or requirement by the regulation and relevant government procedures.	考虑到尚未设计的小细节，但根据法规和相关政府程序完成工作和/或要求是必要的。	item	1				-	-
	<b>Additional items that the Tenderer considers to be necessary</b>	<b>投标人认为必要的其他项目</b>							
	<u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出。如果在投标返回之前未包含在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。</u>							
Add									
Add									
	Bill No.2 carried to Collection	表2转入合计							



ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
5	<b>STEEL STRUCTURE WORKS</b>	<b>钢结构工程</b>							
	<u>Steel Staircase emergency fire exit stair</u>	<u>钢制楼梯紧急消防出口楼梯</u>							
5.01	Steel structure to Column, sub-beam to support Steel staircase	钢结构柱、支撑钢楼梯的次梁	kg	1,646				-	-
5.02	Allow bolt, fixing, bracing, joint, and painting works etc.	预留螺栓、固定、支撑、接头和油漆工程等。	kg	82				-	-
5.04	Painting to steel structure: including 1 rust paint primer and 1 topcoat refer to the general note of steel structure and architectural design	钢结构涂装：包括1遍防锈底漆和1遍面漆。参见钢结构和建筑设计总说明	m2	86				-	-
5.05	Fireproof coating: Refer to the general note of steel structure and architectural design	防火涂料：参见钢结构及建筑设计总说明	m2	86				-	-
5.03	4.5mm. Thick. Checker plate with Epoxy painted ( Non-slip type)	4.5毫米厚。涂有环氧树脂的网纹板（防滑型）	m2	14				-	-
5.06	Handrail steel pipe with oil and rust paint	带油防锈漆的扶手钢管	m	30				-	-
	<u>Steel handrail</u>	<u>钢制扶手</u>							
5.07	Handrail steel pipe with oil paint at Mezzanine floor	夹层楼面油漆扶手钢管	m	17				-	-
	<u>Steel structure for Crane</u>	<u>起重机钢结构</u>							
5.08	Allow for steel structure support for Crane (36kg/m2)	考虑起重机的钢结构支撑（36kg/m2）	kg	7,171				-	-
	<u>Additional items that the Tenderer considers to be necessary</u>	<u>投标人认为必要的其他项目</u>							
	<u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出。如果在投标返回之前未包含在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。</u>							
Add									
Add									
	<b>Bill No.2 carried to Collection</b>	<b>表2转入合计</b>							-



ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
6	<b>ARCHITECTURAL WORKS</b>	<b>建筑工程</b>							
	<b>Wall and Partition</b>	<b>墙体和隔墙</b>							
	<b>Internal wall</b>	<b>内墙</b>							
6.01	200 mm. thick Brickwall	60	m2	52				-	-
6.02	Blast protection walls 240 mm thick including strength >= MU10, fire resistance limit >4 hour, RB 6 @200 two-way steel bars both sides of the wall	240mm厚的防爆墙·包括强度>=MU10. 耐火极限>4小时·墙两侧RB 6@200双向钢筋	m2	788				-	-
6.03	<b>External wall</b>	<b>外墙</b>							
	200 mm. thick Brickwall	砖砌墙	m2	711				-	-
6.04	Blast protection walls 240 mm thick including strength >= MU10, fire resistance limit >4 hour, RB 6 @200 two-way steel bars both sides of the wall	240mm厚的防爆墙·包括强度>=MU10. 耐火极限>4小时·墙两侧RB 6@200双向钢筋	m2	637				-	-
6.05	Chain link wall with steel frame 2.5 m high	2.5米高的钢框架链式墙	m2	378				-	-
	<b>Additional items that the Tenderer considers to be necessary.</b>	<b>投标人认为必要的其他项目</b>							
	<u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<u>投标人可以列出他认为根据图纸和规格完成工程所必需的以下项目，但不包括在上述项目中，这些项目必须在下面明确描述和列出。如果在投标返回之前未包含在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。</u>							
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
7	<b>INTERNAL WALL FINISHES</b>	<b>内墙饰面</b>							
7.01	<b>Internal Wall Plastering</b> Cement and sand plaster to wall for receive the finishes Internal Wall Plastering	<b>内墙水泥砂浆</b> 在墙上抹水泥砂浆，以进行饰面处理 内墙水泥砂浆	m2	2,957				-	-
7.02	<b>Painting Finishes</b> Internal Paint Finishes	<b>油漆饰面</b> 内部油漆饰面	m2	2,957				-	-
7.03	<b>Waterproofing</b> To toilet wall 600 mm. high	<b>防水</b> 防水系统	m2	14				-	-
7.04	<b>Ceramic Wall Tile Finish (600x600 mm.) including cement and sand backing.</b> To toilet	<b>陶瓷墙砖饰面 (600x600 mm.) 包括水泥和背衬</b> 陶瓷墙砖饰面	m2	71				-	-
	<b>Additional items that the Tenderer considers to be necessary.</b> <i>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</i>	<b>投标人认为必要的其他项目</b>  投标人可以列出他认为根据图纸和规格完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下图详细描述和列出。如果在投标返回之前未在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。							
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	数量 Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
8	<b>INTERNAL FLOOR FINISHES</b>	<b>内墙地板饰面</b>							
8.01	Cement steel troweled Burnish finish To substation	水泥刮抹子抛光 至降压站	m2	91					-
8.02	Ceramic Wall Tile Finish (600x600 mm.) including cement and sand backing. To toilet	墙砖饰面 至厕所	m2	17					-
8.03	Conductive floor (Sikafloor) To substation	导电地板 (Sikafloor) 至降压站	m2	698					-
	<b>Additional items that the Tenderer considers to be necessary.</b>	<b>投标人认为必要的其他项目</b>							
	<u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面详细描述和列出。如果在投标返回之前未在投标文件中，则应视为已包含在投标总价中，在最终结算中不予调整。</u>							
Add Add									
	Bill No.2 carried to Collection	表2转入合计							-

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS  
表2: 土建、结构、建筑工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
9	<b>INTERNAL CEILING FINISHES</b>	<b>内部天花板饰面</b>							
9.01	Cement and sand plaster to ceiling for receive the finishes Plastering to exposed ceiling	水泥砂浆/抹灰层 天花板的抹灰	m2	789					-
9.02	Painting Finishes Ceiling Paint Finishes	油漆饰面 内部油漆饰面	m2	789					-
9.03	600mm x 600mm Moisture Resistant Gypsum Board with T-Bar Ceiling To toilet	600mm x 600mm防潮石膏板, 带T形天花板 至厕所	m2	17					-
	<b>Additional items that the Tenderer considers to be necessary.</b> <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<b>投标人认为必要的其他项目</b> <u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目, 但不包括在上述项目中, 这些项目必须在下图详细描述和列出。如果在投标返回之前未在投标书中, 则应视为已包含在投标总价中, 在最终结算中不予调整。</u>							
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	数量 Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
10	<b>DOORS AND WINDOWS</b>	<b>门窗</b>							
10.01	Chain link door including Lockset and Ironmongery Chain link door overall size 8000x4000mm.	链式门 - 包括锁具和五金器具 链式门总尺寸 8000x4000mm	no	1				-	-
10.02	Fire-Rated Steel Door including Lockset and Ironmongery. Single Leaf door overall size 1000x2400 mm.	防火门 - 包括锁具和五金器具 单扇门 - 总尺寸 1000x2400 毫米。	no.	1				-	-
10.03	Double Leaf for fire escape overall size 1500x2700 mm.	双扇消防逃生梯 - 总尺寸 1500x2700 mm.	no.	1				-	-
10.04	Double Leaf for fire escape overall size 2000x2700 mm.	双扇消防逃生梯 - 总尺寸 2000x2700 mm.	no.	6				-	-
10.05	Steel Roller Shutter with fire rate including Lockset and Ironmongery Roller shutter door size 4000mm. clear width x 4000mm. clear height	防火等级的卷帘门 - 包括锁具和五金器具 卷帘门尺寸 4000mm. 净宽 x 4000mm. 净高	no.	1				-	-
10.06	Aluminum Framed Glass Panels including Lockset and Ironmongery Aluminum fix glass window overall size 2000x1000mm.	铝框玻璃面板 - 包括锁具和五金器具 铝制固定玻璃窗 - 总尺寸 2000x1000mm.	no.	2				-	-
10.07	Aluminum fix glass window overall size 2000x2000mm.	铝制固定玻璃窗 - 总尺寸 2000x2000mm.	no.	10				-	-
10.08	Aluminum fix glass window overall size 4000x2100mm.	铝制固定玻璃窗 - 总尺寸 4000x2100mm.	no.	7				-	-
10.09	Allow for small detail have not design yet, but necessary to complete work and/or requirement by the regulation and relevant government procedures.	考虑到尚未设计的小细节 - 但根据法规和相关政府程序完成工作和/或要求是必要的。	item	1				-	-
	<b>Additional items that the Tenderer considers to be necessary</b> <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<b>投标人认为必要的其他项目</b> <u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目 - 但不包括在上述项目中 - 这些项目必须在下面明确描述和列出 - 如果在投标返回之前未包含在投标书中 - 则应视为已包含在投标总价中 - 在最终结算中不予调整。</u>							
Add									
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PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
115KV 降压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
降压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
工程数量及单价表 - 汇总表

BILL NO.2: CIVIL, STRUCTURAL, ARCHITECTURAL WORKS  
表2: 土建、结构、建筑工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
11	<b>EXTERNAL WALL FINISHES</b> <b>Plastering/Skim coating</b>	<b>外墙饰面</b> <b>水泥砂浆/抹灰</b>							
11.01	Cement and sand plaster to wall to receive the finishes External Wall Plastering.	在墙上抹水泥砂浆，以进行饰面处理 外墙抹水泥砂浆	m2	1,438				-	-
11.02	<b>Painting Finishes</b> External Paint Finishes	<b>油漆饰面</b> 外部油漆饰面	m2	1,438				-	-
	<b>Additional items that the Tenderer considers to be necessary.</b> <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<b>投标人认为必要的其他项目</b>  投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中，这些项目必须在下面明确描述和列出。如果在投标返回之前未包含在投标书中，则应视为已包含在投标总价中，在最终结算中不予调整。							
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
12	<b>EXTERNAL FLOOR FINISHES</b>	<b>内外部楼地面</b>							
	<b>External Floor</b>	<b>内外部楼地面</b>							
12.01	50mm thick cement and sand screed finished	50mm厚的水泥砂浆找平层，用于室内装修	m2	97				-	-
12.02	To foot path	至降压站	m2	564				-	-
	To roof slab	到屋顶板							
12.03	Footpath finish	人行道饰面	m	87				-	-
	Precast-concrete curb size 100x250x750 mm	预制混凝土路缘石尺寸100x250x750 mm							
12.04	Concrete pavement brick size 200x300x60mm	混凝土路面砖尺寸200x300x60mm	m2	97				-	-
	Stair finish	楼梯饰面							
12.05	Floor cement and screeding to stair floor area	楼梯地面区域的地面水泥和砂浆层	m2	90				-	-
12.06	PVC nosing	胶梯级突边	m	79				-	-
	Waterproofing	防水							
12.07	To RC roof	到混凝土屋顶	m2	564				-	-
	Floor depress and overflow	地板凹陷和溢流							
12.08	To roof slab	到屋顶板	m	106				-	-
12.09	To roof over flow	屋顶溢流	no	8				-	-
12.1	Allow for small detail have not design yet, but necessary to complete work and/or requirement by the regulation and relevant government procedures.	考虑到尚未设计的小细节，但根据法规和相关政府程序完成工作和/或要求是必要的。	item	1				-	-
	<b>Additional items that the Tenderer considers to be necessary</b>	<b>投标人认为必要的其他项目</b>							
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
13	<b>SANITARY WARES</b>	<b>卫生洁具</b>							
13.01	Water closet	坐厕	no	1				-	-
13.02	Jumbo roll	卷纸	no	1				-	-
13.03	Rinsing spray tap	冲洗喷头	no	1				-	-
13.04	Squat toilets	蹲式厕所	no	1				-	-
13.05	Flush Valve	冲洗值	no	1				-	-
13.06	Jumbo roll	卷纸	no	1				-	-
13.07	Rinsing spray tap	冲洗喷头	no	1				-	-
13.08	Wash basin	洗手盆	no	2				-	-
13.09	Faucet	水龙头	no	2				-	-
13.1	Paper dispenser	纸机	no	1				-	-
13.11	Soap dispenser	给皂机	no	1				-	-
13.12	Counter top for wash basin	洗脸盆台面	m	2				-	-
13.13	Urinal	小便器	no	2				-	-
13.14	Urinal sensor	小便器传感器	no	2				-	-
13.15	Urinal modesty panel	小便器挡板	no	1				-	-
13.16	Partition for WC including lockset, coat hook, Door stopper and all necessary hardware	卫生间隔墙, 包括锁具、衣钩、门挡和所有必要的五金件	no	2				-	-
13.17	Floor drain	地漏	no	3				-	-
13.18	Mirror panel	镜面板	m	2				-	-
	<b>Additional items that the Tenderer considers to be necessary</b>	<b>投标人认为必要的其他项目</b>							
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DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
	<b>Collection</b>	<b>合计</b>							
	Total Building area	建筑面积	m <sup>2</sup>	978					
	<b>Substation System ( General)</b>	<b>高压站系统 ( 概述 )</b>							
1	Main 115kV incoming line and 22kV incoming line (double-circuit incoming line)	1、主115kV进线和22kV进线 (双回路进线)							-
2	115kV gas insulated switchgear (GIS)	2、115kV气体绝缘开关设备 (GIS)							-
3	Power transformer (main transformer)	3、电源变压器 (主变压器)							-
4	22kV switchgear	4、22kV开关设备							-
5	22kV Reactive Power Compensation Device	5、22kV无功补偿装置							-
6	Control and Protection Panel	6、控制和保护面板							-
7	Substation Communication information system	7、通讯信息系统							-
8	115kV step-down station protection and integrated automation system	8、115kV高压站保护和综合自动化系统							-
9	Arc suppression coil and grounding transformer set	9、避雷线圈、消弧线圈及接地变成套装置							-
10	Integrated power supply	10、一体化电源							-
11	Grounding and Lightning Protection	11、接地和防雷							-
12	Transportation, loading, unloading and testing	12、运输、装卸及测试							-
13	Installation, commissioning and power transmission	13、安装、调试及送电							-
	<b>General MEP work</b>	<b>一般机电工程</b>							
14	Mechanical and Electrical System (General)	14 机电系统 (概述)							-
15	Security System	15 安全系统							-
16	Testing and Commissioning	16 测试和调试							-
	<b>Bill No.3 carried to Summary</b>	<b>表3转入汇总表</b>							-

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	Material 材料	Labour 人工	Total 综合	
	<b>Substation System ( General)</b>	<b>高压站系统 ( 常规 )</b>							
	<b>GENERALLY</b>	<b>概述</b>							
	The following Schedule of Works are a guide only. The quantities based on the preliminary design plan are provided for Tenderer's reference only, and Tenderer should fill their own quantities in the SOW according to their own design proposal. It is the responsibility of the Tenderer to measure and satisfy themselves of the accuracy of the quantities for works requiring payment. The descriptions provided herein are for a guide only as to the required scope of Works which form part of this Contract and should be cross-referenced with all drawings and specifications. The format provided in these SOW should be followed in order to assist in tender evaluation. Within each trade or section of works space is provided for Tenderer to insert additional works items which require payment.	以下工程数量表仅供参考。甲方提供的工程数量仅基于初步设计提供投标人参考。投标人应根据自己的设计方案在工程数量表中填写自己的工程数量。投标人有责任测量并确保需要付款的工程量的准确性。本文提供的说明仅作为本合同所需工程范围的指南。应与所有图纸和规范交叉引用。应遵循这些工程数量表中提供的格式，以协助评标。在每个章节工程分项内，为投标人提供了加入需要付款的额外工程项目的填写空间。							
1	<b>Main 115kV incoming line and 22kV incoming line (double-circuit incoming line)</b> <u>Design, supply, installation, and fixing 115 kV and 22 kV main incoming (Double circuit incoming line) in position complete with all accessories, fitting, and support as per PEA specification.</u>	<b>1. 主115KV进线和22kV进线 ( 双回路进线 )</b> <u>根据PEA规范，设计、供应、安装和固定115 kV和22 kV主进线 ( 双回路进线 )，并配备所有附件、配件和支架。</u>							
1.001	The municipal dual circuit incoming line to the sub-station is mainly an overhead rack line, with only the 55 meter section from the factory gate to the factory area being cabled. The amount of cabling work is within the scope of this tender, and the contractor needs to negotiate and communicate with PEA on their own (including the required works outside site boundary).	1.001 变电站市政双回路进线主要为架空架线。仅厂门口至厂区55米段敷设电缆；该敷设电缆工程属于本次招标范围。需承包商自行与PEA协商沟通。(包括工地现场边界外所需的工作)。	LS	1					
1.002	Design, supply, installation, and fixing 115 kV and 22 kV main incoming (22kV reactive power compensation device is required, including a complete set of 22kV parallel capacitors) in position complete with all accessories, fitting, and support as per PEA specification	1.002 根据PEA规范、设计、供应、安装和固定115 kV和22 kV主进线 ( 需要22kV无功功率补偿装置，包括一套完整的22kV并联电容器 )，并配备所有附件、配件和支架	LS	1					
	<b>Additional items that the Tenderer considers to be necessary</b>	<b>投标人认为必要的其他项目</b>							
	The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.	投标人可以列出他认为根据图纸和规格所需工程的以下项目，但不包括在上述项目中。这些项目必须在下列表格中清晰描述并列出。如果在投标前未包含在投标文件中，则应被视为包含在投标总价中，在最终结算中不予调整。							
Add									
Add									
	<b>Bill No.3 carried to Collection</b>	<b>表3转入合计</b>							

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity 数量		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	材料 Material	人工 Labour	综合 Total	
2	115kV gas insulated switchgear (GIS) Supply, installation, and fixing 115 kV Gas Insulated Switch Gear in position complete with all accessories, fitting, and support as per specification. GIS (Gas Insulated Switchgear), including: main transformer, incoming line spacing, busbar, equipment spacing, cable outgoing line spacing, bus tie spacing, online monitoring, etc. Note: Conventional cabinet, non-intelligent Must include but not limited to the following details— (1) Main transformer incoming line interval (2) Cable outgoing line interval (3) Busbar equipment interval (4) Busbar interval (5) Online monitoring (SF6 gas)	2. 115kV气体绝缘开关设备 (GIS) 按照规范提供、安装和固定115kV气体绝缘开关设备，并配备所有附件、配件和支架。 GIS (气体绝缘开关设备)，包括：主变压器进线间隔、母排设备间隔、电缆出线间隔、母排间隔、在线监测。 描述：常规柜，非智能。 说明：常规柜，非智能化。 必须包含但不限于以下细项— (1) 主变压器进线间隔 (2) 电缆出线间隔 (3) 母排设备间隔 (4) 母排间隔 (5) 在线监测 (SF6气体)							
2.001	115 kV GIS Incoming	2.001 115 kV GIS进线	Item	1					-
2.002	115 kV GIS Outgoing	2.002 115 kV GIS出线	Item	1					-
2.003	Bus Sectioner	2.003 母排分路器	Item	1					-
2.004	Local control panel	2.004 本地控制面板	Item	1					-
2.005	Cable Terminator for GIS cable size 800 sq.mm.	2.005 适用于GIS电缆尺寸800平方毫米的电缆终端器	No	6					-
2.006	Cable Terminator for Powe TR cable size 800 sq.mm	2.006 适用于Powe TR电缆尺寸800平方毫米的电缆终端器	No	6					-
	GIS to Power Transformer	GIS到电力变压器							
2.007	115kV 1/C, 800 sq.mm XLPE-Cu	2.007 115kV 1/C, 800平方毫米交联聚乙烯铜	m	122					-
2.008	1Cx800 sq.mm XLPE-Cu (PEA riser pole to 115kV GIS)	2.008 1Cx800平方毫米交联聚乙烯铜 (PEA立杆至115kV GIS)	m	90					-
2.009	115kV 1/C, ..... sq.mm XLPE-Cu	2.009 115kV 1/C, .....平方毫米交联聚乙烯铜	m						-
2.010	Cable Trav 800x150	2.010 电缆桥架800x150	m	11					-
2.011	Dia 150 mm HDPE Conduit	2.011 直径150mm的HDPE管道	m	21					-
2.012	Dia 150 mm IMC Conduit	2.012 直径150mm IMC管道	m	24					-
2.013	Steel support, Fitting and accessories	2.013 钢支架、配件和附件	lot	1					-
2.014	Cable support	2.014 电缆支架	lot	1					-
	<b>Additional items that the Tenderer considers to be necessary</b> The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.	<b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据图纸和规范中工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出，如果在投标之前未包含在投标文件中，则应视为包含在投标总价中。在最终结算中不予调整。							
Add									
Add									
	Bill No.3 carried to Collection	表3转入合计							-

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	Material 材料	Labour 人工	Total 综合	
3	<b>Power transformer (main transformer)</b> Supply, installation and fixing power transformer in position complete with all accessories, fitting, and support as per specification. Description: Secondary energy efficiency, horizontal split Must include but not limited to the following items: ① Vacuum on-load voltage regulator ② Corrugated oil storage cabinet ③ Bushing CT ④ Main transformer terminal box ⑤ Core multi-point grounding fault monitoring	<b>3、电源变压器 (主要压器)</b> 按照规格提供、安装和固定电力变压器, 并配备所有附件、配件和支架。 说明: 二级能效、水平分体 必须包含但不限于以下描述—— ① 真空有载调压开关 ② 波纹内油式储柜 ③ 套管CT ④ 主要端子箱 ⑤ 核心多点接地故障监测							
3.001	TP.1: Power Transformer 3Ø 115/22kV	3.001 TP.1: 电源变压器 3E 115/22kV	No. Item	1					-
3.002	Remote Control Cubicle (RCC), or Neutral Grounding Resistor (NGR)	3.002 远程控制柜 (RCC) 或中性接地电阻器 (NGR)							-
	Power TR to 22kV Switchgear	22kV开关设备的TR电源							-
3.003	22kV 1/C, 800 sq.mm XLPE-Cu	3.003 22kV 1/C, 800平方毫米交联聚乙烯铜	m						-
3.004	22kV 1/C, 400 sq.mm XLPE-Cu	3.004 22kV 1/C, 400平方毫米交联聚乙烯铜	m	144					-
3.005	Cable Terminator for cable size 1/C, 400 sq.mm. (Indoor Type)	3.005 电缆终端, 适用于1/C, 400平方毫米的电缆 (室内型)	No.	6					-
3.006	Cable Box 6-1/Cx400 sq.mm. XLPE Cu.	3.006 6-1/Cx400平方毫米交联聚乙烯铜电缆箱	No.	1					-
3.007	Cable Tray 800x150	3.007 电缆桥架800x150	m	5					-
3.008	Dia 150 mm HDPE Conduit	3.008 直径150mm的HDPE导管	m	6					-
3.009	Dia 150 mm IMC Conduit	3.009 直径150mm IMC导管	m	5					-
3.010	Steel support, Fitting and accessories	3.010 钢支架、配件和附件	Lot	1					-
3.011	Cable support	3.011 电缆支架	Lot	1					-
	<b>Additional items that the Tenderer considers to be necessary</b> The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.	<b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目, 但不包括在上述项目中。这些项目必须在下面详细描述和列出。如果在投标返回之前未包含在投标文件中, 则应视为包含在投标总价中, 在最终结算中不予调整。							
Add									
Add									
	Bill No.3 carried to Collection	表3转入合计							-

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	数量 Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)	
				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total		
4	22kV switchgear Supply, installation, and fixing 22 kV Switchgear in position complete with all accessories, fittings, and support as per specification. Must include but not limited to the following items ① 22kV incoming line cabinet ② Sectional circuit breaker cabinet ③ Sectional isolation cabinet ④ Capacitor bank cabinet ⑤ Grounding transformer cabinet ⑥ Main transformer incoming line common box enclosed busbar ⑦ Inter-cabinet communication common box enclosed busbar ⑧ Maintenance trolley ⑨ Electricity test trolley ⑩ Grounding trolley ⑪ Breakdown fuse	4、22kV开关设备 按照规格提供、安装和固定22kV开关设备，并配备所有附件、配件和支架。 必须包含但不限于以下细项 ① 22kV进线柜 ② 分段断路器柜 ③ 分段隔离柜 ④ 电容器柜 ⑤ 接地变柜 ⑥ 主变进线共箱封闭母线 ⑦ 柜间联络共箱封闭母线 ⑧ 检修小车 ⑨ 验电小车 ⑩ 接地小车 ⑪ 击穿保险								
4.001	22kV Air Insulated Switchgear 1250A, 25KA, 3 Sec.	4.001 22kV空气绝缘开关设备1250A, 25KA, 3秒。	No.	2					-	-
4.002	Local control panel	4.002 本地控制面板	No.						-	-
4.003	Dummy plug	4.003 假插头	No.						-	-
4.004	Fiber optic cable	4.004 光纤电缆	Item						-	-
	22kV Switchgear to TR and building feeder	22kV开关设备至TR和建筑物馈线							-	-
4.005	1/C, 400 sq.mm XLPE-Cu	4.005 1/C, 400平方毫米交联聚乙烯铜	m						-	-
4.006	1/C, 240 sq.mm XLPE-Cu	4.006 1/C, 240平方毫米交联聚乙烯铜	m	111					-	-
4.007	1/C, 50 sq.mm XLPE-Cu	4.007 1/C, 50平方毫米交联聚乙烯铜	m	28					-	-
4.008	Cable Terminator for cable size 3-1/C, 240 sq.mm. (Outdoor Type)	4.008 适用于尺寸为3-1/C、240平方毫米（室外型）的电缆终端	No.	3					-	-
4.009	Cable Terminator for cable size 3-1/C, 240 sq.mm. (Indoor Type)	4.009 尺寸为3-1/C、240平方毫米的电缆终端（室内型）	No.	3					-	-
4.010	Cable Terminator for cable size 3-1/C, 50 sq.mm. (Indoor Type)	4.010 尺寸为3-1/C、50平方毫米的电缆终端（室内型）	No.	6					-	-
	Cable Tray 1000x200	电缆桥架1000x200	m	14					-	-
4.011	Dia 90 mm HDPE Conduit	4.011 直径90mm的HDPE导管	m						-	-
4.012	Dia 90 mm IMC Conduit	4.012 直径90mm IMC导管	m	14					-	-

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	数量 Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
4.013	Steel support, Fitting and accessories	4.013 钢支架、配件和附件	Lot	1				-	-
4.014	Cable support	4.014 电缆支架	Lot	1				-	-
4.015	Underground duct bank 4x4 underground duct bank with dia.150 mm, RTRC at 3.0 m. depth.	地下管槽组 4.015 4x4地下管槽组, 直径150mm, RTRC, 深度3.0m。	m	43				-	-
	<b>Additional items that the Tenderer considers to be necessary</b>	<b>投标人认为必要的其他项目</b>							
	<i>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</i>	<i>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目, 但不包括在上述项目中。这些项目必须在下面清楚地描述并列出。如果他们不在投标之前包含在投标文件中, 则应视为包含在投标总价中, 在最终结算中不予调整。</i>							
Add									
Add									
	Bill No.3 carried to Collection	表3转入合计							-

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰隆水泥碳化硅生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



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				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
5	22kV Reactive Power Compensation Device <u>Supply, Installation, and fixing 22kV Reactive Power Compensation Device in position complete with all accessories, fitting, and support as per specification.</u>	5. 22kV无功补偿装置 按照图纸提供，安装和固定22kV无功功率补偿装置，并配备所有附件、配件和支架。							
5.001	22kV shunt capacitor complete set	5.001 22kV并联电容器成套装置	No.					-	-
5.002	Cable and Conduit for 22kV Reactive Power Compensation Device - Cable .....sq.mm - Conduit .....dia	5.002 22kV 无功功率补偿装置的电缆和导管 - 电缆 ..... 平方毫米 - 导管 ..... 直径	m					-	-
5.003	Steel support, Fitting and accessories	5.003 钢支架、配件和附件	Lot	1				-	-
5.004	Cable support	5.004 电缆支架	Lot	1				-	-
	<b>Additional items that the Tenderer considers to be necessary</b> <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below, if they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据图纸和规格所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出，如果在投标前未包含在投标文件中，则应视为已包含在投标总价中，在最终结算中不予调整。							
Add									
Add									
	Bill No.3 carried to Collection	表3转入合计							-



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管网系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	材料 Material	人工 Labour	综合 Total	
6	Control and Protection Panel 115kV GIS (Gas Insulated Switchgear) Supply, installation and fixing Control and Protection Panel for 115kV GIS Switchgear in position complete with all accessories, fitting, and support as per Specification.	6. 控制和保护面板 115kV GIS (气体绝缘开关设备) 供应、安装和固定115kV GIS 开关设备的控制和保护面板，并按照规范配备所有附件、配件和支架。							
6.001	Control and Protection Panel for 115kV GIS Switchgear including BCUs and Protection Relay with software ...Bidder to provide description of each panel...	6.001 115kV GIS开关设备的控制和保护面板，包括BCU和带软件的保护继电器 ... 投标人应提供每个面板的说明...	Item	1				-	-
6.002	Line Transfer Panel	6.002 线路转换面板	No.					-	-
6.003	Line current differential relay panel at PEA terminal substation  <b>Additional items that the Tenderer considers to be necessary</b>  The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below, if they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.	6.003 PEA终端降压站的线路电流差动继电器面板  <b>投标人认为必要的其他项目</b>  投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出，如果在投标返回之前未包含在投标文件中，则应视为包含在投标总价中，在最终结算中不予调整。	No.					-	-
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SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 卷3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	材料 Material	人工 Labour	综合 Total	
8	<p>115KV step-down station protection and integrated automation system</p> <p><u>Supply, installation and fixing 115KV step-down station protection and integrated automation system in position complete with all accessories, fitting, and support as per specification.</u></p> <p>Must include but not limited to the following items:</p> <p>① 115KV internal bridge protection and standby automatic switching</p> <p>② Substation automation system</p> <p>③ Electric energy metering</p> <p>④ Clock synchronization system</p>	<p>8. 115KV 高压站保护和综合自动化系统</p> <p>按照规范提供、安装和固定高压站通信连接和高压站自动化系统，并配备所有附件、配件和支撑。</p> <p>必须包含但不限于以下细项——</p> <p>① 115KV 内桥保护和备用自投</p> <p>② 变电站自动化系统</p> <p>③ 电能计量</p> <p>④ 时钟同步对时系统</p>							
8.001	CCU (Redundance Power Supply)	8.001 CCU (冗余电源)	No.					-	-
8.002	Monitor for CCU	8.002 CCU 监控	Set					-	-
8.003	Time Data Server (TDS) with GPS antenna	8.003 带GPS天线的时数据服务器 (TDS)	Set					-	-
8.004	Industrial Ethernet Switch for IEC61850 Station Level	8.004 IEC61850站级工业以太网交换机	Set					-	-
8.005	Software for SA (Redundance)	8.005 SA (冗余) 软件	License					-	-
8.006	HMI (Redundance Power Supply)	8.006 HMI (冗余电源)	No.					-	-
8.007	Monitor for HMI	8.007 HMI 监视器	Set					-	-
8.008	Panel for SA	8.008 SA 面板	Set					-	-
8.009	Fiber Optical Patch Cord	8.009 光纤跳线	Lot					-	-
8.010	Communication network cable and accessories (UTP Cat6)	8.010 通信线及配件 (UTP Cat6)	Lot					-	-
8.011	System parameterization, configuration, Pdf drawings, system functional for substation SCADA System	8.011 变电站SCADA系统的系统参数化、配置、Pdf图纸、系统功能	Lot					-	-
	<p><u>Additional items that the Tenderer considers to be necessary</u></p> <p>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</p>	<p><u>投标人认为必要的其他项目</u></p> <p>投标人可以列出他认为根据图纸和规格完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下列中清楚地描述和列出。如果在投标之前未包含在投标文件中，则应视为包含在投标总价中，在最终结算中不予调整。</p>							
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SCHEDULE OF WORKS (SOW)  
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BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	Material 材料	Labour 人工	Total 综合	
9	Arc suppression coil and grounding transformer set Supply, installation and fixing. Service Transformer, Arc suppression coil and grounding transformer set in position complete with all accessories, fitting, and support as per specification. Description: Station transformer Must include but not limited to the following items ① Grounding transformer (station transformer) ② Arc suppression coil ③ On-load switch ④ Metal oxide arrester ⑤ Voltage transformer ⑥ Damping transformer ⑦ Zero-sequence current mutual inductance ⑧ Parallel resistor ⑨ Arc suppression coil control cabinet ⑩ Business and technical cooperation	9、服务变压器、消弧线圈及接地变成套装置 供货、安装和固定服务变压器、消弧线圈和接地变压器，并根据规格配备所有配件、配件和支架。 说明：站用变 必须包含但不限于以下细项 ①接地变（站用变） ②消弧线圈 ③有载开关 ④金属氧化物避雷器 ⑤电压互感器 ⑥阻尼电 ⑦零序电流互感 ⑧并联电阻 ⑨消弧线圈控制柜 ⑩商务技术配合	No.	1				-	-
9.001	Service Transformer 3Ø 22-0.4kV, 160kA Dyn11	9.001 服务变压器3Ø22-0.4kV, . 160kA Dyn11	No.	1				-	-
9.002	Service TR to Load	增加的服务项	m	20				-	-
9.003	1/C, 95 sq.mm NYY	9.002 1层, 95平方毫米NYY	m	28				-	-
9.004	1/C, 50 sq.mm NYY	9.003 1层, 50平方毫米NYY	m	18				-	-
9.005	Dia 75 mm IMC Conduit	9.004 直径75mm IMC导管	m	26				-	-
9.006	Dia 50 mm IMC Conduit	9.005 直径50mm IMC导管	Lot	1				-	-
9.007	Steel support, Fitting and accessories	9.006 钢支架、配件和附件	Lot	1				-	-
9.007	Cable support	9.007 电缆支架	Lot	1				-	-
	<b>Additional items that the Tenderer considers to be necessary</b> The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.	<b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据图纸的竣工所需工程的以下项目，但不包括在上列项目中。这些项目必须在下面明确描述和列出，如果在投标返回之前未包含在投标文件中，则应视为已包含在投标总价中，在最终结算中不予调整。							
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DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity 数量		UNIT RATE 单价			AMOUNT 金额 (THB)
				Reference	Tenderer	Material 材料	Labour 人工	Total 综合	
	<u>Additional Items that the Tenderer considers to be necessary</u>	<u>投标人认为必要的其他项目</u>							
Add Add	The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.	投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下述明确描述和列出，如果在投标返回之前未包含在投标文件中，则应视为包含在投标总价中，在最终结算中不予调整。							
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				参考 Reference	投标人 Tenderer	Material 材料	Labour 人工	Total 综合	
11	<b>Grounding and Lightning Protection</b> Supply, installation, and fixing Earthing and lightning protection in position complete with all accessories, fitting, and support as per specification.	<b>11 接地和防雷</b> 按照规范提供、安装和固定接地和防雷装置，并配备所有配件、配件和支架。							
11.001	Grounding conductor (embedded underground)	11.001 接地导线 (埋于地下)	No.					-	-
11.002	Grounding conductor (embedded in concrete slab/floor)	11.002 接地导线 (嵌入混凝土板/楼板中)	No.					-	-
11.003	Air terminal	11.003 航磁棒	No.					-	-
11.004	Down conductor	11.004 引下线	No.					-	-
11.005	Ground rod	11.005 接地棒	No.					-	-
	<b>Additional items that the Tenderer considers to be necessary</b> The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum and no adjustment will be made in the final settlement.	<b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据规范和图纸工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面清楚地描述和列出。如果他们不在投标之前包含在投标文件中，则应被视为包含在投标总价中，在最终结算中不予调整。							
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	材料 Material	人工 Labour	综合 Total	
12	<p>Transportation, loading, unloading and testing                      To supply Transportation, loading, unloading and testing in the location and correct position, complete with all necessary as per specification.                      Must include but not limited to the following items:</p> <p>12.001 Transportation                      12.002 Loading and unloading                      12.003 On-site testing</p> <p><b>Additional items that the Tenderer considers to be necessary</b>                      The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</p> <p>Add Add</p>	<p>12、运输、装卸及测试                      按照规范要求，在指定地点和正确的位置提供运输、装卸、卸载和测试以及所有必要的服务。                      必须包含但不限于以下细项——</p> <p>12.001 运输                      12.002 装卸                      12.003 现场测试</p> <p><b>投标人认为必要的其他项目</b>                      投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下列清楚描述和列明。如果在投标返回之前未包含在投标文件中，则应视为包含在投标总价中，在最终结算中不予调整。</p>	Item Item Item	1 1 1				- - -	
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				参考 Reference	投标单位 Tenderer	材料 Material	人工 Labour	综合 Total	
13	<p>Installation, commissioning and power transmission                      To Supply installation, commissioning and power supply in position complete with all accessories, fitting, and support as per specification.                      Must include but not limited to the following items:</p> <p>13.001 Installation on site                      13.002 Single machine/online commissioning                      13.003 System/station commissioning                      13.004 Network commissioning                      13.005 Training</p> <p><b>Additional items that the Tenderer considers to be necessary</b>                      The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</p> <p>Add Add</p>	<p>13、安装、调试及供电                      按照规格提供安装、调试和电源以及所有配件、配件和支持。                      必须包含但不限于以下细项——</p> <p>13.001 就位安装                      13.002 单机/联机调试                      13.003 系统/站内调试                      13.004 联网调试                      13.005 培训</p> <p><b>投标人认为必要的其他项目</b>                      投标人可以列出他认为根据图纸和规格所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出，如果在投标返回之前未在投标文件中，则应视为包含在投标总价中，在最终结算中不予调整。</p>							
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				参考 Reference	投标人 Tenderer	Material 材料	Labour 人工	Total 综合	
14	General MEP work <b>Mechanical and Electrical System (General)</b> <u>Supply, Installation and fixing General Mechanical and Electrical System in position complete, with all accessories, fitting, and support as per specification.</u>	<b>一般机电工作</b> <b>14 机电系统 (概述)</b> 按照图纸提供、安装和固定通用机电系统，并配备所有配件、配件和支路。							
14.001	Electrical and Communication System - LV Power Cables - Control Cables - Lighting and Small Power System - Fire Detection and Alarm System	14.001 电气和通信系统 - 低压电力电缆 - 控制电缆 - 照明和小型电力系统 - 火灾探测和报警系统	Item	1				-	-
14.002	HVAC System - Ventilation System - Air Condition System	14.002 暖通空调系统 - 通风系统 - 空调系统	Item	1				-	-
14.003	Sanitary system and Fire protection - Plumbing and Drainage System - Fire Suppression System - Transformer Deluge System	14.003 卫生系统和消防 - 管道和排水系统 - 灭火系统 - 变压器喷淋系统	Item	1				-	-
14.004	Overhead Crane (GIS Room) <b>Additional items that the Tenderer considers to be necessary</b> <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below, if they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	14.004 桥式起重机 (GIS室) <b>投标人认为必要的其他项目</b> 投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上列项目中。这些项目必须在下列说明中描述和列出。如果在投标返回之前未包含在投标文件中，则应视为包含在投标总价中，在最终结算中不予调整。	Item	1				-	-
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 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
 表3: 机电和管道系统工程

DATE: 14-Mar-2025

ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity 数量		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	材料 Material	人工 Labour	综合 Total	
15	Security System <u>Supply, installation, and fixing Security System in position complete with all accessories, fitting, and support as per specification.</u>	15 安全系统 按照规范提供、安装和固定安全系统，并配备所有附件、配件和支架。							
15.001	Security and access control system (Include Equipment, CCTV, cable and conduit)  <u>Additional items that the Tenderer considers to be necessary</u>  <u>The Tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below. If they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	15.001 安全和门禁系统 (包括设备、中央控制台、电缆和导管)  <u>投标人认为必要的其他项目</u>  <u>投标人可以列出他认为根据图纸和规范完成工程所必需的以下项目，但不包括在上述项目中。这些项目必须在下面明确描述和列出。如果在投标之前未包含在投标文件中，则应视为已包含在投标总价中，在最终结算中不予调整。</u>	Item	1					
Add									
	Bill No.3 carried to Collection	表3转入合计							

DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

GECC PRODUCTION BASE (PHASE 2) PROJECT FOR GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.  
 泰国金鹰水泥生产基地二期项目

PROJECT NAME: 115KV SUBSTATION DESIGN & BUILD PROJECT  
 115KV 高压站设计与施工项目



DESIGN AND BUILD SUBSTATION SYSTEM CONTRACT WORKS  
 高压站系统设计与施工承包工程

SCHEDULE OF WORKS (SOW)  
 工程数量及单价表 - 汇总表

BILL NO.3: MECHANICAL, ELECTRICAL AND PLUMBING SYSTEM WORKS  
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ITEM 项目	DESCRIPTION	描述	UNIT 单位	Quantity		UNIT RATE 单价			AMOUNT 金额 (THB)
				参考 Reference	投标人 Tenderer	Material 材料	Labour 人工	Total 综合	
16	<b>Testing and Commissioning</b> <u>Supply, installation and fixing. Testing and Commissioning in position complete with all accessories, fitting, and support as per specification.</u>	<b>16 测试和调试</b> <u>按照规格提供、安装和固定测试和调试，并配备所有附件、配件和支架。</u>							
16.001	Testing (focusing on equipment quality and performance parameters, similar to material entry acceptance. Only after passing the acceptance, it can be allowed to enter the site and be installed)	16.001 测试 (针对设备质量、性能参数, 类似于材料进场验收, 合格后才允许进场就位、安装)	Item	1					
16.002	Commissioning (focusing on the functionality, performance, and other aspects of the device after installation, starting with standalone and then online, and finally conducting on-site and networked commissioning)	16.002 调试 (针对设备安装完成后的功能、性能等, 先单机而后联机, 最后为站内联调、联网调试)	Item	1					
16.003	Factory inspection and review (before the manufacturer ships the equipment, the Employer collaborates with relevant parties to go to the factory and cooperate with the manufacturer to complete the equipment factory test review, on-site inspection, and audit the main materials, production process, and quality control of the entire production process)	16.003 出厂监造 (即厂家发货前, 业主协助相关方到厂、厂家配合, 完成设备出厂试验复核、旁站, 并对设备主材、生产工艺、生产全过程质控等进行复核)	Item	1					
16.004	Information to be submitted for review: ① Submissions related to quality inspection, environmental protection, occupational health and safety systems ② List of main materials, purchase contract and its quality inspection report, and other relevant supporting documents ③ Production process flow and list of main production equipment and other materials related to production control ④ Submissions related to process quality control and instrument calibration ⑤ Equipment factory test report *Note: The above information can be provided in electronic format, with paper files for future reference	16.004 文件提交供审核: ① 资质、环保、职业健康安全等体系相关材料 ② 主材清单、购买合同及其他检测报告等相关证明材料 ③ 生产工艺流程及其主要生产设备清单等生产管控相关材料 ④ 过程品控及其仪器仪表校验等相关材料 ⑤ 设备出厂试验报告 *备注: 以上资料提供电子版即可, 纸质档备查	Item	1					
	<b>Additional items that the Tenderer considers to be necessary</b> <u>The tenderer could list the items below he considers necessary to complete the Works according to the drawings and specifications, but not included in the above-mentioned items. These items must be clearly described and listed below, if they are not included in the tender before the tender return, they shall be deemed to be included in the tender sum, and no adjustment will be made in the final settlement.</u>	<b>投标人认为必要的其他项目</b> <u>投标人可以列出他认为根据图纸和规格完成工程所必需的以下项目, 但不包括在上述项目中。这些项目必须在下面明确描述和列出, 如果在投标返回之前未包含在投标文件中, 则应视为已包含在投标总价中, 在最终结算中不予调整。</u>							
Add Add									
	<b>Bill No.3 carried to Collection</b>	<b>表3转入合计</b>							

## General CONDITIONS

### 通用条件

#### 1 General Provisions 通用条款

##### 1.1 Definitions 定义

In the Contract the following words and expressions shall have the meanings stated, except where the context requires otherwise  
在本合同中，除上下文另有要求外，下列词语或表达应具有以下所述的含义。

1.1.1 “Advance Payment Guarantee” means the guarantee under Sub-Clause 14.2.1 [Advance Payment Guarantee].

1.1.1 预付款保函”系指第 14.2.1 款 [预付款保函] 所述的保函。

1.1.2 “Base Date” means the date 28 days before the latest date for submission of the Tender.

1.1.2 基准日期”系指递交投标书截止前 28 天的日期。

1.1.3 “Claim” means a request or assertion by one Party to the other Party for an entitlement or relief under any Clause of these Conditions or otherwise in connection with, or arising out of, the Contract or the execution of the Works.

1.1.3 索赔”系指根据本条件的任何条款或与本合同相关的情况（或因工程执行引起的问题），一方向另一方提出的要求或主张，以获取应得权利或救济。

1.1.4 “Commencement Date” means the date as stated in the Employer’s Notice issued under Sub-Clause 8.1 [Commencement of Works].

1.1.4 开工日期”系指根据第 8.1 款 [工程的开工] 下发的雇主的通知内规定的日期。

1.1.5 “Compliance Verification System” means the compliance verification system to be prepared and implemented by the Contractor for the Works in accordance with Sub-Clause 4.9.2 [Compliance Verification System].

1.1.5 合规验证体系”系指承包商根据第 4.9.2 款 [合规验证体系] 为本工程编制和实施的合规验证体系。

1.1.6 “Conditions of Contract” or “these Conditions” means these General Conditions as amended by the Particular Conditions.

1.1.6 “合同条件”或“本条件”系指经特殊条件修正的通用条件。

1.1.7 “Contract” means the Contract Agreement, any addenda referred to in the Contract Agreement, these Conditions, the Employer’s Requirements, the Schedules, the Tender, the JV Undertaking (if applicable) and the further documents (if any) which are listed in the Contract Agreement.

1.1.7 合同”系指合同协议书、合同协议书中提及的任何附录、本条件、雇主要求、计划表、投标书、联营体承诺书（如适用）以及合同协议书中列出的其他文件（如有）。

1.1.8 “Contract Agreement” means the agreement entered into by both Parties in accordance with Sub-Clause 1.6 [Contract Agreement], including any annexed memoranda.

1.1.8 合同协议书”系指双方根据第 1.6 款 [合同协议书] 签订的协议书，包括所附的各项备忘录。

1.1.9 “Contract Data” means the pages, entitled contract data which constitute Part A of the Particular Conditions.

1.1.9 合同数据”系指构成专用条件 A 部分标明为合同数据的文页。

1.1.10 “Contract Price” means the agreed amount stated in the Contract Agreement for the execution of the Works, and includes adjustments (if any) in accordance with the Contract.

1.1.10 合同价格”系指为实施工程在合同协议书中规定的金额，包括根据合同做出的调整（如有）。

1.1.11 “Contractor” means the person(s) named as contractor in the Contract Agreement and the legal successors in title of such person(s).

1.1.11 承包商”系指合同协议书中被称为承包商的当事人及其财产所有权的合法继承人。

1.1.12 “Contractor’s Documents” means the documents prepared by the Contractor as described in Sub-Clause 5.2 [Contractor’s Documents], including calculations, digital files, computer programs and other software, drawings, manuals, models, specifications and other documents of a technical nature.

1.1.12 承包商文件”系指第 5.2 款 [承包商文件] 中所述的，由承包商编制的文件，包括计算书、数字文件、计算机程序和其他软件、图纸、说明书、模型、技术规范和其他技术性文件。

1.1.13 “Contractor’s Equipment” means all apparatus, equipment, machinery, construction plant, vehicles and other items required by the Contractor for the execution of the Works.

Contractor’s Equipment excludes Temporary Works, Plant, Materials and any other things intended to form or forming part of the Permanent Works.

1.1.13 承包商设备”系指承包商为执行工程所需的所有仪器、设备、机械、施工生产设备、车辆和其他物品。承包商设备不包括临时工程、厂房、材料和任何其他拟构成或构成永久性工程一部分的物品。

1.1.14 “Contractor’s Personnel” means the Contractor’s Representative and all personnel whom the Contractor utilises on Site or other places where the Works are being carried out, including the staff, labour and other employees of the Contractor and of each Subcontractor; and any other personnel assisting the Contractor in the execution of the Works.

1.1.14 承包商人员”系指承包商代表和承包商在现场（或其他实施工程的地点）聘用的所有人员，包括承包商和每个分包商的职员、工人和其他雇员，以及所有其他帮助承包商实施工程的人员。

1.1.15 “Contractor Representative” means the natural person named by the Contractor in the Contract or appointed by the Contractor under Sub-Clause 4.3 [Contractor’s Representative], who acts on behalf of the Contractor.

1.1.15 “承包商代表”系指由承包商在合同中指名的自然人，或由承包商根据第 4.3 款 [承包商代表] 的规定任命为其代表的自然人。

1.1.16 “Cost” means all expenditure reasonably incurred (or to be incurred) by the Contractor in performing the Contract, whether on or off the Site, including taxes, overheads and similar charges, but does not include profit. Where the Contractor is entitled under a Sub-Clause of these Conditions to payment of Cost, it shall be added to the Contract Price.

1.1.16 “成本（费用）”系指承包商在履行合同过程中在现场内外所发生（或将发生）的所有合理开支，包括税金、管理费和类似支出，但不包括利润。若承包商根据本条件的任一条款有权取得成本费用，应将其加到合同价格内。

1.1.17 “Cost Plus Profit” means Cost plus the applicable percentage for profit stated in the Contract Data (if not stated, five percent (5%)). Such percentage shall only be added to Cost, and Cost Plus Profit shall only be added to the Contract Price, where the Contractor is entitled under a Sub-Clause of these Conditions to payment of Cost Plus Profit.

1.1.17 “成本加利润”系指成本加上合同数据中规定的利润适用百分比（若未规定，则为 5%）。只有在承包商根据本条件条款有权获得成本加利润的付款的情况下，该百分比才能加到成本中，成本加利润才能加到合同价格中。

1.1.18 “Country” means the country in which the Site (or most of it) is located, where the Permanent Works are to be executed.

1.1.18 “工程所在国”系指现场（或大部分现场）所在的国家，即实施永久性工程的国家。

1.1.19 “DAAB” or “Dispute Avoidance/Adjudication Board” means the sole member or three members (as the case may be) so named in the Contract, or appointed under Sub-Clause 21.1 [Constitution of the DAAB] or Sub-Clause 21.2 [Failure to Appoint DAAB Member(s)].

1.1.19 “DAAB”或“争端规避/裁决委员会”系指合同中任命的一名成员委员会或三名成员委员会（视情况而定），或根据第 21.1 款 [DAAB 章程] 或第 21.2 款 [未任命 DAAB 成员] 的规定任命的成员委员会。

1.1.20 “DAAB Agreement” means the agreement signed or deemed to have been signed by both Parties and the sole member or each of the three members (as the case may be) of the DAAB in accordance with Sub-Clause 21.1 [Constitution of the DAAB] or Sub-Clause 21.2 [Failure to Appoint DAAB Member(s)], incorporating by reference the General Conditions of Dispute Avoidance/Adjudication Agreement contained in the Appendix to these General Conditions with such amendments as are agreed.

1.1.20 “DAAB 协议书”系指双方（雇主及承包商）与 DAAB 唯一成员或三人成员（视情况而定）中的每位成员根据第 21.1 款 [DAAB 章程] 或第 21.2 款 [未能任命 DAAB 成员] 签订的或认为已经签订的协议书，并参考本通用条件附录的争端规避/裁决协议书一般条件，结合商

定的此类修订意见进行拟订。

1.1.21 “Date of Completion” means the date stated in the Taking-Over Certificate issued by the Employer; or, if the last paragraph of Sub -Clause 10.1 [Taking Over the Works and Sections] applies, the date on which the Works or Section are deemed to have been completed in accordance with the Contract; or, if taking over of part(s) of the Works is permitted under Sub -Clause 10.2 [Taking Over of Parts of the Works], the date on which such part(s) are taken over or used by the Employer.

1.1.21 竣工日期”系指雇主签发的接收证书内规定的日期；或如果第 10.1 款 [接收工程和分项工程]适用，竣工日期为工程或分项工程按照合同完成的日期；或如果根据第 10.2 款 [部分工程的接收 ]允许接收部分工程，竣工日期为雇主接收或使用此类部分工程的日期。

1.1.22 “day” means a calendar day.

1.1.22 日“天”系指一个日历日。

1.1.23 “DayworkSchedule” means the document entitled daywork schedule (if any) included in the Contract, showing the amounts and manner of payments to be made to the Contractor for labour, materials and equipment used for daywork under Sub -Clause 13.5 [Daywork].

1.1.23 计日工作计划表”系指合同内命名为“计日工作计划表”的文件（如有），内容为根据第 13.5 款 [计日工作 ]向承包商支付计日工作使用的人工、材料和设备付款数额和付款方式。

1.1.24 “Defects Notification Period” or “DNP” means the period for notifying defects and/or damage in the Works or a Section (or a part of the Works, if Sub -Clause 10.2 [Taking Over of Parts of the Works] applies), as the case may be, under Sub -Clause 11.1 [Completion of Outstanding Work and Remedying Defects], as stated in the Contract Data (if not stated, one year), and as may be extended under Sub-Clause 11.3 [Extension of Defects Notification Period]. This period is calculated from the Date of Completion of the Works or Section (or part of the Works).

1.1.24 “缺陷通知期限”或“DNP”系指通知工程或分项工程（或部分工程，如果第 10.2 款 [部分工程的接收 ]适用)存在缺陷和 /或损坏的期限，视情况而定，可以是根据第 11.1 [完成扫尾工作和修补缺陷 ]合同数据 (若未规定,则为 1 年)规定的期限,也可以是根据第 11.3 款 [缺陷通知期限的延长 ]提出的任何延长期。该期限从工程或分项工程（或部分工程）竣工开始计算。

1.1.25 “Delay Damages” means the damages for which the Contractor shall be liable under Sub -Clause 8.8 [Delay Damages] for failure to comply with Sub -Clause 8.2 [Time for Completion].

1.1.25 “误期损害赔偿费”系指承包商未能遵守第 8.2 款 [竣工时间 ]的要求,承包商需按照第 8.8 款 [误期损害赔偿费 ]承担损害赔偿。

1.1.26 “Dispute” means any situation where:

(a) one Party makes a claim against the other Party (which may be a Claim, as defined in these Conditions, or a matter to be determined by the Employer’s Representative under these Conditions, or otherwise);



1.1.26 “争端”系指以下情况:

(a) 一方向另一方提出索赔 (可以是本条件下定义的索赔, 也可以是雇主代表根据本条件决定的事件, 或其他情况 );

(b) the other Party (if the Employer, under Sub-Clause 3.5.2 [Employer 's Representative 's determination] or otherwise) rejects the claim in whole or in part; and

(b) 另一方 (如果雇主根据第 3.5.2 款 [雇主代表的决定 ]或其他情况 ) 拒绝全部或部分索赔 ;

(c) the first Party does not acquiesce (if the Contractor, by giving a NOD under Sub-Clause 3.5.5 [Dissatisfaction with Employer 's Representative 's determination] or otherwise), provided however that a failure by the other Party to oppose or respond to the claim, in whole or in part, may constitute a rejection if, in the circumstances, the DAAB or the arbitrator(s), as the case may be, deem it reasonable for it to do so.

(c) 如果另一方未能全部或部分反对或回应该索赔要求, 则可构成拒收, 在这种情况下, 如果 DAAB 或仲裁人 (视情况而定 )认为做法合理, 第一方不同意 ( (如承包商根据第 3.5.5 款 [对雇主代表的决定不满 ]发出 NOD 或其他情况) )。

1.1.27 “Employer ” means the person named as the employer in the Contract Agreement and the legal successors in title to this person.

1.1.27 “雇主”系指在合同协议书中被称为雇主的当事人及其财产所有权的合法继承人。

1.1.28 “Employer 's Equipment ” means the apparatus, equipment, machinery, construction plant and/or vehicles (if any) to be made available by the Employer for the use of the Contractor under Sub -Clause 2.6 [Employer Supplied Materials and Employer 's Equipment]; but does not include Plant which has not been taken over under Clause 10 [Employer 's Taking Over].

1.1.28 “雇主设备 ”系指雇主要求中所述的, 根据第 2.6 款 [雇主提供的材料及雇主设备 ]由雇主向承包提供使用的仪器、设备、机械、施工生产设备、车辆 (如果有) , 但不包括根据第 10 款 [雇主的接收 ]尚未经雇主接收的生产设备。

1.1.29 “Employer 's Personnel ” means the Employer 's Representative, the assistants described in Sub -Clause 3.2 [Other Employer 's Personnel] and all other staff, labour and other employees of the Employer and of the Employer 's Representative, engaged in fulfilling the Employer 's obligations under the Contract; and any other personnel identified as Employer 's Personnel, by a Notice from the Employer or the Employer 's Representative to the Contractor.

1.1.29 “雇主人员 ”系指雇主代表、第 3.2 款 [其他雇主人员 ]中提到的助手、以及雇主和雇主代表的根据合同履行雇主义务的所有其他职员、工人和其他雇员、以及被认定为雇主人员的任何其他人员和雇主或雇主代表通知承包商作为雇主人员的任何其他人员。

1.1.30 “Employer Rrepresentative ” means the person named by the Employer in the Contract Data appointed by the Employer for the purposes of the Contract, or any replacement appointed under Sub -Clause 3.1 [The Employer 's Representative].

1.1.30 “雇主代表 ”系指在合同数据中由雇主指名的且由雇主出于合同目的任命的人员, 或任何根据第 3.1 款 [雇主代表 ]任命的接替者。

1.1.31 “Employer’s Requirements” means the document entitled employer’s requirements, as included in the Contract, and any additions and modifications to such document in accordance with the Contract. Such document describes the purpose(s) for which the Works are intended, and specifies Key Personnel (if any), the scope, and/or design and/or other performance, technical and evaluation criteria, for the Works.

1.1.31 “雇主要求”系指合同中包含的，标题为雇主要求的文件，以及按照合同对此项文件所作的任何补充和修改。此类文件说明工程的目标、指定关键人员（如有）、范围、和（或）设计、和（或）其他业绩、技术与评估标准。

1.1.32 “Employer-Supplied Materials” means the materials (if any) to be supplied by the Employer to the Contractor under Sub-Clause 2.6 [Employer-Supplied Materials and Employer’s Equipment].

1.1.32 “雇主提供的材料”系指雇主根据第 2.6 款 [雇主提供的材料和雇主设备] 向承包商的材料（如有）

1.1.33 “Exceptional Event” means an event or circumstance as defined in Sub-Clause 18.1 [Exceptional Events].

1.1.33 例外事件 / 异常事件”系指第 18.1 款 [例外事件] 中定义的事件或情况。

1.1.34 “Extension of Time” or “EOT” means extension of the Time for Completion under Sub-Clause 8.5 [Extension of Time for Completion].

1.1.34 时间延长”或“EOT”系指根据第 8.5 款 [竣工时间的延长] 规定的竣工时间的延长。

1.1.35 “FIDIC” means the Fédération Internationale des Ingénieurs-Conseils, the International Federation of Consulting Engineers.

1.1.35 “菲迪克（FIDIC）”系指国际咨询工程师联合会。

1.1.36 “Final Statement” means the Statement defined in Sub-Clause 14.11.2 [Agreed Final Statement].

1.1.36 最终报表”系指第 14.11.2 款 [协定的最终报表] 中定义的报表。

1.1.37 “Foreign Currency” means a currency in which part (or all) of the Contract Price is payable, but not the Local Currency.

1.1.37 外币”系指可用于支付合同价格中部分（或全部）款项的当地货币以外的某种货币。

1.1.38 “General Conditions” means this document entitled “Conditions of Contract for EPC/Turnkey Projects”, as published by FIDIC.

1.1.38 通用条件”系指由 FIDIC 出版的，标题为 EPC/ 交钥匙工程合同条件的本文件。

1.1.39 “Goods” means Contractor’s Equipment, Materials, Plant and Temporary Works, or any of them as appropriate.

1.1.39 货物”系指承包商的设备、材料、生产设备和临时工程，或视情况任何一项。

1.1.40 “Joint Venture” or “JV” means a joint venture, association, consortium or other

unincorporated grouping of two or more persons, whether in the form of a partnership or otherwise.

1.1.40 联营体”或JV系指两名或两名以上人员组成的联营体、联盟、财团或其他非法人团体，不论其形式为合伙企业或其他形式。

1.1.41 “JV Undertaking ” means the letter provided to the Employer as part of the Tender setting out the legal undertaking between the two or more persons constituting the Contractor as a JV. This letter shall be signed by all the persons who are members of the JV, shall be addressed to the Employer and shall include:

- (a) each such member ’s undertaking to be jointly and severally liable to the Employer for the performance of the Contractor ’s obligations under the Contract;
- (b) identification and authorisation of the leader of the JV; and
- (c) identification of the separate scope or part of the Works (if any) to be carried out by each member of the JV.

1.1.41 联营体承诺书 ”系指作为投标书的一部分提供给雇主的信件，其中列明构成承包商为联营体的两名或两名以上人员之间的法律承诺书。本承诺书应由联营体的所有成员签字寄给雇主，并应包括以下：

- (a) 每一个成员就履行承包商在合同项下的义务向雇主承担连带责任的承诺；
- (b) 联营体领导人的认定和授权；
- (c) 确定联营体各成员施工的单独范围或部分工程 (如有)。

1.1.42 “Key Personnel ” means the positions (if any) of the Contractor ’s Personnel, other than the Contractor ’s Representative, that are stated in the Specification.

1.1.42 关键人员 ”系指规范中规定的承包商人员 (如有) 的职位，非承包商代表。

1.1.43 “Laws” means all national (or state or provincial) legislation, statutes, acts, decrees, rules, ordinances, orders, treaties, international law and other laws, and regulations and by-laws of any legally constituted public authority.

1.1.43 法律系指所有全国性 (或州或省) 法律、章程、法案、法令、规章、条例、命令、条约、国际法和其他法律，以及任何合法成立的公共当局制定的规则和细则。

1.1.44 “Local Currency ” means the currency of the Country.

1.1.44 当地货币 ”系指工程所在国的货币。

1.1.45 “Materials ” means things of all kinds (other than Plant), whether on the Site or otherwise allocated to the Contract and intended to form or forming part of the Permanent Works, including the supply-only materials (if any) to be supplied by the Contractor under the Contract.

1.1.45 材料系指所有种类的物品 (生产设备除外)，含在现场的材料或其它合同分配的材料以及拟组成或组成永久性工程一部分的材料，包括根据合同要由承包商供应的只供材料 (如果有)。

1.1.46 “month” is a calendar month (according to the Gregorian calendar).

1.1.46 月”系指公历月 (根据公历)。

1.1.47 “No-objection” means that the Employer has no objection to the Contractor’s Documents, or other documents submitted by the Contractor under these Conditions, and such Contractor’s Documents or other documents may be used for the Works.

1.1.47 “无异议”系指雇主对承包商的文件或承包商在本条件下提交的其他文件无异议，以及此类承包商的文件或其他文件可用于工程。

1.1.48 “Notice” means a written communication identified as a Notice and issued in accordance with Sub-Clause 1.3 [Notices and Other Communications].

1.1.48 “通知”系指根据第 1.3 款 [通知和其他通信] 定义为作为通知并发出的书面通信。

1.1.49 “Notice of Dissatisfaction” or “NOD” means the Notice one Party may give to the other Party if it is dissatisfied, either with an Employer’s Representative’s determination under Sub-Clause 3.5 [Agreement or Determination] or with a DAAB’s decision under Sub-Clause 21.4 [Obtaining DAAB’s Decision].

1.1.49 “不满通知”或“NOD”系指一方若不满意雇主代表根据第 3.5 款 [商定或确定] 做出的决定，或不同意 DAAB 根据第 21.4 款 [取得 DAAB 决定] 做出的决定，可通知另一方。

1.1.50 “Particular Conditions” means the document entitled particular conditions of contract included in the Contract, which consists of Part A - Contract Data and Part B - Special Provisions.

1.1.50 “专用条件”是指本合同中包含的标题为“合同专用条件”的文件，由 A 部分-合同数据和 B 部分-特别条款组成。

1.1.51 “Party” means the Employer or the Contractor, as the context requires. “Parties” means both the Employer and the Contractor.

1.1.51 “当事方（或一方）”根据上下文需要，或指雇主，或指承包商。“双方”系指雇主及承包商。

1.1.52 “Performance Certificate” means the certificate issued by the Employer (or deemed to be issued) under Sub-Clause 11.9 [Performance Certificate].

1.1.52 “履约证书”系指根据第 11.9 款 [履约证书] 的规定由雇主颁发（或视为签发）的证书。

1.1.53 “Performance Damages” means the damages to be paid by the Contractor to the Employer for the failure to achieve the guaranteed performance of the Plant and/or the Works or any part of the Works (as the case may be), as set out in the Schedule of Performance Guarantees.

1.1.53 “履约损害赔偿费”系指承包商未能按履约保函所列的计划表实现生产设备和/或工程，或工程的任何部分（视情况而定）的保证性能，而需向雇主支付的损害赔偿金。

1.1.54 “Performance Security” means the security under Sub-Clause 4.2 [Performance Security].

1.1.54 “履约担保”系指根据第 4.2 款 [履约担保] 规定的担保。

1.1.55 “Permanent Works” means the works of a permanent nature which are to be executed by the Contractor under the Contract.

1.1.55 “永久性工程”系指根据合同承包商要进行施工的永久性质工程。

1.1.56 “Plant” means the apparatus, equipment, machinery and vehicles (including any components) whether on the Site or otherwise allocated to the Contract and intended to form or forming part of the Permanent Works.

1.1.56 “生产设备”系指仪器、设备、机械、车辆（含任何部件），含在现场的设备或合同内规定的设备以及拟组成或组成永久性工程一部分的设备。

1.1.57 “Programme” means a detailed time programme prepared and submitted by the Contractor to which the Employer has given (or is deemed to have given) a Notice of No-objection under Sub-Clause 8.3 [Programme].

1.1.57 “进度计划”指由承包商编制并向雇主提交的详细时间计划且雇主已根据第 8.3 款 [进度计划]发出(或被视为已发出)无异议通知。

1.1.58 “Provisional Sum” means a sum (if any) which is specified in the Contract by the Employer as a provisional sum, for the execution of any part of the Works or for the supply of Plant, Materials or services under Sub-Clause 13.4 [Provisional Sums].

1.1.58 “暂列金额”系指合同中由雇主规定作为暂列金额的一笔款额（如果有），根据第 13.5 款 [暂列金额]的规定，用于工程某一部分的实施，或用于提供生产设备、材料或服务。

1.1.59 “QM System” means the Contractor’s quality management system (as may be updated and/or revised from time to time) in accordance with Sub-Clause 4.9.1 [Quality Management System].

1.1.59 “质量管理体系”或“QM 体系”系指根据第 4.9.1 [质量管理体系]规定的承包商质量管理体系（不时更新或修订）。

1.1.60 “Retention Money” means the accumulated retention moneys which the Employer retains under Sub-Clause 14.3 [Application for Interim Payment] and pays under Sub-Clause 14.9 [Release of Retention Money].

1.1.60 “保留金”系指雇主根据第 14.3 款 [期中付款的申请]的规定扣留的保留金累计金额，根据第 14.9 款 [保留金的支付]的规定进行支付。

1.1.61 “Review” means examination and consideration by the Employer of a Contractor’s submission in order to assess whether (and to what extent) it complies with the Contract and/or with the Contractor’s obligations under or in connection with the Contract.

1.1.61 “审核”系指雇主对承包商提交的文件进行审查和审议，以评估该文件是否（以及在何种程度上）符合合同要求，和 / 或承包商在合同项下或与合同有关的义务。

1.1.62 “Schedules” means the document(s) entitled schedules prepared by the Employer and completed by the Contractor, as attached to the Tender and included in the Contract. Such document(s) may include data, lists and schedules of payments and/or

rates and prices, and guarantees.

1.1.62 “进度表”系指标题为“进度表”，由雇主编制且承包商完成，附于投标书包含在合同内的文件。此类文件可包括数据、付款清单和时间表和 /或费率和价格，以及保函。

1.1.63 “Schedule of Payments” means the document(s) entitled schedule of payments (if any) in the Schedules showing the amounts and manner of payments to be made to the Contractor.

1.1.63 “付款计划表”系指计划表中标题为付款计划表（如有）的文件，内容为向承包商支付的金额和付款方式。

1.1.64 “Schedule of Performance Guarantees” means the document(s) entitled schedule of performance guarantees (if any) in the Schedules showing the guarantees required by the Employer for performance of the Works and/ or the Plant or any part of the Works (as the case may be), and stating the applicable Performance Damages payable in the event of failure to attain any of the guaranteed performance(s).

1.1.64 履约保证计划表”系指计划表内标题为履约保证计划表（如有）的文件，表明雇主为工程和/或生产设备或工程的任何部分（视乎情况而定）的履约所要求的保证，并说明如果未能履行约定，应支付适用的履约损害赔偿金。

1.1.65 “Schedule of Rates and Prices” means the document(s) entitled schedule of rates and prices (if any) in the Schedules.

1.1.65 费用及价格计划表”系指计划表内标题为费用及价格计划表的文件（如有）。

1.1.66 “Section” means a part of the Works specified in the Contract Data as a Section (if any).

1.1.66 “分项工程”系指在合同数据中确定为分项工程（如果有）的工程组成部分。

1.1.67 “Site” means the places where the Permanent Works are to be executed and to which Plant and Materials are to be delivered, and any other places specified in the Contract as forming part of the Site.

1.1.67 现场系指将实施永久工程和运送生产设备与材料到达的地点，以及合同中可能指定为现场组成部分的任何其他场所。

1.1.68 “Special Provisions” means the document (if any), entitled special provisions which constitutes Part B of the Particular Conditions.

1.1.68 “特别条款”系指构成专用条件 B 部分的，标题为“特别条款”的文件（如有）。

1.1.69 “Statement” means a statement submitted by the Contractor as part of an application for payment under Sub-Clause 14.3 [Application for Interim Payment], Sub-Clause 14.10 [Statement at Completion] or Sub-Clause 14.11 [Final Statement].

1.1.69 报表系指承包商根据第 14.3 款 [期中支付的申请]，第 14.10 款 [竣工报表] 或第 14.11 款 [最终报表] 的规定提交的作为付款申请的组成部分的报表。

1.1.70 “Subcontractor” means any person named in the Contract as a subcontractor, or

any person appointed by the Contractor as a subcontractor or designer, for a part of the Works; and the legal successors in title to each of these persons.

1.1.70 “分包商”系指为完成部分工程，在合同中由承包商指名为分包商或设计者、或被任命为分包商或设计者的任何人员，以及这些人员财产所有权的合法继承人。

1.1.71 “Taking-Over Certificate” means a certificate issued (or deemed to be issued) by the Employer in accordance with Clause 10 [Employer’s Taking Over].

1.1.71 “接收证书”系指根据第 10 条 [雇主的接收] 由雇主颁发 (或视为签发) 的证书。

1.1.72 “Temporary Works” means all temporary works of every kind (other than Contractor’s Equipment) required on Site for the execution of the Works.

1.1.72 “临时工程”系指为执行工程，在现场所需的所有各类临时性工程（承包商设备除外）。

1.1.73 “Tender” means the Contractor’s signed offer for the Works, the JV Undertaking (if applicable) and all other documents which the Contractor submitted with the Tender (other than these Conditions, the Schedules and the Employer’s Requirements, if so submitted), as included in the Contract.

1.1.73 “投标书”系指包含在合同中的由承包商提交的为完成工程签署的报价，联营体承诺书以及随同提交的所有其他文件（本条件，计划表和雇主要求除外，如同时提交）。

1.1.74 “Tests after Completion” means the tests (if any) which are stated in the Specification and which are carried out in accordance with the Special Provisions after the Works or a Section (as the case may be) are taken over under Clause 10 [Employer’s Taking Over].

1.1.74 “竣工后试验”系指在技术规范中规定的，在工程或某分项工程（视情况而定）被雇主根据第 10 款 [雇主的接收] 接收后，根据技术条款实施的试验（如有）。

1.1.75 “Tests on Completion” means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out under Clause 9 [Tests on Completion] before the Works or a Section (as the case may be) are taken over under Clause 10 [Employer’s Taking Over].

1.1.75 “竣工试验”系指在合同中规定或双方商定的，或按指示作为一项变更的，在工程或某分项工程（视情况而定）被雇主根据第 10 款 [雇主的接收] 接收前，根据第 9 条 [竣工试验] 的要求，进行的试验。

1.1.76 “Time for Completion” means the time for completing the Works or a Section (as the case may be) under Sub-Clause 8.2 [Time for Completion], as stated in the Contract Data as may be extended under Sub-Clause 8.5 [Extension of Time for Completion], calculated from the Commencement Date.

1.1.76 “竣工时间”系指合同数据中规定的，自开工日期算起，至工程或某分项工程（视情况而定）根据第 8.2 款 [竣工时间] 规定的要求竣工（连同根据第 8.5 款 [竣工时间的延长] 的规定提出的任何延长期）的全部时间。

1.1.77 “Unforeseeable” means not reasonably foreseeable by an experienced contractor

by the Base Date.

1.1.77 “不可预见”系指经验丰富的承包商在基准日期前不能合理预见。

1.1.78 “Variation means any change to the Works, which is instructed as a variation under Clause 13 [Variations and Adjustments].

1.1.78 变更系指按照第 13 条 [变更和调整] 的规定，经指示作为变更的，对工程所做的任何更改。

1.1.79 “Works” mean the Permanent Works and the Temporary Works, or either of them as appropriate.

1.1.79 工程”系指永久性工程及临时工程，或两者中的一个（视情况而定）。

1.1.80 “year” means 365 days.

1.1.80 年指 365 天。

## 1.2 Interpretation 解释

In the Contract, except where the context requires otherwise:

在合同中，除上下文另有需要外：

(a) words indicating one gender include all genders; and “he”, “his” and “himself” shall be read as “he/she”, “his/her” and “himself/herself” respectively;

(a) 表示某一性别的词，包括所有性别；主格宾格表达同一意思（他、他的以及他自身”应分别理解为“她”、“他的/她的”以及“她自身/她自身”）

(b) words indicating the singular also include the plural and words indicating the plural also include the singular;

(b) 单数形式的词也包括复数含义，反之亦然；

(c) provisions including the word “agree”, “agreed” or “agreement” require the agreement to be recorded in writing;

(c) 包括“同意（商定）”、“已达成（取得）一致”或“协议”等词的各项规定都要求用书面记载；

(d) “written or in writing” means hand-written, type-written, printed or electronically made, and resulting in a permanent record;

(d) “书面或用书面”系指手写、打字、印刷、或电子制作，并形成永久性记录。

(e) “may” means that the Party or person referred to has the choice of whether to act or not in the matter referred to;

(e) “可以”系指当事人或被提及的人有权选择是否就所提及的事项采取行动；

(f) “shall means that the Party or person referred to has an obligation under the Contract to perform the duty referred to;

(f) “应该”系指当事人或被提及的人根据合同有义务履行所述职责；

(g) “consent” means that the Employer or the Contractor (as the case may be) agrees to, or gives permission for, the requested matter;

(g) “同意”系指雇主或承包商（视情况而定）同意或准许所要求的事项；

(h) “including” and “includes” shall be interpreted as not being limited to, or qualified by, the stated items that follow;



(h) “包括”应解释为不限于或不限定于下列所述项目 ;

(i) words indicating persons or parties shall be interpreted as referring to natural and legal persons (including corporations and other legal entities); and

(i) 指人或者当事人的词语, 应当理解为指自然人和法人 (包括公司和其他法定实体 )。

(j) “execute the Works ” or “execution of the Works ” means the design, construction and completion of the Works and the remedying of any defects.

(j) “执行工程 ”或“工程的执行 ”系指工程的设计、施工、完工, 以及缺陷修复。

In any list in these Conditions, where the second -last item of the list is followed by “and” or “or” or “and/or ” then all of the list items going before this item shall also be read as if they are followed by “and” or “or” or “and/ or ” (as the case may be).

在本条件的任何列中, 若列的倒数第二项接的是 “和或或和或”, 在本项之前的所有列项也应按照 “和或或和或(视情况而定 )”后接“和或或和或”来阅读。

The marginal words and other headings shall not be taken into consideration in the interpretation of these Conditions.

旁注和其他标题在本条件的解释中不应考虑。

### 1.3 Notices and Other Communications 通知及其他通信交流

Wherever these Conditions provide for the giving of a Notice (including a Notice of Dissatisfaction) or the issuing, providing, sending, submitting or transmitting of another type of communication (including acceptance, acknowledgement, advising, agreement, approval, certificate, Claim, consent, decision, determination, discharge, instruction, No-objection, record(s) of meeting, permission, proposal, record, reply, report, request, Review, Statement, statement, submission or any other similar type of communication), the Notice or other communication shall be in writing and:

本条件发出的所有通知 (含不满意通知) 或颁发, 发送, 提交, 传送其他方式的通信交流 (含接收, 确认, 建议, 协议, 批准, 证明, 索赔, 同意, 决定, 确定, 结清证明, 指示, 无异议, 报表, 声明, 提交物, 或其他类似的通信交流) , 都应是书面形式, 及:

(a) shall be:

(i) a paper -original signed by the Contractor ’s Representative, or the Employer ’s Representative (as the case may be); or

(ii) an electronic original generated from any of the systems of electronic transmission stated in the Contract Data (if not stated, system(s) acceptable to the Employer), where the electronic original is transmitted by the electronic address uniquely assigned to each of such authorised representatives, or both, as stated in these Conditions; and

(a) 应是:

(i) 由承包商代表或雇主代表 (视情况而定 )签署的文件正本 ;或

(ii) 若电子原件需根据合同规定通过每位授权代表 (或二者) 同意的电子地址进行传送, 电子原件需为合同数据 (若为规定, 则选择雇主接受的传输体系) 中规定的电子传输系统体系生成的电子原件。

(b) if it is a Notice, it shall be identified as a Notice. If it is another form of communication, it shall be identified as such and include reference to the provision(s) of the Contract under which it is issued where appropriate;

(b) 如果是通知，则应确定为通知。如果是通信交流的其他形式，应将其确定为适当形式并在适当情况下引用发出该文件的合同条款；

(c) delivered by hand (against receipt), or sent by mail or courier (against receipt), or transmitted using any of the systems of electronic transmission under sub-paragraph (a)(ii) above; and

(c) 以人手 (凭收据) 交付，或以邮递或速递 (凭收据) 交付，或使用上文 (a)(ii) 项下的任何电子传输系统传送；及

(d) delivered, sent or transmitted to the address for the recipient's communications as stated in the Contract Data. However, if the recipient gives a Notice of another address, all Notices and other communications shall be delivered accordingly after the sender receives such Notice.

(d) 交付、发送或传输到合同数据中规定的收件人通信地址。但是，如果收件人发出另一个地址的通知，则所有通知和其他通信应在发件人收到该通知后相应地发送。

Where these Conditions state that a Notice or NOD or other communication is to be delivered, given, issued, provided, sent, submitted or transmitted, it shall have effect when it is received (or deemed to have been received) at the recipient's current address under sub-paragraph (d) above. An electronically transmitted Notice or other communication is deemed to have been received on the day after transmission, provided no non-delivery notification was received by the sender.

如本条件规定通知、NOD 或其他通信交流通过传送，发出，签发，提供，发送，提交或传输方式传递，则通知应在收件人在根据上述 (d) 规定的当前地址收到 (或被认为已收到) 时生效。

All Notices, and all other types of communication referred to above, shall not be unreasonably withheld or delayed.

所有通知，以及上文所述的所有其他类型的通信交流不得无理进行扣留或延误。

When a Notice or NOD is issued by a Party or the Employer's Representative, the paper and/or electronic original shall be sent to the intended recipient and a copy shall be sent to the Employer's Representative or the other Party, as the case may be. All other communications shall be copied to the Parties and/or the Employer's Representative as stated under these Conditions or elsewhere in the Contract.

当一方或雇主代表签发通知或 NOD，纸质原件 / 电子原件应发送至目标接收者，并把副本发送至雇主代表或另一方 (视情况而定)。所有其他的通信交流均应按本条件或合同其他规定向双方和 / 或雇主代表发送副本。

#### 1.4 Law and Language 法律和语言

The Contract shall be governed by the law of the country (or other jurisdiction) stated in the Contract Data (if not stated, the law of the Country), excluding any conflict of law rules. 合同应受合同数据中所述国家 (或其他司法管辖区) 的法律管辖 (若未规定，则受工程所在国法律的管辖)，出现法律冲突除外。

The ruling language of the Contract shall be that stated in the Contract Data (if not stated, the language of these Conditions). If there are versions of any part of the Contract which are written in more than one language, the version which is in the ruling language shall prevail.

合同主导语言应在合同数据中规定 (若未规定，为本条件语言)。当合同任何部分的文本采

用一种以上语言编写时，应以主导语言文本为准。

The language for communications shall be that stated in the Contract Data. If no language is stated there, the language for communications shall be the ruling language of the Contract.

沟通交流应使用合同数据中指定的语言，如未指定，通信交流语言应使用合同主导语言。

#### 1.5 Priority of Documents 文件的优先次序

The documents forming the Contract are to be taken as mutually explanatory of one another. If there is any conflict, ambiguity or discrepancy, the priority of the documents shall be in accordance with the following sequence:

- (a) the Contract Agreement;
- (b) the Particular Conditions Part A –Contract Data;
- (c) the Particular Conditions Part B –Special Provisions;
- (d) these General Conditions;
- (e) the Employer 's Requirements;
- (f) the Schedules;
- (g) the Tender;
- (h) the JV Undertaking (if the Contractor is a JV); and
- (i) any other documents forming part of the Contract.

构成合同的文件要认为是互相说明的。如有冲突、歧义或差异，文件的优先次序如下：

- (a) 合同协议书
- (b) 专用条件 A 部分——合同数据
- (c) 专用条件 B 部分——特殊条款
- (d) 本通用条件
- (e) 雇主要求
- (f) 计划表
- (g) 投标书
- (h) 联营体承诺书（若承包商为联营体）
- (i) 其他任何构成合同部分的文件

If a Party finds an ambiguity or discrepancy in the documents, that Party shall promptly give a Notice to the other Party, describing the ambiguity or discrepancy. After giving or receiving such Notice, the Employer shall issue the necessary clarification or instruction.

如果一方发现文件中存在歧义或差异，应立即通知另一方，并说明歧义或差异。在发出或收到此类通知后，雇主应颁发必要的澄清或指示。

#### 1.6 Contract Agreement 合同协议书

The Contract shall come into full force and effect on the date stated in the Contract Agreement. The costs of stamp duties and similar charges (if any) imposed by law in connection with entry into the Contract Agreement shall be borne by the Employer.

合同自合同协议书规定的日期起全面实施和生效。为签订合同协议书，依法征收的印花税和类似的费用（如果有）应由雇主承担。

If the Contractor comprises a JV, the authorised representative of each member of the JV shall sign the Contract Agreement.

若承包商为联营体，联营体各成员的授权代表应在合同协议书上签字。

#### 1.7 Assignment 权益转让

Neither Party shall assign the whole or any part of the Contract or any benefit or interest in or under the Contract. However, either Party:

任一方都不应将合同的全部或任何部分，或合同中或根据合同所具有的任何利益或权益转让他人。但任一方：

(a) may assign the whole or any part of the Contract with the prior agreement of the other Party, at the sole discretion of such other Party; and

在另一方完全自主决定的情况下，事先征得其同意后，可以将全部或部分转让；

(b) may, as security in favour of a bank or financial institution, assign the Party's right to any moneys due, or to become due, under the Contract without the prior agreement of the other Party.

(b) 可以作为以银行或金融机构为受款人的担保，转让一方根据合同规定的任何到期或将到期应得款项的权利，无需经得另一方的事先同意。

#### 1.8 Care and Supply of Documents 文件的照管和提供

Each of the Contractor's Documents shall be in the custody and care of the Contractor, unless and until submitted to the Employer. The Contractor shall supply to the Employer one paper -original, one electronic copy (in the form as specified in the Employer's Requirements or, if not stated, a form acceptable to the Employer) and additional paper copies (if any) as stated in the Contract Data of each of the Contractor's Documents.

每份承包商文件都应由承包商保存和照管，除非并直到被雇主接收为止。承包商应按照各承包商文件的合同数据所作的规定向雇主提供一份原件，一份电子副本（以雇主的要求内规定的格式，若未规定，则以雇主可接受的格式）和额外的纸质副本（如有）。

The Contractor shall keep at all times, on the Site, a copy of:

- (a) the Contract;
- (b) the records under Sub-Clause 6.10 [Contractor's Records] and Sub-Clause 20.2.3 [Contemporary records];
- (c) the publications (if any) named in the Employer's Requirements;
- (d) the Contractor's Documents; and
- (e) Variations, Notices and other communications given under the Contract.

承包商应在现场时刻保存以下副本：

- (a) 合同；
- (b) 第 6.10 款 [承包商的记录] 和第 20.2.3 款 [同期记录] 项下的记录；
- (c) 雇主的要求内所列明的出版物（如有）；
- (d) 承包商文件；
- (e) 根据合同发出的变更、通知以及其他通信交流。

The Employer's Personnel shall have right of access to all these documents during all normal working hours, or as otherwise agreed with the Contractor.

雇主人员有权在所有正常工作时间内或按照与承包商另行商定的时间查阅所有上述文件。

If a Party becomes aware of an error or defect (whether of a technical nature or otherwise) in a document which was prepared by (or on behalf of) the Contractor for use in the

execution of the Works, the Party shall promptly give a Notice of such error or defect to the other Party. The Contractor shall then promptly rectify the error or defect at the Contractor's risk and cost.

如果一方发现为实施工程准备的由承包商编制（或以承包商名义）文件中有技术性错误或缺陷，应立即将该错误或缺陷通知另一方。承包商应立即纠正错误或缺陷，风险和费用由承包商承担。

#### 1.9 Employer's Use of Contractor's Documents 雇主使用承包商的文件

As between the Parties, the Contractor shall retain the copyright and other intellectual property rights in the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.

由承包商（或以其名义）编制的承包商文件及其他设计文件，就当事双方而言，其版权和其他知识产权应归承包商所有。

The Contractor shall be deemed (by signing the Contract Agreement) to give to the Employer a non-terminable transferable non-exclusive royalty-free licence to copy, use and communicate the Contractor's Documents and such other design documents, including making and using modifications of them. This licence shall:

承包商（通过签署合同）应被认为已经给予雇主一项无限期的、可转让的、不排他的、免版税的，复制、使用和传送承包商文件及此类其他设计文件的许可，包括对它们做出修改和使用修改后的文件的许可。这项许可将：

(a) apply throughout the actual or intended operational life (whichever is longer) of the relevant parts of the Works;

适用于工程相关部分的实际或预期运营期（取较长的）；

(b) entitle any person in proper possession of the relevant part of the Works to copy, use and communicate the Contractor's Documents and such other design documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the Works;

允许具有工程相关部分正当占有权的任何人，为了完成、操作、维修、更改、调整、修复和拆除工程的目的，复制、使用和传送承包商文件以及此类其他设计文件；

(c) in the case of Contractor's Documents and such other design documents which are in the form of electronic or digital files, computer programs and other software, permit their use on any computer on the Site and/or at the locations of the Employer and the Employer's Representative and/or at other places as envisaged by the Contract; and

在承包商文件及此类其他设计文件是电子或数码文件、计算机程序或其他软件形式的情况下，允许它们在现场和/或在雇主及雇主代表的任何地点和/或合同中设想的其他场所的任何计算机上使用；以及

(d) in the event of termination of the Contract:

(d) 在合同终止的情况下：

(i) under Sub-Clause 15.2 [Termination for Contractor's Default], entitle the Employer to copy, use and communicate the Contractor's Documents and the other design documents made by or for the Contractor; or

(i) 根据第 15.2 款[因承包商违约而终止]，雇主有权复制、使用和传输承包商的文件以及由承包商制作或为承包商制作的其他设计文件；

(ii) under Sub -Clause 15.5 [Termination for Employer 's Convenience], SubClause 16.2 [Termination by Contractor] or Sub-Clause 18.5 [Optional Termination], entitle the Employer to copy, use and communicate the Contractor 'Documents for which the Contractor has received payment for the purpose of completing the Works and/or arranging for any other entities to do so.

(ii) 根据第 15.5 款 [因雇主的便利而终止 ], 第 16.2 款 [由承包商终止 ]或第 18.5 款 [自主选择的终止 ], 雇主有权复制、使用和传送承包商的文件, 因为承包商已收到为完成工程的付款, 和/或安排任何其他实体完成该工程。

The Contractor 's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor 's prior consent, be used, copied or communicated to a third party by (or on behalf of) the Employer for purposes other than those permitted under this Sub -Clause.

未经承包商同意, 雇主 (或以其名义) 不得在本款允许以外, 为其他目的使用、复制由承包商 (或以其名义) 编制的承包商文件和其他设计文件, 或将其传送给第三方。

#### 1.10 Contractor 's Use of Employer 's Documents 承包商使用雇主的文件

As between the Parties, the Employer shall retain the copyright and other intellectual property rights in the Employer 'sRequirements and other documents made by (or on behalf of) the Employer. The Contractor may, at the Contractor 's cost, copy, use and communicate these documents for the purposes of the Contract.

由雇主 (或以其名义) 编制的雇主要求以及其他文件, 就当事双方而言, 其版权和其他知识产权应归雇主所有。承包商因合同的目的, 可自费复制、使用和传送上述文件。

These documents (in whole or in part) shall not, without the Employer 's prior consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.

除合同需要外, 未经雇主事先同意, 承包商不得使用、复制上述文件 (全部或部分) , 或其传送给第三方。

#### 1.11 Confidentiality 保密

The Contractor shall disclose all such confidential and other information as the Employer may reasonably require in order to verify the Contractor 's compliance with the Contract.

承包商应按照雇主合理要求, 披露所有机密信息和其他信息, 以核实承包商是否遵守合同。

The Contractor shall treat all documents forming the Contract as confidential, except to the extent necessary to carry out the Contractor 's obligations under the Contract. The Contractor shall not publish, permit to be published, or disclose any particulars of the Contract in any trade or technical paper or elsewhere without the Employer 's prior consent.

承包商应把所有构成合同的文件视为机密文件, 除非在某种程度上根据合同需要履行承包商义务。未经雇主事先同意, 承包商不得在任何交易或技术文件或其他任何地方公布、允许公布或披露合同的任何细节。

The Employer and the Employer 's Personnel shall treat all information provided by the Contractor and marked " confidential ", as confidential. The Employer and the Employer 's Personnel shall not disclose or permit to be disclosed any such information to third parties,

except as may be necessary when exercising the Employer's rights under Sub-Clause 15.2 [Termination for Contractor's Default].

雇主和雇主人员应将承包商提供的标有“机密”字样的所有信息视为机密。雇主和雇主人员不得向第三方披露或允许披露任何此类信息，除非在行使第 15.2 款 [因承包商违约而终止] 雇主权利时，可在必要时披露此类信息。

A Party's obligation of confidentiality under this Sub-Clause shall not apply where the information:

(a) was already in that Party's possession without an obligation of confidentiality before receipt from the other Party;

(b) becomes generally available to the public through no breach of these Conditions; or

(c) is lawfully obtained by the Party from a third party which is not bound by an obligation of confidentiality.

当信息为以下时，一方根据本条承担的保密义务不适用：

(a) 一方在收到另一方信息前，一方已掌握此类信息且无保密义务。

(b) 在不违反本条件的情况下向公众提供此类信息。

(c) 一方从第三方合法取得的此类信息且不受保密义务约束。

#### 1.12 Compliance with Laws 遵守法律

The Contractor and the Employer shall, in performing the Contract, comply with all applicable Laws. Unless otherwise stated in the Employer's Requirements:

承包商及雇主在履行合同期间，应遵守所有适用法律。除非雇主的要求中另有规定：

(a) the Employer shall have obtained (or shall obtain) the planning, zoning or building permit or similar permits, permissions, licences and/or approvals for the Permanent Works, and any other permits, permissions, licenses and/or approvals described in the Employer's Requirements as having been (or being) obtained by the Employer. The Employer shall indemnify and hold the Contractor harmless against and from the consequences of any delay or failure to do so, unless the failure is caused by the Contractor's failure to comply with sub-paragraph (c) below;

(a) 雇主应已（或将）为永久性工程取得规划、区域划定、施工许可或类似的许可、执照和/或批准，以及在雇主要求中所述的雇主已（或将）取得的任何其他许可；雇主应保障并保持使承包商免受因未能完成上述工作带来的伤害，除非承包商未能遵守下列 (c)：

(b) the Contractor shall give all notices, pay all taxes, duties and fees, and obtain all other permits, permissions, licences and/or approvals, as required by the Laws in relation to the execution of the Works. The Contractor shall indemnify and hold the Employer harmless against and from the consequences of any failure to do so unless the failure is caused by the Employer's failure to comply with Sub-Clause 2.2 [Assistance];

(b) 承包商应发出所有通知，缴纳各项税费，按照法律关于执行工程的要求，办理并领取所需要的全部许可、执照或批准；承包商应保障并保持使雇主免受因未能完成上述工作带来的伤害，除非雇主未能遵守第 2.2 款 [协助]。

(c) within the time(s) stated in the Employer's Requirements the Contractor shall provide such assistance and all documentation, as described in the Employer's Requirements or otherwise reasonably required by the Employer, so as to allow the Employer to obtain any permit, permission, licence or approval under sub-paragraph (a) above; and

(c) 在雇主的要求中所述的时间内，承包商应根据雇主的要求或雇主其他合理的要求向雇主提供协助和文件，以便雇主获得上文 (a)项的任何许可证、许可、执照或批准；

(d) the Contractor shall comply with all permits, permissions, licences and/ or approvals obtained by the Employer under sub -paragraph (a) above.

(d) 承包商应遵从雇主根据上文 (a)项获得的所有许可证、许可、执照和 /或批准。

If, having complied with sub -paragraph (c) above, the Contractor suffers delay and/or incurs Cost as a result of the Employer 's delay or failure to obtain any permit, permission, licence or approval under sub -paragraph (a) above, the Contractor shall be entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT] to EOT and/or payment of such Cost Plus Profit.

如果承包已经遵守上述 (c)的要求，却因雇主的延迟或未能取得上述 ( a) 项下的许可证，许可，执照或批准，遭受延误和 /或费用损失，承包商有权根据第 20.2[ 索赔付款和 /或 EOT] 获得 EOT 和 /或成本加利润的付款。

If the Employer incurs additional costs as a result of the Contractor 's failure to comply with:

(i) sub-paragraph (c) above; or

(ii) sub -paragraph (b) or (d) above, provided that the Employer shall have complied with Sub -Clause 2.2 [Assistance],

the Employer shall be entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT] to payment of these costs by the Contractor.

如果雇主因承包商未能遵守下列规定而产生额外费用：

(i) 上述 (c) 项

(ii) 上述 (b) 或 (d) 项，如果雇主未能遵守第 2.2 款 [协助]

雇主有权根据第 20.2 款 [索赔付款和 /或 EOT] 承包商承担的费用补偿。

### 1.13 Joint and Several Liability 共同的和各自的责任

If the Contractor is a Joint Venture:

(a) the members of the JV shall be jointly and severally liable to the Employer for the performance of the Contractor 's obligations under the Contract;

(b) the JV leader shall have authority to bind the Contractor and each member of the JV;

and

(c) neither the members nor (if known) the scope and parts of the Works to be carried out by each member nor the legal status of the JV shall be altered without the prior consent of the Employer (but such consent shall not relieve the altered JV from any liability under sub-paragraph (a) above).

### 1.13 共同的和各自的责任

若承包商为联营体：

(a) 联营体的成员应向雇主承担连带责任，以履行承包商在合同下的义务；

(b) 联营体负责人有权约束承包商以及联营体中的每位成员；

(c) 若未经得雇主的事先同意（但根据上述 (a)项，此类同意不能免除更改后的联营体的责任），不得改变联营体成员或每个成员负责执行的工程范围或联营体的法律地位。



1.14 Limitation of Liability 责任限度

Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit,

loss of any contract or for any indirect or consequential loss or damage which may be

suffered by the other Party in connection with the Contract, other than under:

就本合同下的任何工程使用的损失、利润损失、合同损失或间接损失，一方均不对另一方负责，除根据下列子项外：

- (a) Sub-Clause 8.8 [Delay Damages];
- (b) sub-paragraph (c) of Sub-Clause 13.3.1 [Variation by Instruction];
- (c) Sub-Clause 15.7 [Payment after Termination for Employer's Convenience];
- (d) Sub-Clause 16.4 [Payment after Termination by Contractor];
- (e) Sub-Clause 17.3 [Intellectual and Industrial Property Rights];
- (f) the first paragraph of Sub-Clause 17.4 [Indemnities by Contractor]; and
- (g) Sub-Clause 17.5 [Indemnities by Employer].

The total liability of the Contractor to the Employer under or in connection with the Contract, other than:

- (i) under Sub-Clause 2.6 [Employer-Supplied Materials and Employer's Equipment];
- (ii) under Sub-Clause 4.19 [Temporary Utilities];
- (iii) under Sub-Clause 17.3 [Intellectual and Industrial Property Rights]; and
- (iv) under the first paragraph of Sub-Clause 17.4 [Indemnities by Contractor],

shall not exceed the sum stated in the Contract Data or (if a sum is not so stated) the

Contract Price stated in the Contract Agreement.

- (a) 第 8.8 款 [误期损害赔偿费]
- (b) 第 13.3.1 款 [按指示进行变更] (c) 项
- (c) 第 15.7 款 [因雇主的便利而终止后的付款]
- (d) 第 16.4 款 [承包商终止后的付款]
- (e) 第 17.3 款 [知识产权和工业产权]
- (f) 第 17.4 款 [由承包商保障] 第 1 段
- (g) 第 17.5 款 [由雇主保障]

根据合同或与合同联系承包商对雇主承担全部责任，除了：

- (i) 根据第 2.6 款 [雇主提供的材料及雇主设备]
- (ii) 根据第 4.19 款 [临时公共设施]
- (iii) 根据第 17.3 款 [知识产权和工业产权]
- (iv) 根据第 17.4 款第 1 段 [由承包商保障]

不应超过合同数据内规定的金额，或者不超过 (如未规定金额) 合同协议书内规定的合同价格。

This Sub-Clause shall not limit liability in any case of fraud, gross negligence, deliberate

default or reckless misconduct by the defaulting Party.

本款不应限制违约方的欺骗、明显疏忽、有意违约、或轻率的不当行为等任何情况的责任。

1.15 Contract Termination 合同终止

Subject to any mandatory requirements under the governing law of the Contract,

termination of the Contract under any Sub-Clause of these Conditions shall require no

action of whatsoever kind by either Party other than as stated in the Sub-Clause.

根据本合同管辖法律的任何强制性要求，本条件的任何条款下的合同终止，任意一方可采取

无行动（无作为）进行回应，除非本条款有规定。

## 2 The Employer 雇主

### 2.1 Right of Access to the Site 现场进入权

The Employer shall give the Contractor right of access to, and possession of, all parts of the Site within the time (or times) stated in the Contract Data. The right and possession may not be exclusive to the Contractor. If, under the Contract, the Employer is required to give (to the Contractor) possession of any foundation, structure, plant or means of access, the Employer shall do so in the time and manner stated in the Employer's Requirements. However, the Employer may withhold any such right or possession until the Performance Security has been received.

雇主应在合同文件中规定的时间（或几个时间）内，给承包商进入和占用现场各部分的权利。此项进入和占用权可不为承包商独享。如果根据合同，要求雇主（向承包商）提供任何基础、结构、生产设备或进出通道的占用权，雇主应按雇主要求中规定的时间和方式提供。但雇主在收到履约担保前，可保留上述任何进入或占用权，暂不给予。

If no such time is stated in the Contract Data, the Employer shall give the Contractor right of access to, and possession of, the Site with effect from the Commencement Date.

If the Contractor suffers delay and/or incurs Cost as a result of a failure by the Employer to give any such right or possession within such time, the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to EOT and/or payment of such Cost Plus Profit.

如果在合同文件中没有规定上述时间，雇主应自开工日期起给承包商进入和占用现场的权利。如果雇主未能及时给承包商上述进入和占用的权利，使承包商遭受延误和（或）招致增加费用，承包商根据第 20.2 款 [费用和（或）工期延误的索赔] 的规定有权要求任何此类费用加上利润和（或）工期延误的索赔。

However, if and to the extent that the Employer's failure was caused by any error or delay by the Contractor, including an error in, or delay in the submission of, any of the applicable Contractor's Documents, the Contractor shall not be entitled to such EOT and/or Cost Plus Profit.

但是，如果出现雇主的违约是由于承包商的任何错误或延误，包括在任何承包商文件中的错误或应用文件提交延误造成的情况，承包商应无权得到上述延长期和（或）费用加上利润。

If, under the Contract, the Employer is required to give to the Contractor possession of any foundation, structure, plant or means of access in accordance with Contractor's Documents, the Contractor shall submit such Contractor's Documents to the Employer in the time and manner stated in the Employer's Requirements.

如果按照合同规定，根据承包商的文件要求雇主向承包商提供任何基础、结构、生产设备或进出通道的占用权，承包商应按雇主要求中规定的时间和方式提供承包商的文件给雇主。

## 2.2 Assistance 协助

If requested by the Contractor, the Employer shall promptly provide reasonable assistance to the Contractor so as to allow the Contractor to obtain:

如果承包商有要求，雇主应迅速的对其提供合理的协助以便承包商获得以下文件：

(a) copies of the Laws of the Country which are relevant to the Contract but are not readily available; and

(a) 与合同有关，但不易得到的工程所在国的法律文本；以及

(b) any permits, permissions, licences or approvals required by the Laws of the Country (including information required to be submitted by the Contractor in order to obtain such permits, permissions, licences or approvals):

(b) 工程所在国法律要求下的任何许可、准许、执照或批准 (包括承包商为了得到这种许可、准许、执照或批准而要求提供的相关资料)：

(i) which the Contractor is required to obtain under Sub-Clause 1.12 [Compliance with Laws];

(i) 根据第 1.12 款 [遵守法律] 的规定，承包商需要得到的；

(ii) for the delivery of Goods, including clearance through customs; and

(ii) 为运送货物，包括清关需要的；以及

(iii) for the export of Contractor's Equipment when it is removed from the Site.

(iii) 当承包商设备运离现场出口时需要的。

## 2.3 Employer's Personnel and Other Contractors 雇主人员和其他承包商

The Employer shall be responsible for ensuring that the Employer's Personnel and the Employer's other contractors (if any) on or near the Site:

雇主应负责保证在现场或附近的雇主人员和其他承包商（如果有）做到：

(a) co-operate with the Contractor's efforts under Sub-Clause 4.6 [Co-operation]; and

(a) 根据第 4.6 款 [合作] 的规定，与承包商的各项努力进行合作；以及

(b) comply with the same obligations which the Contractor is required to comply with under sub-paragraphs (a) to (e) of Sub-Clause 4.8 [Health and Safety Obligations] and under Sub-Clause 4.18 [Protection of the Environment].

(b) 遵守与根据第 4.8 款 [健康和安义务] 的第(a)至(e)项和第 4.18 款 [环境保护] 要求承包商所遵循的同样义务。

The Contractor may require the Employer to remove (or cause to be removed) any person of the Employer's Personnel or of the Employer's other contractors (if any) who is found, based on reasonable evidence, to have engaged in corrupt, fraudulent, collusive or coercive practice.

如果发现雇主人员或其他承包商（如果有）涉及腐败、欺诈、共谋或强迫行为并且证据充分，承包商可以要求雇主开除（或导致被开除）其上述人员或其他承包商。

#### 2.4 Employer 's Financial Arrangements 雇主的资金安排

The Employer 's arrangements for financing the Employer 's obligations under the Contract shall be detailed in the Contract Data.

在合同数据表中应明确说明雇主的资金安排是雇主的义务。

If the Employer intends to make any material change (affecting the Employer 's ability to pay the part of the Contract Price remaining to be paid at that time as estimated by the Employer) to these financial arrangements, or has to do so because of changes in the Employer 's financial situation, the Employer shall immediately give a Notice to the Contractor with detailed supporting particulars.

如果雇主计划对其资金安排做出任何重要变更（影响到按雇主估计在当时应付合同价款的支付能力），或由于雇主的资金状况的改变必须做出变更，雇主应将其变更的详细情况通知承包商。

If the Contractor:

如果承包商：

(a) receives an instruction to execute a Variation with a price greater than ten percent (10%) of the Contract Price stated in the Contract Agreement, or the accumulated total of Variations exceeds thirty percent (30%) of the Contract Price stated in the Contract Agreement;

(a) 收到执行价格超过合同协议中约定价格的 10%，或者累计变更总额超过合同协议中约定的合同价格的 30% 的变更指示；

(b) does not receive payment in accordance with Sub-Clause 14.7 [Payment]; or

(b) 未收到第 14.7 款 [付款] 规定的付款；或

(c) becomes aware of a material change in the Employer 's financial arrangements of which the Contractor has not received a Notice under this Sub-Clause, the Contractor may request and the Employer shall, within 28 days after receiving this request, provide reasonable evidence that financial arrangements have been made and are being maintained which will enable the Employer to pay the part of the Contract Price remaining to be paid at that time (as estimated by the Employer).

(c) 承包商意识到雇主在资金安排上的重大变化，并且承包商没有收到本条规定的通知，承包商可以要求雇主在收到该要求的 28 天内提供合理的证据表明其安排了资金并保留在（雇主预计的）时间，用于支付该合同款的剩余应付款项。

#### 2.5 Site Data and Items of Reference 现场数据和有关资料

The Employer shall have made available to the Contractor for information, before the Base Date, all relevant data in the Employer 's possession on the topography of the Site and on sub-surface, hydrological, climatic and environmental conditions at the Site. The Employer shall promptly make available to the Contractor all such data which comes into the Employer 's possession after the Base Date.

雇主应在基准日期之前，向承包商提供其拥有的关于现场地形、地下、水文、气候和环境条件方面的所有有关数据资料。雇主在基准日期之后得到的所有此类资料，也应及时交给承包商。

The original survey control points, lines and levels of reference (the "items of reference" in

these Conditions) shall be specified in the Employer 's Requirements.

涉及的原始测量控制点、线路和基准点 (本条件下的有关资料 )应在雇主的要求中详细说明。

The Employer shall have no responsibility for the accuracy, sufficiency or completeness of

such data and/or items of reference, except as stated in Sub -Clause 5.1 [General Design Obligations].

除第 5.1 款 [设计义务一般要求 ]规定的情况以外, 雇主对这些数据和 /或有关资料的准确性、充分性或完整性不承担责任。

2.6 Employer- Supplied Materials and Employer 's Equipment 雇主提供的材料和设备

If Employer -Supplied Materials and/or Employer 's Equipment are listed in the Employer 's Requirements for the Contractor 's use in the execution of the Works, the Employer shall make such materials and/or equipment available to the Contractor in accordance with the details, times, arrangements, rates and prices stated in the Employer 's Requirements.

如果有雇主提供的材料和 /或雇主提供的设备供承包商在工程实施中使用, 雇主应按照雇主要求中列出的细节、时间、安排、费率和价格提供这些材料和 /或设备给承包商使用。

The Contractor shall be responsible for each item of Employer 's Equipment whilst any of the Contractor 's Personnel is operating it, driving it, directing it, using it, or in control of it.

在承包商的任何人员操作、驾驶、指挥、使用或控制某项雇主设备时, 承包商应对该项设备负责。

3 The Employer 's Administration 雇主的管理

3.1 The Employer 's Representative 雇主代表

The Employer shall appoint the Employer 's Representative who, except as otherwise stated in these Conditions, shall be deemed to act on the Employer 's behalf under the Contract.

雇主可以任命一名雇主代表, 除了本条件另有规定外, 应被视为在本合同条款下雇主的代理。

The Employer 's Representative shall be vested with, and (unless and until the Employer notifies the Contractor otherwise) shall be deemed to have, the full authority of the Employer under the Contract except in respect of Clause 15 [Termination by Employer].

The Employer 's Representative (or, if a legal entity, the natural person appointed to act on its behalf) shall:

除第 15 条 [被雇主终止 ]外, 雇主代表在本合同项下应被授予并被视为拥有雇主的全部权力

(除非雇主另行通知承包商 )。雇主代表 (或, 如为法人, 则为其指定的自然人代表 )应当:

(a) carry out the duties assigned to him/her, and exercise the authority delegated to him/her, by the Employer;

(a) 履行雇主委派给他 /她的职责, 并行使雇主委派给他 /她的权力;

(b) be competent to carry out these duties and exercise this authority;

(b) 有能力履行这些职责并行使这些权力;

(c) act as a skilled professional; and

(c) 表现行为是一个熟练的专业人士; 以及

(c) be fluent in the ruling language defined in Sub -Clause 1.4 [Law and Language].

(d) 熟练使用第 1.4 款 [法律和语言 ]规定的语言。

Where the Employer 's Representative is a legal entity, the Employer 's Representative

shall give a Notice to the Parties of the natural person (or any replacement) appointed and authorised to act on its behalf. The authority shall not take effect until this Notice has been received by both Parties. The Employer 's Representative shall similarly give a Notice of any revocation of such authority.

如果雇主代表是一个法律实体，雇主代表应发出通知指定一个自然人 (或者其他代替人) 并授权其代表该法律实体主持工作。在各方收到本通知前，本授权不生效。雇主代表也可以同样发出通知撤销该项授权。

If the Employer wishes to replace any person appointed as the Employer 's Representative, the Employer shall, not less than 14 days before the intended date of replacement, give a Notice to the Contractor of the replacement 's name, address, duties and authority, and of the date of appointment.

如果雇主希望替换任何已任命的雇主代表，应在不少于 14 天前将替换人的姓名、地址、任务和权力、以及任命的日期通知承包商。

The Employer shall not replace the Employer 's Representative with a person (whether a legal entity or a natural person) against whom the Contractor has raised reasonable objection by a Notice under this Sub -Clause.

承包商根据本条款发出通知，在该通知中提出了合理的反对意见，雇主不得替换雇主代表 (无论是法律实体还是自然人)。

### 3.2 Other Employer 's Personnel 其他雇主人员

The Employer or the Employer 's Representative may from time to time assign duties and delegate authority to assistants, and may also revoke such assignment or delegation, by giving a Notice to the Contractor of the name, assigned duties and delegated authority of the assistant. The assignment, delegation or revocation shall not take effect until this Notice has been received by the Contractor.

雇主或雇主代表可随时对一些助手指派和托付一定的任务和权力，也可撤销这些指派和付托，通过对承包商发出通知告知其姓名、指派的任务和付托的权力。以上指派、付托或撤销在承包商收到上述通知后生效。

However, the Employer 's Representative shall not delegate the authority to:  
但是，雇主代表不得将以下职权委托他人：

- (a) act under Sub -Clause 3.5 [Agreement or Determination]; and/or
- (a) 根据第 3.5 款 [协议或决定] 规定的行为；和 / 或
- (b) issue a Notice to Correct under Sub -Clause 15.1 [Notice to Correct].
- (b) 根据第 15.1 款 [更正通知书] 规定签发的更正通知书。

Assistants shall be suitably qualified natural persons, who are competent to carry out these duties and exercise this authority, and who are fluent in the language for communications defined in Sub -Clause 1.4 [Law and Language].

这些助手应当是具有适当资质的自然人，且具备履行其任务和权利的能力，并能流利地使用第 1.4 款 [法律和语言] 规定的交流语言。

### 3.3 Delegated Persons 受托人员

All persons, including the Employer 's Representative and assistants, to whom duties have been assigned or authority has been delegated by a Notice of delegation given under

Sub-Clause 3.1 [The Employer's Representative] or Sub-Clause 3.2 [Other Employer's Personnel] (as the case may be), shall only be authorised to issue instructions and communications and/or to give Notices to the Contractor to the extent defined by the Notice of delegation. Any acceptance, agreement, approval, check, certificate, comment, consent, disapproval, examination, inspection, instruction, Notice, No -objection, record(s) of meeting, permission, proposal, record, reply, report, request, Review, test, valuation, or similar act (including the absence of any such act) by a delegated person, in accordance with the Notice of delegation, shall have the same effect as though the act had been an act of the Employer.

所有这些人员包括已被指派任务、付托权力的雇主代表和助手，是根据第 3.1 款[雇主代表] 规定或第 3.2 款[其他雇主人员](视情况而定)规定发出通知确定的，应只被授权在付托规定的范围内发布指示、沟通和/或在授权通知规定的范围内向承包商发出通知。由受托人员根据授权通知做出的任何接受、协议、批准、检查、证明、评论、同意、反对、检测、检查、指示、通知、无意见、会议记录、许可、建议、记录、回复、报告、请求、复核、试验、评估、或被受托人类似的行为(没有包括在内的任何此类行动)，应如同雇主采取的行动一样有效。

However:

但:

(a) unless otherwise stated in the delegated person's communication relating to such act, it shall not relieve the Contractor from any duty, obligation or responsibility the Contractor has under or in connection with the Contract; and

(a) 除非在受托人员关于上述行动的信函中另有说明，该行动都不免除承包商在本合同项下或与本合同有关的任何职责、义务或责任；以及

(b) if the Contractor questions any instruction, communication or Notice given by a delegated person, the Contractor may by giving a Notice refer the matter to the Employer.

The Employer shall be deemed to have confirmed such instruction, communication or Notice if the Employer does not respond within 7 days after receiving the Contractor's Notice, reversing or varying the delegated person's instruction, communication or Notice.

(b) 如果承包商对受托人员的指示、信函或通知提出质疑，承包商可将此事项给雇主发出通知。如果雇主收到承包商通知后的 7 日内不回复，不撤销或改变被受托人的指示、信函或通知，雇主将被视为认同被受托人员的指示、信函或通知。

### 3.4 Instructions 指示

The Employer may, through the Employer's Representative or an assistant as stated below, issue to the Contractor (at any time) instructions which may be necessary for the execution of the Works, all in accordance with the Contract. Each instruction shall state the obligation(s) to which it relates and the Sub-Clause (or other term of the Contract) in which the obligation(s) are specified.

按照合同的规定，雇主可通过雇主代表或助手向承包商(在任何时候)发出下述施工所必需的指示。每项指示均应说明与之有关的义务，以及规定这些义务的子条款(或合同的其他条款)。

The Contractor shall only take instructions from the Employer's Representative or an assistant to whom the appropriate authority to give instruction has been delegated by a Notice given under Sub-Clause 3.2 [Other Employer's Personnel].

根据第 3.2 款 [其他雇主人员] 的规定, 并已通知将适当的指示权力授予该代表或助理, 承包商应接受雇主代表或助理的指示。

Subject to the following provisions of this Sub -Clause, the Contractor shall comply with the instructions given by the Employer 's Representative or delegated assistant, on any matter related to the Contract.

在遵守本条款下列规定的前提下, 承包商应遵守雇主代表或授权助理发出与合同有关的任何事项所作的指示。

If an instruction states that it constitutes a Variation, Sub-Clause 13.3.1 [Variation by Instruction] shall apply.

如指示表明其构成变更, 则应适用第 13.3.1 款 [指示变更] 的规定。

If not so stated, and the Contractor considers that the instruction:

如果没有说明, 承包商则认为该指示:

(a) constitutes a Variation (or involves work that is already part of an existing Variation); or

(a) 构成变更 (或涉及的工作已属于现有变更一部分); 或

(b) does not comply with applicable Laws or will reduce the safety of the Works or is technically impossible

the Contractor shall immediately, and before commencing any work related to the instruction, give a Notice to the Employer with reasons. If the Employer does not respond within 7 days (or such other time as may be agreed between the Parties) after receiving this Notice, by giving a Notice confirming, reversing or varying the instruction, the Employer shall be deemed to have revoked the instruction. Otherwise the Contractor shall comply with and be bound by the terms of the Employer 's response.

(b) 不遵守适用的法律, 或会降低工程的安全, 或在技术上不可能。

承包商应在开始与该指示有关的任何工作之前, 将理由通知雇主。如果雇主在收到本通知后 7 天内 (或双方商定的其他时间内), 未发出通知确认、撤销或变更该指示做出答复, 则雇主应被视为已撤销该指示。否则, 承包商应遵守雇主答复的内容并受其约束。

### 3.5 Agreement or Determination 商定或决定

When carrying out his/her duties under this Sub -Clause, the Employer 's Representative shall not be deemed to act for the Employer.

雇主代表根据本款规定履行其职责时, 不应视为代表雇主行事。

Whenever these Conditions provide that the Employer 's Representative shall proceed under this Sub -Clause to agree or determine any matter or Claim, the following procedure shall apply:

当雇主代表应根据本条款规定的这些条件商定或决定任何事项或索赔时, 应适用下列程序:



3.5.1 Consultation to reach agreement 协商达成协议

The Employer's Representative shall consult with both Parties jointly and/or separately, and shall encourage discussion between the Parties in an endeavour to reach agreement.

The Employer's Representative shall commence such consultation promptly to allow adequate time to comply with the time limit for agreement under Sub-Clause 3.5.3 [Time limits]. Unless otherwise proposed by the Employer's Representative and agreed by the Parties, the Employer's Representative shall provide both Parties with a record of the consultation.

雇主代表应与双方共同和 (或)单独协商, 并应鼓励双方进行协商, 努力促使双方达成一致。雇主代表应立即开始协商, 以便有足够的时间满足第 3.5.3 款【时间限制】规定项下的商定期限。除雇主代表另有提议并经双方同意外, 雇主代表应向双方提供协商记录。

If agreement is achieved within the time limit for agreement under Sub-Clause 3.5.3 [Time limits], the Employer's Representative shall give a Notice to both Parties of the agreement, which agreement shall be signed by both Parties. This Notice shall state that it is a "Notice of the Parties' Agreement" and shall include a copy of the agreement.

If:

如果在第 3.5.3 款【时间限制】规定项下的商定期限内达成一致, 雇主代表应向双方发出通知, 由双方签署所达成的协议。本通知应声明这是一份“协商一致的通知”, 并应包括所达成的协议副本。

如果:

(a) no agreement is achieved within the time limit for agreement under Sub-Clause 3.5.3 [Time limits]; or

(a) 在第 3.5.3 款 [时间限制] 规定项下的商定期限内未达成一致 ;

(b) both Parties advise the Employer's Representative that no agreement can be achieved within this time limit

(b) 双方通知雇主代表, 在此期限内不能达成一致

whichever is the earlier, the Employer's Representative shall give a Notice to the Parties accordingly and shall immediately proceed under Sub-Clause 3.5.2 [Employer's Representative's determination].

在以上两者中以较早者为准, 雇主代表应就此通知双方, 并应立即按照第 3.5.2 款[雇主代表的决定]的规定执行。

3.5.2 Employer's Representative's determination 雇主代表的决定

The Employer's Representative shall make a fair determination of the matter or Claim, in accordance with the Contract, taking due regard of all relevant circumstances.

雇主代表应当根据合同, 在充分考虑有关情况的前提下, 公平地决定事项或索赔。

Within the time limit for determination under Sub-Clause 3.5.3 [Time limits], the Employer's Representative shall give a Notice to both Parties of his/her determination.

This Notice shall state that it is a "Notice of the Employer's Representative's Determination", and shall describe the determination in detail with reasons and detailed supporting particulars.

在第 3.5.3 款 [时间限制] 规定项下的决定期限内，雇主代表应将其决定通知双方。本通知应声明这是一份“雇主代表的决定通知”，并应详细说明决定的理由和详细的支持性材料。

### 3.5.3 Time limits 时间限制

The Employer's Representative shall give the Notice of agreement, if agreement is achieved, within 42 days, or within such other time limit as may be proposed by the Employer's Representative and agreed by both Parties (the "time limit for agreement" in these Conditions), after:

如果在 42 天内或者是雇主代表在经双方同意的情况下提出的其他期限内 (本条件下的协议期限) 达成一致，雇主代表应在下列日期之后，发出协商一致的通知：

(a) in the case of a matter to be agreed or determined (not a Claim), the date of commencement of the time limit for agreement as stated in the applicable Sub-Clause of these Conditions;

(a) 至于如果被商定或决定的为事项 (而非索赔)，本合同条件中的相应的条款明确的适用的商定期限起算日期；

(b) in the case of a Claim under sub-paragraph (c) of Sub-Clause 20.1 [Claims], the date the Employer's Representative receives a Notice under Sub-Clause 20.1 from the claiming Party; or

(b) 如果是第 20.1 款 [索赔] 项下的第 (c) 款规定的索赔，雇主代表收到索赔方根据第 20.1 款发出的索赔通知的日期；或

(c) in the case of a Claim under sub-paragraph (a) or (b) of Sub-Clause 20.1 [Claims], the date the Employer's Representative receives:

(c) 如果是第 20.1 款 [索赔] 规定项下的第 (a) 或 (b) 款规定的索赔，雇主代表收到的以下索赔报告的日期：

(i) a fully detailed Claim under Sub-Clause 20.2.4 [Fully Detailed Claim]; or

(i) 根据第 20.2.4 款 [完整详细索赔报告] 规定的完整详细的索赔报告；或

(ii) in the case of a Claim under Sub-Clause 20.2.6 [Claims of continuing effect], an interim or final fully detailed Claim (as the case may be).

(ii) 如属根据第 20.2.6 条 [持续影响的索赔] 规定的索赔，则为期中或最终完整详细的索赔报告 (视情况而定)。

The Employer's Representative shall give the Notice of his/her determination within 42 days, or within such other time limit as may be proposed by the Employer's Representative and agreed by both Parties, (the "time limit for determination" in these Conditions), after the date corresponding to his/her obligation to proceed under the last paragraph of Sub-Clause 3.5.1.

雇主代表应当在下述时间内将其决定发出通知，在 42 天内或者是雇主代表提出的并且是经双方同意的其他期限内 (本条件下的“决定的期限”)，在他/她根据第 3.5.1 款最后一段内容规定履行义务的日期之后。

[Consultation to reach agreement] 协商达成协议

If the Employer's Representative does not give the Notice of agreement or determination within the relevant time limit,

如果雇主代表未能在上述期限内做出商定或者决定的通知：

(i) in the case of a Claim, the Employer's Representative shall be deemed to have given

a determination rejecting the Claim; or

(i) 在索赔的情况下, 应当认为雇主代表已经做出了拒绝索赔的决定; 或

(ii) in the case of a matter to be agreed or determined, the matter shall be deemed to be

a Dispute which may be referred by either Party to the DAAB for its decision under Sub-Clause 21.4 [Obtaining DAAB's Decision] without the need for a NOD (and Sub-Clause 3.5.5 [Dissatisfaction with Employer's Representative's determination] and sub-paragraph (a) of Sub-Clause 21.4.1 [Reference of a Dispute to the DAAB] shall not apply).

(ii) 如果待商定或确定的是事项, 该事项应当被视为是争议, 可由任何一方根据第 21.4 款 [取得 DAAB 的决定] 提交给 DAAB 来决定, 该并不需要发出一份不满意通知 (不适用第 3.5.5 款 [对雇主代表的决定不满意] 的规定和第 21.4.1 款第(a)条 [向 DAAB 提出争议] 的规定)。

### 3.5.4 Effect of the agreement or determination 协议或决定的效力

Each agreement or determination shall be binding on both Parties unless and until corrected under this Sub-Clause or, in the case of a determination, it is revised under Clause 21 [Disputes and Arbitration].

每一项协议或决定对双方均有约束力, 直到根据本条款做出纠正或者根据第 21 款 [争端和仲裁] 规定对之前做出的决定进行了修改。

If an agreement or determination concerns the payment of an amount from one Party to the other Party, the Contractor shall include such an amount in the next Statement and the Employer shall include such amount in the next payment under Sub-Clause 14.7 [Interim Payment] or 14.13 [Final Payment] (as the case may be) that follows that Statement.

如果商定或决定涉及一方向另一方支付金额, 承包商应将该金额列入在下一期支付申请表中包括该金额, 雇主应根据第 14.7 款 [期中付款] 规定或 14.13 款 [最终付款] (视情况而定) 的规定在下次付款中包括该金额。

If, within 14 days after giving or receiving the Employer's Representative's notice of agreement or determination, any error of a typographical or clerical or arithmetical nature is found:

如果在发出或收到雇主代表的协议或决定通知后 14 天内, 发现任何印刷、书写或算术性质的错误:

(a) by the Employer's Representative: then he/she shall immediately advise the Parties accordingly; or

(a) 被雇主代表发现: 那么他/她应立即通知双方; 或

(b) by a Party: then that Party shall give a Notice to the other Employer's Representative stating that it is given under this Sub-Clause 3.5.4 and clearly identifying the error. If the Employer's Representative does not agree there was an error he/she shall immediately advise the Parties accordingly.

(b) 被一方发现: 则该方应向另一方雇主代表发出通知, 说明其依据本条第 3.5.4 款的规定, 并明确指出错误。如果雇主代表不同意存在错误, 他/她应立即通知双方。

The Employer's Representative shall within 7 days after finding the error, or after receiving a Notice under sub-paragraph (b) above (as the case may be), give a Notice to both Parties of the corrected agreement or determination. Thereafter, the corrected agreement or determination shall be treated as the agreement or determination for the purpose of

these Conditions.

雇主代表应在发现错误后 7 天内，或在收到上文第 (b) 款规定的通知 (视情况而定) 后，将更正后的商定或决定通知双方。此后，经修正的协议或决定应视为本条件下的协议或决定。

3.5.5 Dissatisfaction with Employer 's Representative 's determination

3.5.5 不满雇主代表的决定

If either Party is dissatisfied with a determination of the Employer 's Representative:

如任何一方对雇主代表的决定不满意

(a) the dissatisfied Party may give a NOD to the other Party, with a copy to the Employer 's Representative;

(a) 不满的一方可以向另一方发出一份不满意通知，并将一份副本送交给雇主代表；

(b) this NOD shall state that it is a "Notice of Dissatisfaction with the Employer 's Representative 's Determination " and shall set out the reason(s) for dissatisfaction;

(b) 这份不满意通知须声明这是对雇主代表的决定不满意的通知，并须列明不满意的理由；

(c) this NOD shall be given within 28 days after receiving the Employer 's Representative 's Notice of the determination under Sub-Clause 3.5.2 [Employer 's Representative 's Determination] or, if applicable, his/her Notice of the corrected determination under Sub -Clause 3.5.4 [Effect of the agreement or determination] (or, in the case of a deemed determination rejecting the Claim, within 28 days after the time limit for determination under Sub -Clause 3.5.3 [Time limits] has expired); and

(c) 这份不满意通知应当在下述时间内发出，即收到雇主代表根据本条第 3.5.2 款 [雇主代表的决定] 规定发出的雇主代表决定的通知后 28 天内，或者如果适用的话，他/她根据本第 3.5.4 款 [商定或决定的效力] (或者，如被视为拒绝索赔的决定，则应根据第 3.5.3 款 [时间限制] 规定的期限届满后 28 天内做出决定) 规定做出的更正决定的通知，以及；

(d) thereafter, either Party may proceed under Sub-Clause 21.4 [Obtaining DAAB 's Decision].

(d) 此后，任何一方均可根据第 21.4 款 [取得 DAAB 的决定] 的规定进行裁决。

If no NOD is given by either Party within the period of 28 days stated in sub -paragraph (c) above, the determination of the Employer 's Representative shall be deemed to have been accepted by both Parties and be final and binding on them.

如任何一方在上文第 (c) 款所述的 28 天内没有发出不满意通知，雇主代表的决定应视为双方均已接受，并为最终决定，对双方均有约束力。

If the dissatisfied Party is dissatisfied with only part(s) of the Employer 's Representative 's determination:

如不满意的一方只对雇主代表的决定部分不满：

(i) this part(s) shall be clearly identified in the NOD;

(i) 不满意部分应在不满意通知中明确说明；

(ii) this part(s), and any other parts of the determination that are affected by such part(s)

or rely on such part(s) for completeness, shall be deemed to be severable from the remainder of the determination; and

(ii) 不满意部分，以及决定中任何其他剩余部分的完整性受该部分影响或依赖该部分，应被视为与决定的其余部分是可分割的；以及

(iii) the remainder of the determination shall become final and binding on both Parties as

if the NOD had not been given.

(iii) 如果双方没有发出不满意通知， 决定的其他剩余部分应成为最终决定并对双方均有约束力。

In the event that a Party fails to comply with an agreement of the Parties under this Sub-Clause 3.5 or a final and binding determination of the Employer 's Representative, the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub -Clause 21.6 [Arbitration] in which case the first and the third paragraphs of Sub -Clause 21.7 [Failure to Comply with DAAB 's Decision] shall apply to such reference in the same manner as these paragraphs apply to a final and binding decision of the DAAB.

如一方未能遵守双方根据本条第 3.5 款达成的协议、或雇主代表作出的具有约束力的最终决定，另一方可以在不损害其可能享有的任何其他权利的情况下， 将对方不遵守协议或决定的行为根据第 21.6 款[仲裁]规定直接进行仲裁，在第 21.7 款第 1 段和第 3 段[未遵守 DAAB 的决定]规定的这种情况下，上述的类似行为应适用于 DAAB 条款规定的最终和有约束力的决定。

### 3.6 Meetings 会议

Either Party may require the other Party to attend a management meeting to discuss arrangements for future work and/or other matters in connection with execution of the Works.

任何一方均可要求另一方出席管理会议，讨论将要实施工作安排和 /或其他与实施这些工作有关的事项。

The Employer 's other contractors, the personnel of legally constituted public authorities and/or private utility companies, and/or Subcontractors may attend any such meeting, if requested by either Party.

如任一方提出要求，雇主的其他承包商、合法成立的公共机构和 /或私营公用事业公司的人员和/或分包商均可参加任何此类会议。

The Employer shall keep a record of each management meeting and supply copies of the record to those attending. At any such meeting, and in the record, responsibilities for any actions to be taken shall be in accordance with the Contract.

雇主应对每次管理会议作好记录， 并将记录副本提供给出席者。 在任何此类会议上记录的所采取任何行动的责任均应符合合同规定。

#### 4 The Contractor 承包商

##### 4.1 Contractor 's General Obligations 承包商的一般义务

The Contractor shall execute the Works in accordance with the Contract. When completed, the Works (or Section or major item of Plant, if any) shall be fit for the purpose(s) for which they are intended, as defined and described in the Employer 's Requirements or, where no purpose(s) are so defined and described, fit for their ordinary purpose(s).

承包商应按照合同实施工程。完成后，工程应能满足业主要求规定的预期工程目的，或，当无规定的工程目的，应满足一般目的。

The Contractor shall provide the Plant (and spare parts, if any) and Contractor 's Documents specified in the Employer 's Requirements, and all Contractor 's personnel, Goods, consumables and other things and services, whether of a temporary or permanent nature, required to fulfil the Contractor 's obligations under the Contract.

承包商应提供合同规定的生产设备（备件，如果有）和业主要求的承包商文件，以及根据合同履行承包商义务所需的所有临时性或永久性的承包商人员、货物、消耗品及其他物品和服务。

The Works shall include any work which is necessary to satisfy the Employer 's Requirements and Schedules, or is implied by the Contract, and all works which (although not mentioned in the Contract) are necessary for stability or for the completion, or safe and proper operation, of the Works.

工程应包括为满足业主要求和计划表，或合同隐含要求的任何工作，以及（合同虽未提及但）为工程的稳定、或完成、或安全和有效运行所需的所有工作。承包商应对所有现场作业、所有施工方法和全部工程的完备性、稳定性和安全性承担责任。

The Contractor shall be responsible for the adequacy, stability and safety of all the Contractor 's operations and activities, of all methods of construction and of all the Works.

承包商应对所有现场作业、所有施工方法和全部工程的完备性、稳定性和安全性承担责任。

The Contractor shall, whenever required by the Employer, submit details of the arrangements and methods which the Contractor proposes to adopt for the execution of the Works. No significant alteration to these arrangements and methods shall be made without this alteration having been submitted to the Employer.

当业主要求时，承包商应提交其建议采用的工程施工安排和方法的细节。如为将这些改变提交给业主，对这些安排和方法不得做重要改变。

##### 4.2 Performance Security 履约担保

The Contractor shall obtain (at the Contractor 's cost) a Performance Security to secure the Contractor 's proper performance of the Contract, in the amount and currencies stated in the Contract Data. If no amount is stated in the Contract Data, this Sub-Clause shall not apply.

承包商应对确保承包商的合同的适当履行 (自费) 取得履约担保, 保证金额与币种应符合专用条件中的规定。专用条件中没有提出保证金额的, 本款应不适用。

#### 4.2.1 Contractor's obligations 承包商义务

The Contractor shall deliver the Performance Security to the Employer within 28 days after both Parties have signed the Contract Agreement. The Performance Security shall be issued by an entity and from within a country (or other jurisdiction) to which the Employer gives his/her consent and shall be in the form annexed to the Particular Conditions, or in another form agreed by the Employer (but such consent and/or agreement shall not relieve the Contractor from any obligation under this Sub -Clause).

承包商应在双方签署合同协议书后 28 天内, 将履约担保交给业主。履约担保应由业主批准的国家 (或其他司法管辖区) 内的实体提供, 并采用专用条件所附格式或采用业主批准的其他格式 (但是根据本条款, 该许可并未免除承包商的义务)。

The Contractor shall ensure that the Performance Security remains valid and enforceable until the issue of the Performance Certificate and the Contractor has complied with Sub-Clause 11.11 [Clearance of Site]. If the terms of the Performance Security specify an expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 days before the expiry date, the Contractor shall extend the validity of the Performance Security until the issue of the Performance Certificate and the Contractor has complied with Sub -Clause 11.11 [Clearance of Site].

承包商应确保履约担保直到履约证明的颁布且承包商履行完 11.11 条款[现场清理]前持续有效和可执行。如果在履约担保的条款中规定了其期满日期, 而承包商在该期满日期 28 天前尚无权拿到履约证书, 承包商应将履约担保的有效期限延至履约证明的颁布且承包商履行完 11.11 条款[现场清理]时为止。

Whenever Variations and/or adjustments under Clause 13 [Variations and Adjustments] result in an accumulative increase or decrease of the Contract Price by more than twenty percent (20%) of the Contract Price stated in the Contract Agreement:

如根据第 13 节 [变更和调整] 进行的变更和调整导致合同价比合同协议中描述的合同价累计增加或减少超过 20%,

(a) in the case of such an increase, at the Employer's request the Contractor shall promptly increase the amount of the Performance Security in that currency by a percentage equal to the accumulative increase. If the Contractor incurs Cost as a result of this Employer's request, Sub-Clause 13.3.1 [Variation by Instruction] shall apply as if the increase had been instructed by the Employer; or

如应业主要求增加保函额度, 承包商应立即将该货币的履约担保金额增加一个等于累计增加额的百分比。如果承包商因业主要求而引起费用, 则应适用第 13.3.1 款 (通过指示进行的变更), 即增加费用乃业主指示所致。

(b) in the case of such a decrease, subject to the Employer's prior consent the Contractor may decrease the amount of the Performance Security in that currency by a percentage equal to the accumulative decrease.

如在业主事先同意的情况下减少保函额度， 承包商可将以该货币计算的履约担保额减少一个  
等于累计减少的百分比

#### 4.2.2 Claims under the Performance Security 履约保证下的索赔

The Employer shall not make a claim under the Performance Security, except for amounts  
to which the Employer is entitled under the Contract in the event of:

业主不得对履约担保提出索赔，在下列情况下， 业主有权在合同项下有权获得的金额除外：

(a) failure by the Contractor to extend the validity of the Performance Security, as  
described in this Sub -Clause, in which event the Employer may claim the full amount (or,  
in the case of previous reduction(s), the full remaining amount) of the Performance  
Security;

如本款所述， 承包商未能延长履约担保的有效期， 在此情况下， 业主可要求对履约保函全额  
赔偿(或者如果有先前扣减， 则业主可以索赔保函的全部剩余金额 )。

(b) failure by the Contractor to pay the Employer an amount due, as agreed or  
determined under Sub -Clause 3.5 [Agreement or Determination] or agreed or decided  
under Clause 21 [Disputes and Arbitration], within 42 days after the date of the agreement  
or determination or decision or arbitral award (as the case may be);

承包商未按照第 3.5 条 [商定或裁定 ]或根据第 21 条 [争端和仲裁 ] 下达成的商定、决定或者  
仲裁裁决 (视情况而定) 作出后的 42 天内支付应付款项；

(c) failure by the Contractor to remedy a default stated in a Notice given under  
Sub-Clause 15.1 [Notice to Correct] within 42 days or other time (if any) stated in the  
Notice;

承包商未能在第 15.1 款 [改正通知]中规定发出通知的 42 天内或通知规定的其他时间 (如有)，  
纠正违约行为；

(d) circumstances which entitle the Employer to terminate the Contract under  
Sub-Clause 15.2 [Termination for Contractor 's Default], irrespective of whether a Notice of  
termination has been given; or

根据第 15.2 款 [因承包商违约终止 ]规定雇主有权终止合同的情况， 无需雇主发出终止通知；  
或

(e) if under Sub-Clause 11.5 [Remedying of Defective Work off Site] the Contractor  
removes any defective or damaged Plant from the Site, failure by the Contractor to repair  
such Plant, return it to the Site, reinstall it and retest it by the date of expiry of the relevant  
duration stated in the Contractor 's Notice (or other date agreed by the Employer).

如果承包商根据第 11.5 条【场外修补有缺陷的工程】 将任何有缺陷或损坏的设备从现场移  
走，) 但未能在承包商通知中规定的相关期限 (或者雇主同意的其他期限) 届满前修好该设  
备、将其送回现场并重新安装和重新调试。

The Employer shall indemnify and hold the Contractor harmless against and from all



damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent that the Employer was not entitled to make the claim.

业主应赔偿并使承包商免受所有损害、损失和因在业主无权提出索赔的情况下，根据履约保证金提出索赔产生的费用（包括法律费用）的损失。

Any amount which is received by the Employer under the Performance Security shall be taken into account:

业主履约担保下收到的任何款项，都应考虑：

(i) in the final payment to the Contractor under Sub -Clause 14.13 [Final Payment]; or  
在根据第 14.13 条 [最终付款] 向承包商支付的最终款项中；或

(ii) if the Contract is terminated, in payment due to the Contractor under Sub -Clause 15.4 [Payment after Termination for Contractor 's default], Sub-Clause 15.7 [Payment after Termination for Employer 's Convenience], Sub-Clause 16.4 [Payment after Termination by Contractor], Sub-Clause 18.5 [Optional Termination], or Sub-Clause 18.6 [Release from Performance under the Law] (as the case may be).

如果合同终止，承包商根据第 15.4 款 [因承包商违约而在终止合同后付款]、第 15.7 款 [因业主便利而在终止合同后付款]、第 16.4 款 [承包商终止合同后付款]，第 18.5 条 [自主选择终止] 或第 18.6 款 [根据法律解除履约] (视情况而定) 支付的款项。

#### 4.2.3 Return of the Performance Security 退还履约保函

The Employer shall return the Performance Security to the Contractor:

业主应将履约保函退还给承包商：

(a) within 21 days after the issue of the Performance Certificate and the Contractor has complied with Sub -Clause 11.11 [Clearance of Site]; or

在颁发履约证书后 21 天内，承包商遵守了第 11.11 款 [现场清理]；或

(b) promptly after the date of termination if the Contract is terminated in accordance with Sub-Clause 15.5 [Termination for Employer 's Convenience], Sub-Clause 16.2 [Termination by Contractor], Sub -Clause 18.5 [Optional Termination] or Sub -Clause 18.6 [Release from Performance under the Law].

如果根据第 15.5 款 [业主终止的权力]、16.2 款 [由承包商终止]、18.5 款 [自主选择终止] 或 18.6 款 [根据法律解除履约] 终止合同，终止日期后。

#### 4.3 Contractor 's Representative 承包商代表

The Contractor shall appoint the Contractor 's Representative who shall give him/her all authority necessary to act on the Contractor 's behalf under the Contract, except to replace the Contractor 's Representative.

承包商应任命承包商代表，并授予他代表承包商行使合同规定的所有必要的权力，除替换替换承包商代表的权力外。

The Contractor 's Representative shall be qualified, experienced and competent in the main engineering discipline applicable to the Works and fluent in the language for communications defined in Sub -Clause 1.4 [Law and Language].

承包商代表应有资质、经验、能胜任适用于工程的主要工程学科，且能流利地使用第 1.4 款 [法律和语言] 规定的交流语言。

Unless the Contractor's Representative is named in the Contract, the Contractor shall, before the Commencement Date, submit to the Employer for consent the name and particulars of the person the Contractor proposes to appoint as Contractor's Representative. If consent is withheld or subsequently revoked, or if the appointed person fails to act as Contractor's Representative, the Contractor shall similarly submit the name and particulars of another suitable replacement for such appointment. If the Employer does not respond within 28 days after receiving this submission, by giving a Notice to the Contractor objecting to the proposed person or replacement, the Employer shall be deemed to have given the Employer's consent.

除非合同中已写明承包商代表的姓名，承包商应在开工日期前，将其拟任命为承包商代表的人员姓名和详细资料提交给业主，以取得同意。如果未获同意，或随后撤销了同意，或任命的人不能担任承包商代表，承包商应同样地提交另外适合人选的姓名、详细资料，以取得该项任命。如果业主在收到提交内容后的 28 天内未及时回应，向承包商发出反对建议的人或替代者的通知，则视为业主同意提交内容。

The Contractor shall not, without the Employer's prior consent, revoke the appointment of the Contractor's Representative or appoint a replacement (unless the Contractor's Representative is unable to act as a result of death, illness, disability or resignation, in which case his/her appointment shall be deemed to have been revoked with immediate effect and the appointment of a replacement shall be treated as a temporary appointment until the Employer gives his/her consent to this replacement, or another replacement is appointed, under this Sub-Clause).

未经业主事先同意，承包商不应撤销承包商代表的任命，或任命何替代人员（除非承包商代表因其死亡、疾病、残疾或辞职无法继续执行工作，则该任命视为立即失效，而根据本条款，替代者在获得业主许可前或在有其他委派前，应被视为临时委派）。

Unless otherwise agreed by the Employer, the whole time of the Contractor's Representative shall be given to directing the Contractor's performance of the Contract. The Contractor's Representative shall act for and on behalf of the Contractor at all times during the performance of the Contract, including issuing and receiving all Notices and other communications under Sub-Clause 1.3 [Notices and Other Communications] and for receiving instructions under Sub-Clause 3.4 [Instructions].

除非业主另有许可，承包商代表的全部时间应用于指导承包商履行合同。在履行合同期间，承包商代表应始终代表承包商，包括根据第 1.3 款 [通知和其他通信] 发出和接收所有通知和其他通信，以及根据第 3.4 条 [指示] 接受指示。

Unless otherwise agreed by the Employer, the Contractor's Representative shall be based at the Site for the whole time that the Works are being executed at the Site. If the Contractor's Representative is to be temporarily absent from the Site during the execution of the Works, a suitable replacement shall be temporarily appointed, subject to the Employer's prior consent.

除非业主另有许可，否则承包商的代表应在现场执行工程所有时间段都应常驻现场。如果在执行工程时承包商代表暂时不在现场，应委派临时的替代人员，但须经业主事先同意。  
The Contractor's Representative may delegate any powers, functions and authority

except:

除下列情况外，承包商的代表可授权其任何权利、职能和权力：

(a) the authority to issue and receive Notices and other communications under Sub-Clause 1.3 [Notices and Other Communications]; and

根据第 1.3 款[通知及其他通讯 ]发出及接收通知及其他通讯的权力；及

(b) the authority to receive instructions under Sub-Clause 3.4 [Instructions]), to any suitably competent and experienced person and may at any time revoke the delegation.

Any delegation or revocation shall not take effect until the Employer has received a Notice

from the Contractor 's Representative, naming the person, specifying the powers, functions and authority being delegated or revoked, and stating the timing of the delegation or revocation.

根据第 3.4 条[指示]接受指示的权利，授权给任何适当能胜任和有经验的人员，并可在任何时候撤销授权的权力。在业主收到承包商代表的通知（指定人员，指定授权或撤销的权力、职能和权力，并说明委派或撤销的时间安排）之前，任何授权或撤销均不生效，

All these persons shall be fluent in the language for communications defined in Sub-Clause 1.4 [Law and Language].

所有人员应能流利地使用第 1.4 款[法律和语言 ]所界定的通信语言。

#### 4.4 Subcontractors 分包商

The Contractor shall not subcontract:

承包商不得分包：

(a) works with a total accumulated value greater than the percentage stated in the Contract Data of the Contract Price stated in the Contract Agreement (if no such percentage is stated, the whole of the Works); or

总累积价值大于合同协议所述合同价格的合同数据中所述百分比的工程 (如果没有说明该百分比，则整个工程 )；或

(b) any part of the Works for which subcontracting is not permitted as stated in the Contract Data.

合同数据中规定不允许分包的工程的任何部分。

The Contractor shall be responsible for the work of all Subcontractors, for managing and coordinating all the Subcontractors works, and for the acts or defaults of any Subcontractor, any Subcontractor 's agents or employees, as if they were the acts or defaults of the Contractor.

承包商应对所有分包商负责管理、协调所有分包工程，并对分包商、其代理人或雇员的行为或违约，如同承包商自己的行为或违约一样地负责。

Where specified in the Contract Data, the Contractor shall give a Notice to the Employer not less than 28 days before:

对专用条件中有规定的，承包商应在不少于 28 天前向业主通知以下事项：

(i) the intended appointment of a Subcontractor, with detailed particulars which shall include the Subcontractor 's relevant experience, 拟雇用的分包商，并附包括其相关经验的详细资料，

(ii) the intended commencement of the Subcontractor 's work, and

分包商承担工作的拟定开工日期，及

(iii) the intended commencement of the Subcontractor's work on the Site.

分包商承担现场工作的拟定开工日期。

#### 4.5 Nominated Subcontractors 指定的分包商

In this Sub-Clause, "nominated Subcontractor" means a Subcontractor named as such in the Employer's Requirements or whom the Employer, under Sub-Clause 13.4 [Provisional Sums], instructs the Contractor to employ as a Subcontractor.

本款中，“指定的分包商”系指业主根据第 13.4 条 [暂列金额] 的规定，指示承包商雇用的分包商。

##### 4.5.1 Objection to Nomination 拒绝指定

The Contractor shall not be under any obligation to employ a nominated Subcontractor whom the Employer instructs and against whom the Contractor raises reasonable objection by giving a Notice to the Employer, with detailed supporting particulars, no later than 14 days after receiving the Employer's instruction. An objection shall be deemed reasonable if it arises from (among other things) any of the following matters, unless the Employer agrees to indemnify the Contractor against and from the consequences of the matter:

即使有详细的支持文件，在收到业主指示后的 14 天内，承包商没有义务雇用业主指示的指定分包商，并通过向业主发出通知而对其提出合理反对。如存在下列情况时，承包商的拒绝视为合理的，除非业主答应就这些情况对承包商进行赔偿。

(a) there are reasons to believe that the Subcontractor does not have sufficient competence, resources or financial strength;

有充分理由证明分包商没有足够能力、资源或财政实力；

(b) the subcontract does not specify that the nominated Subcontractor shall indemnify the Contractor against and from any negligence or misuse of Goods by the nominated Subcontractor, the nominated Subcontractor's agents and employees; or

分包合同没有明确说明如果指定的分包商、分包商代理及其雇员在对货品遗漏或滥用时，是否对承包商进行赔偿的问题；或

(c) the subcontract does not specify that, for the subcontracted work (including design, if any), the nominated Subcontractor shall:

分包合同未规定，对于分包工程（包括设计，如有），指定分包商应：

(i) undertake to the Contractor such obligations and liabilities as will enable the Contractor to discharge the Contractor's corresponding obligations and liabilities under the Contract; and

承担承包商应承担的义务和责任，使承包商能够根据合同履行承包商的相应义务和责任；以及

(ii) indemnify the Contractor against and from all obligations and liabilities arising under or in connection with the Contract and from the consequences of any failure by the Subcontractor to perform these obligations or to fulfil these liabilities.

免除承包商在本合同项下或与本合同有关的所有义务和责任，以及分包商未能履约的任何失败的后果。

4.5.2 Payments to nominated Subcontractors 向指定分包商进行支付

The Contractor shall pay to the nominated Subcontractor the amounts due in accordance with the subcontract. These amounts plus other charges shall be included in the Contract Price in accordance with sub-paragraph (b) of Sub-Clause 13.4 [Provisional Sums], except as stated in Sub-Clause 4.5.3 [Evidence of Payments].

承包商应按照分包合同向指定分包商支付应付金额。这些金额加上其他费用应按照第 13.4 款 [暂定金额] 的第(b)款计入合同价格, 除非存在第 4.5.3 款 [支付证明] 的情况。

4.5.3 Evidence of Payments 支付证明

Before making an interim payment under Sub-Clause 14.7 [Interim Payment] which includes an amount payable to a nominated Subcontractor, the Employer may request the Contractor to supply reasonable evidence that the nominated Subcontractor has received all amounts due in accordance with previous interim payments by the Employer, less applicable deductions for retention or otherwise. Unless the Contractor:

根据条款 14.7 [期中付款] 进行包含给指定分包商一定金额的期中付款前, 业主可以要求承包商提供指定分包商已收到业主根据上一次应付所有款项的合理证明, 较少适用于保留金或其它款项的扣减。除非承包商:

(a) submits this reasonable evidence, or

提交合理证明, 或

(b) (i) satisfies the Employer in writing that the Contractor is reasonably entitled to withhold or refuse to pay these amounts, and

向业主提供一份使其满意的手写证明, 说明承包商获得合理授权去保留或拒绝支付这些款项, 及

(ii) submits to the Employer reasonable evidence that the nominated Subcontractor has

been notified of the Contractor's entitlement,

向业主提交合理证明, 说明已将承包商的权利通知指定分包商,

then the Employer may (at the Employer's sole discretion) pay, directly to the nominated

Subcontractor, part or all of such amounts included in previous payments (less applicable

deductions) as are due to the nominated Subcontractor and for which the Contractor has

failed to submit the evidence described in sub-paragraphs (a) or (b) above.

然后, 业主可 (由业主自行决定) 直接向指定分包商支付以前付款中应付给指定分包商, 以

及承包商未能提交上述 (a) 或 (b) 段所述的证明的部分或全部款项 (较少适用于扣减金额)。

Thereafter, the Employer shall give a Notice to the Contractor stating the amount paid

directly to the nominated Subcontractor by the Employer and, in the next interim payment

after this Notice, shall include this amount as a deduction under sub-paragraph (b) of

Sub-Clause 14.6.1 [Notice of Interim Payment].

此后, 业主应向承包商发出通知, 说明业主直接向指定分包商支付的金额以及, 在本通知后

的下一期期中付款中, 应包括根据第 14.6.1 款 (B) 项 [期中付款通知] 扣除的数额。

4.6 Co-operation 合作

The Contractor shall, as specified in the Employer's Requirements or as instructed by the

Employer, co-operate with and allow appropriate opportunities for carrying out work by:

承包商应依据合同的规定、或业主的指示, 为可能被雇用在现场或其附近从事本合同未包括

的任何工作的下列人员进行工作提供适当的机会：

(a) the Employer 's Personnel;

业主人员，

(b) any other contractors employed by the Employer; and

业主雇用的任何其他承包商，和

(c) the personnel of any legally constituted public authorities and private utility companies,

任何合法建立的公共当局的人员。

who may be employed in the carrying out, on or near the Site, of any work not included in the Contract. Such appropriate opportunities may include the use of Contractor 's Equipment, Temporary Works, access arrangements which are the responsibility of the Contractor, and/or other Contractor 's facilities or services on the Site.

此类适当的机会可包括使用承包商的设备、临时工程、作为承包商和 /或其他承包商设施的责任的接入安排、或在该站点上的服务。

The Contractor shall be responsible for the Contractor 's construction activities on the Site, and shall use all reasonable endeavours to co-ordinate these activities with those of other contractors to the extent (if any) specified in the Employer 's Requirements or as instructed by the Employer.

承包商应对其在现场的施工活动负责， 并应按照业主要求或业主指示中规定的范围 （如果有）协调其自己与其他承包商的活动。

If the Contractor suffers delay and/or incurs Cost as a result of an instruction under this Sub-Clause, to the extent (if any) that co-operation, allowance of opportunities and coordination was Unforeseeable having regard to that specified in the Employer 's Requirements, the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to EOT and/ or payment of such Cost Plus Profit.

如果承包商因本款规定的指示而遭受延误和 /或招致费用， 在合作的范围内 （如果有的话），与雇主要求中注明的机会和协调的费用是不可预见的， 根据第 20.2 款 [付款和/或EOT 的索赔]， 承包商有权获得 EOT 和 /或支付此类成本加利润。

#### 4.7 Setting Out 放线

The Contractor shall set out the Works in relation to the items of reference under Sub-Clause 2.5 [Site Data and Items of Reference].

承包商应根据第 2.5 款 [现场数据和参考项目 ]规定给相关工程进行放线。

The Contractor shall:

承包商应：

(a) verify the accuracy of all these items of reference before they are used for the Works;

在所有这些参考项目投入工程使用前， 检查其准确性；

(b) rectify any error in the items of reference, positions, levels, dimensions or alignment of the Works; and

纠正在工程的位置、标高、尺寸或定线中的任何差错；以及

(c) be responsible for the correct positioning of all parts of the Works.

承包商应负责对工程的所有部分正确定位。

#### 4.8 Health and Safety Obligations 健康和安义务

The Contractor shall:

承包商应：

(a) comply with all applicable health and safety regulations and Laws;

遵守所有适用的健康和安条例和法律

(b) comply with all applicable health and safety obligations specified in the Contract;

遵守合同中规定的所有适用的健康和安义务；

(c) comply with all directives issued by the Contractor's health and safety officer (appointed under Sub-Clause 6.7 [Health and Safety of Personnel]);

遵守承包商健康和安干事发布的所有指示 (根据第 6.7 款 [人员的健康和安 ]任命)；

(d) take care of the health and safety of all persons entitled to be on the Site and other

places (if any) where the Works are being executed;

照管所有有权进入现场及其他进行施工区域 (如有的话)的所有人员的健康及安；

(e) keep the Site, Works (and the other places (if any) where the Works are being executed) clear of unnecessary obstruction so as to avoid danger to these persons;

保持现场、工程 (以及正在实施工程的其他地方 (如有) ) 无不必要的障碍物，以避免对人员造成危险。

(f) provide fencing, lighting, safe access, guarding and watching of:

为以下提供隔离、照明、安通道、警卫和岗哨：

(i) the Works, until the Works are taken over under Clause 10 [Employer's Taking Over]; and

根据第 10 款 [业主的接收 ]的规定移交前的工程；及

(ii) any part of the Works where the Contractor is executing outstanding works or remedying any defects during the DNP; and

承包商正在执行未完成工程或在 DNP 期间修补的任何缺陷的工程的所有部分；

(g) provide any Temporary Works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the Works, for the use and protection of the public and of owners and occupiers of adjacent land and property.

因实施工程为公众和临近土地和财产的所有人、占用人使用和提供保护 ,提供可能需要的任何临时工程 (包括车行道、人行道、警卫和围墙等 )。

Within 21 days of the Commencement Date and before commencing any construction on the Site, the Contractor shall submit to the Employer for information a health and safety manual which has been specifically prepared for the Works, the Site and other places (if any) where the Contractor intends to execute the Works. This manual shall be in addition to any other similar document required under applicable health and safety regulations and Laws.

在生效日期起计 21 天内并在该地盘开始建造前 21 天内，承包商应向业主提交一份专门为工程编写的健康和安手册，供其参考，承包商拟施工的工程现场和其他地点 (如有) 。本

手册应补充现行的卫生和安全条例和法律所要求的任何其他类似文件。

The health and safety manual shall set out all the health and safety requirements:

健康和安全管理手册应列出所有健康和安全管理要求:

(i) specified in the Employer's Requirements;

业主要求中规定的;

(ii) that comply with all the Contractor's health and safety obligations under the Contract;

and

符合合同规定的所有承包商的健康和安全义务; 以及

(iii) that are necessary to effect and maintain a healthy and safe working environment for

all persons entitled to be on the Site and other places (if any) where the Works are being

executed.

为所有有权进入现场和其他工程实施地点 (如有) 的人员而言, 必须保持健康和安全的工作环境。

This manual shall be revised as necessary by the Contractor or the Contractor's health

and safety officer, or at the reasonable request of the Employer. Each revision of the

manual shall be submitted promptly to the Employer.

本手册应由承包商或承包商的健康和安全员根据需要加以修订, 或应业主的合理要求。手册的每次修订应及时提交给业主。

In addition to the reporting requirement of sub-paragraph (g) of Sub-Clause 4.20

[Progress Reports], the Contractor shall submit to the Employer details of any accident as

soon as practicable after its occurrence and, in the case of an accident causing serious

injury or death, shall inform the Employer immediately.

除第 4.20 款 (G) 项 [进度报告] 的报告要求外, 任何事故发生后, 承包商应在切实可行范围内

尽快向业主提交详细情况, 造成严重伤亡的事故, 应当立即通知用人单位。

#### 4.9 Quality Management and Compliance Verification Systems 质量管理 和合 规验证体系

The Contractor shall, as specified in the Employer's Requirements and as the Employer

may reasonably require, maintain records and make reports (in compliance with the

applicable health and safety regulations and Laws) concerning the health and safety of

persons and any damage to property.

承包商应按照业主要求和业主可能合理要求, (根据适用的卫生和安全条例和法律) 保存有关人员的健康和安全以及对财产的任何损害的记录和报告。

##### 4.9.1 Quality Management System 质量管理体系

The Contractor shall prepare and implement a QM System to demonstrate

compliance with the requirements of the Contract. The QM System shall be

specifically prepared for the Works and submitted to the Employer within 28 days

of the Commencement Date. Thereafter, whenever the QM System is updated or

revised, a copy shall promptly be submitted to the Employer.

承包商应编制并实施 QM 体系, 以证明符合合同要求。QM 体系应在开工之日起 28 天内专



门为工程做好准备并提交给业主。此后，每当 QM 体系更新或修订时，应立即向业主提交一份副本。

The QM System shall be in accordance with the details stated in the Employer's Requirements (if any) and shall include the Contractor's procedures:

质量管理体系应符合业主要求 (如果有的话) 中所述的细节，并应包括承包商的程序：

(a) to ensure that all Notices and other communications under Sub-Clause 1.3 [Notices and Other Communications], Contractor's Documents, as-built records, O&M Manuals, and contemporary records can be traced, with full certainty, to the Works, Goods, work, workmanship or test to which they relate;

确保根据第 1.3 款 [通知和其他通信]、承包商文件发出的所有通知和其他通信，竣工记录、O&M (运行维护) 手册以及同期纪录可以确切追溯与其相关的工程、货物、工程、工艺或试验。

(b) to ensure proper coordination and management of interfaces between the stages of execution of the Works, and between Subcontractors; and

确保工程执行阶段和分包商之间的接口得到适当协调和管理；以及

(c) for the submission of Contractor's Documents to the Employer for Review.

承包商文件提交给业主审查。

The Contractor shall carry out internal audits of the QM System regularly, and at least once every 6 months. The Contractor shall submit to the Employer a report listing the results of each internal audit within 7 days of completion. Each report shall include, where appropriate, the proposed measures to improve and/or rectify the QM System and/or its implementation.

承包商应定期对 QM (质量管理体系) 体系进行内部审核，至少每 6 个月一次。承包商应在竣工后 7 天内向业主提交一份报告，列出每个内部审核的结果。每一份报告应适当包括改进和/或纠正质量管理体系和/或其实施的拟议措施。

If the Contractor is required by the Contractor's quality assurance certification to be subject to external audit, the Contractor shall immediately give a Notice to the Employer describing any failing(s) identified in any external audit. If the Contractor is a JV, this obligation shall apply to each member of the JV.

如果承包商的质量保证证书要求对其进行外部审计，承包商应立即向业主发出通知，说明在任何外部审计中发现的所有问题。如果承包商是合资公司，本义务应适用于合资公司的每个成员。

#### 4.9.2 Compliance Verification System 合规验证体系

The Contractor shall prepare and implement a Compliance Verification System to demonstrate that the design, Materials, Employer-Supplied Materials (if any), Plant, work and workmanship comply in all respects with the Contract.

承包商应编制并实施合规验证体系，以证明设计、材料、业主提供的材料 (如有)、设备、工程和工艺均符合合同要求。

The Compliance Verification System shall be in accordance with the details stated in the Employer's Requirements (if any) and shall include a method for reporting the results of all inspections and tests carried out by the Contractor. In the event that any inspection or test identifies a non-compliance with the Contract, Sub-Clause 7.5 [Defects and Rejection]

shall apply.

合规验证体系应符合业主要求 (如有) 中所述的详细信息, 且应包括报告承包商采用的的所有检查和试验结果的方法。 如果任何检验和测试结果腹部和合同要求, 则适用于第 7.5 款【缺陷和拒收】

#### 4.9.3 General provision 总则

Compliance with the QM System and/or Compliance Verification System shall not relieve the Contractor from any duty, obligation or responsibility under or in connection with the Contract.

遵守质量管理体系和 /或合规验证体系不应免除承包商根据合同或与合同有关的任何义务、义务或责任。

#### 4.10 Use of Site Data 现场数据的使用

The Contractor shall be responsible for verifying and interpreting all data made available by the Employer under Sub -Clause 2.5 [Site Data and Items of Reference].

承包商应负责核实和解释业主根据第 2.5 款 [现场数据和参考项目 ] 提供的所有数据。

#### 4.11 Sufficiency of the Contract Price 合同价格

The Contractor shall be deemed to have satisfied himself/herself as to the correctness and sufficiency of the Contract Price stated in the Contract Agreement.

承包商应被认为已确信合同价格的正确性和充分性。

Unless otherwise stated in the Contract, the Contract Price stated in the Contract Agreement shall be deemed to cover all the Contractor 's obligations under the Contract and all things necessary for the proper execution of the Works in accordance with the Contract.

除非合同另有规定 , 合同协议中合同价格应视为包括承包商根据合同所承担的全部义务 (包括根据暂列金额所承担的义务 , 如果有), 以及为实施工程所需的全部有关事项 .

#### 4.12 Unforeseeable Difficulties 不可预见的困难

Except as otherwise stated in the Particular Conditions:

除合同另有说明外 :

(a) the Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works;

承包商应被认为已取得了工程可能产生影响和作用的有关风险、意外事件和其他情况的全部必要资料 ;

(b) by signing the Contract Agreement, the Contractor accepts total responsibility for having foreseen all difficulties and costs of successfully completing the Works; and

通过签署合同,承包商接受对预见到的为顺利完成工程的所有困难和费用的全部职责 ;

(c) the Contract Price shall not be adjusted to take account of any Unforeseeable or unforeseen difficulties or costs.

合同价格对任何未预见到的困难和费用不应考虑予以调整 .

#### 4.13 Rights of Way and Facilities 道路通行权与设施

The Contractor shall bear all costs and charges for special and/or temporary rights -of-way which may be required for the purposes of the Works, including those for access to the Site.

承包商应为其所需要的专用和 (或)临时道路包括进场道路的通行权 ,承担全部费用和开支。

The Contractor shall also obtain, at the Contractor 's risk and cost, any additional facilities outside the Site which may be required for the purposes of the Works.

承包商还应自担风险和费用 ,取得为工程目的可能需要的现场以外的任何附加设施 .

#### 4.14 Avoidance of Interference 避免干扰

The Contractor shall not interfere unnecessarily or improperly with:

承包商应避免对以下事项产生不必要或不当的干扰 :

(a) the convenience of the public; or

公众的方便 ,或

(b) the access to and use and occupation of all roads and footpaths, irrespective of whether they are public or in the possession of the Employer or of others.

(b)所有道路和人行道的进入、使用和占用 ,不论他们是公共的 ,或是业主或是其他人所有的 .

The Contractor shall indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from any such unnecessary or improper interference.

承包商应保障并保持业主免受因任何此类不必要或不当的干扰造成任何损害赔偿费、 损失和开支(包括法律费用和开支 )的伤害.

#### 4.15 Access Route 进场通路

The Contractor shall be deemed to have been satisfied, at the Base Date, as to the suitability and availability of the access routes to the Site. The Contractor shall take all necessary measures to prevent any road or bridge from being damaged by the Contractor 's traffic or by the Contractor 's Personnel. These measures shall include the proper use of appropriate vehicles (conforming to legal load and width limits (if any) and any other restrictions) and routes.

承包商应被认为在基准日期已对现场的进入道路的适宜性和可用性感到满意。 承包商应采取必要的措施 ,防止任何道路或桥梁因承包商的通行或承包商人员受到损坏 .这些措施应包括正确使用适宜的车辆和道路 .

Except as otherwise stated in these Conditions:

除本条件另有规定外：

(a) the Contractor shall (as between the Parties) be responsible for repair of any damage caused to, and any maintenance which may be required for the Contractor 'use of, access routes;

承包商应(就双方而言)负责因他使用现场通路造成的破坏进行修复,及所需要的任何维护 ;

(b) the Contractor shall provide all necessary signs or directions along access routes, and shall obtain any permissions or permits which may be required from the relevant authorities, for the Contractor 's use of routes, signs and directions;

承包商应提供进场道路的所有必需的标志或方向指示 ,还应为他使用这些道路、标志和方向指示取得必要的有关当局的许可 ;

(c) the Employer shall not be responsible for any third party claims which may arise from the Contractor 's use or otherwise of any access route;

业主不对由于任何进场通路的使用或其他原因引起的第三方索赔负责 ;

(d) the Employer does not guarantee the suitability or availability of particular access routes; and

业主不保证特定进场通路的适宜性和可用性 ;以及

(e) all Costs due to non -suitability or non -availability, for the use required by the Contractor, of access routes shall be borne by the Contractor.

因进场通路对承包商的使用要求不适宜、不能用而发生的费用应由承包商负担 .

To the extent that non -suitability or non -availability of an access route arises as a result of changes to that access route by the Employer or a third party after the Base Date and as a result the Contractor suffers delay and/or incurs Cost, the Contractor shall be entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT] to EOT and/or payment of such Cost.

由于业主或第三方在基准日期后更改该通路而导致通路不适合或不可用的情况, 因此导致承包商延迟和 /或遭受损失, 承包商应有权在符合第 20.2 款 [索赔付款和 /或支付]和 /或支付此类费用的前提下要求索赔。

#### 4.16 Transport of Goods 货物运输

The Contractor shall:

承包商应:

(a) give a Notice to the Employer not less than 21 days before the date on which any Plant, or a major item of other Goods (as specified in the Employer 's Requirements), will be delivered to the Site;

承包商应在不少于 21 天前,将任何工程设备或每项其他主要货物将运到现场的日期 ,通知业

主;

(b) be responsible for packing, loading, transporting, receiving, unloading, storing and protecting all Goods and other things required for the Works;

承包商应负责工程需要的所有货物和其他物品的包装、装货、运输、接收、卸货、存储和保护;

(c) be responsible for customs clearance, permits, fees and charges related to the import, transport and handling of all Goods, including all obligations necessary for their delivery to the Site; and

负责与所有货物的进口、运输和处理有关的清关、许可证、费用, 包括向现场交付所需的所有义务; 以及

(d) indemnify and hold the Employer harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from the import, transport and handling of all Goods, and shall negotiate and pay all third party claims arising from their import, transport and handling.

承包商应保障并保持业主免受因进口, 货物运输引起的所有损害赔偿费、损失和开支 (包括法律费用和开支) 的伤害, 并应协商和支付由于货物运输引起的所有第三方索赔。

#### 4.17 Contractor 's Equipment 承包商设备

The Contractor shall be responsible for all Contractor 's Equipment. When brought on to the Site, Contractor 's Equipment shall be deemed to be exclusively intended for the execution of the Works. The Contractor shall not remove from the Site any major items of Contractor 's Equipment without the Employer 's consent. However, consent shall not be required for vehicles transporting Goods or Contractor 's Personnel off Site.

承包商应负责所有承包商设备。承包商设备运到现场后, 应视作为工程施工专用。未经业主同意, 承包商不得从现场移走承包商设备的任何主要项目。但是, 在现场以外运输货物或承包商人员的车辆不应获得同意。

In addition to any Notice given under Sub-Clause 4.16 [Transport of Goods], the Contractor shall give a Notice to the Employer of the date on which any major item of Contractor 's Equipment has been delivered to the Site. This Notice shall be given within 7 days of the delivery date, shall identify whether the item of Contractor 's Equipment is owned by the Contractor or a Subcontractor or another person and, if rented or leased, shall identify the rental or leasing entity.

除根据第 4.16 款 [货物运输] 发出的任何通知外, 承包商应将承包商设备的任何主要项目交付现场的日期通知业主。该通知应在交付日期的 7 天内给出, 应确定承包商设备项目是否归承包商或分包商或其他人所有, 如租用或租赁, 应确定租赁或租赁实体。

#### 4.18 Protection of the Environment 环境保护

The Contractor shall take all necessary measures to:

承包商应采取一切必要措施:

(a) protect the environment (both on and off the Site);

保护(现场内/外)环境

(b) comply with the environmental impact statement for the Works (if any); and

遵守工程的环境影响声明 (如有); 及

(c) limit damage and nuisance to people and property resulting from pollution, noise and other results of the Contractor 's operations and/ or activities.

限制由其施工作业引起的污染、噪音和其他后果对公众和财产造成的损害和妨害

The Contractor shall ensure that emissions, surface discharges, effluent and any other pollutants from the Contractor 's activities shall exceed neither the values indicated in the Employer 's Requirements, nor those prescribed by applicable Laws.

承包商应确保因其活动产生的气体排放、地面排水及排污等, 不超过业主要求中规定的数值, 也不超过适用法律规定的数值

#### 4.19 Temporary Utilities 临时公用设施

The Contractor shall, except as stated below, be responsible for the provision of all temporary utilities, including electricity, gas, telecommunications, water and any other services the Contractor may require for the execution of the Works.

除下述情况外, 承包商应负责供应其所需的临时公用设施, 包括电、气、通讯设施、水和其他承包商为执行工程可能会要求的服务

The following provisions of this Sub -Clause shall only apply if, as stated in the Employer 's Requirements, the Employer is to provide utilities for the Contractor 's use. The Contractor shall be entitled to use, for the purposes of the Works, the utilities on the Site for which details and prices are given in the Employer 's Requirements. The Contractor shall, at the Contractor 's risk and cost, provide any apparatus necessary for the Contractor 's use of these services and for measuring the quantities consumed. The apparatus provided for measuring quantities consumed shall be subject to the Employer 's consent. The quantities consumed (if any) during each period of payment stated in the Contract Data (if not stated, each month) shall be measured by the Contractor, and the amount to be paid by the Contractor for such quantities (at the prices stated in the Employer 's Requirements) shall be included in the relevant Statement.

本款的下列规定只适用于业主要求业主提供公用设施供承包商使用的情况。承包商应有权为工程目的使用业主要求中提供详细情况和价格的工地上的公用设施。

承包商应承担承包商的风险和费用, 为承包商使用这些服务和计量所消耗的数量提供必要的设备。为测量消耗的数量而提供的仪器应经业主同意。在合同数据所述的每一付款期间 (如果没有说明, 每个月)消耗的数量 (如果有的话)应由承包商计算, 承包商为这些数量支付的金额(按业主要求中规定的价格计算)应包括在有关报表中。

#### 4.20 Progress Reports 进度报告

Monthly progress reports, in the format stated in the Employer 's Requirements (if not stated, in a format acceptable to the Employer) shall be prepared by the Contractor and submitted to the Employer. Each progress report shall be submitted in one paper -original, one electronic copy and additional paper copies (if any) as stated in the Contract Data.

The first report shall cover the period up to the end of the first month following the Commencement Date. Reports shall be submitted monthly thereafter, each within 7 days

after the last day of the month to which it relates.

月度报告应按照业主要求（如没有，则需要业主认可的格式）规定的格式，由承包商编写并提交给业主。进度报告需按照合同数据规定，每次提交一份纸质原版，一份电子副本和额外的纸质副本（如有）。第一次报告应包括自开工日起的第一个月的结尾这段时间。之后报告应每月提交一次，提交日期为每月最后一天之后的七天内。

Reporting shall continue until the Date of Completion of the Works or, if outstanding work

is listed in the Taking-Over Certificate, the date on which such outstanding work is completed. Unless otherwise stated in the Employer's Requirements, each progress report shall include:

报告应持续到承包商完成在工程移交证书上注明的竣工日期时所有未完扫尾工作为止。除业

主要求另有规定，每份报告应包括：

(a) charts, diagrams and detailed descriptions of progress, including each stage of design, Contractor's Documents, procurement, manufacture, delivery to Site, construction, erection, testing, commissioning and trial operation;

设计、承包商文件、采购、制造、货物运达现场、施工、安装、试验、投产准备和试运行等  
每一阶段进展情况的图表和详细说明；

(b) photographs and/or video recordings showing the status of manufacture and of progress on and off the Site;

反映制造情况和现场进展情况的照片

(c) for the manufacture of each main item of Plant and Materials, the name of the manufacturer, manufacture location, percentage progress, and the actual or expected dates of:

关于每项主要工程设备和材料的生产，制造商名称、制造地点、进度百分比，以及下列事项的实际或预计日期；

(i) commencement of manufacture,

开始制造，

(ii) Contractor's inspections,

承包商检验，

(iii) tests, and

试验

(iv) shipment and arrival at the Site;

装船并运抵现场；

(d) the details described in Sub-Clause 6.10 [Contractor's Records];

第6.10款[承包商的人员和设备的记录]中所述的具体信息；

(e) copies of quality management documents, inspection reports, test results, and

compliance verification documentation (including certificates of Materials);

质量管理文件、检验报告、测试结果和符合性验证文件 (包括材料证书) 的副本

(f) a list of Variations, and any Notices given (by either Party) under Sub -Clause 20.2.1

[Notice of Claim];

变更、根据第 20.2.1 款 [索赔通知] 的规定发出 (双方) 的通知;

(g) health and safety statistics, including details of any hazardous incidents and activities

relating to environmental aspects and public relations; and

健康安全统计数据, 包括对环境和公共关系有危害的任何事件与活动的详细情况 ;

(h) comparisons of actual and planned progress, with details of any events or

circumstances which may adversely affect the completion of the Works in accordance with

the Programme and the Time for Completion, and the measures being (or to be) adopted

to overcome delays.

实际进度与计划进度的对比, 包括可能影响按合同竣工的任何事件或情况的详情, 以及为消

除延误正在 (或准备) 采取的措施 .

However, nothing stated in any progress report shall constitute a Notice under a

Sub-Clause of these Conditions.

但是, 任何进度报告中没有规定的任何内容均应在这些条件的子条款下构成通知。

#### 4.21 Security of the Site 现场安保

The Contractor shall be responsible for the security of the Site, and:

承包商应负责现场的安全, 以及:

(a) for keeping unauthorised persons off the Site; and

承包商应负责阻止未经授权的人员进入现场 ;

(b) authorised persons shall be limited to the Contractor 's personnel, the Employer 's

Personnel, and to any other personnel identified as authorised personnel (including the

Employer 's other contractors on the Site), by a Notice from the Employer to the

Contractor.

授权人员应限于承包商的人员、 业主的人员以及被确定为授权人员 (包括业主其他在现场的

承包商), 由业主向承包商发出的通知。

#### 4.22 Contractor 's Operations on Site 承包商的现场作业

The Contractor shall confine the Contractor 's operations to the Site, and to any additional

areas which may be obtained by the Contractor and acknowledged by the Employer as

working areas. The Contractor shall take all necessary precautions to keep Contractor

Equipment and contractor 's Personnel within the Site and these additional areas, and to

keep them off adjacent land.

承包商应将其作业限制在现场、 以及承包商可得到并经业主同意作为工作场地的任何附加区

域内. 承包商应采取一切必要的预防措施, 以保持承包商设备和承包商人员处在现场和此类

附加区域内, 避免他们进入邻近地区 .



At all times, the Contractor shall keep the Site free from all unnecessary obstruction, and shall properly store or remove from the Site any Contractor's Equipment (subject to 4.17 [Contractor's Equipment]) and/or surplus materials. The Contractor shall promptly clear away and remove from the Site any wreckage, rubbish, hazardous waste and Temporary Works which are no longer required.

承包商应一直保持现场没有一切不必要的障碍物，并应妥善存放和处置承包商设备或多余的材料。承包商应从现场清除并运走任何残物、垃圾和不再需要的临时工程。

#### 4.23 Archaeological and Geological Findings 考古和地质发现

Promptly after the issue of a Taking-Over Certificate, the Contractor shall clear away and remove, from that part of the Site and Works to which the Taking-Over Certificate refers, all Contractor's Equipment, surplus material, wreckage, rubbish, hazardous waste and Temporary Works. The Contractor shall leave that part of the Site and the Works in a clean and safe condition. However, the Contractor may retain at locations on the Site agreed with the Employer, during the DNP, such Goods as are required for the Contractor to fulfil obligations under the Contract.

在签发交接证书后，承包商应从接收证书所指的现场和工程中立即清理和清除所有承包商的设备、剩余材料、残骸、垃圾、有害废品和临时工程。承包商应在清洁和安全的条件下离开那部分现场和工程。然而，在 DNP（缺陷通知期）内，承包商可在与业主商定的现场的位置，保留承包商履行合同义务所需的货物。

All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Employer. The Contractor shall take all reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.

在现场发现的所有化石、硬币、有价值的物品或文物、以及具有地质或考古意义的结构物和其他遗迹或物品，应置于业主的照管和权限下。承包商应采取合理的预防措施，防止承包商人员或其他人员移动或损坏任何这类发现物。

The Contractor shall, as soon as practicable after discovery of any such finding, give a Notice to the Employer in good time to give the Employer opportunity to promptly inspect and/or investigate the finding before it is disturbed. This Notice shall describe the finding and the Employer shall issue instructions for dealing with it.

承包商在发现任何此类发现后，应在切实可行范围内尽快向业主发出通知，在现场被破坏前给予业主及时检查和/或调查发现物的机会。本通知应对该发现物进行说明，且业主应发布处理发现物的指示。

If the Contractor suffers delay and/or incurs Cost from complying with the Employer's instructions, the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to EOT and/or payment of such Cost.

如果承包商因执行业主指示遭受延误和（或）招致费用，承包商有权就第 20.2 款 [支付和/或 EOT（延期）索赔] 至 EOT 和/或此类成本的支付要去索赔。

## 5 Design 设计

### 5.1 General Design Obligations 设计义务一般要求

The Contractor shall be deemed to have scrutinised, prior to the Base Date, the Employer's Requirements (including design criteria and calculations, if any).

承包商应被视为,在基准日期前已仔细审查了业主要求(包括设计标准和计算,如果有)。

The Contractor shall carry out, and be responsible for, the design of the Works and for the accuracy of such Employer's Requirements (including design criteria and calculations), except as stated in this Sub-Clause below.

承包商应实施并负责工程的设计,并在除下列业主应负责的部分外,对业主要求(包括设计标准和计算)的正确性负责。

Design shall be prepared by designers who:

准备设计的设计人员应:

(a) are engineers or other professionals, qualified, experienced and competent in the disciplines of the design for which they are responsible;

是在其所负责的设计科目上具有相应资格、经验和能力的工程师或其他专业人员;

(b) comply with the criteria (if any) stated in the Employer's Requirements; and  
符合业主要求中规定的标准(如有);

(c) are qualified and entitled under applicable Laws to design the Works. The Employer shall not be responsible for any error, inaccuracy or omission of any kind in the Employer's Requirements as originally included in the Contract and shall not be deemed to have given any representation of accuracy or completeness of any data or information, except as stated in this Sub-Clause below. Any data or information received by the Contractor, from the Employer or otherwise, shall not relieve the Contractor from the Contractor's responsibility for the execution of the Works.

在适用法律规定下,具有相应的资质和权利进行工程设计。除下述情况外,业主不应对原包括在合同内的业主要求中的任何错误、不准确、或遗漏负责,并不应被认为,对任何数据或资料给出了任何不准确性或完整性的表示。承包商从业主或其他方面收到任何数据或资料,不应解除承包商对设计和工程施工承担的职责。

However, the Employer shall be responsible for the correctness of the following portions of the Employer's Requirements and of the following data and information provided by (or on behalf of) the Employer:

但是,业主应对业主要求中的下列部分,以及由(或代表)业主提供的下列数据和资料的正确性负责:

(a) portions, data and information which are stated in the Contract as being immutable or the responsibility of the Employer,

在合同中规定的由业主负责的、或不可变的部分、数据和资料,

(b) definitions of intended purposes of the Works or any parts thereof,  
对工程或其任何部分的预期目的的说明,

(c) criteria for the testing and performance of the completed Works, and  
竣工工程的试验和性能的标准,

(d) portions, data and information which cannot be verified by the Contractor, except as

otherwise stated in the Contract.

除合同另有说明外，承包商不能核实的部分、数据和资料。

## 5.2 Contractor's Documents 承包商文件

The Contractor's Documents shall comprise the documents:

承包商文件应包括以下文件：

(a) specified in the Employer's Requirements (if any);

业主要求中规定的文件（如果有）；

(b) required to satisfy all permits, permissions, licences and other regulatory approvals

which are the Contractor's responsibility under Sub-Clause 1.12 [Compliance with Laws];

and

为满足根据 1.12 款 [遵守法律] 所规定的承包商责任范围内的准许、许可、执照和其他监管批准；

(c) described in Sub-Clause 5.6 [As-Built Records] and/or Sub-Clause 5.7 [Operation and Maintenance Manuals], where applicable.

适用第 5.6 款 [竣工文件] 和第 5.7 款 [操作和维修手册] 中所述的文件。

### 5.2.1 Preparation by Contractor 承包商准备

Unless otherwise stated in the Employer's Requirements, the Contractor's Documents shall be written in the language for communications defined in Sub-Clause 1.4 [Law and Language].

除非业主要求中另有说明，承包商文件应使用第 1.4 款 [法律和语言] 规定的交流语言书写

The Contractor shall prepare all Contractor's Documents, and any other documents necessary to complete and implement the design during execution of the Works and to instruct the Contractor's Personnel.

承包商应编制所有的承包商文件，还应编制指导承包商人员所需要的任何其他文件。

### 5.2.2 Review by Employer 业主审核

In this Sub-Clause 5.2.2:

在此款 5.2.2 中：

- "Review Period" means the period not exceeding 21 days, or as otherwise stated in the

Employer's Requirements, calculated from the date on which the Employer receives a Contractor's Document and a Contractor's Notice;

除非业主要求中另有说明，审核期不应超过 21 天，从业主收到一份承包商文件和承包商通知的日期算起；

- "Contractor Document" excludes any of the Contractor's Documents which is not specified in the Employer's Requirements or these Conditions as being required to be

submitted for Review, but includes all documents on which a specified Contractor's Document relies for completeness; and

“承包商文件”不包括任何业主要求或条款中未规定要提交审核的文件，但是包括保证规定的承包商文件完整性的所有文件。

- "Contractor's Notice" means the Notice which shall state that the relevant Contractor

's

Document is considered by the Contractor to be ready for Review under this Sub

-Clause

5.2.2 and for use, and that it complies with the Employer's Requirements and these Conditions, or the extent to which it does not do so.

“承包商通知”系指说明承包商认为相关承包商文件已准备好根据本款第 5.2.2 款进行审查和使用，并符合业主要求和相关条款，或列明不符合的内容。

If the Employer's Requirements or these Conditions specify that a Contractor's Document is to be submitted to the Employer for Review, it shall be submitted accordingly, together with a Contractor's Notice.

如果业主要求或这些条款中规定了要提交业主审核的承包商文件，这些文件应依照要求，连同通知一并上报。

The Employer shall, within the Review Period, give a Notice to the Contractor:

业主应在审核期内向承包商发出通知：

(a) of No -objection (which may include comments concerning minor matters which will not substantially affect the Works); or

无异议（可能包括对工程无实质性影响的次要事件的意见）；

(b) that the Contractor's Document fails (to the extent stated) to comply with the Employer's Requirements and/or the Contract, with reasons.

承包商的文件（在说明的范围）不符合业主要求和 /或合同，并附理由。

If the Employer gives no Notice within the Review Period, the Employer shall be deemed

to have given a Notice of No -objection to the Contractor's Document (provided that all other Contractor's Documents on which that Contractor's Document relies (if any) have been given, or are deemed to have been given, a Notice of No -objection).

如果业主未在审查期内发出通知，则应视为业主已发出对承包商文件无异议的通知（前提是承包商文件所依赖的所有其他承包商文件（如有）均已发出或被视作已发出无异议通知）。

If the Employer instructs that further Contractor's Documents are reasonably required to demonstrate that the Contractor's design complies with the Contract, the Contractor shall prepare and submit them promptly to the Employer at the Contractor's cost.

如果业主要求需要更多的承包商文件来证明承包商的设计符合合同要求，承包商应立即准备并提交给业主，费用由承包商承担。

If the Employer gives a Notice under sub -paragraph (b) above, the Contractor shall:

如果业主根据上述（b）项发出通知，承包商应：

(i) revise the Contractor's Document;

修改承包商的文件

(ii) resubmit it to the Employer for Review in accordance with this Sub -Clause 5.2.2, and

the Review Period shall be calculated from the date that the Employer receives it; and

根据本款第 5.2.2 款的规定重新提交业主审查，审查期应从业主收到之日起计算。

(iii) not be entitled to EOT for any delay caused by any such revision and resubmission

and/or by subsequent Review by the Employer.

对于任何此类修订和重新提交和 /或业主随后审查造成的任何延误，无权获得工期延长。

If the Employer incurs additional costs as a result of such resubmission and subsequent

Review, the Employer shall be entitled subject to Sub -Clause 20.2 [Claims For Payment

and/or EOT] to payment by the Contractor of the costs reasonably incurred.

如果业主因此类重新提交和随后的审查而招致额外费用，业主有权根据第 20.2 款【费用和 /或工期延长的索赔】要求承包商支付合理发生的费用。

### 5.2.3 Construction 施工

Except for Contractor 's Documents under Sub-Clause 5.6 [As-Built Records] and Sub-Clause 5.7 [Operation and Maintenance Manuals], for each part of the Works requiring Contractor 's Documents to be submitted for Review:

除第 5.6 款【竣工记录】和第 5.7 款【操作和维护手册】规定的承包商文件外，要求提交承包商文件供审查的工程各部分：

(a) construction of such part shall not commence until a Notice of No -objection is given (or is deemed to have been given) by the Employer for all the Contractor 's Documents which are relevant to its design and execution;

在业主发出（或视为已发出）与设计 and 施工有关的所有承包商文件无异议通知之前，不得开始该部分的施工；

(b) construction of such part shall be in accordance with these Contractor 's Documents; and

该部分的施工应符合承包商文件；

(c) the Contractor may modify any design or Contractor 's Documents which have previously been submitted for Review, by giving a Notice to the Employer with reasons. If the Contractor has commenced construction of the part of the Works to which such design or Contractor 's Documents are relevant:

承包商可通过向业主发出通知并说明理由，修改先前已提交审查的任何设计或承包商文件。

如果承包商已开始施工与此类设计或承包商文件相关的工程部分：

(i) work on this part shall be suspended;

暂停该部分工作；

(ii) the provisions of Sub -Clause 5.2.2 [Review by Employer] shall apply as if the Employer had given a Notice in respect of the Contractor 's Documents under paragraph (b) of Sub-Clause 5.2.2; and

第 5.2.2 款 [业主审查] 的规定应适用，如同业主已根据第 5.2.2 款（b）项就承包商的文件发出通知一样。

(iii) work on this part shall not resume until a Notice of No -objection is given (or is deemed to have been given) by the Employer for the revised documents.

在业主就修订后的文件发出（或视为已发出）无异议通知之前，不得恢复本部分的工作。

### 5.3 Contractor 's Undertaking 承包商的承诺

The Contractor undertakes that the design, the Contractor 's Documents, the execution of the Works and the completed Works will be in accordance with:

承包商承诺其设计、承包商文件、实施和竣工的工程符合：

(a) the Laws of the Country; and

工程所在国的法律；

(b) the documents forming the Contract, as altered or modified by Variations.

经过变更做出更改或修正的构成合同的各项文件。

### 5.4 Technical Standards and Regulations 技术标准和法规

The Contractor 's Documents, the execution of the Works and the completed Works (including defects remedied by the Contractor) shall comply with the Country 's technical

standards, building, construction and environmental Laws, Laws applicable to the product

being produced from the Works, and other standards specified in the Employer's Requirements, applicable to the Works, or defined by applicable Laws.

承包商文件、施工和竣工工程（包括承包商对工程缺陷的修复），均应符合工程所在国的技术标准、建筑、施工与环境方面的法律、适用于工程将生产的产品法律、以及业主要求中提出的适用于工程、或适用法律规定的其他标准。

All these technical or other standards and Laws shall, in respect of the Works, and each Section, be those in force when the Works or Section are taken over under Clause 10 [Employer's Taking Over].

所有这些关于工程和其各分项工程的技术或其他法规，应是在业主根据第 10 条 [业主接收] 的规定接收工程或分项工程时有效的。

References in the Contract to published standards shall be understood to be references to

the edition applicable on the Base Date, unless stated otherwise. If changed or new applicable standards come into force in the Country after the Base Date, the Contractor

shall promptly give a Notice to the Employer and (if appropriate or requested by the Employer) submit proposals for compliance. To the extent that:

除非另有说明，合同中提到的各项已公布标准应视为在基准日期适用的版本。如果在基准日期后，上述版本有修改或有新的标准生效，承包商应通知业主，并（如适宜）提交遵守新标准的建议书。如果：

(a) the Employer considers that compliance is required and such compliance requires change(s) to the execution of the Works; and

业主确定需要遵守，且遵守的要求对工程实施进行变更；

(b) the Contractor's proposals for compliance constitute a Variation; then the Employer

shall initiate a Variation in accordance with Clause 13 [Variations and Adjustments].

承包商遵守新标准的建议书构成一项变更时，业主应按照第 13 条 [变更和调整] 的规定着手做出变更。

## 5.5 Training 培训

If no training of employees of the Employer (and/or other identified personnel) by the Contractor is specified in the Employer's Requirements, this Clause shall not apply.

如果业主要求中未规定承包商对业主雇员（和 /或其他指定人员）的培训，则本款不适用。

The Contractor shall carry out training of employees of the Employer (and/or other personnel identified in the Employer's Requirements) in the operation and maintenance of

the Works, and any other aspect of the Works, to the extent specified in the Employer's Requirements.

承包商应在业主要求中规定的范围内，对业主员工（和 /或业主要求中确定的其他人员）进行工程操作和维护以及业主要求中规定的工程任何其他方面的培训。

If the Employer's Requirements specify training which is to be carried out before taking-over, the Works shall not be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over the Works and Sections] until this training has been completed in accordance with the Employer's Requirements.

如果业主要求中规定了工程接收前要进行培训，在此项培训根据业主要求结束前，不应认为工程已经按照第 10.1 款 [工程和分项工程的接收] 规定的接收要求的竣工。

The timing of the training shall be as stated in the Employer's Requirements (if not stated,

as acceptable to the Employer). The Contractor shall provide qualified and experienced training staff, training facilities and all training materials as necessary and/or as stated in the Employer's Requirements.

培训的时间安排应符合业主要求中的规定（如果没有规定，则应符合业主要求）。承包商应提供合格且经验丰富的培训人员、培训设施和所有必要和/或业主要求中规定的培训材料。

#### 5.6 As-Built Records 竣工记录

If no as-built records to be prepared by the Contractor are specified in the Employer's Requirements, this Sub-Clause shall not apply.

如果业主要求中没有规定承包商应编制的竣工记录，则本款不适用。

The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records of the execution of the Works, showing the exact as-built locations, sizes and details of the work as executed by the Contractor. The format, referencing system, system of electronic storage and other relevant details of the as-built records shall be as stated in the Employer's Requirements (if not stated, as acceptable to the Employer). These records shall be kept on the Site and shall be used exclusively for the purposes of this Sub-Clause.

承包商应编制并随时更新一套完整的、有关工程施工情况的“已完工程”记录，如实记载竣工工程的准确位置、尺寸和实施工作的详细说明。竣工记录的格式、参考系、电子存储系统和其他相关细节应符合业主要求中的规定（如果未规定，则应符合业主要求）。这些记录应保存在现场，并仅限于用于本款的目的。

The Contractor shall submit to the Employer under Sub-Clause 5.2.2 [Review by Employer]:

承包商应根据第 5.2.2 款 [业主审查] 的规定向业主提交：

(a) the as-built records for the Works or Section (as the case may be) before the commencement of the Tests on Completion; and

竣工检验开始前工程或分项工程（视情况而定）的竣工记录

(b) updated as-built records to the extent that any work is executed by the Contractor:

在以下时点，更新承包商所实施工程的竣工记录

(i) during and/or after the Tests on Completion, before the issue of any Taking-Over Certificate under Sub-Clause 10.1 [Taking Over the Works and Sections]; and

在竣工试验期间和/或之后，在根据第 10.1 款 [工程和分项工程的接收] 颁发任何接收证书之前

(ii) after taking over under Sub-Clause 10.1 [Taking Over the Works and Sections], before the issue of the Performance Certificate.

在根据第 10.1 款 [工程和分项工程的接收] 的规定进行接收之后，在颁发履约证书之前。

The number of copies of as-built records to be submitted by the Contractor under this Sub-Clause shall be as required under Sub-Clause 1.8 [Care and Supply of Documents].

承包商根据本款提交的竣工记录副本的数量应符合第 1.8 款 [文件的照管和提供] 的要求。

#### 5.7 Operation and Maintenance Manuals 操作和维修手册

If no operation and maintenance manuals to be prepared by the Contractor are specified in the Employer's Requirements, this Sub-Clause shall not apply.

如果业主要求中没有规定承包商应编制的操作和维护手册，则本款不适用。

The Contractor shall prepare, and keep up-to-date, a complete set of operation and

maintenance manuals for the Works (the “O&M Manuals” in these Conditions).

承包商应为工程编制一套完整的操作和维护手册（本条款中的“操作和维护手册”），并保持更新。

The format and other relevant details of the O&M Manuals shall be as stated in the Employer’s Requirements and, in any case, these manuals shall:

操作和维护手册的格式和其他相关细节应符合业主要求，在任何情况下，这些手册应：

(a) be in sufficient detail for the Employer to:

足够详细，以便业主：

(i) operate, maintain and adjust the Works to ensure that the performance of the Works,

Section and/or Plant (as the case may be) continues to comply with the performance criteria specified in the Employer’s Requirements and the Schedule of Performance Guarantees; and

运行、维护和调整工程，以确保工程、区段和 /或设备（视情况而定）的性能继续符合业主要求和履约保证中规定的性能标准。

(ii) operate, maintain, dismantle, reassemble, adjust and repair the Plant; and

操作、维修、拆卸、重新组装、调整和修复生产设备；

(b) include an inventory of spare parts required for the Employer’s future operation and maintenance of the Plant.

包括业主未来设备运行和维护所需的备件清单。

Before commencement of the Tests on Completion, the Contractor shall submit provisional O&M Manuals for the Works or Section (as the case may be) to the Employer under Sub-Clause 5.2.2 [Review by Employer].

在竣工试验开始前，承包商应根据第 5.2.2 款 [业主审核] 的规定，向业主提交工程或分项工程（视情况而定）的临时运行和维护手册。

If during the Tests on Completion any error or defect is found in the provisional O&M Manuals, the Contractor shall promptly rectify the error or defect at the Contractor’s risk and cost.

如果在竣工试验期间，在临时运行和维护手册中发现任何错误或缺陷，承包商应立即纠正错误或缺陷，风险和费用由承包商承担。

Before the issue of any Taking-Over Certificate under Sub-Clause 10.1 [Taking Over the Works and Sections], the final O&M Manuals shall be submitted to the Employer under Sub-Clause 5.2.2 [Review by Employer].

在根据第 10.1 款 [工程和分项工程的接收] 颁发任何接收证书之前，应根据第 5.2.2 款【业主审核】向业主提交最终的运行和维护手册。

#### 5.8 Design Error 设计错误

If errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the Contractor’s design and/or the Contractor’s Documents, they and the Works shall be corrected in accordance with Sub-Clause 7.5 [Defects and Rejection]. If such Contractor’s Documents were previously the subject of a Notice of Non-objection given (or deemed to be given) by the Employer under Sub-Clause 5.2.2 [Review by Employer], the provisions of Sub-Clause 5.2.2 shall apply as if the Employer had given a Notice in respect of the Contractor’s Documents under subparagraph (b) of Sub-Clause 5.2.2.

如果在承包商的设计和（或）承包商的文件中发现错误、遗漏、含糊、不一致、不充分或其



他缺陷，则应按照第 7.5 款【缺陷和拒收】的规定对这些缺陷和其带来的工程问题进行纠正。

如果此类承包商的文件曾是业主根据第 5.2.2 款【业主审核】发出（或视为发出）无异议通知的标的，则第 5.2.2 款的规定应适用，等同于业主已就承包商文件按第 5.2.2 款（b）项的规定发出了通知。

All corrections and resubmissions under this Sub -Clause shall be at the Contractor 's risk and cost.

本款下的所有更正和重新提交应由承包商承担风险和费用。

## 6 Staff and Labour 员工

### 6.1 Engagement of Staff and Labour 员工的雇用

Except as otherwise stated in the Specification, the Contractor shall make arrangements for the engagement of all Contractor 's Personnel, and for their payment, accommodation, feeding, transport and welfare.

除非规范中另有规定，承包商应安排雇用所有承包商人员，并安排他们的报酬、住宿、膳食、交通和福利。

### 6.2 Rates of Wages and Conditions of Labour 工资标准和劳动条件

The Contractor shall pay rates of wages, and observe conditions of labour, which comply with all applicable Laws and are not lower than those established for the trade or industry where the work is carried out.

承包商所付的工资标准及遵守的劳动条件应符合适用法律的规定，且不低于实施工作的地区工商业现行的标准和条件。

If no established rates or conditions are applicable, the Contractor shall pay rates of wages and observe conditions which are not lower than the general level of wages and conditions observed locally by employers whose trade or industry is similar to that of the Contractor.

如果没有现成的标准和条件可以引用，承包商所付的工资标准及遵守的劳动条件，应不低于当地与承包商类似的工商业业主所付的一般工资标准及遵守的劳动条件。

### 6.3 Recruitment of Persons 人员招聘

The Contractor shall not recruit, or attempt to recruit, staff and labour from amongst the Employer 's Personnel.

承包商不得从业主的人员中招聘或试图招聘职员和劳工。

The Employer shall not recruit, or attempt to recruit, staff and labour from amongst the Contractor 's Personnel.

业主不得从承包商的人员中招聘或试图招聘职员和劳工。

### 6.4 Labour Laws 劳动法

The Contractor shall comply with all the relevant labour Laws applicable to the Contractor 's Personnel, including Laws relating to their employment (including wages and working hours), health, safety, welfare, immigration and emigration, and shall allow them all their legal rights.

承包商应遵守适用于承包商人员的所有相关劳动法，包括有关其雇佣（包括工资和工作时间）、健康、安全、福利、移民和移民的法律，并应允许他们享有所有合法权利。

The Contractor shall require the Contractor 's personnel to obey all applicable Laws, including those concerning health and safety at work.

承包商应要求承包商人员遵守所有适用法律，包括与工作健康和安全的法律。

#### 6.5 Working Hours 工作时间

No work shall be carried out on the Site on locally recognised days of rest, or outside the normal working hours stated in the Contract Data, unless:

除非出现下列情况，在当地公认的休息日，或在合同资料规定的正常工作时间以外，不应在现场进行工作：

(a) otherwise stated in the Contract;

合同中另有规定，；

(b) the Employer gives consent; or

业主同意；或

(c) the work is unavoidable or necessary for the protection of life or property or for the safety of the Works, in which case the Contractor shall immediately give a Notice to the Employer with reasons and describing the work required.

为保护生命或财产，或为工程的安全，不可避免或必需的工作，在此情况下，承包商应立即通知业主，说明原因和所需完成的工作。

#### 6.6 Facilities for Staff and Labour 为员工提供设施

Except as otherwise stated in the Employer 's Requirements, the Contractor shall provide and maintain all necessary accommodation and welfare facilities for the Contractor 's Personnel.

除业主要求中另有说明外，承包商应为承包商人员提供和保持一切必要的食宿和福利设施。

If such accommodation and facilities are to be located on the Site, except where the Employer has given the Contractor prior permission, they shall be located within the areas identified in the Employer 's Requirements. If any such accommodation or facilities are found elsewhere within the Site, the Contractor shall immediately remove them at the Contractor 's risk and cost. The Contractor shall also provide facilities for the Employer 's Personnel as stated in the Employer 's Requirements.

如果此类住宿和设施位于现场，除非业主事先给予承包商许可，否则应建在业主要求中确定的区域内。如果在现场其他地方发现任何此类住宿或设施，承包商应立即将其移走，风险和费用由承包商承担。承包商还应按照业主要求为业主人员提供设施。

#### 6.7 Health and Safety of Personnel 人员健康和安全的

In addition to the requirements of Sub-Clause 4.8 [Health and Safety Obligations], the Contractor shall at all times take all necessary precautions to maintain the health and safety of the Contractor 's Personnel. In collaboration with local health authorities, the Contractor shall ensure that:

除第 4.8 款[健康和安全的义务]的要求外，承包商应始终采取一切必要的预防措施，以保持承包商人员的健康和安全的。承包商应与当地卫生部门合作，确保：

(a) medical staff, first aid facilities, sick bay, ambulance services and any other medical

services stated in the Employer 's Requirements are available at all times at the Site and

at any accommodation for Contractor 's and Employer 's Personnel; and

医务人员、急救设施、医务室、救护车服务和业主要求中规定的任何其他医疗服务在现场和承包商和业主人员的任何住宿处随时可用；

(b) suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics. The Contractor shall appoint a health and safety officer at the Site, responsible for maintaining health, safety and protection against accidents. This officer shall:

为所有必要的福利和卫生要求以及预防流行病作出了适当的安排。 承包商应在现场任命一名健康和安全人员，负责维护健康、安全和防止事故发生。该人员应：

(i) be qualified, experienced and competent for this responsibility; and  
有资格、有经验和胜任这项职责

(ii) have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorised to enter and/or work on the Site and to take protective measures to prevent accidents.

有权发布指令，以维护所有授权进入和 /或在现场工作的人员的健康和安全，并采取保护措施防止事故发生。

Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.

在工程实施过程中，承包商应提供该人员履行其职责和权利所需要的任何事项。

#### 6.8 Contractor 's Superintendence 承包商的监督

From the Commencement Date until the issue of the Performance Certificate, the Contractor shall provide all necessary superintendence to plan, arrange, direct, manage, inspect, test and monitor the execution of the Works.

从开工日期到颁发履约证书，承包商应对工作的计划、安排、指导、管理、检查、试验提供一切必要的监督。

Superintendence shall be given by a sufficient number of persons:

此类监督应由足够的下述人员执行：

(a) who are fluent in or have adequate knowledge of the language for communications

(defined in Sub -Clause 1.4 [Law and Language]); and

能够流利地使用或对交流语言具有足够的知识（第 1.4 款 [法律和语言 ]所规定的）；

(b) who have adequate knowledge of the operations to be carried out (including the methods and techniques required, the hazards likely to be encountered and methods of preventing accidents), for the satisfactory and safe execution of the Works.

对将要进行的作业（包括所需的方法和技术、可能遇到的危险以及防止事故发生的方法）有充分的了解，以便合乎要求地、安全地实施工程。

#### 6.9 Contractor 's Personnel 承包商人员

The Contractor 's Personnel (including Key Personnel, if any) shall be appropriately qualified, skilled, experienced and competent in their respective trades or occupations.

承包商人员（包括关键人员，如有）应在各自的行业或职业中具有相应的资格、技能、经验和能力。

The Employer may require the Contractor to remove (or cause to be removed) any person employed on the Site or Works, including the Contractor 's Representative and Key Personnel (if any), who:

业主可要求承包商撤换（或促使撤换）任何受雇于现场或工程的，有下列行为的任何人员，包括承包商代表和关键人员（如果有）：

(a) persists in any misconduct or lack of care;

经常行为不当，或工作漫不经心；

(b) carries out duties incompetently or negligently;

无能力履行义务或玩忽职守；

(c) fails to comply with any provision of the Contract;

不遵守合同的任何规定；

(d) persists in any conduct which is prejudicial to safety, health, or the protection of the environment;

坚持有损安全、健康，或有损环境保护的行为；

(e) is found, based on reasonable evidence, to have engaged in corrupt, fraudulent, collusive or coercive practice; or

根据合理证据，被发现从事腐败、欺诈、串通或胁迫行为。

(f) has been recruited from the Employer's Personnel in breach of Sub-Clause 6.3 [Recruitment of Persons].

在违反第 6.3 款【人员招聘】的情况下从业主的人员中招聘。

If appropriate, the Contractor shall then promptly appoint (or cause to be appointed) a suitable replacement. In the case of the replacement of the Contractor's Representative, Sub-Clause 4.3 [Contractor's Representative] shall apply. In the case of the replacement of Key Personnel (if any), Sub-Clause 6.12 [Key Personnel] shall apply.

如果适宜，承包商应立即任命（或安排任命）合适的替代人员。在更换承包商代表的情况下，第 4.3 款 [承包商代表] 应适用。在更换关键人员（如有）的情况下，第 6.12 款【关键人员】应适用。

#### 6.10 Contractor's Records 承包商记录

Unless otherwise proposed by the Contractor and agreed by the Employer, in each progress report under Sub-Clause 4.20 [Progress Reports], the Contractor shall include records of:

除非承包商另有建议并经业主同意，否则在根据第 4.20 款 [进度报告] 提交的每份进度报告中，承包商应包括下列记录：

(a) occupations and actual working hours of each class of Contractor's Personnel;

各类承包商人员的职业和实际工作时间；

(b) the type and actual working hours of each of the Contractor's Equipment;

每个承包商设备的类型和实际工作时间；

(c) the types of Temporary Works used;

所用临时工程的类型；

(d) the types of Plant installed in the Permanent Works; and

安装在永久工程中的装置类型；

(e) the quantities and types of Materials used for each work activity shown in the Programme, at each work location and for each day of work.

计划中所示每个工作活动、每个工作地点和每天工作所用材料的数量和类型。

#### 6.11 Disorderly Conduct 无序行为

The Contractor shall at all times take all necessary precautions to prevent any unlawful,

riotous or disorderly conduct by or amongst the Contractor \_\_\_\_\_'s Personnel, and to preserve peace and protection of persons and property on and near the Site.

承包商应始终采取各种必要的预防措施 \_\_\_\_\_,防止承包商人员或其内部 \_\_\_\_\_,发生任何非法的、骚扰的或无序的行为 \_\_\_\_\_,以保持安定,保护现场及临近人员和财产的安全。

#### 6.12 Key Personnel 关键人员

If no Key Personnel are specified in the Employer \_\_\_\_\_'s Requirements ~~this Clause~~ shall not apply.

如果业主要求中没有规定关键人员,则本款不适用。

The Contractor shall appoint the natural persons named in the T\_\_\_\_\_ender to the positions of Key Personnel. If not so named, or if an appointed person fails to act in the relevant position of Key Personnel, the Contractor shall submit to \_\_\_\_\_the Employer for consent the name and particulars of another person the Contractor proposes to appoint to such position. If consent is withheld or subsequently revoked, the Contractor shall similarly submit the name and particulars of a suitable replacement for such position.

承包商应任命标书中指定的自然人担任关键人员。\_\_\_\_\_如果未指定,或指定人员未能担任关键人员的相关职务,承包商应向业主提交其拟任命的其他人员的姓名和详细信息,以获得同意。

如果业主拒绝同意或随后撤销同意,\_\_\_\_\_承包商应同样提交该职位的合适替代人选的姓名和详情。

If the Employer does not respond within 14 days after receiving any such submission, by giving a Notice stating an objection to the appointment of such person (or replacement) with reasons, the Employer shall be deemed to have given the Employer \_\_\_\_\_'s consent.

如果业主在收到任何此类文件后 \_\_\_\_\_14 天内未作出回应,并发出通知,说明反对任命(或更换)此类人员的理由,则应视为业主已同意。

The Contractor shall not, without the Employer \_\_\_\_\_'s prior consent, revoke the appointment of any of the Key Personnel or appoint a replacement (unless the person is unable to act as a result of death, illness, disability or resignation, in which case the appointment shall be deemed to have been revoked with immediate effect and the appointment of a replacement shall be treated as a temporary appointment until the Employer gives his/her consent to this replacement, or another replacement is appointed, under this Sub \_\_\_\_\_-Clause).

未经业主事先同意,\_\_\_\_\_承包商不得撤销对任何关键人员的任命或任命替代人员 \_\_\_\_\_(除非该人员因死亡、疾病、残疾或辞职而不能担任职务,在这种情况下,该任命应被视为已撤销。替代人员的任命应视为临时任命,直至业主根据本款同意此项替换或任命另一名替换人员为止。

All Key Personnel shall be based at the Site (or, where Works are being executed off the Site, at the location of the Works) for the whole time that the Works are being executed. If any of the Key Personnel is to be temporarily absent during execution of the Works, a suitable replacement shall be temporarily appointed, subject to the Employer's prior consent.

所有关键人员应在工程实施的整个过程中驻扎在现场 \_\_\_\_\_(或在现场外实施工程时,\_\_\_\_\_驻扎在工程所在地)。如果任何关键人员在工程实施期间暂时缺席,应在征得业主事先同意的情况下,临时任命一名合适的替代人员。

All Key Personnel shall be fluent in the language for communications defined in Sub-Clause 1.4 [Law and Language].

所有关键人员应能流利地使用第 \_\_\_\_\_1.4 款【法律和语言】中规定的交流语言。

## 7 Plant, Materials and Workmanship 生产设备、材料和工艺

### 7.1 Manner of Execution 实施方法

The Contractor shall carry out the manufacture, supply, installation, testing and commissioning and/ or repair of Plant, the production and manufacture, supply and testing of Materials, and all other operations and activities during the execution of the Works:

承包商应按以下方法进行生产设备的制造、供货、安装、试验、投产准备和 (或) 修复、材料的生产加工、供货和试验以及工程实施作业期间的所有其他作业和活动:

- (a) in the manner (if any) specified in the Contract,  
按照合同规定的方法 (如果有);
- (b) in a proper workmanlike and careful manner, in accordance with recognized good practice, and  
按照公认的良好惯例, 使用恰当、精巧、仔细的方法;
- (c) with properly equipped facilities and non-hazardous Materials, except and otherwise specified in the Contract.  
除合同另有规定外, 使用适当配备的设施和无危险的材料。

### 7.2 Samples 样品

The Contractor shall submit the following samples of Materials, and relevant information, to the Employer, for Each sample shall be labelled as to origin and intended use in the Works consent prior to using the Materials in or for the works.

承包商应在工程中使用材料前向雇主提交以下材料的样品和相关的信息。

- (a) samples of Materials specified in the Contract, at the Contractor's cost; and  
承包商应自费提供合同中规定的材料样本;
- (b) additional samples instructed by the Employer as a Variation,  
雇主指示作为变更的特定样品,

Each samples shall be labelled as to origin and intended use in the works.

每件样品应标明其原产地、及其在工程中预期的用处。

### 7.3 Inspection 检验

The Employer's Personnel shall, during all the normal working hours stated in the Contract Data and at all reasonable times:

雇主人员应在所有合同数据中规定的正常工作时间和合理的时间内:

- (a) have full access to all parts of the Site and to all places from which natural Materials are being obtained,  
有充分机会进入现场的所有部分、以及获得天然材料的所有地点;
- (b) during production, manufacture and construction (at the Site and, to the extent specified in the Employer's Requirement, elsewhere), be entitled to examine, inspect,

measure and test the materials and workmanship, and to check the progress of manufacture of Plant and production and manufacture of Materials.

有权在加工、生产和施工期间 (在现场和其他雇主要求规定的范围), 对材料和工艺进行检查、检验、测量和试验, 并对生产设备的制造和材料的加工生产进度进行检查。

( i ) examine, inspect, measure and test ( in the Employer 's Requirements )the Materials and workmanship,

按照雇主要求指出的部分对材料和工艺进行检查、检验、测量和试验,

( ii ) to check the progress of manufacture of Plant and production and manufacture of Materials, and

对生产设备的制造和材料的加工生产进度进行检查 ,

(iii) make records (including photographs and/ or video recordings); and

做好包括影像记录在内的记录;

( c ) carry out other duties and inspections, as specified in these conditions and the Employer 's Requirements.

按照本条件和雇主要求执行其他任务和进行其他检验。

The Contractor shall give the Employer's Personnel full opportunity to carry out these activities, including providing safe access, facilities, permissions and safety equipment.

承包商应为雇主人员进行上述活动提供一切机会, 包括提供安全进入条件、设施、许可和安全装备。

In respect of the work which Employer's Personnel are entitled to' examine, inspect, measure and/or test, the Contractor shall give a Notice to the Employer whenever any Materials , Plant or such work is ready for inspection and before it is covered up, put out of sight, or packaged for storage or transport. The Employer shall then either carry out the examination, inspection, measurement or testing without unreasonable delay, or the employer shall promptly give notice to the Contractor that the Employer 's Personnel do not require to do so.

对于雇主人员有权检查、检验、测量和 (或)试验的工作, 每当任何材料、设备或此类工作已经准备好接受检验, 在覆盖、掩蔽、包装以便储存或运输前, 承包商应通知雇主。这时, 雇主应及时进行检查、检验、测量或试验, 不得无故拖延, 或者通知雇主应立即通知承包商雇主人员无需进行这些工作。

#### 7.4 Testing by the Contractor 承包商所要进行的试验

This Sub-Clause shall apply to all tests specified in the Contract, except as otherwise stated under Sub -Clause 12 [Tests after Completion].

本款适用于除第 12 款 [竣工后试验] 另有规定以外的所有试验。

The Contractor shall provide all apparatus, assistance, documents and other information, temporary supplies of electricity, and water equipment, fuel, consumables, instruments, labour, materials, and suitably qualified and experienced and competent staff, as are

necessary to carry out the specified tests efficiently and properly. All apparatus, equipment and instruments shall be calibrated in accordance with the standards specified in the Employer's Requirements or defined by applicable Laws and, if requested by the Employer, the Contractor shall submit calibration certificates before carrying out testing.

为有效合理进行规定的试验，承包商应提供所需的所有仪器、帮助、文件和其他资料、临时用电、供水设备、燃料、消耗品、工具、劳力、材料，以及具有适当资质和经验而且有能力的人员。根据雇主要求中规定的标准或适用法律中明确规定对所有仪器，设备和工具进行校验；如果雇主要求，承包商应在进行试验前将校验证证书提交给雇主。

The Employer may, under Clause 13 [Variations and Adjustments], vary the location or timing or details of specified tests, or instruct the Contractor to carry out additional tests. If these varied or additional tests show that the tested Plant, Materials or workmanship is not in accordance with the Contract, the cost and any delay incurred in carrying out this Variation shall be borne by the Contractor.

根据第 13 条 [变更和调整] 的规定，雇主可以改变进行规定试验的位置或时间安排或细节，或指示承包商进行附加的试验。如果这些变更或附加的试验表明，经过试验的生产设备、材料、或工艺不符合合同要求，承包商应负担进行本项变更和任何误期招致的费用。

The Employer shall give a Notice to the Contractor of not less than 72 hours of the Employer's intention to attend the tests. If the Employer does not attend at the time and place stated in the Contractor's Notice under this Sub-Clause, the Contractor may proceed with the tests, unless otherwise instructed by the Employer. These tests shall then be deemed to have been made in the Employer's presence. If the Contractor suffers delay and/ or incurs Cost from complying with any such instruction or as a result of a delay for which the Employer is responsible, the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to EOT and/ or payment of Cost Plus Profit.

雇主应至少提前 72 小时将参加试验的意图通知承包商。如果雇主没有在商定该子条款规定中说明的时间和地点参加试验，除非雇主另有指示，承包商可以自行进行试验。这些试验应被视为是在雇主在场情况下进行的。倘若承包商因遵照任何此类指示遭受延误和 (或) 招致增加费用或该误期是雇主的责任造成的，承包商有权遵照子条款 20.2 [付款索赔和/或延期补偿] 提出对延期补偿和合理利润，给予支付。

If the Contractor causes any delay to specified test (including varied or additional tests) and such delay causes the Employer to incur costs, the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to payment of these costs by the Contractor.

倘若承包商导致规定的试验出现误期，该试验包括变更或附加的试验。如果该误期招致雇主发生了一些费用，雇主应有权遵照子条款 20.2 [付款索赔和 /或延期补偿] 的规定提出让分包商对这些费用给予支付。



The Contractor shall promptly forward to the Employer duly certified reports of the tests

When the specified tests have been passed, the Employer shall endorse the Contractor's

test certificate, or issue a test certificate to the Contractor, to that effect. If the Employer

has not attended the tests, he the Employer shall be deemed to have accepted the readings as accurate.

承包商应立即向雇主提交充分证实的试验报告。当规定的试验通过时，雇主应在承包商的试验证书上签字认可，或向承包商颁发等效的试验证书。如果雇主未参加试验，他应被视为已经认可试验示数是准确的。

#### 7.5 Defects and Rejection 缺陷和拒收

If, as a result of an examination, inspection, measurement or testing, any Plant, Materials,

design or workmanship is found to be defective or otherwise not in accordance with the

Contract, the Employer shall endorse the Contractor's test certificate, or issue a test

certificate to the Contractor, to that effect. The Contractor shall then promptly prepare and

submit a proposal for necessary remedial work.

如果检查、检验、测量或试验结果，发现任何生产设备、材料、设计或工艺有缺陷，或不符合

合同要求，雇主应签署承包商的试验报告或向承包商颁发等效的证书。承包商应立即为必要的修补工作准备并提交方案。

The Employer may Review this proposal, and may give a Notice to the Contractor stating

the extent to which the proposed work, if carried out, would not result in the Plant,

Materials, design or workmanship complying with the Contract. After receiving such a

Notice the Contractor shall promptly submit a revised proposal to the Employer. If the

Employer gives no such Notice within 14 days after receiving the Contractor's proposal (or

revised proposal), the Employer shall be deemed to have given a Notice of No objection.

雇主可以审查该方案并可通知承包商如果进行所建议的工作并不会使得设备、材料、设计或

工艺符合合同要求。在收到此类通知后，承包商应立即向雇主提交经修订的方案。倘若雇主

在收到承包商的方案或者经修订的方案后 14 天内没有发出通知，就应认定为雇主已经给出

了无异议通知。

If the Contractor fails to promptly submit a proposal (or revised proposal) for remedial

work, or fails to carry out the proposed remedial work to which the Employer has given (or

is deemed to have given) a Notice of No objection, the Employer may:

倘若承包商未能立即提交修补工作方面方案或经修订的方案，亦或者未能进行雇主给出或者

认定已经给出无异议通知的所建议的修补工作，雇主可以：

(a) instruct the Contractor under sub-paragraph (a) and/ or (b) of Sub-Clause 7.6

[Remedial Work ]; or

指示承包商按照子条款 7.6[修补工作] (a) 和/或 (b) 项行事；或者

(b) reject the design, Plant, Materials or workmanship by giving a Notice to the

Contractor, with reasons, in which case sub-paragraph (a) of Sub-Clause 11.4 [Failure to

Remedy Defects] shall apply.

通知承包商拒收设计，设备，材料或工艺并说明理由；这种情况适用于第 11.4 款[未能修补缺陷] (a) 项。

After remedying defects in any Plant, Materials, design or workmanship, if the employer requires any such items to be retested, the tests shall be repeated in accordance with Sub-Clause 7.4 [Testing by the Contractor] at the Contractor's risk and cost. If the rejection and retesting cause the Employer to incur additional costs, the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to payment of these costs by the Contractor.

修补任何设备，材料，设计或工艺上的缺陷后，如果雇主有重新试验的要求时，承包商应自担风险和费用依据第 7.4 款 [由承包商进行的试验] 重复进行试验。如果此项拒收和再次试验使雇主增加了费用，承包商应遵照第 20.2 款 [付款索赔和/或延期补偿] 的规定，提出让承包商对这些费用，给予支付。

#### 7.6 Remedial work 修补工作

In addition to any previous examination, inspection, measurement or testing, or test certificate or Notice of No-Objection by the Employer, at any time before the issue of the Taking-Over Certificate for the Works the Employer may instruct the Contractor to:

在颁发工程接受证书前的任何时间，连同任何雇主以前的检查，检验，测量或试验，或试验证书或无异议通知书，业主可以指示承包商：

(a) repair or remedy (if necessary, off the Site), remove from the Site and replace any Plant or Materials which is not in accordance with the Contract,

将不符合合同要求的任何生产设备或材料进行修补（如有必要，在现场以外），移出现场，并进行更换；

(b) repair or remedy, remove and re-execute any other work which is not in accordance with the Contract, and

修补，去除不符合合同的任何其他工作，并重新实施；

(c) carry out any remedial work which is urgently required for the safety of the Works, whether because of an accident, unforeseeable event or otherwise.

从事因意外、不可预见的事件或其他原因引起的、为工程的安全迫切需要的任何修复工作。

The Contractor shall comply with the instruction as soon as practicable and not later than the time(if any) specified in the instruction, or immediately if urgency is specified under sub-paragraph (c) above.

承包商应尽快并且不迟于指示中规定的时间（如有）或者如果以上（c）项中有规定的紧迫性立即遵守指示。

The Contractor shall bear the cost of all remedial work required under this Sub-Clause, except to the extent that any work under sub-paragraph (c) above is attribute to:

除任何以上项中的任何工作归因于以下情形外的，承包商均应承担所有该子条款中规定的所有修复工作的费用：

(i) any act by the Employer or the employer's Personnel. If the Contractor suffers delay and/ or incurs Cost in carrying out such work, the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to EOT and/ or payment of Cost Plus Profit.

任何雇主或雇主人员的行动。倘若承包商在执行该项工作中遭受延误和 (或) 招致费用, 承包商有权遵照子条款 20.2 [付款索赔和 /或延期补偿] 提出对延期补偿和合理利润, 给予支付。

(ii) an Exceptional Event, in which case Sub-Clause 18.4 [Consequences of an Exceptional Event] shall apply.

异常事件可以适用于第 18.4 款 [异常事件的后果]。

If the Contractor fails to comply with the Employer's instruction, the Employer may (at the Employer's sole discretion) employ and pay other persons to carry out the work. Except to the extent that the Contractor would have been entitled to payment for work under this Sub-Clause, the employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to payment by the Contractor of all costs arising from this failure.

This entitlement shall be without prejudice to any other rights the Employer may have, under the Contractor or otherwise.

如果承包商未能服从任何雇主的指示, 雇主可以 (雇主完全自主决定) 雇用并付款给他人从事该工作。除承包商原有权从该该款规定的工作所得付款的范围外, 雇主应有权遵照第 20.2 款 [付款索赔和/或延期补偿] 的规定, 提出让承包商对因他未履行指示而使雇主支付的所有费用, 给予支付。该权利是在在不损害根据合同或其他规定所具有的任何其他权利的情况下享有的。

#### 7.7 Ownership of Plant and Materials 生产设备和材料的所有权

Each item of Plant and Materials shall, to the extent consistent with the mandatory requirements of the Laws of the Country, become the property of the Employer at whichever is the earlier of the following times, free from liens and other encumbrances:

从下列二者中较早的时间起, 在符合工程所在国法律强制性要求规定范围内, 每项生产设备和材料都应无扣押和其他阻碍地成为雇主的财产。

(a) when it is delivered to the Site;

当上述生产设备、材料运至现场时;

(b) when the Contractor is paid the value of the Plant and Materials under Sub-Clause

8.11 [Payment for Plant and Materials after Employer's Suspension].

当根据第 8.11 款 [雇主责令暂停后对生产设备和材料的支付] 的规定, 承包商有权得到按生产设备和材料价值的付款时。

(c) when the Contractor is paid the amount determined for the Plant and Materials under Sub-Clause 14.5 [Plant and Materials intended for the Works].

当承包商按照第 14.5 款 [拟用于工程的生产设备和材料] 得到设备和材料确定的金额时。

## 7.8 Royalties 土地(矿区)使用费

Unless otherwise stated in the Employer's Requirements, the Contractor shall pay all royalties, rents and other payments for:

除非在雇主要求中另有说明, 承包商应为以下事项支付所有的土地 (矿区) 使用费、租金和其他付款:

(a) natural Materials obtained from outside the Site, and

从现场以外地区得到的天然材料;

(b) the disposal of material from demolitions and excavations and of other surplus material (whether natural or man-made), except to the extent that disposal areas within

the Site are specified in the Employer's Requirements.

在雇主要求中规定的现场范围内的弃置区以外, 弃置拆除、开挖的材料和其他剩余材料(不论是天然的或人工的)。

## 8 commencement, Delays and Suspension 开工、延误和暂停

### 8.1 Commencement of Works 工程的开工

Unless the Commencement Date is stated in the Contract Agreement, the Employer shall give a Notice to the Contractor stating the Commencement Date not less than 14 days before the Commencement Date.

除非合同协议书说明开工日期, 雇主应在开工日期前不少于 14 日向承包商发出通知, 指出开工日期。

Unless otherwise stated in the Particular Conditions, the Commencement Date shall be within 42 days after the date on which Contract comes into full force and effect under Sub-Clause 1.6 [Contract Agreement].

除非在专用条件中另有说明, 开工日期应在第 1.6 款 [合同协议书] 规定的合同全面实施和生效日期后 42 天内。

The Contractor shall commence the execution of the Works on, or as soon as is reasonably practicable after, the Commencement Date and shall then proceed with the Works with due expedition and without delay.

承包商应在开工日期那一天或其后, 在合理可能情况下尽早开始工程的设计和施工, 随后应以正当速度, 不拖延地进行工程。

### 8.2 Time for Completion 竣工时间

The Contractor shall complete the whole of the Works, and each Section (if any), within the Time for Completion for the Works or Section (as the case may be), including completion of all work which is stated in the Contract as being required for the Works or Section to be considered to be completed for the purposes of taking-over under Sub-Clause 10.1 [Taking Over of the Works and Sections].

承包商应在工程或分项工程 (视情况而定) 的竣工时间内, 完成整个工程和每个分项工程 (如果有), 包括完成合同提出的、工程和分项工程按照第 10.1 款 [工程和分项工程的接收] 规定的接收要求竣工所需要的全部工作。

### 8.3 Programme 进度计划

The Contractor shall submit an initial programme for the execution of the Works to the Employer within 28 days after receiving the Notice under Sub-Clause 8.1 [Commencement of Works]. This programme shall be prepared using programming software stated in the Employer's requirements (if not stated, the programming software acceptable to the Employer).

承包商应在收到第 8.1 款 [工程的开工] 的规定的通知后 28 天内, 向雇主提交一份执行工程初步计划。该计划应使用雇主要求中说明的计划编制软件编制 (如无规定, 则使用雇主可接受的计划编制软件)。

Unless otherwise stated in the Particular Conditions, the Contractor shall also submit a revised programme which accurately reflects the actual progress of the Works, whenever any programme ceases to reflect actual progress or is otherwise inconsistent with the Contractor's obligations.

除非在专用条件中另有说明, 当任何计划不能反应实际的进度或不符合承包商的义务时, 承包商也应该提交一个修订后的计划并且该计划精确反应工程的实际进度。

The initial programme and each revised programme shall be submitted to the Employer in one paper copy, one electronic copy and additional paper copies (if any) as stated in the Contract Data, and shall include:

按照合同数据中说明的, 应将初步计划及每一版修订的计划一份纸质版, 一份电子版和另外几份纸质版的 (如果有) 并且应包括:

(a) the Commencement Date and the Time for Completion, of the Works and of each Section (if any);

工程以及每个分项工程 (如果有) 的开工日期和竣工时间;

(b) the date right of access to and possession of (each part of) the Site is to be given to the Contractor in accordance with Sub-Clause 2.1 [Right of Access to the Site];

根据第 2.1 款 [现场进入权] 将现场 (每一部分) 进入权和现场 (每一部分) 占用权的日期通知给承包商。

(c) the order in which the Contractor intends to carry out the Works, including the anticipated timing of each stage of design, preparation and submission of Contractor's Documents, procurement, manufacture, inspection, delivery to Site, construction, erection, installation, work to be undertaken by any nominated Subcontractor (as defined in Clause 4.5 [Nominated Subcontractors]), testing, commissioning and trial operation;

承包商计划实施工程的工作顺序, 包括设计各阶段的预期时间安排, 承包商文件的编制和提交, 采购, 制造, 检验, 运至现场, 施工, 吊装, 安装, 由任何指定的分包商从事的工作 (4.5 款 [指定的分包商] 规定的), 试验, 投产准备和试运行;

(d) the Review periods under Sub -Clause 5.2.2 [Review by Employer], and periods for Review for any other submissions specified in the Employer 's Requirements or required under these Conditions;

第 5.2.2 款[雇主审核]规定的审核期限和任何雇主要求规定或者在这些条件下要求的其他所提交的文件的审核期限;

(e) the sequence and timing of inspections and tests specified in, or required by, the Contract;

合同规定或要求的检验和试验的次序和时间安排;

(f) for a revised programme: the sequence and timing of the remedial work (if any) to which the Employer has given a Notice of No -objection under Sub -Clause 7.5 [Defects and Rejection] and/ or the remedial work (if any) instructed under Sub -Clause 7.6 [Remedial Work];

对于修订的计划: 雇主按照第 7.5 款 [缺陷和拒收]发出无异议通知的修复工作(如果有)的次序和时间安排和 /或第 7.6 款 [修复工作]规定中指示的修复工作(如果有) ;

(g) all activities (to the level of detail specified in the Employer 's Requirements), logically linked and showing the earliest and latest start and finish dates for each activity, the float (if any), and the critical path(s);

逻辑上有联系并且显示每一项活动的最早和最新的开始和结束日期所有的活动 (达到雇主要求中规定的详细程度 ), 工作时差(如果有), 和关键线路;

(h) the dates of all locally recognised days of rest and holiday periods (if any);

所有当地公认的休息日和节假日(如果有) ;

(i) all key delivery dates of Plant and Materials;

设备和材料的所有关键交付日期;

(j) for a revised programme and for each activity: the actual progress to date, any delay to such progress and the effects of such delay on other activities (if any); and

关于修订的计划和每一项活动: 至本日的实际进度, 该进度的任何误期和该误期对其他活动(如果有)的影响; 和

(k) a supporting report which includes:

支持性报告包括:

( i ) a description of all the major stages of the execution of the Works;

工程实施所有主要阶段的描述;

(ii) a general description of the methods which the Contractor intends to adopt in the execution of the Works;

在工程实施中承包商拟采用的方法的一般描述;

(iii) details showing the Contractor 's reasonable estimate of the number of each class of Contractor 's Personnel , and of each type of Contractor 's Equipment, required on the Site, for each major stage of the execution of the Works;

现场要求对工程实施各主要阶段承包商对承包商每班人员人数和承包商设备的各个类型合理估计的详情说明;

(iv) if a revised programme, identification of any significant of change(s) to the previous programme submitted by the Contractor; and

倘若是一个修订的计划，标出和承包商先前提交的计划存在的任何重大变化：

(v) the Contractor 's proposals to overcome the effects of any delay(s) on progress of the Works.

承包商克服任何误期对工程进度的影响的方案：

The Employer shall Review the initial programme, and each revised programme, submitted by the Contractor and may give a Notice to the Contractor stating the extent to which it does not comply with the Contract or ceases to reflect actual progress or is otherwise inconsistent with the Contractor 'osbligations. If the Employer gives no such Notice:

雇主应审核承包商提交的初步计划和每一版修订的计划并且可以向承包商发出通知，指出其中不符合合同要求或不能反应实际的进度或不符合承包商的义务的部分。如果雇主没有发出这种通知：

-within 21 days after receiving the initial programme; or

-在收到初步计划后 21 天内；或者

-within 14 days after receiving a revised programme

-在收到修订的计划后 14 天内

the Employer shall be deemed to have give a Notice of No-objection and the initial programme or revised programme (as the case may be) shall be the programme.

应被视为雇主已经发出了无异议通知并且初步计划或修订的计划（视情况而定）应是最终的计划。

The Contractor shall proceed in accordance with the Programme, subject to the Contractor 'osher obligations under the Contract. The Employer 'sPersonnel shall be entitled to rely on the Programme when planning their activities.

承包商应根据合同规定的承包商的其他义务按照该计划行事。当计划活动的时候，雇主人员有权将该计划作为依据。

Nothing in any programme, the programme or any supporting report shall be taken as, or relieve the Contractor from any obligation to give, a Notice under the Contract.

任何计划，该计划或任何支持性报告中任何部分都不应被作为合同规定的通知或者不应解除合同规定承包商发出通知的任何义务。

If, at any time, the Employer gives a Notice to the Contractor that the Programme fails (to the extent stated) to comply with the Contract or ceases to reflect actual progress or is otherwise inconsistent with the Contractor 'osbligations, the Contractor shall within 14 days after receiving this Notice submit a revised programme to the Employer in accordance with this Sub -Clause.

在任何情况下，倘若雇主通知承包商指出进度计划（在指出的部分）不符合合同要求，或与实际进度或承包商提出的意向不一致或不符合承包商的义务时，承包商应在收到该通知后 14 天内遵照本款要求向雇主提交一份修订进度计划。

#### 8.4 Advance Warning 预警

Each Party shall advise the other Party in advance of any known or probable future events or circumstances which may:

一方应提前告诉另一方任何已知或很有可能的未来事件或情况， 而该未来事件或情况可能会：

(a) adversely affect the work of the Contractor 's Personnel;

对承包商人员的工作造成不利影响；

(b) adversely affect the performance of the Works when completed;

对工程完成时的性能造成不利影响；

(c) increase the Contract Price; and/ or

增加合同价；和 /或

(d) delay the execution of the Works or a Section (if any).

误期工程或一个分项工程（如果有）的实施；

The Employer may request the Contractor to submit a proposal under Sub -Clause 13.3.2

[Variation by Request for Proposal] to avoid or minimise the effects of such event(s) or

cicumstance(s).

雇主可以要求承包商按第 13.3.2 款 [方案要求变更]提交一个方案来规避或这类事件或情况造成的影响。

#### 8.5 Extension of Time for Completion 竣工时间的延长

The Contractor shall be entitled subject to Sub -Clause 20.2[Claims For Payment and/ or

EOT] to an extension of the Time for Completion if and to the extent that completion for

the purposes of Sub -Clause 10.1 [Taking Over of the Works and Sections] is or will be

delayed by any of the following causes:

如由于下列任何原因， 致使达到按照第 10.1 款 [工程和分项工程的接收 ]要求的竣工受到或将受到延误的程度， 承包商有权按照第 20.2 款 [付款索赔和/或延期补偿]的规定提出延长竣工时间：

(a) a Variation (except that there shall be no requirement to comply with Sub -Clause 20.2 [Claims For Payment and/ or EOT]);

变更(除非没有要遵守第 20.2 款 [付款索赔和/或延期补偿]的要求)；

(b) a cause of delay giving an entitlement to extension of time EOT under a Sub -Clause of these Conditions, or

根据本条件某款， 有权获得延长期的原因； 或

(c) any delay, impediment or prevention caused by or attributable to the Employer, the Employer's Personnel, or the Employer's other contractors on the Site (or any Unforeseeable shortages in the availability of Employer -Supplied Materials, if any, caused by epidemic or government actions).

由雇主、雇主人员、或在现场的雇主的其他承包商造成或引起的任何延误、妨碍和阻碍 (或者如果有，由政府行为或传染病导致的雇主提供的材料不可预见性短缺 )。

When determining each EOT under Sub -Clause 20.2 [Claims For Payment and/ or EOT ],

the Employer 's Representative shall review previous determinations under Sub -Clause

3.5 [ Agreement or Determination ] and may increase, but shall not decrease, the total EOT.

当按照第 20.2 款 [付款索赔和/或延期补偿]规定确定每一项延长时， 雇主代表应对以前按

照第 3.5 款 [协议或确定]规定所作的确定进行审查， 可以增加， 但不得减少总的延长时



If a delay caused by a matter which is the Employer's responsibility is concurrent with a delay caused by a matter which is the Contractor's responsibility, the Contractor's entitlement to EOT shall be assessed in accordance with the rules and procedures stated in the Special Provision (if not stated, as appropriate taking due regard of all relevant circumstances).

如果雇主职责的事项导致误期和承包商职责的事项导致误期同时发生，应按照特别条款（如无规定，视情况而定应对有关情况给予应有的考虑）中说明的规则和程序对承包商申请延长时间的权利进行评估。

#### 8.6 Delays Caused by Authorities 当局造成的延误

If

如果

- (a) the Contractor has diligently followed the procedures laid down by the relevant legally constituted public authorities or private utility entities in the Country, 承包商已努力遵守了工程所在国依法成立的有关公共当局或私人公用事业实体所制订的程序；
- (b) these authorities delay or entities delay or disrupt the Contractor's work, and 这些当局延误或实体延误或打乱了承包商的工作；
- (c) the delay or disruption was unforeseeable, 延误或中断是不可预见的；

then this delay or disruption will be considered as a cause of delay under sub -paragraph

(b) of Sub -Clause 8.5 [Extension of Time for Completion].

则上述延误或中断应被视为根据第 8.5 款 [竣工时间的延长] (b) 项规定的延误的原因。

#### 8.7 Rate of Progress 工程进度

If, at any time:

如果在任何时候:

- (a) actual progress is too slow to complete the Works or a Section (if any) within the relevant Time for Completion, and/or 实际工程或分项工程（如果有）进度对于在相应的竣工时间内完工过于迟缓，和 (或)
- (b) progress has fallen (or will fall) behind the Programme (or the initial programme if it has not yet become the Programme) under Sub -Clause 8.3 [Programme], 进度已(或将)落后于根据第 8.3 款 [进度计划] 的规定制订的进度计划（或如果还没有变成进度计划的初步计划），

other than as a result of a cause listed in Sub -Clause 8.5 [Extension of Time for Completion], then the Employer may instruct the Contractor to submit, under Sub -Clause 8.3 [Programme], a revised programme describing the revised methods which the Contractor proposes to adopt in order to expedite progress and complete the works or a Section (if any) within the Time for Completion.

除由于第 8.5 款 [竣工时间的延长] 中列举的某项原因造成的结果外，雇主可指示承包商根据第 8.3 款 [进度计划] 的规定提交一份修订的进度计划，以及说明承包商为加快进度在竣工时间内竣工工程或分项工程（如果有），建议采取的修订方法的补充报告。

Unless the Employer gives a Notice to the Contractor stating otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or in the numbers of Contractor's Personnel and/or Goods, at the Contractor's risk and cost. If these revised methods cause the Employer to incur additional costs, the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to payment of these costs by the Contractor, in addition to delay damages (if any).

除非雇主另有通知承包商说明，承包商应采取这些修订方法，对可能需要增加工时、（或）承包商人员和（或）货物的数量，承包商应自行承担风险和费用。如果这些修订方法使雇主招致附加费用，雇主应有权遵照子条款 20.2 [付款索赔和 /或延期补偿] 的规定连同误期损害赔偿费（如果有），提出让承包商对这些费用，给予支付。

Sub-Clause 13.3.1 [Variation by Instruction] shall apply to revised methods, including acceleration measures, instructed by the Employer to reduce delays resulting from causes listed under Sub-Clause 8.5 [Extension of Time for Completion].

第 13.3.1 款 [基于指示的变更] 应适用于修订的方法，包括雇主下达指示的赶进度措施，来减少第 8.5 款 [竣工时间的延长] 规定中列出的因素导致的误期。

#### 8.8 Delay Damages 误期损害赔偿费

If the Contractor fails to comply with Sub-Clause 8.2 [Time for Completion], the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to payment of Delay Damages by the Contractor for this default. Delay damages shall be the amount stated in the Contract Data, which shall be paid for every day which shall elapse between the relevant Time for Completion and the relevant date of Completion of the Works or Section. The total amount due under this Sub-Clause shall not exceed the maximum amount of delay damages (if any) stated in the Contract Data.

如果承包商未能遵守第 8.2 款 [竣工时间] 的要求，为其违约行为，雇主有权根据第 20.2 款 [付款索赔和/或延期补偿] 的规定提出让承包商对因其违约行为造成的误期损害赔偿费，给予支付。此项误期损害赔偿费应按照专用条件中规定的每天应付金额，以工程竣工或分项工程完成时的相应日期超过相应的竣工时间的天数计算。但按本款计算的赔偿总额，不得超过专用条件合同数据中规定的误期损害赔偿费的最高限额（如果有）。

These delay damages shall be the only damages due from the Contractor for the Contractor's failure to comply with Sub-Clause 8.2 [Time for Completion], other than in the event of termination under Sub-Clause 15.2 [Termination for Contractor's Default] after completion of the Works. These Delay damages shall not relieve the Contractor from the obligation to complete the Works, or from any other duties, obligations or responsibilities which the Contractor may have under or in connection with the Contract.

除在工程竣工前根据第 15.2 款 [因承包商违约终止] 的规定终止的情况外，这些误期损害赔偿

费应是承包商为承包商未能遵守第 8.2 款 [竣工时间] 违约应付的唯一损害赔偿费。 这些误期损害赔偿费不应解除承包商完成工程的义务， 或合同规定或与合同有关的事项的其可能承担的其他责任、义务或职责。

This Sub -Clause shall not limit the Contractor 's liability for Delay Damages in any case of fraud, gross negligence, deliberate default or reckless misconduct by the Contractor.

该子条款不应限制承包商因其任何欺骗、 严重过失、 有意违约、 或轻率的不当行为等情况引起的误期损害赔偿费的责任。

#### 8.9 Employer 's Suspension 雇主方面的暂时停工

The Employer may at any time instruct the Contractor to suspend progress of part or all of the Works , which instruction shall state the date and cause of the suspension.

雇主可以随时指示承包商暂停工程某一部分或全部的施工。

During such suspension, the Contractor shall protect, store and secure such part or all of the Works (as the case may be) against any deterioration, loss or damage.

在暂停期间， 承包商应保护、 保管、 并保证该部分或全部工程 (视情况而定 ) 不致产生任何变质、 损失或损害。

To the extent that the cause of such suspension is the responsibility of the Contractor, Sub -Clause 8.10 [Consequences of Employer 's Suspension], 8.11 [Payment for Plant and Materials after Employer 's suspension] and 8.12 [Prolonged Suspension] shall not apply.

到导致这类暂停是承包商的责任的地步 , 则不应适用第 8.10 款 [雇主暂停的后果 ], 第8.11 款 [雇主暂停后设备和材料的付款 ] 和第 8.12 款 [拖长的暂停 ]。

#### 8.10 Consequences of Employer 's Suspension 雇主暂停的后果

If the Contractor suffers delay and/or incurs Cost from complying with the Employer's instructions under Sub -Clause 8.9 [Employer 's Suspension] and/or from resuming the work under Sub -Clause 8.13 [Resumption of Work], the Contractor shall be entitled subject to Sub -Clause 20.2 [ Claims For Payment and/ or EOT ] to EOT and/ or payment of such Cost Plus Profit :

如果承包商因执行雇主根据第 8.9 款 [雇主暂停] 的规定发出的指示， 和(或)根据第 8.13 款 [复工] 规定因为复工， 而遭受延误和 (或) 招致增加费用， 承包商有权遵照第 20.2 款 [付款索赔和/或延期补偿] 的规定提出对延期补偿和合理利润， 给予支付。

The Contractor shall not be entitled to EOT, or to payment of the Cost incurred, in making good.

承包商应无权得到带来的延长期和招致费用的支付。

(a) the consequences of the Contractor 's faulty or defective design, workmanship, Plant or Materials; and/ or

因承包商有缺陷的设计、 工艺、 设备或材料导致的后果； 和 /或

(b) any determination, loss or damage caused by the Contractor 's failure to protect, store or secure in accordance with Sub -Clause 8.9 [ Employer 's Suspension].

承包商未能按照第 8.9 款 [雇主暂停] 尽到保护， 保管或保证的义务造成的确定， 损失或损害。

8.11 Payment for Plant and Materials after Employer § Suspension 雇主暂停后对生  
产设备和材料的付款

The Contractor shall be entitled to payment of the value (as at the date of suspension  
instructed under Sub-Clause 8.9 [Employer's Suspension] of Plant and/or Materials which  
have not been delivered to Site, if:

在下列条件下，按照第 8.9 款 [雇主暂停] 指示承包商有权得到尚未运到现场的生产设备和 (或)  
材料(按暂停开始日期时) 的价值的付款:

(a) the work on Plant or delivery of Plant and/or Materials has been suspended for  
more than 28 days, and

生产设备的生产、或生产设备和 (或) 材料的交付被暂停达到 28 天以上;

(i) the Plant and/or Materials were scheduled, in accordance with the Programme, to

have been completed and ready for delivery to the Site during the suspension period;

and

按照进度计划，在暂停阶段计划完成和准备将设备和 /或材料运至现场; 和

(ii) the Contractor provides the Employer with reasonable evidence that the Plant and/or

Materials comply with the Contract; and

承包商向雇主提供设备和 /或材料遵守合同合理的证据; 和

(b) the Contractor has marked the Plant and/or Materials as the Employer's property in  
accordance with the Employer's instructions.

承包商已按雇主的指示，标明上述生产设备和 (或) 材料为雇主的财产。

8.12 Prolonged Suspension 拖长的暂停

If the suspension under Sub-Clause 8.9 [Employer's Suspension] has continued for  
more than 84 days, the Contractor may give a Notice to the Employer requesting  
permission to proceed.

如果第 8.9 款 [雇主暂停] 所述的暂停已持续 84 天以上，承包商可以通知雇主要求雇主允许  
继续施工。

If the Employer does not give a Notice under Sub-Clause 8.13 [Resumption of Work]  
within 28 days after receiving the Contractor's Notice under this Sub-Clause, the  
Contractor may either, by giving notice to the Employer, treat the suspension as an  
omission under Clause 13 [Variations and Adjustments] of the affected part of the Works.

If the suspension affects the whole of the Works, the Contractor may give notice of  
termination under Sub-Clause 16.2 [Termination by Contractor].

如在收到承包商按照第 8.13 款 [复工] 规定拟定的通知后 28 天内，雇主没有给出按照该子条  
款规定拟定的通知，承包商或者可以

(a) agree to a further suspension, in which case the Parties may agree the EOT and/ or

Cost Plus Profit (if the Contractor incurs Cost), and/ or payment for suspended Plant and/

or Materials, arising from the total period of suspension.

同意继续暂停，在这种情况下，如果承包商方面发生费用，双方可以就延期和 /或费用加利润的赔偿和 /或整个暂停期产生的暂停设备和 /或材料方面的付款达成一致，

or (and if the Parties fail to reach agreement under this sub -paragraph(a))

或者（如果双方未能在该（ a）项规定下达成一致）

(b) after giving a (second) Notice to the Employer, treat the suspension as an omission of

the affected part of the Works (as if it had been instructed under Sub-Clause 13.3.1

[Variation by Instruction]) with immediate effect including release from any further

obligation to protect, store and secure under Sub -Clause 8.9 [Employer 's Suspension]. If

the suspension affects the whole of the Works, the Contractor may give a Notice of

termination under Sub -Clause 16.2 [Termination by Contractor].

发给雇主一个（第二个）通知后，将工程受暂停影响的部分视为删减项目（如同第 13.3.1 款

[基于指示变更]规定下已经被指示的那样）立即生效，包括解除遵照第 8.9 款 [雇主的暂停] 进

一步保护，保管和保证的义务。如果暂停影响到了整个工程，承包商可以根据第 16.2 款 [由

承包商终止]发出终止通知。

### 8.13 Resumption of Work 复工

The Contractor shall resume work as soon as practicable after receiving a Notice from the

Employer to proceed with the suspended work.

在收到雇主发出的通知后，承包商应尽快复工继续完成曾经暂停的工作。

At the time stated in this Notice (if no stated, immediately after the Contractor received this

Notice), the Contractor and the Employer shall jointly examine the Works and the Plant

and Materials affected by the suspension. The Employer shall record any deterioration,

loss, damage or defect in the Works or Plant or Materials which has occurred during the

suspension and shall provide this record to the Contractor. The Contractor shall promptly

make good all such deterioration, loss, damage or defect so that the Works, when

completed, shall comply with the Contract.

在该通知规定的时间（如果没有规定，立即在承包商收到该通知后），说明承包商和雇主应

共同对受暂停影响的工程、生产设备和材料进行检查。雇主应记录在暂停期限内发生的工程

或设备或材料中发生任何变质，损失，损害或缺陷并将该记录提供给承包商。承包商应负责

立即恢复在暂停期间发生的工程或生产设备或材料的所有这类变质、损失、损害或缺陷或损

失；当完成修复后，应使其满足合同要求。

## 9 Tests on Completion 竣工试验

### 9.1 Contractor's Obligations 承包商的义务

The Contractor shall carry out the Tests on Completion in accordance with this Clause and

Sub-Clause 7.4 [Testing by the Contractor], after submitting the documents under Sub -

Clause 5.6 [As-Built Documents] and Sub-Clause 5.7 [Operation and Maintenance

Manuals].

承包商应在按照第 5.6 款 [竣工文件] 和第 5.7 款 [操作和维修手册] 的要求, 提交各种文件后, 按照本条和第 7.4 款 [承包商试验] 的要求进行竣工试验。

The Contractor shall submit to the Employer, not less than 42 days before the date the Contractor intends to commence the Tests on Completion, a detailed test programme showing the intended timing and resources required for these tests.

承包商应在开始进行每项竣工试验, 前最少 42 天前将说明这些试验拟定时间安排和所需要的各项资源的详细试验进度计划提交给雇主。

The Employer may Review the proposed test programme and may give a Notice to the Contractor stating the extent to which it does not comply with the Contract. Within 14 days after receiving this Notice, the Contractor shall revise the test programme to rectify such non-compliance. If the Employer give no such Notice within 14 days after receiving the test programme (or revised test programme), the Employer shall be deemed to have given a Notice of No -objection. The Contractor shall not commence the Tests on Completion until a Notice of No -objection is given (or is deemed to have been given) by the Employer.

雇主可以审查建议试验进度计划并通知承包商说明该计划不符合合同规定。在收到该通知后 14 天内, 承包商应修订该试验进度计划来纠正未遵办的事项。倘若雇主在收到该试验进度计划或修订后的试验进度计划后 14 天内没有发出此类通知, 应被视为雇主已经发出了无异议通知。在雇主没有给出无异议通知或雇主没有被视为已经发出无异议通知前, 承包商不得开始进行竣工试验。

In addition to any date(s) shown in the test programme, the Contractor shall give a Notice to the Employer, of not less than 21 days, of the date after which the Contractor will be ready to carry out each of the Tests of Completion. The Contractor shall commence the Tests on Completion within 14 days after this date, or on such day or days as the Employer shall instruct, and shall proceed in accordance with the Contractor 'test programme to which the Employer has given (or is deemed to have given) a Notice of No-objection.

连同试验进度计划中的任何日期, 承包商应提前 21 天将他可以进行每项竣工试验的日期通知雇主。承包商应在该日期后 14 天内或雇主指示的某日或某几日内开始进行竣工试验, 并且应该按照雇主已经发出无异议通知或应视为雇主已经发出无异议通知的承包商的试验进度计划进行试验。

Unless otherwise stated in the Employer 's Requirements, the Tests on Completion shall be carried out in stages in the following sequence:

除非在雇主要求中另有说明, 竣工试验应分阶段按照以下顺序进行:

- (a) pre-comissioning tests (on or off the Site, as appropriate), which shall include the appropriate inspections and ("dry" or "cold") functional tests to demonstrate that each item of the works or Section can safely under -take the next stage under sub-paragraph (b) below;  
启动前试验 (视情况, 在现场内或外), 应包括适当的检验和 (干燥性能) 试验, 以证明每项工程或分项工程能够安全地承受以下项下一阶段 (b) 项试验;

(b) commissioning tests, which shall include the operational tests specified in the Employer's Requirements to demonstrate that the Works or Section can be operated safely and as specified in the Employer's Requirements, under all available operating conditions; and

启动试验, 应包括雇主要求中规定的操作试验, 以证明工程或分项工程能够在所有可利用的操作条件下按照雇主要求中规定的安全地操作。

(c) trial operation (to the extent possible under available operating conditions), which shall demonstrate that the Works or Section perform reliably and in accordance with the Contract.

试运行(按照现有操作条件规定可能的范围内), 应证明工程或分项工程运行可靠, 符合合同要求。

The tests of each stages described in sub-paragraphs(b) and (c) above shall not be commenced until the Works or Section have passed the previous stage.

在工程或分项工程还没有通过上一阶段试验的情况下, 不应该开始进行以上 (b)和(c)项中描述的各个阶段的试验。

During trial operation, when the Works or Section (as the case may be) are operating under stable conditions, the Contractor shall give notice to the Employer that they are ready for any other Tests on Completion, including performance tests. Performance tests shall be carried out to demonstrate whether the Works or Section conform comply with the performance criteria specified in the Employer's Requirements and with the Schedule of Performance Guarantees.

在试运行期间, 当工程或分项工程(视情况而定)正在稳定条件下运行时, 承包商应通知雇主, 告知他们可以进行任何其他竣工试验, 包括各种性能试验, 进行性能试验是为了证明工程或分项工程是否符合雇主要求中规定的标准和履约保证计划表。

Trial operation, including performance testing, shall not constitute a taking-over under Clause 10 [Employer's Taking Over].

包括性能测试, 试运行不应构成第 10 条 [雇主的接收] 规定的接收。

Any product produced by , and any revenue or other benefit resulting from, trial operation under this Sub -Clause shall be the property of the Employer.

工程在试运行期间生产的任何产品, 任何由此产生的收益或其他成果应属于雇主的财产。

As soon as the Works, or a Section, in the Contractor's opinion, have passed each stage of the Tests on Completion described in sub-paragraph (a) to(c) above, the Contractor shall submit a certified report of the results of these Tests to the Employer. The Employer shall Review each such report and may give a Notice to the Contractor stating the extent to which the results of the tests do not comply with the Contract. If the Employer does not give such a Notice within 14 days after receiving the results of the tests, the Employer shall be deemed to have given a Notice of No -objection.

按照承包商的意见, 一旦工程或某分项工程通过了本款以上 (a)到(c)项中的每一阶段竣工试验, 承包商应向雇主提供一份经证实的这些试验结果的报告。 雇主应审查每一项此类报告并

可以通知承包商试验结果不符合合同要求。如果雇主在收到试验结果后 14 天内没有发出此类通知，应视为雇主已经发出了无异议通知。

In considering the results of the Tests on Completion, the Employer shall make allowances for the effect of use of (any part of) the Works by the Employer on the performance or other characteristics of the Works.

在考虑竣工试验结果时，雇主应考虑到因雇主对工程（工程任何部分）的使用，对工程的性能或其他特性产生的影响。

## 9.2 Delayed Tests 延误的试验

If the Contractor has given a Notice under Sub -Clause 9.1 [Contractor 's Obligations] that the Works or Section (as the case may be) are ready for Tests on Completion, and these tests are unduly delayed by the Employer 's Personnel or by a cause for which the Employer is responsible, Sub -Clause 10.3 [Interference with Tests on Completion] shall apply.

倘若承包商按照第 9.1 款 [承包商的义务] 的规定发出了通知告知可以做工程或分项工程（视情况而定）竣工试验而雇主人员或者由雇主应负责的原因导致不当地延误了这些试验，应适用于第 10.3 款 [对竣工试验的干扰]。

If the Tests on Completion are unduly delayed by the Contractor, the Employer may by giving a Notice to the Contractor require the Contractor to carry out the Tests within 21 days after receiving the Notice. The Contractor shall carry out the Tests on such day or days within this period of 21 days as the Contractor may fix, for which the Contractor shall give a prior notice to the Employer of not less than 7 days.

如果承包商不当地延误竣工试验，雇主可通知承包商，要求在接到通知 21 天内进行竣工试验。承包商应在这 21 天期限内的某日或某几日内进行竣工试验，并将该日期提前 7 天通知雇主。

If the Contractor fails to carry out the Tests on Completion within this period of 21 days :

如果承包商未在规定的这 21 天内进行竣工试验

(a) after a second Notice is given by the Employer to the Contractor, the Employer 's Personnel may proceed with the tests;

雇主向承包商发出第二次通知后，雇主人员可以继续这些试验；

(b) the Contractor may attend and witness these tests;

承包商可以参与并见证这些试验；

(c) within 28 days of these tests being completed, the Employer shall send a copy of the test results to the Contractor; and

在这些试验完成后 28 天内，雇主应发一份试验结果给承包商；和

(d) if the Employer incurs additional costs as a result of such testing, the Employer shall be entitled subject to Sub -Clause 20.2 [ Claims For Payment and/ or EOT ] to payment by the Contractor of the costs reasonably incurred.



如果此类试验使得雇主增加了费用，雇主应有权遵照第 20.2 款[付款索赔和/或延期补偿]提出让承包商对发生的合理费用，给予支付。

Whether or not the Contractor attends, these Tests on Completion shall be deemed to have been carried out in the presence of the Contractor and the results of these tests shall be accepted as accurate.

无论承包商参与与否，这些竣工试验应被视为是承包商在场时进行的，试验结果应认为准确，予以认可。

### 9.3 Retesting 重新试验

If the Works, or a Section, fail to pass the Tests on Completion, Sub-Clause 7.5 [ Defects and Rejection] shall apply. The Employer or the Contractor may require these failed Tests, and the Tests on Completion on any related work, to be repeated under the same terms and conditions. Such repeated tests shall be treated as Tests on Completion for the Purposes of this Clause.

如果工程或某分项工程未能通过竣工试验，应适用第 7.5 款[缺陷和拒收]的规定，雇主或承包商可要求按相同的条款和条件，重新进行这些未通过的试验和相关工程的竣工试验。此类重复做的试验均应视为是出于该条款目的做的竣工试验。 @

### 9.4 Failure to Pass Tests on Completion 未能通过竣工试验

If the Works, or a Section, fail to pass the Tests on Completion repeated under Sub-Clause 9.3 [Retesting], the Employer shall be entitled to:

如果工程或某分项工程未能通过根据第 9.3 款[重新试验]的规定重新进行的竣工试验，雇主应有权：

(a) order further repetition of Tests on Completion under Sub-Clause 9.3 [Retesting];

下令根据第 9.3 款[重新试验]再次重复竣工试验；

(b) reject the Works if the effect of the failure is to deprive the Employer of substantially

the whole benefit of the Works in which event the Employer shall have the same remedies as are provided in sub-paragraph (c) of Sub-Clause 11.4 [Failure to Remedy Defects]; or

拒收工程如果此项试验未通过的影响，使雇主实质上丧失了工程或分项工程的整个利益时，拒收工程或分项工程（视情况而定），在此情况下，雇主需采取与第 11.4 款[未能修补缺陷](c)项规定的相同补救措施；或

(c) reject the Section if the effect of the failure is that the Section cannot be used for its

intended purpose(s) under the Contract, in which event the Employer shall have the same remedy as are provided in sub-paragraph (c) of Sub-Clause 11.4 [Failure to Remedy Defects]; or

拒收分项工程如果此项试验未通过的影响是分项工程的使用不能够达到合同规定的拟定目标，在此情况下，雇主需采取与第 11.4 款[未能修补缺陷](c)项规定的相同补救

措施；或

(d) issue a Taking -Over Certificate, if the Employer so requests.

如果雇主这样要求，颁发接受证书。

In the event of sub -paragraph (b) above, the Contractor shall proceed in accordance with all other obligations under the Contract, and the Employer shall be entitled subject to Sub-Clause 20.2 [ Claims For Payment and/ or EOT ] to payment by the Contractor or a reduction in the Contract Price as described under sub-paragraph (b) (i) or (b) (ii) of Sub-Clause 11.4 [Failure to Remedy Defects ], respectively. This entitlement shall be without prejudice to any other rights the Employer may have, under the Contract or otherwise.

在采用以上 (b)项办法的情况下，承包商应继续履行合同规定的所有其他义务。雇主应有权分别遵照第 20.2 款 [付款索赔和/或延期补偿]向承包商索要付款或者按照第 11.4 款 [未能修补缺陷] (b) (i) 或 (b) (ii) 降低合同价。这一权利应在不损害根据合同或其他规定雇主可以拥有的任何其他权利。

## 10 Employer's Taking Over 雇主的接收

### 10.1 Taking Over of the Works and Sections 工程和分项工程的接收

Except as stated in Sub -Clause 9.4 [Failure to Pass Tests on Completion] and Sub -Clause

10.2 [Taking Over of Parts of the Works], the Works shall be taken over by the Employer

when:

除第 9.4 款 [未能通过竣工试验]和第 10.2 款 [部分工程的接收] 中所述情况外，当

(a) the Works have been completed in accordance with the Contract, including the passing of the Tests on Completion and except as allowed in sub -paragraph (i) below

除下面 (i)项允许的情况以外，工程已按合同规定竣工，其中包括竣工试验的通过；

(b) if applicable, the Employer has given (or is deemed to have given) a Notice of

No-objection to the as -built records submitted under sub -paragraph (a) of Sub -Clause 5.6 [ As-Built Records ];

如果适用，雇主对根据第 5.6 款 [竣工记录] (a) 项已提交的竣工记录已经发出或应视为已经发出无异议通知；

(c) if applicable, the Employer has given (or is deemed to have given) a Notice of

No-objection to the provisional O&M Manuals for the Works submitted under Sub-Clause 5.7 [ Operation and Maintenance Manuals ];

如果适用，雇主对根据第 5.7 款 [操作和维修手册]提交的暂行的操作和维护手册已经发出或应视为已经发出无异议通知；

(d) if applicable, the Contractor has carried out the training as described under

Sub-Clause 5.5 [Training]; and

如果适用，承包商根据第 5.5 款 [培训]已经进行培训；

(e) a Taking -Over Certificate for the Works has been issued, or is deemed to have been

issued in accordance with this Sub -Clause.

已按照本款规定颁发工程接收证书，或被认为已经颁发时，雇主应接收工程。

The Contractor may apply for a Taking -Over Certificate by giving a Notice to the Employer not more than 14 days before the Works will, in the Contractor's opinion, be complete and ready for taking over. If the Works are divided into Sections, the Contractor may similarly apply for a Taking -Over Certificate for each Section.

承包商可在他认为工程将竣工并做好接收准备的日期前不多于 14 天，申请接收证书。若工程分成若干个分项工程，承包商可类似地为每个分项工程申请接收证书。

If any part of the Works is taken over under Sub -Clause 10.2 [Taking over of Parts of the Works], the remaining Works or Section shall not be taken over until the conditions described in sub -paragraphs (a) to (e) above have been fulfilled.

如果根据第 10.2 款[部分工程的接收]接收了工程的任何部分，在达到第 (a)到 (e)项描述的条件前不得接收剩余的工程或分项工程。

The Employer shall, within 28 days after receiving the Contractor's Notice, either:

雇主在收到承包商通知后 28 天内，或者：

(i) issue the Taking -Over Certificate to the Contractor, stating the date on which the Works or Section were completed in accordance with the Contract, except for any minor outstanding work and defects(as listed in the Taking -Over Certificate) which will not substantially affect the safe use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied); or

向承包商颁发接收证书，注明工程或分项工程按照合同要求竣工的日期，任何对工程或分项工程预期安全使用目的没有实质影响的少量收尾工作和缺陷 (正如接收证书中列出的)(直到或当收尾工作和缺陷修补完成时)除外；或

(ii) reject the application by giving a Notice to the Contractor with reasons. This notice shall specify the work required to be done, the defects required to be remedied and/ or the documents to be submitted by the Contractor to enable the Taking -Over Certificate to be issued. The Contractor shall then complete this work before giving a further notice under this Sub -Clause.

通知承包商拒绝申请，说明理由，并指出在能颁发接收证书前承包商需做的工作，需要修补的缺陷和 /或需要提交的文件。承包商应在再次根据本款发出申请通知前，完成此项工作。

If the Employer does not issue the Taking -Over Certificate or to reject the Contractor's application within the ~~this~~ period of 28 days, and if the conditions described in sub-paragraph (a) to (d) above have been fulfilled, the Works or Section shall be deemed to have been completed in accordance with the Contract on the fourteenth day after the Employer receives the Contractor 's Notice of application and, the Taking-Over Certificate shall be deemed to have been issued.

如果雇主在这 28 天期限内未颁发接收证书，又未拒绝承包商的申请，而如果已经达到了以上第(a)到 (d) 项描述的条件，在雇主收到承包商申请通知后的第十四天时，工程或分项工程应视为符合合同规定竣工，接收证书应视为已颁发。

## 10.2 Taking Over of Parts of the Works 部分工程的接收

Parts of the Works (other than Sections) shall not be taken over or used by the Employer, except as may be stated in the Employer's Requirements or as may be agreed by both Parties.

除雇主要求中可能说明或可能经双方同意以外, 任何部分工程 (分项工程以外), 雇主均不得接收或使用。

## 10.3 Interference with Tests on Completion 对竣工试验的干扰

If the Contractor is prevented, for more than 14 days (either a continuous period, or multiple periods which total more than 14 days), from carrying out the Tests on Completion by the Employer's personnel or by a cause for which the Employer is responsible (including any performance test that is not possible due to available operating conditions during trial operation):

如果由雇主应负责的原因或雇主人员妨碍承包商进行竣工试验 (包括由于在试运行期间现有的操作条件不可能进行的任何性能试验) 达 14 天以上 (或者是连续的时间段, 或者是累计时间段总计超过 14 天的),

(a) the Contractor shall carry out the Tests on Completion as soon as practicable and, in any case, before the expiry date of the relevant DNP; and

在任何情况下, 在相关缺陷通知期限 (DNP) 截止日期前, 承包商应尽快地进行竣工试验; 和

(b) If the Contractor suffers delay and/or incurs Cost as a result of being so prevented, the

Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT]

to EOT and/ or payment of such Cost Plus Profit:

如果由于受到妨碍, 使承包商遭受延误和 (或) 招致增加费用, 承包商应向雇主发出通知, 有权根据第 20.2 款 [付款索赔和 /或延期补偿] 规定向雇主提出申请延期补偿和 /或费用加利润付款:

## 11 Defects after taking over 接收后的缺陷

### 11.1 Completion of Outstanding Work and Remedying Defects 完成扫尾工作和修补缺陷

In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:

为了使工程、承包商文件和每个分项工程在相应缺陷通知期限期满日期或其后尽快达到合同要求 (合理的损耗除外), 承包商应:

(a) complete any work which is outstanding on the relevant Date of Completion, within

the time(s) stated in the Taking -Over Certificate or such other reasonable time as is

instructed by the Employer, and

在该接收证书说明的时间内或雇主指示的这些其他合理时间内，在完成接收证书注明相应竣工日期时尚未完成的任何工作；

- (b) execute all work required to remedy defects or damage, of which a Notice is given to the Contractor by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).

在工程或分项工程 (视情况而定) 的缺陷通知期限期满日期或其以前，按照雇主或以雇主名义给承包商的要求，完成修补缺陷或损害所需要的所有工作。

If a defect appears or damage occurs during the relevant DNP, a Notice shall be given to the Contractor accordingly, by (or behalf of) the Employer. Promptly thereafter:

如果出现缺陷，或发生损害，雇主或以雇主名义应在缺陷通知期限内根据情况，通知承包商。之后立即：

- (i) the Contractor and the Employer's Personnel shall jointly inspect the defect or damage;

承包商和雇主人员应共同检查缺陷或损坏情况；

- (ii) the Contractor shall then prepare and submit a proposal for necessary remedial work;

and

然后，承包商应为必要的修补工作编制并提交一个方案；和

- (iii) the second, third and fourth paragraphs of Sub -Clause 7.5 [Defects and Rejection] shall apply.

适用第 7.5 款 [缺陷和拒收] 的第二，第三和第四段

#### 11.2 Cost of Remedying Defects 修补缺陷的费用

All work referred to in sub -paragraph (b) of Sub -Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

如果由于下述原因达到造成第 11.1 款 [完成扫尾工作和修补缺陷] (b) 项中提出的所有工作的程度，其执行中的风险和费用应由承包商承担：

- (a) the design of the Works, other than a part of design for which the Employer is responsible (if any);

除雇主负责 (如果有) 的一部分设计外，工程的设计；

- (b) Plant, Materials or workmanship not being in accordance with the Contract,

生产设备、材料或工艺不符合合同要求；

- (c) improper operation or maintenance which was attributable to matters for which the

Contractor is responsible (under Sub -Clause 5.5 [Training], Sub -Clause 5.6 [As-Built Records] and/ or Sub -Clause 5.7 [Operation and Maintenance Manuals]

or otherwise), or

由承包商 (根据第 5.5 款 [培训]，第 5.6 款 [竣工记录] 和/或 第 5.7 款 [操作和维修手册] )

或其他规定 )负责的事项产生的不当的操作或维修；或

(d) failure by the Contractor to comply with any other obligation under the Contract.

承包商未能遵守任何其他义务。

If the Contractor considers that the work is attributable to any other cause, the Contractor shall promptly give a Notice to the Employer and the Employer's Representative shall proceed under Sub -Clause 3.5 [Agreement or Determination] to agree or determine the cause (and , for the purpose of Sub -Clause 3.5.3 [Time limits ], the date of this Notice shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3). If it is agreed or determined that the work is attributable to a cause other than those listed above, Sub -Clause 13.3 .1 [Variation by Instruction] shall apply.

如果承包商考虑到由于任何其他原因达到造成该工作的程度， 承包商应立即通知雇主， 而雇主代表应按照第 3.5 款[协议或确定 ]来就原因达成一致或确定（并且，基于第 3.5.3 款[时限]的目的，该通知发出的日期应作为按照第 3.5.3 款达成协议的时间限制的起始点）。如果经达成一致或确定以上那些列车来的不构成原因， 则应适用第 13.3.1 款[基于指示的变更 ]的规定。

#### 11.3 Extension of Defects Notification Period 缺陷通知期限的延长

The Employer shall be entitled to an extension of the DNP(Defects Notification Period)for the Works or a Section (or a part of the Works, if Sub -Clause 10.2 [T aking Over of Parts of the Works] applies): .

雇主应有权对工程或某一分项工程 （或如果适用第 10.2 款[接收部分工程 ]可以是工程的一部分， ）的缺陷通知期限提出一个延长期。

(a) if and to the extent that the Works, Section(or the part of the Works) or a major item of Plant (as the case may be, and after taking over) cannot be used for the intended purpose(s)by reason of a defect or damage which is attributable to any of the matters under sub -paragraphs (a)to (d) of Sub -Clause 11.2 [Cost of Remedying Defects]; and.

如果因为某项缺陷或损害达到使工程、 分项工程（或工程的特定部分） 或某项主要生产设备（视情况而定，并在接收以后）不能按原定目的使用的程度， 该缺陷或损害是由于第 11.2 款[修补缺陷的费用 ]中任何事项引起的；和

(b) subject to Sub -Clause 20.2 [ Claims For Payment and/ or EOT ].

根据第 20.2 款[付款索赔和 /或延期补偿 ]。

However, a Defects Notification Period shall not be extended by more than two years after the expiry of the DNP stated in the Contract Data.

但是，缺陷通知期限的延长不得超过合同数据中说明缺陷通知期限截止日后两年。

If delivery and/or erection of Plant and/or Materials was suspended under Sub -Clause 8.8 [Suspension of Work] or Sub -Clause 16.1 [Contractor's Entitlement to Suspend Work], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the DNP (Defects Notification Period) for the Works,

of which the Plant and/or Materials form part, would otherwise have expired.

当生产设备和 (或)材料的交付和 (或)安装, 已根据第 8.8 款[暂时停工]或第 16.1 款[承包商暂停工作的权利]的规定暂停进行时, 对于构成工程一部分的生产设备和 (或)材料的缺陷通知期限原期满日期 2 年后发生的任何缺陷或损害, 本条规定的承包商各项义务应不适用。

#### 11.4 Failure to Remedy Defects 未能修补缺陷

If the remedying of any defect or damage under Sub-Clause 11.1 [Completion of Outstanding Works and Remedying Defects] is unduly delayed by the Contractor, a date may be fixed by (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. A Notice of this fixed date shall be given to the Contractor by (or on behalf of) the Employer, which Notice shall allow the Contractor reasonable time (taking due regard of all relevant circumstances) to remedy the defect or damage.

如果任何对于第 11.1 款[完成扫尾工作和修补缺陷]中的缺陷或损害的修补由承包商不当延迟, 雇主或者以雇主名义确定日期, 该缺陷或损害应在该日期当天或之前进行修补。将由雇主或以雇主名义将这个确定的日期通知给承包商。该通知将给出承包商合理的时间 (适当考虑所有的相关情况) 对缺陷或损害进行修补。

If the Contractor fails to remedy the defect or damage by the date stated in this Notice and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [Cost of Remedying Defects], the Employer may (at the Employer's sole discretion):  
如果承包商到通知中说明的日期仍未修补好缺陷或损害, 且此项修补工作根据第 11.2 款[修补缺陷的费用]的规定应由承包商承担实施的费用, 雇主可以 (雇主完全自主选择):

(a) carry out the work or have the work carried out by others (including any retesting), in the manner required under the Contract and at the Contractor's cost, but the Contractor shall have no responsibility for this work. The Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to payment by the Contractor of the costs reasonably incurred by the Employer in remedying the defect or damage;  
以合同中规定的方式由他自己或他人进行此项工作 (包括任何重复试验), 由承包商承担费用, 但承包商对此项工作将不再负责; 雇主应有权根据第 20.2 款[付款索赔和/或延期补偿]提出由承包商对由雇主修补缺陷或损害而发生的合理费用, 给予支付。

(b) accept the damaged or defective work, in which case the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT] to:  
接受修补损害或缺陷的工作, 在这种情况下, 雇主有权根据第 20.2 款[付款索赔和/或延期补偿]:

(i) payment of Performance Damages by the Contractor in full satisfaction of this failure; or

由承包商支付限于满足此项试验未通过的要求的性能损害部分

(ii) if there is no Schedule of Performance Guarantee under the Contract, or no applicable Performance Damages, a reduction in the Contract Price. The reduction shall be in full satisfaction of this failure only and shall be in the amount as shall be appropriate to cover the reduced value to the Employer as a result of this failure;

如果在合同中没有规定的履约保证中没有计划表， 或者没有适用的性能损害， 则降低合同价格。该合同价的降低仅限于满足此项试验未通过的要求而且应足以弥补此项试验未通过的后果给雇主带来的价值损失。

(c) treat any part of the Works which cannot be used for its intended purpose(s) under the Contract by reason of this failure as an omission, as if such omission had been instructed under Sub -Clause 13.3.1 [Variation by Instruction]; or

将因该故障使得合同规定的不能用于预期适用目的的任何工程部分视为删减项，如同该删减项已经根据第 13.3.1 款 [基于指示的变更] 指示过了那样；或者 @

(d) terminate the Contract as a whole with immediate effect (and Sub-Clause 15.2 [Termination for Contractor 's Default] shall not apply), if the defect or damage deprives the Employer of substantially the whole benefit of the Works. The Employer shall then be entitled subject to Sub -Clause 20.2 [ Claims For Payment and/ or EOT ] to recover from the Contractor all sums paid for the Works, plus financing charges and any costs incurred in dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

如果缺陷或损害， 使雇主实质上丧失了工程的整个利益时， 立即生效（不适用于第 15.2 款 [由承包商过错引起的合同终止 ]）终止整个合同。然后，雇主应根据第 20.2 款 [付款索赔和 /或延期补偿 ] 从分包商那里追回为工程付的所有款项，加上融资费用和任何在拆除缺陷或损害，清理现场和将设备和材料返给承包商发生的任何花销。

The exercise of discretion by the Employer under sub -paragraph (c) or (d) above shall be without prejudice to any other rights the Employer may have, under the Contract or otherwise.

根据合同或其他规定，按照以上 (c) 或(d)项由雇主行使自主权不损害雇主的任何其他权利。

#### 11.5 Removal of Defective Work off Site 从现场移出有缺陷的工程

If, during the DNP , the Contractor considers that any defect or damage in any Plant cannot be remedied expeditiously on the Site the Contractor shall give Notice, with reasons, to the Employer requesting consent to remove the defective or damaged Plant off the Site for the purposes of repair. This Notice shall clearly identify each item of defective or damaged Plant, and shall give details of:

如果在缺陷通知期限内承包商认为任何设备的任何缺陷或损害不能够在现场无法迅速修复，承包商应发通知给雇主并说明原因并要求出于修理的目的同意将存在缺陷或损害的设备从现场移除。该通知应清晰显示有缺陷或损害的设备的一项并且给出详情如下：

(a) the defect or damage to be repaired;



拟修理的缺陷或损害；

(b) the place to which defective or damaged Plant is to be taken for repair; 拟将待修理有缺

陷或损害的设备带往的地点；

(c) the transportation to be used (and insurance cover for such transportation);

用什么运输方式（涵盖运输的保险费用）；

(d) the proposed inspections and testing off the Site;

拟在现场以外进行的建议的检查和试验；

(e) the planned duration required before the repaired Plant shall be returned to the Site;

and

在修理完毕的设备返回现场前的计划历时长短；和

(f) the planned duration for reinstallation and retesting of the repaired Plant (under Sub-Clause 7.4 [Testing by the Contractor] and/ or Clause 9 [Tests on Completion] if applicable).

修理完毕的设备重新安装和重新试验的计划历时长短（如果适用，按照第 7.4 款 [承包商进行的试验] 和 / 或第 9 款 [竣工试验]）。

The Contractor shall also provide any further details that the Employer may reasonably require.

承包商还应提供雇主合理要求的更多详情。

When the Employer gives consent (which consent shall not relieve the Contractor from any obligation or responsibility under this Clause), the Contractor may remove from the Site such items of Plant as are defective or damaged. As a condition of This consent, the Employer may require the Contractor to increase the amount of the Performance Security by the full replacement cost of the defective or damaged Plant.

承包商可经雇主同意（该同意不应解除该条款规定的承包商的任何义务和职责），将此类有缺陷或损害的各项生产设备移出现场。作为该同意的条件之一，雇主可要求承包商按有缺陷或损害的设备的全部重置成本，增加履约担保的金额。

#### 11.6 Further Tests after Remedying Defects 修补缺陷后进一步试验

Within 7 days of completion of the work of remedying of any defect or damage, the Contractor shall give a Notice to the Employer describing the remedied Works, Section and/ or Plant and the proposed repeated tests (under Clause 9 [Tests on Completion] or Clause 12 [Tests after Completion], as applicable). If the Employer does not respond within 14 days after receiving this Notice, by giving a Notice to the Contractor objecting to such proposed repeated testing and/ or instructing the repeated tests that are necessary to demonstrate that the remedied Works, Section and/ or Plant comply with the Contract, the Employer shall be deemed to have agreed with the Contractor's proposed repeated testing.

在任何缺陷或损害的修补工作完成后 7 天内，承包商应通知雇主描述修补工程，分项工程

和/或设备和计划重复的试验的情况（如果适用，按照第 9 款[竣工试验]或第 12 款[竣工后试验]）。如果雇主在收到该通知后 14 天内没有给出通过通知承包商拒绝该类计划好的重复试验和/或指示必要的重复试验表明修补好的工程，分项工程和 /或设备符合合同规定之类的反应，应视为雇主已经和承包商就计划好的重复试验达成一致。

If the Contractor fails to give such a Notice within the 7 days, the Employer may give a Notice to the Contractor, within 14 days after the defect or damage is remedied, instructing the repeated tests that are necessary to demonstrate that the remedied Works, Section and/ or Plant comply with the Contract.

如果承包商未能在 7 天内给出此类通知，雇主可以在缺陷或损害修补好后 14 天内通知承包商，指示重复试验对于说明修补工程，分项工程和 /或设备符合合同规定是有必要的。

All repeated tests under this Sub -Clause shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub -Clause 11.2 [Cost of Remedying Defects], for the cost of the remedial work.

这些试验，除应根据第 11.2 款[修补缺陷的费用]的规定，由对修补费用负责的一方承担试验的风险和费用外，应按先前试验的适用条款进行。

#### 11.7 Right of Access after Taking Over 接收后的进入权

Until the date 28days after issue of the Performance Certificate, the Contractor shall have the right of access to all parts of the Works and to records of the operation, maintenance and performance of the Works, except as may be inconsistent with the Employer's reasonable security restrictions.

颁发履约证书后 28 天前，承包商应有进入工程的所有部分，使用工程的运行、维护和性能记录的权力。但不符合雇主的合理保安限制的情况除外。

Whenever the Contractor intends to access any part of the Works or such records during the relevant DNP:

当承包商在相关缺陷通知期限期间想进入工程的任何部分或使用这类记录：

(a) the Contractor shall request access by giving a Notice to the Employer, describing the parts of the Works and/ or records to be accessed, the reasons for such access, and the Contractor's preferred date for access. This Notice shall be given in reasonable time in advance of the preferred date for access, taking due regard of all relevant circumstances including the Employer's security restrictions; and

承包商应通知雇主要求进入并描述清楚要进入的工程部分和 /或要使用的记录，此类进入的原因和承包商选定进入的日期。选定进入日期后要提前在合理的时间发出通知，并对包括雇主的合理保安限制的情况在内的所有相关情况给予应有的考虑。

(b) within 7 days after receiving the Contractor's Notice, the Employer shall give a Notice to the Contractor either:

在收到承包商通知后的 7 天内，雇主也要通知承包商：

(i) stating the Employer's consent to the Contractor's request; or

说明雇主同意承包商的请求；或

(ii) proposing reasonable alternative date(s), with reasons. If the Employer fails to give

this Notice within the 7 days, the Employer shall be deemed to have given consent to the

Contractor's access on the preferred date stated in the Contractor's Notice.

计划合理的可选日期，并说明理由。如果雇主未能在 7 天内发出此通知，应视为雇主已经

同意承包商在承包商通知中说明的选定日期进入。

If the Contractor incurs additional Cost as a result of any unreasonable delay by the

Employer in permitting access to the Works or such records by the Contractor, the

Contractor shall be entitled subject to Sub-Clause 20.2 [ Claims For Payment and/ or EOT ]

to payment of any such Cost Plus Profit.

如果承包商在雇主允许承包商进入工程或使用此类记录中导致了任何不合理的延迟并因此

增加了费用，则承包商应有权遵照第 20.2 款 [付款索赔和 /或延期补偿 ] 提出对任何此类费用

和合理利润，给予支付。

#### 11.8 Contractor to Search 承包商调查

The Contractor shall, if instructed by the Employer, search for the cause of any defect,

under the direction of the Employer. The Contractor shall carry out the search on the

date(s) stated in the Employer's instruction or other date(s) agreed with the Employer.

如果雇主指示承包商调查任何缺陷的原因，承包商应在雇主的指导下进行调查。承包商应在

雇主指示中说明的日期或雇主同意的其它日期进行调查。

Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2

[Cost of Remedying Defects], the Contractor shall be entitled subject to Sub-Clause 20.2

[Claims For Payment and/ or EOT ] to payment of the Cost Plus Profit of the search.

除非根据第 11.2 款 [修补缺陷的费用 ]的规定应由承包商承担修补费用的情况，承包商应有权

遵照第 20.2 款 [付款索赔和 /或延期补偿 ]的规定，提出对调查中的费用和合理利润，给予支

付。

If the Contractor fails to carry out the search in accordance with this Sub-Clause, the

search may be carried out by the Employer's Personnel. The Contractor shall be given a

Notice of the date when such a search will be carried out and the Contractor may attend at

the Contractor's own cost. If the defect is to be remedied at the cost of the Contractor

under Sub-Clause 11.2 [Cost of Remedying Defects], the Employer shall be entitled

subject to Sub-Clause 20.2 [Claims For Payment and/ or EOT ] to payment by the

Contractor of the costs of the search reasonably incurred by the Employer.

如果承包商未能按照该条款进行调查，调查可以由雇主方人员实施。当此类调查即将开始进

行之际，通知承包商，承包商可以自费参加。如果缺陷修补是由承包商按照第 11.2 款 [修补

缺陷费用 ]自费修补的，雇主有权根据第 20.2 款 [付款索赔和 /或延期补偿 ] 提出由承包商对

雇主在调查中的合理花费，给予支付。

#### 11.9 Performance Certificate 履约证书

Performance of the Contractor's obligations under the Contract shall not be considered to have been completed until the Employer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor fulfilled the Contractor's obligations under the Contract.

直到雇主向承包商颁发履约证书，注明承包商完成合同规定的各项承包商义务的日期后，才应认为合同规定的承包商的履约义务已经完成。

The Employer shall issue the Performance Certificate to the contractor (with a copy to the DAAB) within 28 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has:

履约证书应由雇主在最后一个缺陷通知期限期满后 28 天内颁发，或在承包商提供

(a) supplied all the Contractor's Documents and, if applicable, the Employer has given (or is deemed to have given) a Notice of No-objection to the as-built records under sub-paragraph (b) of Sub-Clause 5.6 [As-Built Records] ; and

所有承包商文件和如果适用，雇主已经或被视为已经对第 5.6 款 (b) 项中规定的竣工记录发出了无异议通知；和

(b) completed and tested all the Works (including remedying any defects) in accordance with the Contract.

按照合同要求完成了所有工程的施工和试验，包括修补任何缺陷后立即颁发。

If the Employer fails to issue the Performance Certificate within this period of 28 days, the Performance Certificate shall be deemed to have been issued on the date 28 days after the date on which it should have been issued, as required by this Sub-Clause:

如果雇主未能在该 28 天内颁发履约证书，应认为履约证书已经在本款要求的应颁发日期后 28 天的日期颁发；

Only the Performance Certificate shall be deemed to constitute acceptance of the Works.

只有履约证书应被认为构成对工程的认可。

#### 11.10 Unfulfilled Obligations 未履行的义务

After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

颁发履约证书后，每一方仍应负责完成当时尚未履行的任何义务。为了确定这些未完义务的性质和范围，合同应被认为仍然有效。

However in relation to Plant, the Contractor shall not be liable for any defects or damage occurring more than two years after expiry of the DNP for the Plant except if prohibited by law or in any case of fraud, gross negligence deliberate default or reckless misconduct.

但是，在设备方面，除法律禁止或者因其任何欺骗、严重过失、有意违约、或轻率的不当行为等情况下，承包商应对发生在设备缺陷通知期限失效后至少两年的任何缺陷或损害负责。

#### 11.11 Clearance of Site 现场清理

Promptly after the issue of the Performance Certificate, the Contractor shall:

一经颁发履约证书后，承包商应：

(a) remove any remaining Contractor 's Equipment, surplus materials, wreckage, rubbish and Temporary Works from the Site;

从现场撤走任何剩余的承包商设备、多余材料、残余物、垃圾和临时工程等。

(b) reinstate all parts of the Site which were affected by the Contactor 's activities during the execution of the Works and are not occupied by the Permanent Works; and  
将在工程实施期间承包商活动影响过的和现在非永久工程占用的现场所有部分恢复原状； 和

(c) leave the Site and the Works in the condition stated in the Employer 's Requirements (if not stated, in a clean and safe condition).

使得现场和工程处于雇主要求中说明的状态（如果没有规定，就让其保持干净整洁和安全的状态）。

If the Contractor fails to comply with sub-paragraphs (a),(b)and/ or(c) above within 28 days after the issue of the Performance Certificate, the Employer may sell (to the extent permitted by applicable Laws) or otherwise dispose of any remaining items and/ or may reinstate and clean the Site (as may be necessary) at the Contactor 's cost.

如果承包商未能在履约证书颁发后 28 天内遵守以上 (a),(b) 和 / 或 (c)项，雇主可以出售（在先行法律允许的范围内）或由承包商承担费用处理任何剩余的设施和 /或恢复和清理现场（可能需要的）。

The Employer shall be entitled subject to Sub -Clause 20.2 [ Claims For Payment and/ or EOT ] to payment by the Contractor of the costs reasonably incurred in connection with, or attributable to, such sale or disposal and reinstating and/ or cleaning the Site, less an amount equal to the moneys from the sale (if any).

雇主应有权根据第 20.2 款 [付款索赔和 /或延期补偿 ] 提出由承包商对此类销售或处理和复原和 /或清理现场，销售所得金额无法补齐的金额有关的或造成的合理性的花费，给予支付。

#### 12 Test after Completion 竣工后试验

##### 12.1 Procedure for Tests after Completion 竣工后试验的程序

If Tests after Completion are specified in the Contract, this Clause shall apply. Unless otherwise stated in the Particular Conditions:

如果合同规定了竣工后试验，除非专用条件中另有说明，应适用本条规定：

The timing of the T ests after Completion shall be as soon as is reasonably practicable after the Works or Section (as the case may be) have been taken over by the Employer.

竣工后的试验时间应在工程或部分（视情况而定）已由雇主接管后，在合理可行的范围内尽快完成。

The Employer shall provide all electricity, water, sewage (if applicable), fuel, consumables, materials, and make the Employer's Personnel and Plant available for the Tests after

Completion. The Contractor shall:

雇主应提供所有电力, 水, 污水 (如适用的话), 燃料, 消耗品, 材料, 并使雇主的人员和工

厂可供竣工后试验。承包商应:

- (a) provide all other apparatus, assistance, documents and other information, equipment, instruments, labour, and suitably qualified, experienced and competent staff, as are necessary to carry out the Tests after Completion efficiently and properly;

提供执行技术所需的所有其他工具、协助、文件和其他信息、设备、工具、劳动力, 以及适当合格、经验丰富和胜任的工作人员, 必要时进行有效适当的竣工后试验;

- (b) submit to the Employer, not later than 42 days before the date the Contractor intends to commence the Tests after Completion, a detailed test programme showing the intended timing and resources required for these tests, The Employer may Review the proposed test programme and may give a Notice to the Contractor stating the extent to which it does not comply with the Contract. Within 14 days after receiving this Notice, the Contractor shall revise the test programme to rectify such non-compliance. If the Employer gives no such Notice within 14 days after receiving the test programme (or revised test programme), the Employer shall be deemed to have given a Notice of No -objection;

于承包商打算进行竣工后试验日期前 42 天向雇主提交一份详细的试验方案, 说明预定的时间和资源要求。雇主审查拟定的试验方案, 并向承包商发出通知, 说明其不符合合同的程度。在收到本通知后 14 天内, 承包商应修改试验计划, 以纠正这种不符合规定的情况。如雇主在收到试验计划 (或经修订的试验计划) 后 14 天内没有发出该通知, 则雇主视为已发出不反对通知书;

- (c) in addition to any date(s) shown in the test programme, give a Notice to the Employer of not less than 21 days, of the date after which the Contractor will be ready to carry out each of the Tests after Completion;

除测试计划所显示的任何日期外, 须向雇主发出不少于 21 天的通知, 说明承包商准备进行每项竣工后试验的日期;

- (d) not commence the Tests after Completion until a Notice of No -objection is given (or is deemed to have been given) by the Employer to the Contractor's test programme;

在雇主向承包商的试验计划发出不反对通知 (或视为已发出) 之前, 不得开始竣工后试验;

- (e) commence the Tests after Completion within 14 days after the date stated in the Notice under sub -paragraph (c) above, or on such day or days as the Employer shall instruct;

在根据上文 (C) 发出的通知所述日期后 14 天内, 或在雇主指示的日期内开始竣工后试验;

- (f) proceed to carry out the Tests after Completion in accordance with:

竣工后试验应根据以下要求进行：

(i) the Contractor's test programme to which the Employer has given (or is deemed to have given) a Notice of No -objection;

雇主已发出（或被视为已发出）不反对承包商试验方案的通知书；

(ii) the Employer's Requirements; and

雇主的要求；以及

(iii) if applicable, the O&M Manuals to which the Employer has given (or is deemed to have given) a Notice of No-objection, under Sub-Clause 5.7

[Operation and Maintenance Manuals] ; and

如果适用，雇主根据 O&M 手册 5.7 款已给出（或被视为已给出）无异议通知【操

作和维护手册】；及，

in the presence of such Employer's Personnel and/or Contractor's Personnel as either Party may reasonably request.

在雇主人员和 / 或承包商人员在场的情况下，任何一方均可合理要求。

The results of the Tests after Completion shall be compiled and evaluated by both Parties.

Appropriate account shall be taken of the effect of the Employer's prior use of the Works.

竣工后试验结果由双方编制和评估。对雇主提前使用工程的影响应予适当考虑。

## 12.2 Delayed tests 延误的试验

If the Contractor has given a Notice under sub-paragraph (c) of Sub-Clause 12.1[Procedure for Tests after Completion] that the Works or Section (as the case may be) are ready for Tests after Completion, and the Contractor is prevented from carrying out the Tests after Completion, or these tests are unduly delayed, by the Employer's Personnel or by a cause for which the Employer is responsible:

如果承包商已根据第 12.1 条 [竣工后检验程序 ](c) 发出通知，表示工程或分项工程（视情况而定）已准备进行竣工后试验，且由于雇主人员或雇主责任，导致承包商无法进行试验，或这些试验被不适当地推迟：

the Contractor shall carry out the Tests after Completion as soon as practicable

and, in any case, before the expiry date of the relevant DNP; and

承包商应在切实可行范围内尽快进行竣工后试验，并在任何情况下，在相关 DNP 的失效日期之前进行；

(a) if the Contractor incurs Cost as a result of any such prevention and/ or delay, the

Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to payment of such Cost Plus Profit.

如果承包商因任何此类预防和 /或延误而发生，则承包商有权根据第 20.2 款【付款和 /或 EOT 索赔】的规定支付此类费用和利润。

If, for reasons not attributable to the Contractor, a test after Completion on the Works or any Section cannot be completed during the DNP (or any other period agreed by both Parties), then the Works or Section shall be deemed to have passed this Test after Completion.

如果工程或任何分项工程的竣工后试验，未能 DNP 期限(或双方商定的任何其他期限)内完成，且原因不在承包商方面，工程或分项工程应被视为已通过了竣工后试验。

### 12.3 Retesting 重新试验

Subject to Sub-Clause 12.4 [Failure to Pass Tests after Completion], if the Works, or a Section, fail to pass the Tests after Completion:

根据第 12.4 款【未能通过竣工后试验】，如果工程或某分项工程未能通过竣工后试验：

(a) sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall apply; and

应适用第 11.1 款 [完成扫尾工作和修补缺陷] (b) 项；

(b) after remedying any defect or damage, Sub-Clause 11.6 [Further Tests after Remedying Defects] shall apply.

补救任何缺陷或损坏后，适用第 11.6 款 [修复缺陷后的进一步试验]。

If and to the extent that this failure and retesting are attributable to any of the matters listed in sub-paragraphs (a) to (d) of Sub-Clause 11.2 [Cost of Remedying Defects] and cause the Employer to incur additional costs, the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to payment of these costs by the Contractor.

如果此项未通过试验和重新试验是由第 11.2 款 [修补缺陷的费用] (a) 至 (d) 项所列任何事项造成的，致使雇主增加费用的，承包商应根据第 20.2 款 [付款索赔和 /或 EOT] 的规定向雇主支付这些费用。

### 12.4 Failure to Pass Tests after Completion 未能通过竣工后试验

(a) the Works, or a Section, fail to pass any or all of the Tests after Completion; and

工程或某分项工程未能通过任何或全部竣工后试验；及

(b) applicable Performance Damages are set out in the Schedule of Performance Guarantees

适用的履约损害赔偿列于履约担保表

the Employer shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to payment of these Performance Damages by the Contractor in full satisfaction of this failure. If the Contractor pays these Performance Damages to the Employer during



the DNR then the Works or Section shall be deemed to have passed these Tests after

Completion.

雇主应根据 20.2 条 [付款索赔和 /或 EOT] 的规定, 要求承包商以完全满意的方式支付这些履约损害赔偿金。如果承包商在 DNR 期间向雇主支付了这些损害赔偿, 则工程或分项工程应被视为通过了竣工后试验。

If the Works, or a Section, fail to pass a Test after Completion and, by giving a Notice to the Employer, the Contractor proposes to make adjustments or modifications to the Works or such Section (including an item of Plant):

如果工程或某分项工程未通过某项竣工后试验, 通过向雇主发出通知, 承包商建议对工程或该分项工程 (包括设备项目) 进行调整或修正:

(i) the Contractor may be instructed by a Notice given by the Employer that right of access to the Works or Section cannot be given until a time that is convenient to the Employer, which time shall be reasonable;

雇主发出的通知可指示承包商, 到雇主方便时才能给予工程或分项工程的进人权, 该时间应合理;

(ii) the Contractor shall remain liable to carry out the adjustments or modifications and to satisfy this Test, within a reasonable period of receiving the Notice under sub -paragraph (i) above; and

承包商应在等待关于雇主方便时间的通知的合理期限内有责任进行调整或修正并满足该试验; 及

(iii) if the Contractor does not receive a Notice under sub -paragraph (i) above during the relevant DNP, the Contractor shall be relieved of the obligation to make such adjustments or modifications and the Works or Section (as the case may be) shall be deemed to have passed this Test after Completion.

如果承包商根据上述 (i) 款在相关 DNP 期限内未收到此项通知, 承包商应解除上述义务, 而工程或分项工程 (视情况而定) 应视为通过了该项竣工后试验。

If the Contractor incurs additional Cost as a result of any unreasonable delay by the Employer in permitting access to the Works or Section by the Contractor, either to investigate the causes of a failure to pass a Test after Completion or to carry out any adjustments or modifications, the Contractor shall be entitled subject to Sub -Clause 20.2 \Claims For Payment and/or EOT] to payment of any such Cost Plus Profit.

如果对承包商为调查未通过某项竣工后试验的原因, 或为进行任何调整或修正, 要进入工程或分项工程, 雇主无故延误给予许可, 招致承包商增加费用, 承包商应: 有权根据第 20.2 款 [付款索赔和 /或 EOT] 的规定提出支付任何此类费用和合理利润。

13 Variations and Adjustments 变更和调整

13.1 Right to Vary 变更权

Variations may be initiated by the Employer under Sub-Clause 13.3 [Variation Procedure]

at any time before the issue of the Taking-Over Certificate for the Works.

在颁发工程接收证书前的任何时间，雇主可根据第 13.3 款 [变更程序] 提出变更。

Other than as stated under Sub-Clause 11.4 [Failure to Remedy Defects], a Variation shall

not comprise the omission of any work which is to be carried out by the Employer or by

others unless otherwise agreed by the Parties.

除第 11.4 款【未能补救的缺陷】规定外，变更不包括雇主或他人进行的任何工作，除非双

方另有约定。

The Contractor shall be bound by each Variation instructed under Sub-Clause 13.3.1

【Variation by Instruction】, and shall execute the Variation with due expedition and

without delay, unless the Contractor promptly gives a Notice to the Employer stating (with

detailed supporting particulars) that:

承包商应受第 13.3.1 款【指示变更】规定的每一项变更的约束，并及时、无延误的执行

变更，除非承包商迅速向雇主发出通知，说明 (附有详细证明详情)：

(a) the varied work was Unforeseeable having regard to the scope and nature of the Works

described in the Employer's Requirements;

考虑到雇主要求中所述工程的范围和性质，变更是不可预见的；

(b) the Contractor cannot readily obtain the Goods required for the Variation;

承包商难以取得变更所需要的货物；

(c) it will adversely affect the Contractor's ability to comply with Sub-Clause 4.8 [Health and

Safety Obligations] and/or Sub-Clause 4.18 [Protection of the Environment];

会对承包商遵守第 4.8 款【健康和安义务】和/或第 4.18 款【环境保护】产生不利地影响；

(d) it will have an adverse impact on the achievement of the Schedule of Performance

Guarantees; or

将对履约保证的完成产生不利的的影响；

(e) it may adversely affect the Contractor's obligation to complete the Works so that they

shall be fit for the purpose(s) for which they are intended under Sub-Clause 4.1

[Contractor's General Obligations],

可能会对承包商完成工程的义务产生不利影响，使其符合第 4.1 款【承包商的一般义务】所

规定的目的。

Promptly after receiving this Notice, the Employer shall respond by giving a Notice to the

Contractor cancelling, confirming or varying the instruction. Any instruction so confirmed

or varied shall be taken as an instruction under Sub-Clause 13.3.1 [Variation by

instruction].

收到本通知后，雇主应立即向承包商发出通知，取消、确认或变更指示。任何经如此确认或

变更的指示须按照第 13.3.1 款【指示变更】的指示进行。

### 13.2 Value Engineering 价值工程

The Contractor may, at any time, submit to the Employer a written proposal which (in the Contractor's opinion) will, if adopted:

承包商可随时向雇主提交书面建议，提出 (他认为) 采纳后将：

(a) accelerate completion;

加快竣工；

(b) reduce the cost to the Employer of executing, maintaining or operating the Works;

降低雇主的工程施工、维护、或运行的费用；

(c) improve the efficiency or value to the Employer of the completed Works; or

提高雇主的竣工工程的效率或价值，或；

(d) otherwise be of benefit to the Employer.

给雇主带来其他利益的建议。

The proposal shall be prepared at the cost of the Contractor and shall include the details

as stated in sub -paragraphs (a) to (c) of Sub -Clause 13.3.1 \Variation by Instruction].

此类建议书应由承包商自费编制，并应包括第 13.3.1 款【指示变更】(a)到 (c)所列内容。

The Employer shall, as soon as practicable after receiving such proposal, respond by

giving a Notice to the Contractor of the Employer's consent or otherwise. The Employer's

consent or otherwise shall be at the sole discretion of the Employer. The Contractor shall

not delay any work while awaiting a response.

在收到此类建议后，雇主应在切实可行的范围内尽快向承包商发出雇主是否同意。雇主是否

同意应由雇主自行决定。承包商在等待答复时不得延误任何工作。

If the Employer gives his/her consent to the proposal, with or without comments, the

Employer shall then instruct a Variation. Thereafter:

如果雇主同意该建议，不论是否有意见，雇主应指示作出 更改。此后：

(i) the Contractor shall submit any further particulars that the Employer may reasonably

require; and

承包商应提交雇主可合理要求的任何进一步详情；及

(ii) then the third paragraph of Sub -Clause 13.3.1 \Variation by Instruction] shall apply

which shall include consideration by the Employer of the sharing (if any) of the benefit,

costs and/or delay between the Parties stated in the Particular Conditions.

则应适用第 13.3.1 款【指示变更】第 3 段，该款包括雇主对在 专项条款 中双方利益、成本

和/或延迟之间的共享（如有）的考虑。

### 13.3 Variation Procedure 变更程序

Subject to Sub -Clause 13.1 [Right to Vary], Variations shall be initiated by the Employer in

accordance with either of the following procedures:

除第 13.1 条【变更权】另有规定外，变更应由雇主按照下列任何一种程序提出：

### 13.3.1 Variation by Instruction

#### 13.3.1 指示的变更

The Employer may instruct a Variation by giving a Notice (describing the required change and stating any requirements for the recording of Costs) to the Contractor in accordance with Sub-Clause 3.4 [Instructions].

雇主可根据第 3.4 款【指示】向承包商发出通知（描述所需的变化，并说明对成本记录的任何要求）的变更。

The Contractor shall proceed with execution of the Variation and shall within 28 days (or other period proposed by the Contractor and agreed by the Employer) of receiving the Employer's instruction, submit to the Employer's Representative detailed particulars including:

承包商应在收到雇主指示后 28 天内（或承包商提出并经雇主同意的其他期限）继续实施变更，向雇主代表提交详细资料，包括：

(a) a description of the varied work performed or to be performed, including details of the resources and methods adopted or to be adopted by the Contractor;

对已完成或将要进行的各种工作的说明，包括承包商采用或将要采用的资源和方法的详细情况；

(b) a programme for its execution and the Contractor's proposal for any necessary modifications (if any) to the Programme according to Sub-Clause 8.3 [Programme] and to the Time for Completion; and

根据第 8.3 款【进度计划】和竣工时间对计划进行必要修改（如有）的执行方案和承包商的建议；以及

(c) the Contractor's proposal for adjustment to the Contract Price, with supporting particulars, Whenever the omission of any work forms part (or all) of a Variation, and if:

承包商对合同价格进行调整的建议书，及佐证详情，当任何工程遗漏构成变更的一部分（或全部）时，如果：

the Contractor has incurred or will incur cost which, if the work had not been omitted, would have been deemed to be covered by a sum forming part of the Contract Price stated in the Contract Agreement; and

承包商已经或将要产生费用，如果没有遗漏，将被视为包括在合同协议中规定的合同价格的一部分金额中；及

the omission of the work has resulted or will result in this sum not forming part of the Contract Price

工程的遗漏已导致或将导致这一数额不构成合同价格的一部分

this cost may be included in the Contractor's proposal (and, if so, shall be clearly identified). If the Parties have agreed to the omission of any work which is to be carried out by others, the Contractor's proposal may also include the amount of any loss of profit and other losses and damages suffered (or to be suffered) by the Contractor as a result of the omission.

这一费用可列入承包商的建议 (如果是的话, 应明确说明 )。如果双方同意不进行任何由他人遗漏的工作, 承包商的建议也可以包括该遗漏造成的任何利润损失和其他损失及损害赔偿 (或将要遭受的) 的数额。

Thereafter, the Contractor shall submit any further particulars that the Employer's Representative may reasonably require.

此外, 承包商应提交雇主代表可能合理要求的任何进一步详情。

The Employer's Representative shall then proceed under Sub -Clause 3.5 Agreement or Determination] to agree or determine:

然后, 雇主代表应根据第 3.5 款【协议或决定】同意或决定:

(i)EOT, if any; and/or

EOT (如有); 和/或

(ii)the adjustments to the Contract Price and the Schedule of Payments, if any

对合同价格及付款进度表作出的调整, (如有)

(and, for the purpose of Sub -Clause 3.5.3 [Time limits], the date the Employer's Representative receives the Contractor's submission (including any requested further particulars) shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3). The Contractor shall be entitled to such EOT and/or adjustments to the Contract Price, without any requirement to comply with Sub -Clause 20.2 \Claims For Payment and/or EOT\.

(就第 3.5.3 款【时间限制】而言, 雇主代表收到承包商提交的材料 (包括任何要求的进一步详情)的日期为达成协议的开始日期 )。承包商应有权获得此类 EOT 和/或合同价格的调整, 无需遵守第 20.2 款【付款索赔】和 /或 EOT。

If no Schedule of Rates and Prices is included in the Contract, the adjustments under sub-paragraph (ii) above shall be derived from the Cost Plus Profit of executing the work.

如果合同中没有包括费率和价目表, 则上文 (ii) 项下的调整应从执行工作的成本加利润。

If a Schedule of Rates and Prices is included in the Contract, the following provisions of

this Sub -Clause 13.3.1 shall apply to the adjustments under sub -paragraph (ii) above.

如果合同中包括费率和价目表, 本款第 13.3.1 款下规定应适用于上文 (ii)项下的调整。

For each item of work forming part (or all) of a Variation, the appropriate rate or price for the item shall be the rate or price specified for such item in the Schedule of Rates and Prices or, if there is no such item, the rate or price specified for similar work. However, a new rate or price shall be appropriate for an item of work if no rate or price for this item is specified in the Schedule of Rates and Prices and no specified rate or price is appropriate because the item of work is not of similar character, or is not executed under similar conditions, as any item in the Contract.

对于构成变更的一部分 (或全部)的每一项工程, 该项目的适当费率或价格, 须为在费率及价

格附表中就该项目指明的费率和价格或, 如没有该项目, 则为类似的工作指定的费率或价格。

但是, 如果费率表中没有规定该项目的费率或价格, 及合同中的任何一项, 因为工程不具有类似性而费率表中没有指定的费率或价格, 则新的费率或价格应适用于工作项目,

Each new rate or price shall be derived from any relevant rates or prices in the Schedule of Rates and Prices, with reasonable adjustments taking account of all relevant circumstances. If no rates or prices are relevant for the derivation of a new rate or price, it shall be derived from the Cost Plus Profit of executing the work.

每一新的费率或价格应从费率和价格表中的任何有关费率或价格中得出，并在考虑到所有有关情况的情况下作出合理调整。如果新费率或新价格的推导与价格表中的任何有关费率或价格无关，则应从执行工作的成本加利润中得出。

Until such time as the adjustments under sub-paragraph (ii) above are agreed or determined, the Employer shall assess a provisional rate or price for the purposes of interim payment under Sub-Clause 14.6 [Interim Payment].

在商定或确定上述第 (ii) 款之下的调整之前，雇主应根据 14.6 款【期中付款】评估临时支付的临时费率或价格。

### 13.3.2 Variation by Request for Proposal 征求建议书方式变更

The Employer may request a proposal, before instructing a Variation, by giving a Notice (describing the proposed change) to the Contractor.

雇主可在指示更改前，向承包商发出通知 (详述建议的变化)，以征求建议书。

The Contractor shall respond to this Notice as soon as practicable, by either:

承包者应在切实可行范围内尽快对本通知作出答复，通过下列方式之一：

(a) submitting a proposal, which shall include the matters as described in sub-paragraphs

(a) to (c) of Sub-Clause 13.3.1 [Variation by Instruction]; or

提交建议书，其中应包括第 13.3.1 款【指示的变更】(a) 至 (c) 项所述事项；或

(b) giving reasons why the Contractor cannot comply (if this is the case), by reference to

the matters described in sub-paragraphs (a) to (e) of Sub-Clause 13.1 [Right to Vary].

根据第 13.1 款【变更的权利】第 (a) 至 (e) 段所述的事项，说明承包商不能遵守 (如果是这种情况) 的原因。

If the Contractor submits a proposal, the Employer shall, as soon as practicable after receiving it, respond by giving a Notice to the Contractor stating the Employer's consent or otherwise. The Contractor shall not delay any work whilst awaiting a response.

如果承包商提交了建议书，雇主应在收到建议书后尽快作出答复，向承包商发出通知，说明雇主是否同意。在等待响应的同时，承包商不得延误任何工作。

If the Employer gives consent to the proposal, with or without comments, the Employer shall then instruct the Variation. Thereafter, the Contractor shall submit any further particulars that the Employer may reasonably require and the third paragraph of Sub-Clause 13.3.1 [Variation by Instruction] shall apply.

如果雇主同意建议书，不论是否有评论，雇主应指示变更。此后，承包商应提交雇主可能合理要求的任何进一步详情，并应适用第 13.3.1 款【指示的变更】第三段的规定。

If the Employer does not give consent to the proposal, with or without comments, and if

the Contractor has incurred Cost as a result of submitting it, the Contractor shall be entitled subject to Sub-Clause [Claims For Payment and/or EOT] to payment of such Cost.

如果雇主不同意该建议书，不论是否有评论，且如果承包商因提交该建议书而产生费用，则承包商应有权根据【支付索赔和 /或EOT】要求支付此类费用。

#### 13.4 Provisional Sums 暂列金额

Each Provisional Sum shall only be used, in whole or in part, in accordance with the Employer's instructions, and the Contract Price shall be adjusted accordingly. The total

sum paid to the Contractor shall include only such amounts for the work, supplies or services to which the Provisional Sum relates, as the Employer shall have instructed.

每笔暂列金额只应按雇主指示全部或部分地使用，并对合同价格相应进行调整。付给承包商的总金额只应包括雇主已指示的，与暂列金额有关的工作、供货或服务的应付款项。

For each Provisional Sum, the Employer may instruct:

对于每笔暂列金额，雇主可以指示用于下列支付：

(a) work to be executed (including Plant, Materials or services to be supplied) by the Contractor, and for which adjustments to the Contract Price and the Schedule of Payments (if any) shall be agreed or determined under Sub-Clause 13.3.1 [Variation by Instruction]; and/or

承包商应执行的工程（包括要供应的设备、材料或服务），并对合同价格和付款时间表（如有）进行调整，应根据第 13.3.1 款【指示的变更】确定；和 /或

(b) Plant, Materials, works or services to be purchased by the Contractor from a nominated Subcontractor (as defined in Sub-Clause 4.5 [Nominated Subcontractors]) or otherwise,

and for which there shall be included in the Contract Price:

承包商须向指定分包商（按第 4.5 款【指定分包商】的定义）或他人购买生产设备、材料或服务，合同价格应包括：

(i) the actual amounts paid (or due to be paid) by the Contractor; and

承包商已付 (或应付) 的实际金额，以及

(ii) a sum for overhead charges and profit, calculated as a percentage of these actual amounts by applying the relevant percentage rate (if any) stated in the applicable Schedule. If there is no such rate, the percentage rate stated in the Contract Data shall be applied.

以适用附表规定的有关百分率（如果有）计算的，这些实际金额的一个百分比，作为管理费和利润的金额。如果没有这一比率，则应适用合同数据中规定的百分比比率。

If the Employer instructs the Contractor under sub-paragraph (a) and/or (b) above, this

instruction may include a requirement for the Contractor to submit quotations from the Contractor's suppliers and/or subcontractors for all (or some) of the items of the work to

be executed or Plant, Materials, works or services to be purchased. Thereafter, the

Employer may respond by giving a Notice either instructing the Contractor to accept one of these quotations (but such instruction shall not be taken as an instruction under Sub-Clause 4.5 [Nominated Subcontractors]), or revoking the instruction. If the Employer does not so respond within 7 days of receiving the quotations, the Contractor shall be entitled to accept any of these quotations at the Contractor's discretion.

如果雇主根据上文 (a)和/或 (b)项指示承包商, 本指示可包括要求承包商提交承包商供应商和/或分包商对所有 (或部分)待执行的工程项目或购买的生产设备、材料、工程或服务。其后, 雇主可发出通知, 指示承包商接受其中一项报价 (但该指示不得视为第 4.5 款【指定分包商】的指示), 或撤销该指示。如果雇主在收到报价后 7 天内未作出答复, 承包商应有权酌情接受其中任何报价。

Each Statement that includes a Provisional Sum shall also include all applicable invoices, vouchers and accounts or receipts in substantiation of the Provisional Sum.

包括暂列金额的每份报表还应包括所有适用的发票, 凭证、以及帐单或收据等证明。

### 13.5 Daywork 计日工作

If a Daywork Schedule is not included in the Contract, this Sub-Clause shall not apply.

如果合同中未包括计日工作计划表, 则本款不适用。

For work of a minor or incidental nature, the Employer may instruct that a Variation shall be executed on a daywork basis. The work shall then be valued in accordance with the Daywork Schedule, and the following procedure shall apply.

For work of a minor or incidental nature, the Employer may instruct that a Variation shall be executed on a daywork basis. The work shall then be valued in accordance with the daywork schedule included in the Contract, and the following procedure shall apply. If a daywork schedule is not included in the Contract, this Sub-Clause shall not apply.

对于一些小的或附带性的工作, 雇主可指示按计日工作实施变更。这时, 工作应按照计日工作计划表, 并按下述程序进行估价。

Before ordering Goods for such work (other than any Goods priced in the Daywork Schedule), the Contractor shall submit one or more quotations from the Contractor's suppliers and/or subcontractors to the Employer. Thereafter, the Employer may instruct the Contractor to accept one of these quotations (but such instruction shall not be taken as an instruction under Sub-Clause 4.5[Nominated Subcontractors]). If the Employer does not so instruct the Contractor within 7 days of receiving the quotations, the Contractor shall be entitled to accept any of these quotations at the Contractor's discretion.

在为工作订购货物前 (除计日工作时间表内的货物), 承包商应向雇主提交承包商供应商和/或分包商的一份或多份报价单。其后, 雇主可指示承建商接受其中一项报价 (但该指示不得视为 4.5 款【指定分包商】的指示)。如果雇主未在收到报价后 7 天内指示承包商, 承包商应有权自行决定接受这些报价。

Except for any items for which the Daywork Schedule specifies that payment is not due,



the Contractor shall deliver each day to the Employer accurate statements in duplicate  
(and one electronic copy), which shall include records (as described under Sub -Clause

6.10 [Contractors 'Records] of the resources used in executing the previous day's work.

除计日工作计划表中规定不应支付的任何项目外， 承包商应向雇主提交每日的精确报表， 一式二份（及电子版一份）报表应包括 （如第 6.10 款【承包商的记录】中所述 ）用于前一天工作中使用的各项资源的详细资料。

One copy of each statement shall, if correct and agreed, be signed by the Employer and promptly returned to the Contractor. If not correct or agreed, the Employer's Representative shall proceed under Sub-Clause 3.5 [Agreement or Determination] to agree or determine the resources (and, for the purpose of Sub -Clause 3.5.3 [Time limits], the date the works which are the subject of the Variation under this Sub-Clause are completed by the Contractor shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3).

报表如果正确或经同意，将由雇主签署并退回承包商 1 份。如果报表不正确或未同意，雇主代表应根据第 3.5 款【协议或决定】同意或确定资源（和，就第 3.5.3 款【时间限制】而言，应于根据本款规定变更的工程由承包商完成， 即为根据第 3.5.3 款达成协议的时限的开始日期）。

In the next Statement, the Contractor shall then submit priced statements of the agreed or determined resources to the Employer, together with all applicable invoices, vouchers and accounts or receipts in substantiation of any Goods used in the daywork (other than Goods priced in the Daywork Schedule).

在下一份报表中， 承包商应向雇主提交之后商定或确定资源的价格报表， 连同所有计日工作中所使用货物适用的发票，凭证、以及帐单或收据等证明 （计日工作表中定价的货物除外 ）。

Unless otherwise stated in the Daywork Schedule, the rates and prices in the Daywork Schedule shall be deemed to include taxes, overheads and profit.

除计日工作表另有规定外，计日工作表中的费率和价格应视为包括税收、间接费用和利润。

### 13.6 Adjustments for Changes in Legislation 因法律改变的调整

Subject to the following provisions of this Sub -Clause, the Contract Price shall be adjusted to take account of any increase or decrease in Cost resulting from a change in:

在不违反本款下列规定的情况下， 合同价格应考虑由下列改变造成的任何费用增减， 进行调整。

(a)the Laws of the Country (including the introduction of new Laws and the repeal or modification of existing Laws);

工程所在国的法律包括施用新的法律， 废除或修改现有法律；

(b)the judicial or official governmental interpretation or implementation of the Laws

referred to in sub -paragraph (a) above;

对上文(a)分段所述法律的司法或官方解释或执行;

(c) any permit, permission, license or approval obtained by the Employer or the Contractor

under sub -paragraph (a) or (b), respectively, of Sub -Clause 1.12 [Compliance with Laws];

or

雇主或承建包分别根据第上述 1.12 款【遵守法律】 (a)或 (b) 项取得的任何许可证、执照或批

准; (d) the requirements for any permit, permission, licence and/or approval to be obtained

by the Contractor under sub -paragraph (b) of Sub -Clause 1.12 [Compliance with Laws],

承包商根据第上述 1.12 款【遵守法律】 (b) 项获得的任何许可证、执照和 /或批准的要求,

made and/or officially published after the Base Date, which affect the Contractor in the

performance of obligations under the Contract. In this Sub -Clause "change in Laws"

means any of the changes under sub -paragraphs (a), (b), (c) and/or (d) above.

在“基准日期”之后作制定 /或正式公布, 影响到承包商履行合同规定的义务。在本款中, 法

律改变”系指上文 (a), (b), (c) 和 /或 (d) 项下的任何改动。

If the Contractor suffers delay and/or incurs an increase in Cost as a result of any change

in Laws, the Contractor shall be entitled subject to Sub -Clause 20.2 [Claims For Payment

and/or EOT] to EOT and/or payment of such Cost.

如果承包商因法律的任何变化而受到延误和 /或导致费用增加, 承包商应有权要求根据 20.2

款【支付索赔和 /或 EOT】 EOT 和 /或支付此类费用。

If there is a decrease in Cost as a result of any change in Laws, the Employer shall be

entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT] to a reduction in the

Contract Price.

如果由于法律的任何改变, 成本有所下降, 雇主应有权根据第 20.2 款【支付索赔和 /或 EOT】

的规定要求降低合同价格。

If any adjustment to the execution of the Works becomes necessary as a result of any

change in Laws:

如果由于法律的任何变化, 有必要对工程的执行作出任何调整:

(i) the Contractor shall promptly give a Notice to the Employer, or

(ii) the Employer shall promptly give a Notice to the Contractor (with detailed supporting

particulars).

(i) 承包商应立即向雇主发出通知, 或

(ii) 雇主应立即向承包商发出通知 (附有详细的佐证详情)。

Thereafter, the Employer shall either instruct a Variation under Sub -Clause

之后, 雇主须根据副条款的规定, 指示作出更改。

13.3.1 [Variation by Instruction] or request a proposal under Sub -Clause

13.3.2 [Variation by Request for Proposal].

13.3.1 【指示的变更】或根据副条款要求提交建议书

13.3.2 【征求建议书方式更改】征求建议书方式更改

13.7 Adjustments for Changes in Costs 因成本改变的调整

If there are no schedule(s) of cost indexation in the Particular Conditions, this Sub-  
Clause shall not apply.

如果专用条款中没有成本索引的时间表，则本款不适用。

The amounts payable to the Contractor shall be adjusted for rises or falls in the cost of  
labour, Goods and other inputs to the Works, by the addition or deduction of the amounts  
calculated in accordance with the schedule(s) of cost indexation in the Particular  
Conditions.

应支付给承包商的款项应根据劳动力、货物、以及工程的其他投入的成本的升降进行调整时，  
应按照专用条件成本指数表的规定进行计算。

To the extent that full compensation for any rise or fall in Costs is not covered by this  
Sub-Clause or other Clauses of these Conditions, the Contract Price stated in the  
Contract Agreement shall be deemed to have included amounts to cover the contingency  
of other rises and falls in costs.

如果本条款或本条件的其他条款未涵盖任何成本增加或下降的全部补偿，则合同协议书中规  
定的合同价格应视为包括用于支付其他费用涨跌的意外费用的数额。

The adjustment to be applied to the amount otherwise payable to the Contractor under  
Clause 14 [Contract Price and Payment] shall be calculated for each of the currencies in  
which the Contract Price is payable. No adjustment shall be applied to work valued on the  
basis of Cost or current prices.

根据第 14 款【合同价格和付款】适用于应付给承包商的数额的调整数，应按合同价格的每  
一种货币计算。不应根据成本或现价对工作进行调整。

Until such time as each current cost index is available, the Employer shall use a  
provisional index for the purpose of interim payments under Sub-Clause 14.6 [Interim  
Payment]. When a current cost index is available, the adjustment shall be recalculated  
accordingly.

直到每个现行成本指数都可用为止，雇主应根据第 14.6 款【期中付款】在期中付款中使用  
临时指数。当有现行成本指数时，应相应地重新计算调整数。

If the Contractor fails to complete the Works within the Time for Completion, adjustment of  
prices thereafter shall be made using either:

如果承包商未能在竣工时间内完成工程，应使用以下方式调整价格：

(a) each index or price applicable on the date 49 days before the expiry of the Time for  
Completion of the Works; or

在工程竣工时间届满前 49 天适用的每项指数或价格；或

(b) the current index or price

当前指数或价格。

whichever is more favourable to the Employer.

对雇主更有利之一。

14 Contract Price and Payment 合同价格和付款

14.1 The Contract Price 合同价格

Unless otherwise stated in the Particular Conditions:

除非在专用条件中另有规定:

(a) payment for the Works shall be made on the basis of the lump sum Contract Price stated in the Contract Agreement, subject to adjustments, additions (including Cost or Cost Plus Profit to which the Contractor is entitled under these Conditions) and/or deductions in accordance with the Contract;

(a) payment for the Works shall be made on the basis of the lump sum Contract Price, subject to adjustments in accordance with the Contract; and

工程款的支付应以合同协议规定的总额合同价格为基础, 根据合同做出增 (包括承包商根据本条件有权获得的成本或成本加利润) 和 /或减;

(b) the Contractor shall pay all taxes, duties and fees required to be paid by the Contractor under the Contract, and the Contract Price shall not be adjusted for any of these costs, except as stated in Sub -Clause 13.6 [Adjustments for Changes in Laws]; and

承包商应支付根据合同要求应由其支付的各项税费。除第 13.6 款【因法律改变的调整】说明的情况以外, 合同价格不应因任何这些税费进行调整。

(c) if any quantities are set out in a Schedule, they shall not be taken as the actual and correct quantities of the Works which the Contractor is required to execute, and they shall be used only for the purpose(s) stated in the Schedule and for no other purpose(s).

如果任何数量列于时间表, 不应将其视为承包商必须执行的实际和正确的工程数量, 而该数量的用途只可用于附表所述的目的, 而不得用作其他用途。

14.2 Advance Payment 预付款

If no amount of advance payment is stated in the Contract Data, this Sub -Clause shall not apply

如果合同资料中没有列明预付款项的数额, 则本款不适用。

Subject to the following provisions of this Sub -Clause, the Employer shall make an advance payment, as an interest -free loan for mobilisation and design, The amount of the advance payment and the currencies in which it is to be paid shall be as stated in the Contract Data.

根据本款的下列规定, 雇主应支付预付款项, 作为动员和设计的无息贷款, 预付款的金额和支付的货币应按照 合同资料 的规定。

14.2.1 Advance Payment Guarantee 预付款保函

The Contractor shall obtain (at the Contractor's cost) an Advance Payment Guarantee in

amounts and currencies equal to the advance payment, and shall submit it to the Employer. This guarantee shall be issued by an entity and from within a country (or other jurisdiction) to which the Employer gives consent, and shall be based on the sample form included in the tender documents or on another form agreed by the Employer (but such consent and/or agreement shall not relieve the Contractor from any obligation under this Sub-Clause).

承包商应以相当于预付款的金额和货币获得 (费用由承包商承担) 预付款保函, 并将其提交雇主。本保函应由一个实体发出, 并在雇主同意的国家 (或其他管辖范围内) 发出, 并须以投标文件所载的样本表格或雇主同意的另一份表格为基础 (但这种同意和 /或协议不得免除承包商根据本款承担的任何义务)。

The Contractor shall ensure that the Advance Payment Guarantee is valid and enforceable until the advance payment has been repaid, but its amount may be progressively reduced by the amount repaid by the Contractor.

承包商应确保预付款保函是有效可行的, 直到预付款得到偿还为止, 但其金额可以逐步减少, 按承包商偿还的金额计算。

If the terms of the Advance Payment Guarantee specify its expiry date, and the advance payment has not been repaid by the date 28 days before the expiry date:

如果预付款保函的条款规定了其到期日, 且预付款尚未在到期日前 28 天内偿还:

(a) the Contractor shall extend the validity of this guarantee until the advance payment has been repaid;

承包商应将本保函的有效期延长至预付款已偿还为止;

(b) the Contractor shall immediately submit evidence of this extension to the Employer; and

承包商应立即向雇主提交延长的证据;

(c) if the Employer does not receive this evidence 7 days before the expiry date of this guarantee, the Employer shall be entitled to claim under the guarantee the amount of advance payment which has not been repaid.

如果雇主在本保函有效期满前 7 天没有收到本证据, 雇主有权在保函下索赔未偿还的预付款。

When submitting the Advance Payment Guarantee, the Contractor shall include an application (in the form of a Statement) for the advance payment.

提交预付款保函时, 承包商应包括预付款的申请 (以报表的形式)。

#### 14.2.2 Advance Payment 预付款

The Employer shall make the advance payment within 14 days after:

雇主应在下列情况发生后 14 天内支付预付款:

(a) the Employer has received both the Performance Security and the Advance Payment Guarantee, in the form and issued by an entity in accordance with Sub-Clause 4.2.1 [Contractor's Obligation] and Sub-Clause 14.2.1 [Advance Payment Guarantee]

respectively; and

雇主同时收到由实体按照第 4.2.1 款【承包商的义务】和的 14.2.1【预付款保函】形式提交的履约保证金和预付款保函；和

(b)the Employer has received the Contractor's application for the advance payment under Sub-Clause 14.2.1 [Advance Payment Guarantee].

雇主已收到承包商根据第 14.2.1 款【预付款保函】提出的预付款申请。

#### 14.2.3 Reoayment of Advance Payment 预付款的偿还

The advance payment shall be repaid through percentage deductions in interim payments under Sub-Clause 14.6 [Interim Payment]. Unless other percentages are stated in the Contract Data:

预付款应根据第 14.6 款【期中付款】在期中付款中按百分比扣减。合同数据中列有其他百分比除外：

(a)deductions shall commence with the interim payment in which the total of all interim payments in the same currency as the advance payment (excluding the advance payment and deductions and release of retention moneys) exceeds ten percent (10%) of the portion of the Contract Price stated in the Contract Agreement payable in that currency less Provisional Sums; and

扣除应从期中付款开始，在期中付款中，以与预付款相同的货币支付（不包括预付款、扣除和质保金的发放）超过合同协议书中规定的合同价格的百分之十（10%）减去暂定金额；和

(b)deductions shall be made at the amortisation rate of one quarter (25%) of the amount of each interim payment (excluding the advance payment and deductions and release of retention moneys) in the currencies and proportions of the advance payment, until such time as the advance payment has been repaid.

应扣除每个期中付款金额的四分之一（25%）的摊销率（不包括预付款、扣除和质保金）按预付款的货币和比例计算，直至预付款已偿还为止。

If the advance payment has not been repaid before the issue of the Taking-Over Certificate for the Works, or before termination under Clause 15 [Termination by Employed] Clause 16 [Suspension and Termination by Contractor] or Clause 18 [Exceptional Events](as the case may be), the whole of the balance then outstanding shall immediately become due and payable by the Contractor to the Employer.

在工程验收证书签发前，预付款尚未还清的，或在第 15 条【雇用终止】第 16 条【承包商暂停和终止】或第 18 条【异常事件】（视情况而定）终止之前，所有未清余额应立即由承包商支付给雇主。

#### 14.3 Application for Interim Payments 期中付款的申请

The Contractor shall submit a Statement to the Employer after the end of the period of payment stated in the Contract Data (if not stated, after the end of each month). Each

Statement shall:

承包商应在合同资料规定的支付期限末 (如无规定, 则在每月月末 )后, 向雇主提交报表, 每份报表应该:

(a) be in a form acceptable to the Employer;

(a) 雇主可接受的表格;

(b) be submitted in one paper -original, one electronic copy and additional paper copies (if any) as stated in the Contract Data; and

(b) 按合同资料所述, 一份正本、一份电子文本及其他纸质副本 (如有的话) 呈交; 及

(c) show in detail the amounts to which the Contractor considers that the Contractor is entitled, with supporting documents which shall include sufficient detail for the Employer to investigate these amounts together with the relevant report on progress in accordance with Sub -Clause 4.20 [Progress Reports].

详细说明承包商自己认为有权得到的款额, 以及包根据第 4.20 款【进度报告】的规定编制的相关进度报告, 和供雇主调查这些款项在内的证明文件。

The Statement shall include the following items, as applicable, which shall be expressed

in the various currencies in which the Contract Price is payable, in the sequence listed:

适用时, 该报表应包括下列项目, 以合同价格应付的各种货币奉示, 并按下列顺序排列:

(i) the estimated contract value of the Works executed, and the Contractor's Documents produced, up to the end of the period of payment (including Variations but excluding items described in sub -paragraphs (ii) to (x) below);

截至付款期结束已实施的工程和已提出的承包商文件的估算合同价值 (包括各项变更, 但不包括以下 (ii)至 (x) 项所列项目 );

(ii) any amounts to be added and/or deducted for changes in Laws under Sub -Clause 13.6 [Adjustments for Changes in Laws], and for changes in Cost under Sub-Clause 13.7 [Adjustments for Changes in Cos];

按照第 13.6 款【因法律改变的调整】和第 13.7 款【因成本改变的调整】的规定, 由于法律改变和成本改变, 应增和 /或减的任何款额;

(iii) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the Contract Data to the total of the amounts under sub -paragraphs (i), (ii) and (vi) of this Sub -Clause, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the Contract Data;

至雇主提取的保留金额达到合同资料中规定的保留金限额 (如果有) 前, 按合同资料中规定的保留金百分比第 (i), (ii) 和 (vi) 计算的, 对上述款项总额应减少的任何保留金额;

(iv) any amounts to be added and/or deducted for the advance payment and repayments under Sub -Clause 14.2 [Advance Payment];

按照第 14.2 款【预付款】的规定, 因预付款的支付和偿还应增加和 /或减少的任何款额;

(v) any amounts to be added and/or deducted for Plant and Materials under Sub -Clause 14.5 [Plant and Materials intended for the Works];

第14.5 款【拟用于工程的生产设备和材料】 规定的设备和材料应增加和 /或扣除的任何金额;

(vi) any other additions and/or deductions which have become due under the Contract or

otherwise, including those under Sub -Clause 3.5 [Agreement or Determination] -

根据合同、或包括根据第 3.5 款【协议或确定】等其他规定，应付的任何其他增加额或减少额；

(vii) any amounts to be added for Provisional Sums under Sub-Clause 13.4 [Provisional Sums];

根据第 13.4 款【暂列金额】用于暂定金额的任何金额；

(viii) any amount to be added for release of Retention Money under Sub-Clause 14.9 [Release of Retention Money];

根据第 14.9 条【保留金的支付】为支付保留金而增加的任何金额；

(ix) any amount to be deducted for the Contractor's use of utilities provided by the Employer under Sub -Clause 4.19 [Temporary Utilities]; and

根据第 4.19 款【临时设施】为承包商使用雇主提供的公用事业而应扣除的任何数额；和

(x) the deduction of amounts previously paid by the Employer under Sub-Clause 14.7 [Payment].

根据 14.7 【支付】扣除雇主先前支付的款额。

#### 14.4 Schedule of Payments 付款计划表

If the Contract includes a Schedule of Payments specifying the instalments in which the

Contract Price will be paid then, unless otherwise stated in this Schedule:

如果合同包括对合同价格的支付规定了分期支付的付款计划表，除非该表中另有规定，否则：

(a) the instalments quoted in the Schedule of Payments shall be treated as the estimated contract values for the purposes of sub -paragraph (i) of Sub -Clause 14.3 [Application for Interim Payment], subject to Sub -Clause 14.5 [Plant and Materials intended for the Works]; and

该付款计划表所列分期付款额，应是为了应对第 14.3 款【期中付款的中请】中 (i)项，并依照第 14.5 款【拟用于工程的生产设备和材料】的规定估算的合同价值；和

(b) if: 如果

(i) these instalments are not defined by reference to the actual progress achieved in execution of the Works; and

分期付款额不是参照工程实施达到的实际进度确定；和

(ii) actual progress is found by the Employer to differ from that on which the Schedule of Payments was based,

雇主发现实际进展与付款时间表不同，

then the Employer's Representative may proceed under Sub -Clause 3.5 [Agreement or Determination] to agree or determine revised instalments (and, for the purpose of Sub-Clause 3.5.3 [Time limits], the date when the difference under sub-paragraph (ii) above was found by the Employer shall be the date of commencement of the time limit for



agreement under Sub -Clause 3.5.3). Such revised instalments shall take account of the extent to which progress differs from that on which the Schedule of Payments was based.

雇主代表可按照第 3.5 款【协议或确定】的要求进行商定或确定，修改该分期付款额（以及，根据第 3.5.3 款【时间限制】的目的，雇主发现上文 (ii) 项下的分歧日期应为根据第 3.5.3 款达成协议时的开始日期）。这些经修订的分期付款应考虑到进度与付款时间表所依据的进度有多大不同。

If the Contract does not include a Schedule of Payments, the Contractor shall submit non-binding estimates of the payments which the Contractor expects to become due during each period of 3 months. The first estimate shall be submitted within 42 days after the Commencement Date. Revised estimates shall be submitted at intervals of 3 months, until the issue of the Taking -Over Certificate for the Works.

如果合同未包括付款计划表，承包商应在每三个月期间，提交他预计应付的无约束性估算付款额。第二次估算应在开工日期后 42 天内提交。直到颁发工程接收证书前，每三个月间隔应提交修正的估算。

#### 14.5 Plant and Materials intended for the Works 拟用于工程的生产设备和材料

If no Plant and/or Materials are listed in the Contract Data for payment when shipped and/or payment when delivered, this Sub -Clause shall not apply.

如果合同资料中未列发货时付款和 /或交货时付款的生产设备和 /或材料，则本款不适应。

The Contractor shall include, under sub -paragraph (v) of Sub -Clause 14.3 [Application for Interim Payment]:

根据第 14.3 款【期中付款申请】第 (v)，承包商应包括：

an amount to be added for Plant and Materials which have been shipped or delivered (as

the case may be) to the Site for incorporation in the Permanent Works; and

就已发运或交付（视属情况而定）到施工现场纳入永久工程的生产设备和材料而增加的款额；

及

an amount to be deducted when the contract value of such Plant and Materials is included

as part of the Permanent Works under sub -paragraph (i) of Sub -Clause 14.3 [Application for Interim Payment].

在根据第 14.3 款【申请期中付款】第 (i)，此类生产设备和材料的合同价格列入永久工程的一部分时，应扣除的数额。

The Employer's Representative shall proceed under Sub -Clause 3.5 [Agreement or Determination] to agree or determine each amount to be added for Plant and Materials if

the following conditions are fulfilled (and, for the purpose of Sub -Clause 3.5.3 [Time limits],

the date these conditions are fulfilled shall be the date of commencement of the time limit

for agreement under Sub -Clause 3.5.3):

雇主代表应根据 3.5 款【协议或确定】同意或决定为生产设备和材料增加一笔费用，如满足

下列要求（而且，就第 3.5.3 条【时间限制】而言，这些条件得到满足的日期应为根据第 3.5.3

款达成协议的时限的开始日期) ；

(a) the Contractor has:

(a) 承包商有:

(i) kept satisfactory records (including the orders, receipts, Costs and use of Plant and Materials) which are available for inspection by the Employer;

(i) 保持令人满意的记录 (包括订单、收据、成本和使用的生产设备和材料) ，可供雇主检查；

(ii) submitted evidence demonstrating that the Plant and Materials comply with the Contract (which may include test certificates under Sub-Clause 7.4 [Testing by the Contractor] and/or compliance verification documentation under Sub-Clause 4.9.2 [Compliance Verification System]) to the Employer; and

(ii) 提交证据证明该生产工厂和材料符合合同 (其中可包括承包商根据第 7.4 款【承包商试验】的试验证明和 / 或根据第 4.9.2 款【遵照核查体系】的履约核查文件) 给雇主；以及

(iii) submitted a statement of the Cost of acquiring and shipping or delivering (as the case may be) the Plant and Materials to the Site, supported by satisfactory evidence;

提交获取、运输或将生产设备和材料运送至现场 (视情况而定) 的成本报表，并提供了令人满意的证据；

and either:

或者

(b) the relevant Plant and Materials:

(b) 相关的生产设备和材料

(i) are those listed in the Contract Data for payment when shipped;

在发货时是否列于合同资料中以供付款；

(iii) have been shipped to the Country, en route to the Site, in accordance with the Contract; and

已按照合同运往该国，并在前往施工现场的途中；及

(iv) are described in a clean shipped bill of lading or other evidence of shipment, which has been submitted to the Employer together with:

在清关提单或其他装运证据中说明，并应和下列文件一起提交给雇主：

evidence of payment of freight and insurance;

支付运费和保险费的证据；

any other documents reasonably required by the Employer; and

雇主合理要求的任何其他文件；

a written undertaking by the Contractor that the Contractor will deliver to the Employer (prior to submitting the next Statement) a bank guarantee in a form and issued by an entity to which the Employer gives consent (but such consent shall not relieve the Contractor from any obligation in the following provisions of this sub-paragraph), in amounts and currencies equal to the amount due under this Sub-Clause. This guarantee shall be in a similar form to the form described in Sub-Clause 14.2.1 [Advance Payment]

Guarantee] and shall be valid until the Plant and Materials are properly stored on Site and protected against loss, damage or deterioration;

承包商的书面承诺，其将向雇主提交一份银行保函（在提交下一份报表之前），以经雇主同意的实体单位出具的银行保函形式（但该同意不得免除承包商在本段下列条文中规定的任何义务），金额与货币与本款下的相等。本保函应与 14.2.1 【预付款保函】的格式类似，并应有效，直到生产设备和材料妥放于现场且进行保护以防止损失、破损和变质。

or

或

(c) the relevant Plant and Materials:

(c) the relevant Plant and Materials:

(i) are those listed in the Contract Data for payment when delivered to the Site, and

在发运到现场时列入合同资料中以付款，和

(ii) have been delivered to and are properly stored on the Site, are protected against loss, damage or deterioration, and appear to be in accordance with the Contract.

已交付至现场并在现场妥善储存，受到保护，防止丢失、损坏或变质，并符合合同要求。

The amount so agreed or determined shall take account of the evidence and documents required under this Sub-Clause and of the contract value of the Plant and Materials. If sub-paragraph (b) above applies, the Employer shall have no obligation to make any payment under this Sub-Clause until the Employer has received the bank guarantee in accordance with sub-paragraph (b)(iii) above. The sum to be paid by the Employer in an interim payment shall be the equivalent of eighty percent (80%) of this agreed or determined amount. The currencies for this sum shall be the same as those in which payment will become due when the contract value is included under sub-paragraph (i) of Sub-Clause 14.3 [Application for Interim Payment]. At that time, the interim payment shall include the applicable amount to be deducted which shall be equivalent to, and in the same currencies and proportions as, this additional amount for the relevant Plant and Materials.

如此商定或确定的金额应考虑到本款所要求的证据和文件以及生产设备和材料的合同价值。

如适用本款（b），在雇主按照上文（b)(iii)项收到银行保函之前，没有义务根据本款支付任何款项。雇主在期中付款中支付的金额应等于该商定或确定金额的百分之八十（80%）。这笔款项应与根据合同价值包括在 14.3 【申请期中付款】第（i）到期付款一样。同时，期中付款应包括应扣除的应扣适用金额，并以相同的货币和比例作为相关生产设备和材料的额外金额。

#### 14.6 Interim payments 期中付款

No amount will be paid to the Contractor until:

除以下情况，不得向承包商支付金额：

(a) the Employer has received the Performance Security in the form, and issued by an

entity, in accordance with Sub -Clause 4.2.1 [Contractor's obligations] ; and

雇主已根据第 4.2.1 款【承包商的义务】收到了履约担保函，该保函以一定的形式由实体签发；以及

(b) the Contractor has appointed the Contractor's Representative in accordance with Sub -Clause 4.3 [Contractor's Representative].

承包商已按照第 4.3 款【承包商代表】指定了承包商的代表。

#### 14.6.1 Notice of interim payment 期中付款通知

The Employer shall, within 28 days after receiving a Statement and supporting documents, give a Notice to the Contractor:

雇主应在收到报表和证明文件后 28 天内，向承包商发出通知：

(a) stating the amount which the Employer fairly considers to be due for the interim payment; and

列出雇主公平的认为应支付的期中付款金额；以及

(b) including any additions and/or deductions which have become due under Sub -Clause 3.5 [Agreement or Determination] or under the Contract or otherwise,

包括根据第 3.5 款【协议或确定】或根据合同或其他方式到期应付的任何增加和 /或扣减金额，

with detailed supporting particulars (which shall identify any difference between a notified amount and the corresponding amount in the Statement and give the reasons for such difference).

及详细的证明资料（须指明所通知的款额与报表中相应数额之间的任何差异，并说明差异的原因）。

#### 14.6.2 Withholding (amounts in) an interim payment 期中付款中的扣留（金额）

The Employer may withhold an interim payment which would (after retention and other deductions) be less than the minimum amount of interim payment (if any) stated in the Contract Data, In this event, the Employer shall promptly give a Notice to the Contractor accordingly.

雇主可扣留期中付款（保留和其他扣减之后）低于合同资料中规定的临时支付（如有）的最低金额（如果有），在此情况下，雇主应及时向承包商发出相应通知。

An interim payment shall not be withheld for any other reason, although:

期中付款不得因任何其他原因而被扣留，尽管：

(a) if any thing supplied or work done by the Contractor is not in accordance with the Contract, the estimated cost of rectification or replacement may be withheld until rectification or replacement has been completed;

如承包商所提供的任何物件或所进行的工作不符合合同，修复或更换的估计费用可扣留，直至完成修复或更换；

(b) if the Contractor was or is failing to perform any work, service or obligation in

accordance with the Contract, the value of this work or obligation may be withheld until the work or obligation has been performed. In this event, the Employer shall promptly give a Notice to the Contractor describing the failure and with detailed supporting particulars of the value withheld; and/or

如果承包商未按照合同履行任何工作、服务或义务，则该工作或义务的价值可被扣留，直至工程或义务履行。在这种情况下，雇主应立即向承包商发出通知，说明违约情况，并提供扣留价值的详细证明细节；和 /或

(c) if the Employer finds any significant error or discrepancy in the Statement or supporting documents, the amount of the interim payment may take account of the extent to which this error or discrepancy has prevented or prejudiced proper investigation of the amounts in the Statement until such error or discrepancy is corrected in a subsequent Statement.

如果雇主在报表或证明文件中发现任何重大错误或不一致之处，期中付款的数额可考虑到这一错误或差异在多大程度上妨碍或阻碍了对报表中的金额进行适当调查，直到这种错误或差异在后续陈述中得到纠正。

For each amount so withheld, in the supporting particulars for the interim payment the Employer shall detail his/her calculation of the amount and state the reasons for it being withheld.

对于每一笔如此扣留的金额，雇主应在期中付款的支持事项中详细说明其计算的金额，并说明扣留的原因。

#### 14.6.3 Correction or modification 更正或修改

The Employer may, in any interim payment, make any correction or modification that should properly be made to any previous interim payment. An interim payment shall not be deemed to indicate the Employer's acceptance, approval, consent or Notice of No-objection to any Contractor's Document or to (any part of) the Works.

在任何期中付款中，雇主可对任何先期中付款进行任何更正或修改。期中付款不应被视为雇主对任何承包商文件或工程（任何部分）的接受、批准、同意或不反对的通知。

If the Contractor considers that an interim payment does not include any amounts to which the Contractor is entitled, these amounts shall be identified in the next Statement (the "identified amounts" in this paragraph). The Employer shall then make any correction or modification that should properly be made in the next interim payment. Thereafter, to the extent that:

如果承包商认为期中付款不包括承包商有权获得的任何金额，则应在下一份报表（本段的“已确认金额”）中确定这些金额。雇主应作出任何更正或修改，以便在下次期中付款中适当进行。此后，在这样的程度上：

(a) the Contractor is not satisfied that this next interim payment includes the identified amounts; and

承包商对下一次期中付款包括已确定金额不满意：和

(b) the identified amounts do not concern a matter for which the Employer's Representative is already carrying out his/her duties under Sub -Clause 3.5 [Agreement or Determination]

已确定金额不涉及雇主代表根据第 3.5 款【协议或确定】已履行职责的事项  
the Contractor may, by giving a Notice, refer this matter to the Employer's Representative and Sub -Clause 3.5 [Agreement or Determination] shall apply (and, for the purpose of Sub -Clause 3.5.3 [Time limits], the date the Employer's Representative receives this Notice shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3).

承包商可通过发出通知，将此事项提交给雇主代表，第 3.5 款【协议或确定】应适用（且出于第 3.5.3 款【时间限制】的目的，雇主代表收到该通知的日期应为第 3.5.3 款规定的协议期限的开始日期。）

#### 14.7 Payment 付款

The Employer shall pay to the Contractor:

雇主应向承包商支付：

(a) the advance payment within the period stated in Sub -Clause 14.2.2[Advance Payment];

(a) 在第 14.2.2 款【预付款】规定的期限内的预付款

(b) the interim payment due under:

(b) 由于以下原因导致的期中付款：

(i) Sub -Clause 14.6 [Interim Payment] within the period stated in the Contract Data (if not stated, 56 days) after the Employer receives the Statement and supporting documents; or  
第14.6 款【期中付款】在雇主收到报表和证明文件后的合同资料所述期间内 (如果没有说明，则为 56 天)；或

(ii) Sub -Clause 14.13 [Final Payment], within the period stated in the Contract Data (if not stated, 42 days) after the Employer receives the Partially Agreed Final Statement (or, if sub-paragraph (ii) of Sub -Clause 14.13 applies, within 84 days after the Employer receives the draft final Statement that is deemed to be a Partially Agreed Final Statement);

and

第 14.13 款【最终付款】，在雇主收到部分商定的最后报表 (或如第 14.13 款(ii)适用，在雇主收到被视为部分商定的最终报表后的 84 天)后，在合同资料所述期间内 (如果未说明，则为42 天)。

(c) the Final Payment under Sub -Clause 14.13 [Final Payment] within the period stated in the Contract Data (if not stated, 56 days) after the Employer:

根据第 14.13 条【最终付款】在合同数资料所述期间内 (如果没有说明，则为 56 天)：

(i) receives the Final Statement (or if the second paragraph of Sub -Clause 14.13 applies,

after the expiry of 14 days after the Employer issues the Notice stating the Final Payment);

and

收到最终报表 (如适用第 14.13 款第 2 段, 则在雇主发出最终付款通知后 14 天届满后); 及

(ii) receives (or the Contractor is deemed to have issued) the discharge under Sub -Clause

14.12 [Discharge].

根据 14.12 【结清证明】收到 (或承包商被视为已发布) 结清证明。

Payment of the amount due in each currency shall be made into the bank account, nominated by the Contractor, in the payment country (for this currency) specified in the Contract.

每种货币的应付款额应入位于合同 (为此货币) 指定的付款国境内承包商指定的银行帐户。

#### 14.8 Delayed Payment 延迟付款

If the Contractor does not receive payment in accordance with Sub -Clause 14.7[Payment],

the Contractor shall be entitled to receive financing charges compounded monthly on the amount unpaid during the period of delay.

如果承包商没有在按照第 14.7 款 【付款】 规定的时间收到付款, 承包商应有权就未付款额按月计算复利, 收取延误期的融资费用。

Unless otherwise stated in the Contract Data, these financing charges shall be calculated

at the annual rate of three percent (3%) above:

除非合同资料中另有规定, 上述融资费用应以高出贴现率三个百分点 (3%) 的年利率进行计算,

(a) the average bank short -term lending rate to prime borrowers prevailing for the currency of payment at the place for payment, or

平均银行短期贷款利率用于支付支付地点的付款币种的主要借款人, 或

(b) where no such rate exists at that place, the same rate in the country of the currency of payment, or

不存在此费率的地点下, 与支付货币的国家的汇率相同, 或

(d) in the absence of such a rate at either place, the appropriate rate fixed by the law of the country of the currency of payment.

在没有这样的费率的地点, 由所在国法律确定的适当费率。

The Contractor shall by request, be entitled to payment of these financing charges by the Employer, without:

承包商应根据要求, 有权要求雇主支付这些融资费用, 但不得:

(i) the need for the Contractor to submit a Statement or any formal Notice (including any requirement to comply with Sub -Clause 20.2[Claims For Payment and/or EOT]; and

承包商需要提交一份报表或任何正式通知 (包括遵守第 20.2 条 【付款索赔和 /或 EOT】 的任何要求); 和

(ii) prejudice to any other right or remedy.

损害任何其他权利或补救。

#### 14.9 Release of Retention Money 保留金的返还

After the issue of the Taking -Over Certificate for:

颁发工程接收证书后:

(a) the Works, the Contractor shall include the first half of the Retention Money in a Statement; or

工程, 承包商应在报表中包括保留金的前一半, 或

(b) for a Section, the Contractor shall include the relevant percentage of the first half of the Retention Money in a Statement.

分项工程, 承包商应在报表中包括保留金前一半的相关百分比。

After the latest of the expiry dates of the Defects Notification Periods, the Contractor shall include the second half of the Retention Money in a Statement promptly after such latest date. If a Taking -Over Certificate was (or was deemed to have been) issued for a Section, the Contractor shall include the relevant percentage of the second half of the Retention Money in a Statement promptly after the expiry date of the DNP for the Section.

在各缺陷通知期限的最末一个期满日期后, 承包商在报表中应包括保留金的后一半。如对某分项工程颁发了(或被视为颁发了)接收证书, 在该分项工程 DNP 期满日期后, 承包商在报表中应包括保留金的后一半的相关百分比部分。

In the next interim payment after the Employer receives any such Statement, the Employer shall release the corresponding amount of Retention Money. However, when considering the amount to be due for release of Retention Money under Sub -Clause 14.6 [Interim Payment], if any work remains to be executed under Clause 11 [Defects after Taking Over] or Clause 12 [Tests after Completion], the Employer shall be entitled to withhold the estimated cost of this work until it has been executed.

在雇主收到任何此类报表后的下一笔期中付款中, 雇主应发放相应数额的保留金。但是, 在考虑应根据第 14.6 款【期中付款】发放保留金的数额时, 如果根据第 11 款【缺陷责任】或第 12 款【竣工后试验】的规定, 还有任何工作要做, 雇主应有权在该项工作完成前, 扣发完成该工作的估算费用。

The relevant percentage for each Section shall be the percentage value of the Section as stated in the Contract Data. If the percentage value of a Section is not stated in the Contract Data, no percentage of either half of the Retention Money shall be released under this Sub -Clause in respect of such Section.

每个分项工程的相关百分比应是合同资料中规定的该分项工程的价值百分比。如果合同资料中没有规定该分项工程的价格百分比, 则不应根据本款对有关分项工程的保留金任何一半按百分比放还。

#### 14.10 Statement at Completion 竣工报表



Within 84 days after the Date of Completion of the Works, the Contractor shall submit to the Employer a Statement at completion with supporting documents, in accordance with Sub-Clause 14.3[Application for Interim Payment], showing:

在收到工程竣工日期后的 84 天内，承包商应按照第 14.3 款【期中付款的申请】的要求，向雇主递交竣工报表并附证明文件列出：

(a) the value of all work done in accordance with the Contract up to the Date of Completion of the Works

截至工程竣工之日止，按合同要求完成的所有工作的价值；

(b) any further sums which the Contractor considers to be due at the Date of Completion of the Works; and

承包商认为在工程竣工之日止应付的任何其他款额；及

(c) an estimate of any other amounts which the Contractor considers have or will become due after the Date of Completion of the Works under the Contract or otherwise. These estimated amounts shall be shown separately (to those of sub-paragraphs (a) and (b) above) and shall include estimated amounts for:

承包商认为或在工程竣工后将到期的应付给他的任何其他款项的估计款额。估计款额在竣工报表中应单独（到上文 (a) 到 (b)）列出：

(i) Claims for which the Contractor has submitted a Notice under Sub-Clause 20.2 [Claims For Payment and/or EOT];

承包商已根据第 20.2 款【付款索赔和 /或 EOT】提交通知的索赔

(ii) any matter referred to the DAAB under Sub-Clause 21.4 [Obtaining DAAB's Decision-]; and

根据第 21.4 款【获得 DAAB 的决定】提交给 DAAB 的任何事项，和

(iii) any matter for which a NOD has been given under Sub-Clause 21.4 [Obtaining DAAB's Decision].

根据第 21.4 款【获得 DAAB 的决定】发出 NOD 的任何事项。

The Employer shall then proceed in accordance with Sub-Clause 14.6 [Interim Payment].

雇主之后应按照第 14.6 款【期中付款】行事。

#### 14.11 Final Statement 最终报表

Submission by the Contractor of any Statement under the following provisions of this Sub-Clause shall not be delayed by reason of any referral under Sub-Clause 21.4 [Obtaining DAAB's Decision] or any arbitration under Sub-Clause 21.6[Arbitration].

承包商根据本款下列规定提交的任何报表，不得因根据第 21.4 款【获得 DAAB 的决定】或任何根据第 21.6 款【仲裁】的仲裁而延迟提交。

##### 14.11.1 Draft Final Statement 最终报表草稿

Within 56 days after the issue of the Performance Certificate, the Contractor shall submit

to the Employer, a draft final Statement.

在履约证书签发后的 56 天内，承包商应向雇主提交一份最终报表草稿。

This Statement shall:

报表应该:

(a) be in the same form as Statements previously submitted under Sub-Clause 14.3 [Application for Interim Payment];

(a) 以与先前在第 14.3 款【期中付款申请】下提交的报表相同的形式;

(b) be submitted in one paper -original, one electronic copy and additional paper copies (if any) as stated in the Contract Data; and

(b) 按照合同资料的规定提交一份纸质正本、一份电子副本和额外的纸质副本（如有）；以及

(c) show in detail, with supporting documents:

(c) 详述，并附证明文件:

(i) the value of all work done in accordance with the Contract;

(i) 按照合同完成的所有工作的价值

(ii) any further sums which the Contractor considers to be due at the date of the issue of the Performance Certificate, under the Contract or otherwise; and

(ii) 承包商认为在发出履约证书当日根据合同或其他方式到期应付的任何其他款项；及

(iii) an estimate of any other amounts which the Contractor considers have or will become due after the issue of the Performance Certificate, under the Contract or otherwise, including estimated amounts, by reference to the matters described in sub-paragraphs (c)(i) to (iii) of Sub-Clause 14.10 [Statement at Completion]. These estimated amounts shall be shown separately (to those of sub-paragraphs (i) and (ii) above).

(iii) 承包商认为已到期或将在根据合同或其他方式签发履约证书后到期应付的任何其他数额的估计数，包括根据 14.10 款【竣工报表】(c)(i) 到 (iii) 所述事项计算的估计数额。这些估计数额应单独列出（到上文(i) 到 (ii)）。

Except for any amount under sub -paragraph (iii) above, if the Employer disagrees with or cannot verify any part of the draft final Statement, the Employer shall promptly give a Notice to the Contractor. The Contractor shall then submit such further information as the Employer may reasonably require within the time stated in this Notice, and shall make such changes in the draft as may be agreed between them.

除上述第 (iii) 项规定的任何金额外，如果雇主不同意或无法核实最终报表草稿的任何部分，雇主应立即向承包商发出通知。承包商之后应在该通知所述时间内向雇主提交合理要求的进一步资料，并应在双方商定的草案中作出这样的修改。

#### 14.11.2 Agreed Final Statement 商定的最终报表

If there are no amounts under sub-paragraph (iii) of Sub-Clause 14.11.1 [Draft Final Statement], the Contractor shall then prepare and submit to the Employer the final

Statement as agreed (the “ Final Statement ” in these Conditions).

如果在第 14.11.1 款【最终报表草稿】 (iii) 项下没有金额，承包商应准备并向雇主提交最终报表（“最终报表”在这些条件下）。

However if:

但是，如果：

(a) there are amounts under sub-paragraph (iii) of Sub-Clause 14.11.1 [Draft Final Statement]] and/or

(a) 在第 14.11.1 条【最终报表草稿】 (iii) 下有金额，和 /或

(b) following discussions between the Employer and the Contractor, it becomes evident that they cannot agree any amount(s) in the draft final Statement,

(b) 雇主与承包商讨论后，无法在最终报表草稿中商定任何数额，

the Contractor shall then prepare and submit to the Employer a Statement, identifying separately: the agreed amounts, the estimated amounts and the disagreed amount(s) (the “ Partially Agreed Final Statement ” in these Conditions).

承包商应准备并向雇主提交一份报表， 分别确定： 确定的数额， 估计的数额和不同意的数额（在这些条件下 “部分确定的最后声明” ）。

#### 14.12 Discharge 结清证明

When submitting the Final Statement or the Partially Agreed Final Statement (as the case may be), the Contractor shall submit a discharge which confirms that the total of such Statement represents full and final settlement of all moneys due to the Contractor under or in connection with the Contract. This discharge may state that the total of the Statement is subject to any payment that may become due in respect of any Dispute for which a DAAB proceeding or arbitration is in progress under Sub -Clause 21.6 [Arbitration] and/or that it becomes effective after the Contractor has received:

承包商在提交最终报表或部分确定最终报表（视情况而定）时，应提交一份结清证明， 确认最终报表上的总额代表了根据合同或与合同有关的事项， 应付给承包商的所有款项的全部和最终的结算总额。该结清证明可注明总报表受任何根据第 21.6 条【仲裁】和 /或在承包商收到下列文件后生效的 DAAB 程序或仲裁的约束：

(a) full payment of the total amount stated in the Final Statement; and

最终报表所述的全部费用的缴付；及

(b) the Performance Security.

履约保函

If the Contractor fails to submit this discharge, the discharge shall be deemed to have been submitted and to have become effective when the conditions of sub -paragraphs (a)

and (b) have been fulfilled, If no Final Statement has been submitted by the Contractor

and the second paragraph of Sub -Clause 14.13 [Final Payment] applies, the discharge

shall be deemed to have been issued by the Contractor after the Contractor has received

the Final Payment under the second paragraph of Sub-Clause 14.13 and the Performance Security.

如果承包商未能提交结清证明，则结清证明应被视为已经提交，且在 (a) 和 (b) 满足时生效。如果承包商未提交最终报表，则适用第 14.13 款【最终支付】第二段，[最后付款]，在承包商根据 14.13 款第二段和履约保函收到最终付款后，结清证明应被视为由承包商颁发。

A discharge under this Sub-Clause shall not affect either Party's liability or entitlement in respect of any Dispute for which a DAAB proceeding or arbitration is in progress under Clause 21 [Disputes and Arbitration].

根据本款的结清证明，不影响任何一方对任何根据第 21 款【争议和仲裁】正在进行的 DAAB 程序或仲裁的争议的责任或权利。

#### 14.13 Final Payment 最终付款

Within 28 days after receiving the Final Statement or the Partially Agreed Final Statement (as the case may be), and the discharge under Sub-Clause 14.12[Discharge], the Employer shall give a Notice to the Contractor stating :

在收到最终报表或部分确定的最终报表 (视情况而定) 后的 28 天内，和根据第 14.12 款【结清证明】，雇主应向承包商发出通知，说明：

(a) the amount which the Employer fairly considers is finally due, including any additions and/or deductions which have become due under Sub-Clause 3.5 [Agreement or Determination] or under the Contract or otherwise; and

雇主公正的认为最终到期的金额，包括根据 3.5 款【协议或确定】或根据合同或其它方式到期的任何增加和 / 或扣减；和

(b) after giving credit to the Employer for all amounts previously paid by the Employer and for all sums to which the Employer is entitled, and after giving credit to the Contractor for all amounts (if any) previously paid by the Contractor and/or received by the Employer under the Performance Security, the balance (if any) due from the Employer to the Contractor or from the Contractor to the Employer, as the case may be (the "Final Payment" in these conditions),

在将雇主以前支付的所有款项和雇主有权获得的所有款项授信给雇主之后，并在将所有先前由承包商支付和 / 或雇主根据履约担保收到的款项授信给承包商之后 (如有)，雇主应支付给承包商或承包商应付给雇主的余额 (如有)，视情况而定 (这些条件下的“最终付款”)

with detailed supporting particulars.

附有详细的佐证资料。

If the Contractor has not submitted a draft final Statement within the time specified under Sub-Clause 14.11.1 [Draft Final Statement], the Employer shall request the Contractor to do so. Thereafter, if the Contractor fails to submit a draft final Statement within a period of 28 days, within a further 28 days after this time limit has expired the Employer shall give a Notice to the Contractor stating the Final Payment, with detailed supporting particulars.

如果承包商未在第 14.11.1 款【最终报表草案】规定的时间内提交最终报表草案，雇主应要求承包商这样做。之后，如果承包商未在 28 天内提交最终报表草案，雇主应在此期限届满后的 28 天内向承包商发出通知，说明最终付款情况，并提供详细的证明。

If:

如果:

(i) the Contractor has submitted a Partially Agreed Final Statement under Sub-Clause 14.11.2 [Agreed Final Statement]; or

包者已根据第 14.11.2 款【商定的最终报表】提交了部分商定的最终报表；或

(ii) no Partially Agreed Final Statement has been submitted by the Contractor but, to the extent that a draft final Statement submitted by the Contractor is deemed by the Employer to be a Partially Agreed Final Statement

承包商未提交部分商定的最终报表，但如果承包商提交的最终报表草案在一定程度上被雇主视为部分商定的最终报表

the Employer shall proceed in accordance with Sub-Clause 14.6 [Interim Payment] and Sub-Clause 14.7 [Payment] to make an interim payment to the Contractor.

雇主应按照第 14.6 款【期中付款】和第 14.7 款【付款】的规定向承包商支付期中付款。

#### 14.14 Cessation of Employer's Liability 雇主责任的中止

The Employer shall not be liable to the Contractor for any matter or thing under or in connection with the Contract or execution of the Works, except to the extent that the Contractor shall have included an amount expressly for it in:

除承包商在下列文件中，为合同或工程实施引发的或与之有关的任何问题或事项，明确提出款额要求以外，雇主应不再为上述问题或事项对承包商承担责任：

(a) the Final Statement or Partially Agreed Final Statement; and

在最终报表或部分商定的最终报表；和

(b) (except for matters or things arising after the issue of the Taking-Over Certificate for the Works) the Statement under Sub-Clause 14.10 [Statement at Completion].

(颁发工程接收证书后发生的问题或事项除外)，根据 14.10 款【竣工报表】所述的报表

Unless the Contractor makes or has made a Claim under Sub-Clause 20.2 [Claims For Payment and/or EOT] in respect of an amount or amounts included in the Final Payment

within 56 days of receiving the Final Payment the Contractor shall be deemed to have accepted the Final Payment as correct. The Employer shall then have no further liability to the Contractor, other than to return the Performance Security to the Contractor.

除非承包商在收到最终付款后 56 天内，根据第 20.2 款【付款索赔和 /或EOT】就最终付款中包括的一笔或多笔款项提出或已经提出索赔，承包商应被视为已接受最终付款为正确的付款。除将履约保证金退还给承包商外，雇主不应应对承包商承担进一步的责任。

However, this Sub-Clause shall not limit the Employer's liability under the Employer's indemnification obligations, or the Employer's liability in any case of fraud, gross

negligence, deliberate default or reckless misconduct by the Employer.

但本款不应限制雇主因其赔偿义务，或因其任何欺骗、重大疏忽，有意违约、或轻率的不当行为等情况引起的责任。

#### 14.15 Currencies of Payment 支付的货币

The Contract Price shall be paid in the currency or currencies named in the Contract Data.

If more than one currency is so named, payments shall be made as follows:

合同价格应按合同资料规定的货币或几种货币支付。如果规定了一种以上货币，应按以下办法支付：

(a) if the Contract Price stated in the Contract Agreement was expressed in Local Currency only or in Foreign Currency only:

如果合同协议中规定的合同价格只是用当地货币表示的或仅以外币表示：

(i) the proportions or amounts of the Local and Foreign Currencies, and the fixed rates of exchange to be used for calculating the payments, shall be as stated in the Contract Data, except as otherwise agreed by both Parties;

当地货币和外币的比例或款额，以及计算付款采用的固定汇率，除双方另有商定外，应按合同资料的规定执行；

(ii) payments and deductions under Sub-Clause 13.4 [Provisional Sums] and Sub-Clause 13.6 [Adjustments for Changes in Laws] shall be made in the applicable currencies and proportions; and

根据第 13.4 款 [暂列金额] 和第 13.6 款 [因法律改变的调整] 规定的付款和减少应按适用货币和比例执行；和

(iii) other payments and deductions under sub-paragraphs (i) to (iv) of Sub-Clause 14.3 [Application for Interim Payment] shall be made in the currencies and proportions specified in sub-paragraph (a) (i) above;

根据第 14.3 款 【期中付款的申请】 (i) 至 (iv) 项做出的其他支付和减少，应按上述 (a)(i) 项规定的货币和比例执行；

(b) whenever an adjustment is agreed or determined under Sub-Clause 13.2 [Value Engineering] or Sub-Clause 13.3 [Variation Procedure], the amount payable in each of the applicable currencies shall be specified. For this purpose, reference shall be made to the actual or expected currency proportions of the Cost of the varied work, and to the proportions of various currencies specified in sub-paragraph (a)(i) above;

凡根据第 13.2 款 【价值工程】或第 13.3 款 【变更程序】商定或决定调整，应规定以每种适用货币支付的金额。为此，应参照各项工作费用的实际或预期货币比例，以及上述 (a)(i) 项规定的各种货币所占比例；

(c) payment of Delay Damages shall be made in the currencies and proportions specified in the Contract Data;

迟延损害赔偿应当按合同资料规定的货币和比例支付；

(d) payment of Performance Damages shall be made in the currencies and proportions specified in the Schedule of Performance Guarantees;

应按履约保函规定的货币和比例支付履约损害赔偿;

(e) other payments to the Employer by the Contractor shall be made in the currency in which the sum was expended by the Employer, or in such currency as may be agreed by both Parties;

承包商向雇主支付的其他款项应以雇主支付的货币支付, 或以双方同意的货币支付;

(f) if any amount payable by the Contractor to the Employer in a particular currency exceeds the sum payable by the Employer to the Contractor in that currency, the Employer may recover the balance of this amount from the sums otherwise payable to the Contractor in other currencies; and

如果承包商应付给雇主的某种货币的任何款额, 超过了雇主应付给承包商的该种货币的款额, 雇主可以从另应付给承包商的其他货币的款额中, 收回该项差额;

(g) if no rates of exchange are stated in the Contract Data, they shall be those prevailing on the Base Date and published by the central bank of the Country.

如果在合同资料中没有说明汇率, 应采用基准日期当天工程所在国中央银行发布的汇率。

## 15 TERMINATION by EMPLOYER 由雇主终止

### 15.1 Notice to Correct 通知改正

If the Contractor fails to carry out any obligation under the Contract the Employer may, by giving a Notice to the Contractor, require the Contractor to make good the failure and to remedy it within a specified time ( "Notice to Correct" in these Conditions).

如果承包商未能根据合同履行任何义务, 雇主可向承包商发出通知, 要求其在规定的合理时间内, 纠正并补救上述违约行为 (在这些情况下 "更正通知")。

The Notice to Correct shall:

更正通知应:

(a) describe the Contractor's failure;

说明承包商的违约

(b) state the Sub-Clause and/or provisions of the Contract under which the Contractor has the obligation; and

说明承包商负有义务的合同条款和 /或规定;

(c) specify the time within which the Contractor shall remedy the failure, which shall be reasonable, taking due regard of the nature of the failure and the work and/or other action required to remedy it.

具体说明承包商应在何种时间内补救违约, 这一时限应是合理的, 同时适当考虑到违约的性质以及补救工作和 /或采取其他必要的行动。

After receiving a Notice to Correct the Contractor shall immediately respond by giving a Notice to the Employer describing the measures the Contractor will take to remedy the

failure, and stating the date on which such measures will be commenced in order to comply with the time specified in the Notice to Correct.

收到更正通知后，承包商应立即作出答复，向业主发出通知，说明承包商将采取哪些措施更正违约，并述明开始采取该措施的日期，以符合通知书所指定的改正时间。 The time specified in the Notice to Correct shall not imply any extension of the Time for Completion. 通知中规定的改正时间并不意味着竣工时间的任何延长。

## 15.2 Termination for Contractor's Default 因承包商违约的终止

Termination of the Contract under this Clause shall not prejudice any other rights of the Employer under the Contract or otherwise.

根据本条款终止合同不应损害雇主根据合同或其他方式享有的任何其他权利。

### 15.2.1 Notice 通知

The Employer shall be entitled to give a Notice (which shall state that it is given under this Sub-Clause 15.2.1) to the Contractor of the Employer's intention to terminate the Contract

or, in the case of sub-paragraph (f), (g) or (h) below a Notice of termination, if the

Contractor: 雇主有权向承包商发出通知 (须述明是根据本款第 15.2.1 作出的), 说明雇主终止合同的意图, 或在 (f)、(g)或(h)项下发出终止合同通知,

(a) fails to comply with:

未遵守

(i) a Notice to Correct;

更正通知书;

(ii) a binding agreement, or final and binding determination, under Sub-Clause 3.5 [Agreement or Determination]; or

根据第 3.5 条【协议或确定】订立的具有约束力的协议或最终且有约束力的确定; 或

(iii) a decision of the DAAB under 21.4 [Obtaining DAAB's Decision] (whether binding or final and binding)

DAAB 根据 21.4【取得 DAAB 的决定】作出的决定 (无论是具有约束力的还是最终的且具有约束力的)

and such failure constitutes a material breach of the Contractor's obligations under the Contract;

这种不履行构成对承包商合同义务的重大违反;

(b) abandons the Works or otherwise plainly demonstrates an intention not to continue performance of the Contractor's obligations under the Contract;

放弃工程, 或明确表现出不继续按照合同履行其义务的意向;

(c) without reasonable excuse fails to proceed with the Works in accordance with Clause 8

[Commencement, Delays and Suspension] or, if there is a maximum amount of Delay

Damages stated in the Contract Data, the Contractor's failure to comply with Sub -Clause



8.2 [Time for Completion] is such that the Employer would be entitled to Delay Damages

that exceed this maximum amount;

无合理解释，未按照第 8 条【开工、延误和暂停】的规定进行工程，或，如果合同资料中

规定了最大限度的延迟损害赔偿，承包商未遵守第 8.2 款【竣工时间】，雇主有权延误超过

这一最高数额的损害赔偿；

(d)without reasonable excuse fails to comply with a Notice of rejection given by the

Employer under Sub-Clause 7.5 [Defects and Rejection] or an Employer's instruction

under Sub -Clause 7.6 [Remedial Work], within 28 days after receiving it;

在收到后 28 天内，无合理理由不遵从雇主根据第 7.5 款【缺陷和拒绝】发出的拒绝通知书

或雇主根据第 7.6 款【修补工做】发出的指示；

(e)fails to comply with Sub -Clause 4.2 [Performance Security]

未遵从第 4.2 款【履约担保】

(f) subcontracts the whole, or any part of, the Works in breach of Sub-Clause 4.4

[Subcontractors], or assigns the Contract without the required agreement under

Sub-Clause 1.7 [Assignment];

违反第 4.4 款【分包商】规定的全部或部分工程的分包，或未根据第 1.7 款【权益转让】的

要求协议转让合同；

(g)becomes bankrupt or insolvent; goes into liquidation, administration, reorganisation,

winding -up or dissolution; becomes subject to the appointment of a liquidator, receiver,

administrator, manager or trustee; enters into a composition or arrangement with the

Contractor 's creditors; or any act is done or any event occurs which is analogous to or has

a similar effect to any of these acts or events under applicable Laws;

破产或无力偿还债务；进入清算、管理、重组、结算或解散；被任命为清算人、接收人、

管理员、经理或受托人；与承包商的债权人形成组合或安排；或根据适用法律作出类似于

或具有类似于上述任何行为或事件的任何行为或事件；

or if the Contractor is a JV:

或如果承包商是联营体

(i)any of these matters apply to a member of the JV, and

上述任何事宜适用于联营体成员之一，及

(ii)the other member(s) do not promptly confirm to the Employer that, in accordance with

Sub-Clause 1.13(a) [Joint and Several Liability], such member's obligations under the

Contract shall be fulfilled in accordance with the Contract; or

另一成员未及时向雇主确认，根据第 1.13(a) 款【共同的和各自的责任】，该成员应按照合

同的规定履行合同规定的义务；或

(h)is found, based on reasonable evidence, to have engaged in corrupt, fraudulent,

collusive or coercive practice at any time in relation to the Works or to the Contract.

在合理证据的基础上，被裁定在与工程或合同有关的任何时间从事腐败、欺诈、串通或胁

迫性。

15.2.2 Termination 终止

Unless the Contractor remedies the matter described in a Notice given under Sub -Clause

15.2.1 [Notice] within 14 days of receiving the Notice, the Employer may by giving a second Notice to the Contractor immediately terminate the Contract. The date of termination shall be the date the Contractor receives this second Notice.

除非承包商在收到通知后 14 天内对根据第 15.2.1 款【通知】所述事项作出补救，雇主可以第二次通知承包商立即终止合同。终止日期应是承包商收到第二次通知的日期。

However, in the case of sub -paragraph (f), (g) or (h) of Sub -Clause 15.2.1 [Notice], the Employer may by giving a Notice under Sub -Clause 15.2.1 immediately terminate the Contract and the date of termination shall be the date the Contractor receives this Notice.

但是，就第 15.2.1 款【通知】项(f), (g) 或 (h) 而言，雇主可根据第 15.2.1 款发出通知，立即终止合同，终止日期应为承包商收到本通知的日期。

15.2.3 After termination 终止之后

After termination of the Contract under Sub -Clause 15.2.2 [Termination], the Contractor shall:

根据第 15.2.2 款【终止】终止合同后，承包商应：

(a)comply immediately with any reasonable instructions included in a Notice given by the

Employer under this Sub -Clause:

立即遵守雇主根据本款发出的通知中包含的任何合理指示：

(i)for the assignment of any subcontract; and

转让任何分包合同；及

(ii)for the protection of life or property or for the safety of the Works;

保护生命或财产或工程的安全；

(b)deliver to the Employer:

向雇主交付：

(i)any Goods required by the Employer,

雇主要求的任何货物；

(ii)all Contractor's Documents, and

所有承包商的文件，以及

(iii)all other design documents made by or for the Contractor; and

由承包商或为承包商制作的所有其他设计文件；以及

(c)leave the Site and, if the Contractor does not do so, the Employer shall have the right to

expel the Contractor from the Site.

离开现场，如果承包商不这样做，雇主应有权将承包商驱逐出现场。

15.2.4 Completion of the Works 工程的竣工

After termination under this Sub -Clause, the Employer may complete the Works and/or arrange for any other entities to do so. The Employer and/or these entities may then use

any Goods, Contractor's Documents and other design documents made by or on behalf of the Contractor to complete the Works.

根据条款终止后，雇主可以继续完成工程，和 /或安排其他实体完成。这时雇主和 /或这些实体可以使用任何货物、承包商文件和由承包商或以其名义编制的其他设计文件。

After such completion of the Works, the Employer shall give another Notice to the Contractor that the Contractor's Equipment and Temporary Works will be released to the Contractor at or near the Site. The Contractor shall then promptly arrange their removal, at the risk and cost of the Contractor. However, if by this time the Contractor has failed to make a payment due to the Employer, these items may be sold (to the extent permitted by applicable Laws) by the Employer in order to recover this payment. Any balance of the proceeds shall then be paid to the Contractor.

在工程完成后，雇主应发出通知，将在现场或其附近把承包商设备和临时工程放还给承包商。承包商应迅速自行承担风险和费用，安排将它们运走。但如果此时承包商还有应付雇主的款项没有付清，雇主可以出售这些物品（在适用法律允许的范围内），以收回欠款。收益的任何余款应付给承包商。

#### 15.3 Valuation after Termination for Contractor's Default 承包商违约终止后的估价

After termination of the Contract under Sub -Clause 15.2 [Termination for Contractors Default], the Employer's Representative shall proceed under Sub -Clause 3.5 [Agreement or Determination] to agree or determine the value of the Permanent Works, Goods and Contractor's Documents, and any other sums due to the Contractor for work executed in accordance with the Contract (and, for the purpose of Sub -Clause 3.5.3 [Time limits], the date of termination shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3).

根据第 15.2 款【因承包商违约的终止】终止合同后，雇主代表应根据第 3.5 款【协议或决定】同意或确定永久工程、货物和承包商文件的价值，以及应付给承包商的按照合同执行工程的任何其他款项（根据第 3.5.3 款【时间限制】而言，终止日期应为根据第 3.5.3 款达成协议的开始日期）。

This valuation shall include any additions and/or deductions, and the balance due (if any), by reference to the matters described in sub -paragraphs (a) and (b) of Sub -Clause 14.13 [Final Payment].

本估价应包括与第 14.13 款【最终付款】(a) and (b) 所述事项有关的任何增减和 /或扣减，以及应付余额 (如有)。

This valuation shall not include the value of any Contractor's Documents, Materials, Plant and Permanent Works to the extent that they do not comply with the Contract.

本估价不包括任何承包商不遵守合同的文件、材料、生产设备和永久工程的价值。

#### 15.4 Payment after Termination for Contractor's Default 承包商违约终止后的付款

The Employer may withhold payment to the Contractor of the amounts agreed or determined under Sub-Clause 15.3 [Valuation after Termination for Contractor's Default] until all the costs, losses and damages (if any) described in the following provisions of this Sub-Clause have been established.

雇主可根据第 15.3 款【承包商违约终止后的估价】约定或确定的金额暂不支付承包商应支付款项，直至本款下列规定所述的费用、损失和损害 (如有)均已确定为止。

After termination of the Contract under Sub-Clause 15.2 [Termination for Contractor's Default], the Employer shall be entitled subject to Sub-Clause [Claims For Payment and/or EOT] to payment by the Contractor of:

在根据第 15.2 款【因承包商违约的终止】合同终止后，雇主应有权按条款【付款索赔和 / 或 EOT】要求承包商支付款项；

(a) the additional costs of execution of the Works, and all other costs reasonably incurred by the Employer (including costs incurred in clearing, cleaning and reinstating the Site as described under Sub-Clause 11.11 [Clearance of Site]), after allowing for any sum due to the Contractor under Sub-Clause 15.3 [Valuation after Termination for Contractors Default];

根据第 15.3 款【承包商违约终止后的估价】在扣除应付给承包商的任何款项后，工程执行的额外费用，以及业主合理发生的所有其他费用（包括根据 11.11【现场清理】所述的，包括清理、清洗和恢复现场所需的费用）；

(b) any losses and damages suffered by the Employer in completing the Works; and  
雇主在完成工程时所承受的任何损失及损害；及

(c) Delay Damages, if the Works or a Section have not been taken over under Sub-Clause 10.1 [Taking Over the Works and Sections] and if the date of termination under Sub-Clause 15.2 [Termination for Contractors Default] occurs after the date corresponding to the Time for Completion of the Works or Section (as the case may be). Such Delay Damages shall be paid for every day that has elapsed between these two dates.

延迟损害，如果工程或分项工程尚未根据第 10.1 款【工程和单位工程的接受】接管，以及如果根据第 15.2 款【因承包商违约的终止】终止日期，发生在与工程或分项工程 (视情况而定) 竣工时间相对应的日期之后，这种延迟损害应按这两个日期之间的每一天支付。

15.5 Termination for Employer's Convenience 为方便雇主的终止

The Employer shall be entitled to terminate the Contract at any time for the Employer's convenience, by giving a Notice of such termination to the Contractor (which Notice shall state that it is given under this Sub-Clause 15.5).

为方便雇主，通过向承包商发出终止合同的通知 (通知应说明根据 15.5 款予以终止)，雇主有权随时终止合同。

After giving a Notice to terminate under this Sub-Clause, the Employer shall immediately:

在发出根据本款终止合同的通知后，雇主应立即：

(a) have no right to further use any of the Contractor's Documents, which shall be returned to the Contractor, except those for which the Contractor has received payment or for which payment is due;

无权进一步使用任何承包商文件，这些文件应退还给承包商，但承包商已收到付款或付款到期的文件除外；

(b) if Sub-Clause 4.6 [Co-operation] applies, have no right to allow the continued use (if any) of any Contractor's Equipment, Temporary Works, access arrangements and/or other of the Contractor's facilities or services; and

如果第 4.6 款【合作】适用，则无权允许继续使用 (如有) 任何承包商的设备、临时工程、进出安排和 / 或承包商的其他设施或服务；以及

(c) make arrangements to return the Performance Security to the Contractor.

安排将履约保函退还给承包商。

Termination under this Sub-Clause shall take effect 28 days after the later of the dates on which the Contractor receives this Notice or the Employer returns the Performance Security. Unless and until the Contractor has received payment of the amount due under Sub-Clause 15.6 [Valuation after Termination for Employer's Convenience], the Employer shall not execute (any part of) the Works or arrange for (any part of) the Works to be executed by any other entities.

本款下的终止应在承包商收到该通知的日期后 28 天或雇主主返回履约保函的较晚的日期。

除非在承包商收到第 15.6 款【为方便雇主终止后的估价】规定的款项后，雇主不得执行 (任何部分) 工程或安排工程 (任何部分) 由任何其他实体执行的。

After this termination, the Contractor shall proceed in accordance with Sub-Clause 16.3 [Contractors Obligations After Termination].

该终止后，承包商应按照第 16.3 款【终止后承包商的义务】执行。

15.6 Valuation after Termination for Employer's Convenience 为方便雇主终止后的估价

After termination under Sub-Clause 15.5 [Termination for Employer's Convenience] the Contractor shall, as soon as practicable, submit detailed supporting particulars (as reasonably required by the Employer) of:

在根据第 15.5 款【为方便雇主的终止】终止合同后，承包商应在切实可行范围内尽快提交详细的证明资料 (按雇主的合理要求)。

(a) the value of work done, which shall include:

所做工作的价值，其中应包括：

(i) the matters described in sub-paragraphs (a) to (e) of Sub-Clause 18.5 [Optional Termination], and

第 18.5 款【选择终止】第 (a) 至 (e) 段所述事项，以及

(ii) any additions and/or deductions, and the balance due (if any), by reference to the matters described in sub -paragraphs (a) and (b) of Sub -Clause 14.13 [Final Payment] -, and

第 14.13 款【最终付款】(a) 和 (b) 项所述事项的任何增加和 /或扣减, 以及应付余额 (如有), 和

(b) the amount of any loss of profit or other losses and damages suffered by the Contractor as a result of this termination.

承包商因这一终止而遭受的任何利润损失或其他损失和损害的数额。

The Employer 's Representative shall then proceed under Sub -Clause 3.5 [Agreement or Determination] to agree or determine the matters described in sub -paragraphs (a) and (b) above (and, for the purpose of Sub -Clause 3.5.3 [Time Limits], the date the Employer 's Representative receives the Contractor 's particulars under this Sub-Clause shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3).

雇主代表应根据第 3.5 款【协议或决定】, 就上文 (a) 和 (b) 项所述事项达成协议或作出决定 (和, 为 3.5.3 【时间限制】的目的, 雇主代表根据本款收到承包商的详细资料的日期应为根据第 3.5.3 款达成协议的日期开始 )。

The Employer shall pay the amount so agreed or determined to the Contractor, without the need for the Contractor to submit a Statement

雇主应向承包商支付如此商定或确定的金额, 而不需要承包商提交报表。

15.7 Payment after Termination for Employer 's Convenience 为方便雇主终止后的付款

The Employer shall pay the Contractor the amount agreed or determined under Sub-Clause 15.6 [Valuation after Termination for Employer 's Convenience] within 112 days after the Employer receives the Contractor's submission under that Sub -Clause.

在雇主收到承包商根据该条款提交的资料 112 天内, 雇主应向承包商支付根据 15.6 款【为方便雇主终止后的估价】商定或确定的金额。

16 SUSPENSION AND TERMINATION BY CONTRACTOR 由承包商暂停和终止

16.1 Suspension by Contractor 承包商的暂停

If

如果

(a) the Employer fails to provide reasonable evidence in accordance with Sub -Clause 2.4 [Employer 's Financial Arrangements] -,

雇主未能根据第 2.4 款【雇主的资金安排】提供合理的证据,

(b) the Employer fails to comply with Sub -Clause 14.7 [Payment]; or

雇主未能遵守 14.7 【付款】; 或

(c) the Employer fails to comply with:

雇主未能遵守：

(i)a binding agreement, or final and binding determination under Sub-Clause 3.5 [Agreement or Determination] -, or

有约束力的协议，或根据第 3.5 款【协议或决定】作出的最终和有约束力的决定，或

(ii)a decision of the DAAB under 21.4 [Obtaining DAAB's Decision] (whether binding or final and binding)

根据 21.4【取得 DAAB 的决定】取得 DAAB 决定（无论约束力或最终和有约束力）

and such failure constitutes a material breach of the Employer's obligations under the Contract,

这种不履约构成在合同下对雇主义务的重大违约，

the Contractor may, not less than 21 days after giving a Notice to the Employer (which

Notice shall state that it is given under this Sub-Clause 16.1), suspend work (or reduce the rate of work) unless and until the Employer has remedied such default.

承包商可在向雇主发出通知后不少于 21 天(该通知应说明是根据第 16.1 款发出)暂停工作(或降低工程效率)，直至雇主补救该违约行为为止。

This action shall not prejudice the Contractor's entitlements to financing charges under Sub-Clause 14.8 [Delayed Payment] and to termination under Sub-Clause 16.2 [Termination by Contractor].

本行动不应损害承包商根据第 14.8 款【延迟付款】和根据第 16.2 款【承包商终止】获得融资费用的权利。

If the Employer subsequently remedies the default as described in the above Notice before the Contractor gives a Notice of termination under Sub-Clause 16.2 [Termination by Contractor], the Contractor shall resume normal working as soon as is reasonably practicable.

如果雇主随后在承包商根据第 16.2 款【承包商的终止】发出终止通知之前，按照上述通知中所述的方式对违约进行补救，承包商应在合理可行的情况下尽快恢复正常工作。

If the Contractor suffers delay and/or incurs Cost as a result of suspending work (or reducing the rate of work) in accordance with this Sub-Clause, the Contractor shall be entitled subject to Sub-Clause 20.2 [Claims For Payment and/or EOT] to EOT and/or payment of such Cost Plus Profit.

如果承包商因根据本款暂停工程(或降低工做效率)而受到延误和/或引起费用，承包商应有权根据 20.2 款【付款索赔和/或 EOT】向 EOT 和/或支付这种成本加利润。

16.2 Termination by Contractor 由承包商终止

Termination of the Contract under this Clause shall not prejudice any other rights of the Contractor, under the Contract or otherwise.

根据本条款终止合同不应损害承包商根据合同或其他享有的任何其他权利。

16.2.1 Notice 通知

The Contractor shall be entitled to give a Notice (which shall state that it is given under this Sub-Clause 16.2.1) to the Employer of the Contractor's intention to terminate the Contract or, in the case of sub -paragraph (f) (ii), (g), (h) or (i) below a Notice of termination, if:

承包商有权向雇主发出通知（该通知应说明，根据本款 16.2.1），说明承包商终止合同意图，或在以下 (f) (ii), (g), (h) 或 (i) 的情况下通知终止，如果：

(a) the Contractor does not receive the reasonable evidence within 42 days after giving a Notice under Sub -Clause 16.1 [Suspension by Contractor] in respect of a failure to comply with Sub -Clause 2.4 [Employer 's Financial Arrangements]-,

承包商在根据第 16.1 款【承包商的暂停】的规定，就未能遵照第 2.4 款【雇主的资金安排】规定的事项发出通知后 42 天内，仍未收到合理的证明；

(b) the Contractor does not receive a payment under Sub -Clause 14.7 [Payment] within 42 days after the expiry of the relevant period for payment stated in Sub -Clause 14.7;

承包商根据 14.7 款规定的相关付款期限届满后 42 天内未收到第 14.7 款【付款】项下的付款；

(c) the Employer fails to comply with:

雇主未遵守：

(i) a binding agreement, or final and binding determination under Sub -Clause 3.5 [Agreement or Determination]; or

根据第 3.5 款【协议或决定】达成的具有约束力的协议，或最终和有约束力的决定；或

(ii) a decision of the DAAB under 21.4 [Obtaining DAAB's Decision] (whether binding or final and binding)

根据 21.4 款【取得 DAAB 的决定】（无论有约束力或最终和有约束力）

and such failure constitutes a material breach of the Employer's obligations under the Contract;

此类违约构成在合同下违反雇主义务的重大违约行为。

(d) the Employer substantially fails to perform, and such failure constitutes a material breach of, the Employer's obligations under the Contract;

雇主实质上未能根据合同规定履行其义务，这种不约构成在合同下违反雇主义务的重大违约行为

(e) the Contractor does not receive a Notice of the Commencement Date under Sub -Clause 8.1 [Commencement of Works] within 84 days after both Parties have signed the Contract Agreement;

在双方签署合同协议后 84 天内，承包商未收到 8.1 款【工程的开工】规定的开工日期通知；

(f) the Employer:

雇主：

(i) fails to comply with Sub -Clause 1.6 [Contract Agreement], or

雇主未遵守第 1.6 款【合同协议书】的规定；

(ii) assigns the Contract without the required agreement under Sub -Clause 1.7



[Assignment] -

根据第 1.7 条【权益转让】在没有所需协议的情况下转让

(g) a prolonged suspension affects the whole of the Works as described in sub -paragraph

(b) of Sub -Clause 8.12 [Prolonged Suspension];

如第 8.12 款【拖长的暂停】(b) 所述的拖长的停工影响了整个工程；或

(h) the Employer becomes bankrupt or insolvent; goes into liquidation, administration, reorganisation, winding -up or dissolution; becomes subject to the appointment of a liquidator, receiver, administrator, manager or trustee; enters into a composition or arrangement with the Employer's creditors; or any act is done or any event occurs which is analogous to or has a similar effect to any of these acts or events under applicable Laws; or

业主破产或无力偿还债务； 进入清算、管理、重组、结算或解散； 被任命为清算人、 接收人、 管理员、 经理或受托人； 与业主的债权人形成组合或安排； 或根据适用法； 或

(i) the Employer is found, based on reasonable evidence, to have engaged in corrupt, fraudulent, collusive or coercive practice at any time in relation to the Works or to the Contract.

根据合理证据，发现雇主曾在任何时候就工程或合同从事贪污、 欺诈、 串谋或胁迫性的行为。

#### 16.2.2 Termination 终止

Unless the Employer remedies the matter described in a Notice given under Sub -Clause

16.2.1 [Notice] within 14 days of receiving the Notice, the Contractor may by giving a second Notice to the Employer immediately terminate the Contract. The date of termination shall then be the date the Employer receives this second Notice. 除非雇主在收到通知的 14 天内对根据第 16.2.1 款【通知】所给出的通知中描述的事项进行修补，承包商

可以发第二份通知给业主立即终止合同。终止的日期应为雇主收到第二份通知的日期。

However, in the case of sub -paragraph (f)(ii), (g), (h) or (i) of Sub -Clause 16.2.1 [Notice],

by giving a Notice under Sub -Clause 16.2.1 the Contractor may terminate the Contract

immediately and the date of termination shall be the date the Employer receives this Notice.

然而，就第 16.2.1 款【通知】(f)(ii), (g), (h) 或 (i) 项而言，承包商可立即终止合同，终止日期应为雇主收到本通知的日期。

If the Contractor suffers delay and/or incurs Cost during the above period of 14 days, the

Contractor shall be entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT]

to EOT and/or payment of such Cost Plus Profit.

如果承包商在上述 14 天期间遭受延误和 /或引起费用，承包商应根据 20.2【付款索赔和 /或 EOT】向 EOT 和 /或支付此类成本加利润。

#### 16.3 Contractor's Obligations After Termination

终止后的承包商的义务

After termination of the Contract under Sub-Clause 15.5 [Termination for Employer's Convenience] Sub -Clause 16.2 [Termination by Contractor] or Sub -Clause 18.5 [Optional Termination], the Contractor shall promptly:

在根据第 15.5 款【为方便雇主的终止】、第 16.2 款【由承包商终止】、或第 18.5 款【选择的终止】的规定发出的终止通知生效后，承包商应迅速：

(a) cease all further work, except for such work as may have been instructed by the Employer for the protection of life or property or for the safety of the Works. If the Contractor incurs Cost as a result of carrying out such instructed work the Contractor shall be entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT] to be paid such Cost Plus Profit;

停止所有进一步的工作，雇主为保护生命或财产或工程的安全可能指示的工作除外。如果承包商因执行此类指示的工作而导致成本，则承包商有权根据第 20.2 款【付款索赔和 /或 EOT】要求支付该成本加利润；

deliver to the Employer all Contractor's Documents, Plant, Materials and other work for which the Contractor has received payment;

向雇主移交承包商已得到付款的承包商文件、生产设备、材料和其他工作；

remove all other Goods from the Site, except as necessary for safety, and leave the Site.

从现场运走除为了安全需要以外的所有其他货物，并撤离现场。

#### 16.4 Payment after Termination by Contractor 承包商终止合同后的付款

After termination under Sub -Clause 16.2[Termination by Contractor], the Employer shall promptly:

根据 16.2 【承包商的终止】终止后，业主应立即

pay the Contractor in accordance with Sub -Clause 18.5[Optional Termination]; and

按照 18.5 款【选择的终止】向承包商付款；和

subject to the Contractor's compliance with Sub -Clause 20.2 [Claims For Payment and/or

EOT], pay the Contractor the amount of any loss of profit or other losses and damages

suffered by the Contractor as a result of this termination.

根据 20.2 【付款索赔和 /或 EOT】，付给承包商因此项终止而承受的任何利润损失或其他损失或损害的款额。

#### 17 Care of the Works and Indemnities 工程的照管与保障

##### 17.1 Responsibility for Care of the Works 工程照管的义务

Unless the Contract is terminated in accordance with these Conditions or otherwise, subject to Clause 17.2 Liability for Care of the Works the Contractor shall take full responsibility for the care of the Works, Goods and Contractors Documents from the Commencement Date until the Date of Completion of the Works, when responsibility for the care of the Works shall pass to the Employer. If a Taking -over Certificate is issued (or is deemed to be issued )for any Section or Part, responsibility for the care of the Section

or Part shall then pass to the Employer.

除非根据这些条件或以其他条款终止合同，根据第 17.2 款【工程照管的责任】，承包商应从开工日期起承担照管工程、货物和承包商文件的全部职责，直到工程竣工之日止，这时工程照管职责应移交给雇主。如果对某单位工程或部分工程颁发了（或照上述应视为已发）接收证书，则对该单位工程或部分工程的照管职责应移交给雇主。

If the Contract is terminated in accordance with these Conditions or otherwise, the Contractor shall cease to be responsible for the care of the works from the date of termination.

如果根据这些条款或其他条款终止合同，承包商应自终止之日起不承担对工程的照管责任。

After responsibility has accordingly passed to the Employer, the Contractor shall take responsibility for the care of any work which is outstanding on the Date of Completion, until this outstanding work has been completed.

在照管职责按上述规定移交给雇主后，承包商仍应对在接收证书上注明日期时的任何扫尾工作承担照管职责，直到此扫尾工作完成为止。

If any loss or damage occurs to the Works, Goods or Contractors Documents, during the period when the Contractor is responsible for their care, from any cause whatsoever except as stated in Sub-clause 17.2 Liability for Care of the Works), the Contractor shall rectify the loss or damage at the Contractor's risk and cost, so that the Works, Goods or Contractors Documents (as the case may be) comply with the Contract.

如果承包商负责照管期间，由于第 17.2 款【工程照管的责任】中所列以外的原因，致使工程、货物或承包商文件发生任何损失或损害，承包商应自行承担风险和费用，修正该项损失或损害，使工程、货物和承包商文件符合合同要求。

#### 17.2 liability for care of the works 工程照管的责任

The Contractor shall be liable for any loss or damage caused by the Contractor to the Works, Goods or Contractors Documents after the issue of a Taking-over Certificate. The Contractor shall also be liable for any loss or damage, which occurs after the issue of a Taking-over Certificate and which arose from an event which occurred before the issue of this Taking-over Certificate, for which the Contractor was liable.

承包商应对颁发接收证书后由承包商造成对工程、货物和承包商文件的任何损失或损害负责。承包商还应对颁发接收证书后发生的，由承包商负责的颁发接收证书前发生的事件引起的任何损失或损害负责。

The Contractor shall have no liability whatsoever, whether by way of indemnity or otherwise, for loss or damage to the Works, Goods or Contractors Documents caused by any of the following events (except to the extent that such Works, Goods or Contractors Documents have been rejected by the Employer under Sub-clause 7.5 Defects and Rejection before the occurrence of any of the following events.

对于因以下任何事件（除了根据第 7.5 款【缺陷和拒收】的规定，在发生以下任何事件之前，此类工程、货物或承包商文件已被业主拒收以外）导致的工程、货物或承包商文件的损失或损坏，承包商不承担任何责任，不做其他方式进行赔偿。

(a) interference, whether temporary or permanent, with any right of way light, air, water or other easement (other than that resulting from the Contractors method of construction) which is the unavoidable result of the execution of the Works in accordance with the Contract;

干扰，根据合同实施工程中不可避免的通行权、灯光、空气、水或其他地役权（承包商施工方法引起的除外）的干扰，包括临时的或永久的。

(b) use or occupation by the Employer of any part of the Permanent works, except as may be specified in the Contract;

雇主使用或占用永久工程的任何部分，合同中另有规定的除外。

(c) fault, error, defect or omission in any element of the design of the Works by the Employer, other than design carried out by the Contractor in accordance with Contractors obligations under the Contract;

业主在工程设计的任何部分中的错误、缺陷或遗漏，合同规定的承包商义务进行的设计除外。

(d) any operation of the forces of nature (other than those allocated to the contractor in the Contract Data) which is Unforeseeable or against which an experienced contractor could not reasonably have been expected to have taken adequate preventative precautions;

不可预见的或经验丰富的承包商无法合理地预防的自然力的任何操作（合同资料中分配给承包商的除外）。

(e) any of the events or circumstances listed under sub -paragraphs (a) to (1) of Sub -clause

18.1 Exceptional Events; and/or

第 18.1 款【例外事件】（a）至（f）项所列的任何事件或情况；和 / 或

(f) any act or default of Employers Personnel or Employers other contractors.

业主人员或业主其他承包商的任何违约行为

Subject to Sub -clause 18.4 [Consequences of an Exceptional Event, if any of the events described in sub -paragraphs (a) to (1) above occurs and results in damage to the Works, Goods or Contractors Documents the Contractor shall promptly give a Notice to the Employer. Thereafter, the Contractor rectify any loss and/or damage that may arise to the extent instructed by the Employer. Such instruction shall be deemed to have been given under Sub -clause 13.3.1 Variation by Instruction.

根据第 18.4 款【例外事件的后果】，如果上述（a）至（f）段所述的任何事件发生，并对工程、货物或承包商文件造成损害，承包商应立即通知业主。此后，承包商应在业主指示的范围内纠正任何此类损失和 / 或损害。此类指示应被视为是根据第 13.3.1 条【指示变更】发出的。

If the loss or damage to the Works or Goods or Contractors Documents results from a combination of:

如果工程或货物或承包商文件的损失或损坏是由以下因素综合造成的：

1. any of the events described in sub -paragraphs (a) to (1) above, and

上文 (a) 至 (f) 项所述的任何事件, 以及

2.a cause for which the Contractor is liable

原因是承包商应负责的

and the contractor suffers a delay and/or incurs Cost from rectifying the loss and/or damage, the Contractor shall subject to Sub -clause 20.2 [Claims for Payment and/or EOT be entitled to a proportion of EOT and/or Cost Plus Profit to the extent that any of the above events have contributed to such delays and/or Cost.

承包商因纠正损失和 / 或损害而遭受延误和 / 或招致费用, 承包商应根据第 20.2 款【支付索赔和 / 或 EOT】的规定, 在上述任何事件导致此类延误和 / 或费用的情况下, 按一定比例的工期延长和 / 或成本加利润的比例提出索赔。

17.3 intellectual and industrial property rights 知识产权和工业产权

In this Sub -clause, "infringement" means an infringement (or alleged infringement) of any patent, registered design, copyright, trademark, trade name, trade secret or other intellectual or industrial property right relating to the Works; and "claim means a third party claim (or proceedings pursuing a third party claim) alleging an infringement.

本条款中, “侵权”是指侵犯 (或被指称侵犯) 与工程有关的任何专利权、已登记的设计、版权、商标、商号商品名称、商业机密、或其他知识产权或工业产权; “索赔”是指指称第三方侵权的索赔 (或为索赔进行的第三方诉讼)。

Whenever a Party receives a claim but fails to give notice to the other Party of the claim within 28 days of receiving it, the first Party shall be deemed to have waived any right to indemnity under this Sub -clause.

当一方未能在收到任何索赔 28 天内, 向另一方发出关于索赔的通知时, 该方应被认为已放弃根据本条款规定的任何受保障的权利。

The Employer shall indemnify and hold the Contractor harmless against and from any claim (including legal fees and expenses) alleging an infringement which is or was:

雇主应保障并保持承包商免受因以下情况提出的指称侵权的任何索赔引起的损害 (包括法律费用和开支):

(a) an unavoidable result of the Contractors compliance with the Employers Requirements and/or any Variation; or

(i) 上文 (a) 至 (f) 项所述的任何事件, 以及

(b) a result of any Works being used by the Employer:

雇主使用任何工程的结果:

1. for a purpose other than that indicated by, or reasonably to be inferred from, the Contract. Or

为了合同中指明的或根据合同可合理推断的事项以外的目的; 或

2. in conjunction with any thing not supplied by the Contractor unless such use was disclosed to the Contractor before the Base Date or is stated in the Contract.

与非承包商提供的任何物品联合使用，除非此项使用已在基准日期前向承包商透露，或在合同中有规定。

The Contractor shall indemnify and hold the Employer harmless against and from any other claim (including legal fees and expenses) alleging an infringement which arises out of or in relation to

承包商应保障并保持雇主免受由以下事项产生或与之有关的任何其他索赔引出的损害（包括法律费用和开支）：

1. the Contractors execution of the Works: or

承包商的工程实施；

2. the use of Contractors Equipment

承包商设备的使用；

Party is entitled to be indemnified under this Sub -clause, the indemnifying party may (at the indemnifying Partys cost) assume overall responsibility for negotiating the settlement of the claim, and/or any litigation or arbitration which may arise from it. The other Party shall, at the request and cost of the indemnifying Party, assist in contesting the claim. This other Party (and the Contractor's Person the Employers Personnel, as the case may be shall not make any admission which might be prejudicial to the indemnifying party, unless the indemnifying Party failed to promptly assume overall responsibility for the conduct of any negotiations, litigation or arbitration after being requested to do so by the other Party.

如果一方根据本条款规定有权受保障，补偿方可（由补偿方承担费用）全权承担组织解决索赔的谈判，以及可能由其引起的任何诉讼或仲裁。在补偿方请求并承担费用的情况下，另一方应协助争辩该索赔。此另一方（承包商人员或雇主人员，根据情况而定）不应做出可能损害补偿方的任何承认，除非补偿方未能在该另一方请求下，全权承担组织任何谈判、诉讼或仲裁事宜。

17.4 indemnities by contractor 承包商提供的保障

The Contractor shall indemnify and hold harmless the Employer, the Employers Personnel, and their respective agents, against and from all third party claims, damages, losses and expenses (including legal fees and expenses) in respect of:

承包商应保障并保持使雇主、雇主人员、以及他们各自的代理人免受以下所有包括第三方的索赔、损害赔偿费、损失和开支（包括法律费用和开支）带来的伤害：

(a) bodily injury, sickness, disease or death of any person whatsoever arising out of or in the course of or by reason of the Contractors execution of the Works, unless attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel, or any of their respective agents; and

由承包商项目实施引起、或在其过程中、或因其原因产生的任何人员的人身损害、患病、疾病或死亡，除非是由于雇主、雇主人员，或他们各自的任何代理人的任何疏忽、故意行为、或违反合同造成的。

(b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss:

由下列情况造成的对任何财产、不动产或动产（工程除外）的损害或损失：

(1) arises out of or in the course of or by reason of the Contractor's execution of the Works,  
and

由承包商项目实施引起、或在其过程中、或因其原因产生的；

(2) is attributable to any negligence, wilful act or breach of the Contract by the Contractor, the Contractor's Personnel, the Contractor's agents, or anyone directly or indirectly employed by any of them.

由于雇主、雇主人员，他们各自的任何代理人、或他们中任何人直接或间接聘用的任何人的任何疏忽、故意行为、或违反合同造成的。

The Contractor shall also indemnify and hold harmless the Employer against all acts, errors or omissions by the contractor in carrying out the Contractor's design obligations that result in the works or Section or Part or major item of Plant, if any) when completed, not being fit for the purpose(s) for which they are intended under Sub-clause 4.1 [ Contractor's General Obligations.

承包商还应保障并保护业主免受承包商在履行承包商设计义务过程中的所有行为、错误或疏忽，这些行为、错误或疏忽导致工程（或工段、部分或主要设备项目，如有）竣工时，不符合第 4.1 款【承包商一般义务】规定的预期用途

17.5 indemnities by employer 雇主提供的保障

the Employer shall indemnify and hold harmless the Contractor, the Contractor's Personnel, and their respective agents, against damages, losses and expenses (including legal fees and expenses) in respect of:

雇主应保障并保持使承包商、承包商人员、和他们各自的代理人免受以下发面所有索赔、损害赔偿费、损失和开支（包括法律费用和开支）带来的伤害：

(a) bodily injury, sickness, disease or death, or loss of or damage to any property other than the Works, which is attributable to any negligence, wilful act or breach of the Contract by the Employer, the Employer's Personnel or their respective agents; and

由雇主、雇主人员，或他们各自的任何代理人的任何疏忽、故意行为、或违反合同造成的人身伤害、患病、疾病或死亡

(b) damage to or loss of any property, real or personal (other than the Works), to the extent that such damage or loss arises out of any event described under sub-paragraphs (a) to (f) of Sub-clause 17.2 Liability for Care of the Works.

由第 17.2 款【工程照管的责任】的（ a）至（ f）项所述的任何情况造成的对任何财产、不动产或动产（工程除外）的损害或损失

17.6 shared indemnities 共同赔偿

承包商根据第 17.4 款【承包商提供的保障】和（或）第 17.3 款【知识产权和工业产权】对

雇主承担赔偿责任。因第 17.2 款 (a) 至 (f) 项所述事件可能导致上述损害、损失或伤害时，承包商对雇主的赔偿责任应按比例减少。

similarly, the Contractors liability to indemnify the Employer, under Sub-clause 17.4 Indemnities by Contractor and/or under Sub-clause 17.3 Intellectual and Industrial Property Rights), shall be reduced proportionately to the extent that any event described under sub-paragraphs(a) to(f)of Sub-clause 17.2 Liability for Care of the Works) may have contributed to the said damage, loss or injury.

同样，雇主根据第 17.5 款【雇主提供的保障】和/或根据第 17.3 款【知识产权和工业产权】对承包商承担赔偿责任，根据第 17.1 款【工程照管的义务】因承包商应负责的任何事件导致的上述损害、损失或伤害的程度，雇主的赔偿责任应按比例减少。

## 18.Exceptional Events 例外事件

### 18.1 Exceptional Events 例外事件

"Exceptional Event" means an event or circumstance which:

“例外事件”指下列事件或情况：

1. is beyond a Party's control;

一方无法控制的；

2. the Party could not reasonably have provided against before entering into the Contract;

该方在签订合同前，不能对之进行合理防备的；

3. having arisen, such Party could not reasonably have avoided or overcome; and

发生后，该方不能合理避免或克服的；

4. is not substantially attributable to the other Party.

不主要归因于他方的。

An Exceptional Event may comprise but is not limited to any of the following events or circumstance provided that conditions (1) to (4) above are satisfied:

在符合上述第 (1)至第(4)项条件的情况下，例外事件可包括但不限于下列任何一项事件或情况：

a. war, hostilities (whether war be declared or not), invasion, act of foreign enemies;

战争、敌对行动（不论宣战与否）、入侵、外敌行为；

b. rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war;

判乱、恐怖主义、革命、暴动、军事政变或篡夺政权、或内战；

c. riot, commotion or disorder by persons other than the Contractors personnel and other employees of the Contractor and Subcontractors;



承包商人员、承包商和分包商的其他雇员以外人员的暴乱、骚乱或混乱；

d. strike or lockout not solely involving the Contractor's Personnel and other employees of the Contractor and Subcontractors;

罢工或停工不单涉及承包商人员和承包商和分包商的其他雇员；

e. encountering munitions of war, explosive materials, ionising radiation or contamination

by radio -activity, except as may be attributable to the Contractor's use of such munitions, explosives, radiation or radio -activity; or

遭遇战争军火、爆炸物资、电离辐射或放射性污染，但可能因承包商使用此类军火、炸药、辐射或放射性引起的除外；

f. natural catastrophes such as earthquake, tsunami, volcanic activity, hurricane or typhoon.

自然灾害，如地震、飓风、台风、或火山活动。

#### 18.2 notice of an exceptional event 例外事件通知

If a Party is or will be prevented from performing any obligations under the Contract due to an Exceptional Event (the "affected Party" in this Clause), then the affected Party shall give a Notice to the other Party of such an Exceptional Event, and shall specify the obligations, the performance of which is or will be prevented (the "prevented obligations" in this Clause).

如果一方因某一特殊事件（本条款中的“受影响方”）使其履行合同规定的任何义务已或将受到阻碍，则受影响方应向另一方发出此类例外事件的通知，并且应规定履行已或将受到阻碍的义务（本条款中的“被阻碍的义务”）。

This Notice shall be given within 14 days after the affected Party became aware, or should have become aware, of the Exceptional Event, and the affected Party shall then be excused performance of the prevented obligations from the date such performance is prevented by the Exceptional Event. If this Notice is received by the other Party after this period of 14 days, the affected Party shall be excused performance of the prevented obligations only from the date on which this Notice is received by the other Party.

本通知应在受影响方知道或应该知道该例外事件后 14 天内发出，受影响方应从该例外事件阻止其履行义务之日起免除其履行被阻碍义务的责任。如果另一方在这 14 天之后收到本通知，则受影响的一方仅可从另一方收到本通知之日起免除履行被阻碍的义务。

Thereafter, the affected Party shall be excused performance of the prevented obligations for so long as such Exceptional Event prevents the affected Party from performing them.

Other than performance Of the prevented obligations, the affected Party shall not be excused performance of all other obligations under the Contract.

此后，只要这种例外事件阻碍了受影响方履行这些义务，受影响方应被免除履行这些义务的责任。除履行被阻碍的义务外，受影响方不得免除履行本合同项下的所有其他义务。

However, the obligations Of either Party to make payments due to the Other Party under the Contract shall not be excused by an Exceptional Event.

但是，任何一方在合同项下对另一方的付款义务不应因例外情况而免除。

### 18.3 Duty to minimise Delay 将延误减至最小的义务

Each Party shall at all times use all reasonable endeavours to minimise any delay in the performance of the Contract as a result of an Exceptional Event.

每方都应始终尽所有合理的努力，使例外事件对履行合同造成的任何延误减至最小。

If the Exceptional Event has a continuing effect, the affected Party shall give further Notices describing the effect every 28 days after giving the first Notice under Sub -Clause 18.2 [Notice of an Exceptional Event].

如果例外事件具有持续影响，受影响方应在根据第 18.2 款【例外事件通知】发出第一份通知后每 28 天发出一次描述影响的进一步通知。

The affected Party shall immediately give a Notice to the other Party when the affected Party ceases to be affected by the Exceptional Event. If the affected Party fails to do so, the other Party may give a Notice to the affected Party stating that the other Party considers that the affected Party's performance no longer prevented by the Exceptional Event, with reasons.

当受影响方不再受该例外事件影响时，受影响方应立即通知另一方。如果受影响的一方没有这样做，另一方可以向受影响的一方发出通知，说明另一方认为受影响的一方的行为不再受到例外事件的阻碍，并说明理由。

### 18.4 consequences of an exceptional event 例外事件的后果

If the Contractor is the affected Party and suffers delay and/or incurs Cost by reason of the Exceptional Event of which he/she gave a Notice under Sub -Clause 18.2 (Notice of an Exceptional Event), the Contractor shall be entitled subject to Sub -Clause 20.2 [Claims For Payment and/or EOT] to:

如果承包商是受影响的一方并因其根据第 18.2 条（例外事件通知）发出通知的例外事件而遭受延误和 / 或产生费用，则承包商有权根据第 20.2 款【付款和 / 或延期申请】去：

(a) EOT; and/or  
延期，和 / 或

(b) the Exceptional Event is of the kind described in sub-paragraphs (a) to (e) of Sub-Clause 18.1 [Exceptional Events] and, the case of sub-paragraphs (b) to (e) of that Sub-Clause occurs in the Country, payment of such Cost.

例外事件属于第 18.1 款【例外事件】第 (a)至(e)项所述的类型，并且，如该例外事件第 (b)至(e)项发生在该国，则支付该等费用。

### 18.5 Optional Termination 自主选择终止

If the execution of substantially all the Works in progress is prevented for a continuous period of 84 days by reason of an Exceptional Event of which Notice has been given under Sub-Clause 18.2 (Notice of an Exceptional Event), or for multiple periods which total more than 140 days due to the Same Exceptional Event, then either Party may give to the other party a Notice of termination of the Contract.

如果因已根据第 18.2 款 [例外事件通知] 的规定发出通知的例外事件, 使基本上全部进展中的工程实施受到阻碍已连续 84 天, 或由于同一通知的例外事件断续阻碍几个期间累计 140 天, 任一方可以向他方发出终止合同的通知。

In this event, the date of termination shall be the date 7 days after the Notice is received by the other Party, and the Contractor shall proceed in accordance with Sub-Clause 16.3 [Contractor's Obligations After Termination].

在这种情况下, 终止日期应为另一方收到通知后的第 7 天, 承包商应按照第 16.3 款【终止后承包商的义务】进行。

After the date of termination the Contractor shall, as soon as practicable, submit detailed supporting particulars (as reasonably required by the Employers Representative) of the value of the work done, which shall include:

在终止日期后, 承包商应在切实可行的范围内尽快提交已完成工作进度的详细证明资料 (雇主代表合理要求的), 其中应包括:

1. the amounts payable for any work carried out for which a price is stated in the Contract;

已完成的、合同中有价格规定的任何工作的应付金额;

2.the Cost of Plant and Materials ordered for the Works which have been delivered to the Contractor, or of which the Contractor is liable to accept delivery. This Plant and Materials shall become the property of (and be at the risk of) the Employer when paid for by the Employer, and the Contractor shall place the same at the Employers disposal;

为工程订购的、已交付给承包商或承包商有责任接受交付的生产设备和材料的费用; 当雇主支付上述费用后, 此项生产设备与材料应成为雇主的财产 (风险也由其承担), 承包商应将其交由雇主处理;

3.any other Cost or liability which in the circumstances was reasonably incurred by the Contractor in the expectation of completing the Works;

在承包商原预期要完成工程的情况下, 合理的任何其他费用或债务;

4.the Cost of removal of Temporary Works and Contractor S Equipment from the Site and the return of these items to the Contractors place of business in the Contractor's country (or to any other destination(s) at no greater cost); and

将临时工程和承包商设备撤离现场、并运回承包商本国工作地点的费用, (或运往任何其他目的地, 但其费用不得超过);

5.the Cost of repatriation of the Contractor's staff and labour employed wholly in connection with the Works at the date of termination.

将终止日期时的完全为工程雇用的承包商的员工遣返回国的费用。

The Employer's Representative shall then proceed under Sub -Clause 3.5 (Agreement or Determination] to agree or determine the value of work done (and, for the purpose of Sub-Clause 3.5.3 [Time limits], the date the Employer's Representative receives the Contractor's particulars under this Sub -Clause shall be the date of commencement of the time limit for agreement under Sub -Clause 3.5.3).

然后，雇主代表应根据第 3.5 款（协议或决定）进行协商或确定所完成工作价值（并且，就第3.5.3 款【期限】而言，雇主代表收到承包商在本条项下的详细资料之日为第 3.5.3 条项下协议期限开始之日。

The Employer shall issue a Notice, under Sub -Clause 14.6.1 [Notice of interim payment], for the amount so agreed or determined, without the need for the Contractor to submit a Statement.

雇主应根据第 14.6.1 款【临时付款通知】的规定，对商定或确定的金额发出通知，而不需要承包商提交一份声明。

18.6 Release from performance under the law 根据法律解除履约

In addition to any other provision of this Clause, if any event arises outside the control of the Parties (including, but not limited to, an Exceptional Event) which:

除本条款的任何其他规定外，如果发生任何超出双方控制范围的事件（包括但不限于例外事件）：

(a) makes it impossible or unlawful for either Party or both Parties to fulfil their contractual obligations; or

使任何一方或双方履行其合同义务是不可能或非法的；或者

(b) under the law governing the Contract, entitles the Parties to be released from further performance of the Contract,

根据管辖合同的法律，使各方有权免于进一步履行合同，

and if the Parties are unable to agree on an amendment to the Contract that would permit the continued performance of the Contract, then after either Party gives a Notice to the other Party of such event:

如果双方无法就允许继续履行合同的合同修正案达成协议，则在任何一方就该等事件通知另一方：

1. the Parties shall be discharged from further performance, and without prejudice to the rights of either Party in respect of any previous breach of the Contract; and

双方应解除进一步履约的义务，并不影响任何一方对过去任何违反合同事项的权利；

2. the amount payable by the Employer to the Contractor shall be the same as would have

been payable under Sub -Clause 18.5 [Optional Termination], and such amount shall be paid by the Employer, as if the Contract had been terminated under that Sub -Clause. 雇主应向承包商支付的款额应与根据第 18.5 款【自主选择终止】应支付的款额相同，雇主应支付该款项，如同根据该款合同已终止一样。

## 19 insurance 保险

### 19.1 general requirements 保险的一般要求

without limiting either Party's obligations or responsibilities under the Contract, the Contractor shall effect and maintain all insurances for which the Contractor is responsible with insurers and in terms, both of which shall be subject to consent by the Employer. These terms shall be consistent with terms (if any) agreed by both Parties before the date that both Parties signed the Contract Agreement.

在不限任何一方在本合同项下的义务或责任的情况下，承包商应向保险公司投保并续保承包商应负责的所有保险，保险条款应经业主同意。这些条款应与双方在签订合同协议书之日前商定的条款（如有）一致。

The insurances required to be provided under this Clause are the minimum required by the Employer, and the Contractor may, at the Contractor's own cost, add such other insurances that the Contractor may deem prudent.

本条要求的保险是业主要求的最低保险，承包商可在承包商处增加承包商认为谨慎的其他保险。

whenever required by the Employer, the Contractor shall produce the insurance policies which Contractor is required to effect under the Contract. As each premium is paid, the Contractor shall promptly submit either a copy of each receipt of payment to the Employer, or confirmation from the insurers that the premium has been paid, 当业主要求时，承包商应制定合同要求承包商实施的保险单。在支付每一笔保险费后，承包商应立即向业主提交每份付款收据的副本，或向保险公司提交已支付保险费的确认书。

if the Contractor fails to effect and keep in force any of the insurances required under Sub-clause 19.2 insurances to be provided by the Contractor then and in any such case, the Employer may effect and keep in force such insurances and pay any premium as may be necessary and recover the same from the Contractor from time to time by deducting the amount(s) so paid from any moneys due to the Contractor or otherwise recover the same as a debt from the Contractor. The provisions of Clause 20 Employers and Contractor's Claims shall not apply to this Sub -clause.

如果承包商未能按第 19.2 款【承包商提供的保险】的要求办理保险并使之保持有效，则在任何此类情况下，雇主可办理并保持有效的此类保险。并根据需要支付任何保险费，并不时向承包商追回保险费。第 20 条【业主和承包商的索赔】的规定不适用于本款。

If either the Contractor or the Employer fails to comply with any condition of the

insurances effected under the Contract, the Party so failing to comply shall indemnify the other Party against all direct losses and claims(including legal fees and expenses) arising from such failure.

如果承包商或业主中的任何一方未能遵守根据合同生效的任何保险条件，则未能遵守的一方应赔偿另一方因此类未遵守而产生的所有直接损失和索赔（包括法律费用和开支）。

The Contractor shall also be responsible for the following

承包商还应负责以下事项：

(a) notifying the insurers of any changes in the nature, extent or programme for the execution of the Works; and

通知保险人工程实施的性质、范围或计划的任何变更；以及

(b) the adequacy and validity of the insurances in accordance with the Contract at all times during the performance of the Contract.

在合同履行期间，根据合同规定的保险的充分性和有效性。

The permitted deductible limits allowed in any policy shall not exceed the amounts stated in the Contract Data( if not stated, the amounts agreed with the Employer).

任何保单中允许的扣除限额不得超过合同资料中规定的金额（如果未规定，则为与雇主商定的金额）。

Where there is a shared liability the loss shall be borne by each Party in proportion to each Party's liability, provided the non-recovery from insurers has not been caused by a breach of this Clause by the Contractor or the Employer. In the event that non-recovery from insurers has been caused by such a breach, the defaulting Party shall bear the loss suffered.

如果有共同责任，损失应由每一方按照各自责任的比例承担，前提是未向保险公司追偿不是由承包商或雇主违反本条造成的。因违约行为致使保险人无法追偿的，由违约方承担损失。

19.2 insurance to be provided by the contractor 承包商提供的保险

The contractor shall provide the following insurances:

承包商应提供以下保险：

19.2.1 the works 工程

the Contractor shall insure and keep insured in the joint names of the Contractor and the Employer from the Commencement Date until the date of the issue of the Taking-over Certificate for the Works.

承包商应以承包商和业主的联合名义投保，自开工日期起至颁发工程接收证书之日止。

(a) the Works and Contractors Documents, together with Materials and Plant for incorporation in the Works, for their full replacement value The insurance cover shall extend to include loss and damage of any part of the Works as a consequence of failure of

elements defectively designed or constructed with defective material or workmanship; and  
工程和承包商文件，以及用于工程的材料和设备用全部重置价值。 保险范围应扩大到包括因  
使用有缺陷的材料或工艺设计或建造的构件出现故障而导致的工程任何部分的损失和损坏；  
以及

(b) an additional amount of fifteen percent (15%) of such replacement value (or such other  
amount as may be specified in the Contract Data to cover any additional costs incidental  
to the rectification of loss or damage, including professional fees and the cost of  
demolition and removal of debris.

该重置价值的百分之十五（15%）的额外金额（或合同资料中可能规定的其他金额），以支  
付纠正损失或损害附带的任何额外费用，包括专业费用和拆除和清除碎片的费用。

The insurance cover shall cover the Employer and the Contractor against all loss or  
damage from whatever cause arising until the issue of the Taking-over certificate for the  
Works. Thereafter, the insurance shall continue until the date of the issue of the  
Performance Certificate in respect of any incomplete work for loss or damage arising from  
any cause occurring before the date of the issue of the Taking-over Certificate for the  
Works, and for any damage occasioned by the Contractor in the course of any operation  
carried out by the Contractor for the purpose of complying with the Contractors obligations  
under Clause 11 Defects after Taking Over and Clause 12 Tests after Completion.

保险范围应包括业主和承包商在颁发工程接收证书之前，因任何原因造成的所有损失或损害。  
此后，对于工程接收证书颁发之日前发生的任何原因导致的任何未完成工程的损失或损害以  
及在承包商为履行第 11 款【接收后缺陷】和第 12 款【竣工后试验】规定的承包商义务而进  
行的任何作业过程中，承包商造成的任何损失或损害，保险应持续到履约证书颁发之日为止。

However, the insurance cover provided by the actor for the Works may exclude any of the  
following:

但是，承包商为工程提供的保险可不包括以下任何一项：

1. the cost of making good any part of the Works which is defective (including defective  
material and workmanship) or otherwise does not comply with the Contract, provided that  
it does not exclude the cost of making good any loss or damage to any other part of the  
Works attributable to such defect or non-compliance;

修复任何有缺陷（包括有缺陷的材料和工艺）或不符合合同要求的工程部分的费用，但不排  
除因该等缺陷或不符合规定而对工程任何其他部分造成的任何损失或损害进行补偿的费用。

2. indirect or consequential loss or damage including any reductions in the Contract Price  
for delay

间接或后果性损失或损害，包括因延误而降低的合同价格；

3. wear and tear, shortages and pilferages; and  
磨损、短缺及盗窃

4. unless otherwise stated in the Contract Data, the risks arising from Exceptional Events.

除非合同资料中另有规定，例外事件引起的风险

#### 19.2.2 goods 货物

The Contractor shall insure, in the joint names of the Contractor and the Employer, the Goods and other things brought to Site by the Contractor to the extent specified and/or amount stated in the Contract Data (if not specified or stated, for their full replacement value including delivery to Site.

承包商应以承包商和业主的联合名义，按照合同资料中规定的范围和（或） 金额（如果未规定或说明，则按其全部重置价值，包括运至现场）为承包商运至现场的货物和其他物品投保。

The Contractor shall maintain this insurance from the time the Goods are delivered to the Site until they are no longer required for the Works.

从货物运至现场到工程不再需要为止，承包商应保持这一保险有效。

#### 9.2.3 Liability for breach of professional duty 违反职业责任的责任

To the extent, if any, that the Contractor is responsible for the design of part of the Permanent Works under Sub-clause 4.1 Contractors General obligations), and/or any other design under the Contract, and consistent with indemnities specified in Clause 17

Care of the Works and Indemnities:

在一定程度上，如果有的话，承包商应根据第 4 款【承包商的一般义务】的规定负责部分永久工程的设计和合同规定的任何其他设计，并根据第 17 条【工程照管和保障】规定的赔偿。

a. The Contractor shall effect and maintain professional indemnity insurance against liability arising out of any act, error or omission by the Contractor in carrying out the Contractors design obligations an amount not less than that stated in the Contract Data(if not stated, the amount agreed Employer); and

承包商应为承包商在履行其设计义务时的任何行为、 错误或疏忽引起的责任投保专业赔偿保险，保险金额不少于合同资料中规定的金额。（若未说明，则为与业主商定的金额）；

b. If stated in the Contract Data, such professional indemnity insurance shall also indemnify the Contractor against liability arising out of contractor's design obligations under the Contract that results in the Works (or Section or Part or major item of Plant, if any)completed, not being fit for the purpose(s) for which they are intended under Sub-clause 4. 1 Contractors General Obligations.

如果合同资料中有规定，此类专业赔偿保险还应赔偿承包商在履行合同规定的承包商设计义务时因承包商的任何行为、错误或疏忽而导致工程（或区段、部分或主要永久设备项目，如果有的话）竣工时不符合第 4 款规定的预期目的的责任。

The Contractor shall maintain this insurance for the period specified in the Contract Data.

承包商应在合同资料中规定的期限内维持该保险。

#### 19.2.4 Injury to persons and damage to property 人身伤害和财产损害



The Contractor shall insure, in the joint names of the Contractor and the Employer, against liabilities for death or injury to any person, or loss of or damage to any property (other than the Works) arising out of the performance of the Contract and occurring before the issue of the Performance Certificate other than loss or damage caused by an Exceptional Event.

承包商应以承包商和业主的联合名义，为因履行合同而引起的、在颁发履约证书前发生的任何人员伤亡、或任何财产（工程除外）的损失或损坏的责任投保。由特殊事件引起的损失或损害除外。

The insurance policy shall include a cross liability clause such that the insurance shall apply to the Contractor and the Employer as separate insureds.

保险单应包括可支付条款，以便保险作为单独被保险人适用于承包商和业主。

Such insurance shall be effected before the Contractor begins any work on the Site and shall remain in force until the issue of the Performance Certificate and shall be for not less than the amount stated in the Contract Data (if not stated, the amount agreed with the Employer).

此类保险应在承包商开始现场任何工作之前生效，并在颁发履约证书之前保持有效，且保险金额不得低于合同资料中规定的金额（如果未规定，则为与业主商定的金额）。

#### 19.2.5 Injury to employees 员工伤害

The Contractor shall effect and maintain insurance against liability for claim damages, losses and expenses (including legal fees and expenses) arising out of the execution of the Works in respect of injury, sickness, disease or death of any person employed by the Contractor or any of the Contractor's other personnel.

承包商应为因实施工程而引起的与承包商或任何承包商其他人员雇用的任何人员的伤害、疾病或死亡有关的索赔、损害、损失和费用（含法律费用）的责任投保并保持有效。

The Employer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

雇主也应根据保险单得到赔偿，但该保险可排除由于雇主或雇主人员的任何行为或疏忽而引起的损失和索赔。

The insurance shall be maintained in full force and effect during the whole time that the Contractor's Personnel are assisting in the execution of the Works. For any person employed by a Subcontractor, the insurance may be effected by the Subcontractor, but the Contractor shall be responsible for the Subcontractor's compliance with this Sub-clause.

在承包商人员协助实施工程的整个期间，保险应保持完全有效。对于分包商雇用的任何人员，保险可由分包商办理，但承包商应对分包商遵守本款的规定负责。

19.2.6 Other insurances required by Laws and by local practice 法律和当地惯例要求  
的其他保险

Contractor shall provide all other insurances required by the Laws of the countries  
where(any part of) the Works are being carried out, at the Contractor's own cost.

承包商应自费提供工程（任何部分）实施所在国法律要求的所有其他保险。

Other insurances required by local practice (if any) shall be detailed in the Contract Data  
and the Contractor shall provide such insurances in compliance with the details given, at  
the Contractors own cost.

当地惯例要求的其他保险（如有）应在合同资料中详细说明，承包商应根据给出的细节提供  
此类保险，费用由承包商承担。

20 Employer 's and Contractor 's Claims 雇主和承包商的索赔

20.1 claims 索赔

A claim may arise:

索赔可能由以下情况发生:

if the Employer considers that the Employer is entitled to any additional payment from the

如果业主认为业主有权从承包商处获得任何额外付款（或合同价格的减少）和 /或延长缺陷  
通知期:

(b) if the Contractor considers that the Contractor is entitled to any additional payment  
from the Employer and/or to EOT; or

如果承包商认为承包商有权从业主获得额外付款和 /或工期延长

(c) if either Party considers that he/she is entitled to another entitlement or relief against

the other Party. Such other entitlement or relief may be of any kind whatsoever(including

in connection with any certificate, determination, instruction, Notice, opinion or valuation of

the Employer) except to the extent that it involves any entitlement referred to in  
sub-paragraphs(a) and/or(b)above.

如果任何一方认为他 /她有权获得另一方的权利或责任免除。此类其他权利或责任免除可以

是任何形式的（包括与雇主的任何证书、决定、指示、通知、意见或估价有关），但涉及上  
述（a）和（b）项所述权利的情况除外。

in the case of a Claim under sub -paragraph(a)or(b)above, Sub -clause 20.2 Claims For  
Payment and/or EOT shall apply.

如果根据上述（a）或（b）项提出索赔，则第 20.2 款【付款和 /或EOT 索赔】应适用。

In the case of a Claim under sub -paragraph(c)above, where the other Party has disagreed

with the requested entitlement or relief(or is deemed to have disagreed if he/she does not respond within a reasonable time), a Dispute shall not be deemed to have arisen but the claiming Party may, by Notice refer the Claim to the Employers Representative and Sub-clause 3.5 Agreement or Determination shall apply. This Notice shall be given as soon as practicable after the claiming Party becomes aware of the disagreement(or deemed disagreement )and shall include details of the claiming Party's case and the other Party's disagreement(or deemed disagreement).

根据上述 (c) 项提出的索赔, 如果另一方不同意请求的权利或责任免除 (或如果他 /她在合理时间内未作出答复, 则视为不同意) 。不应视为已发生争端, 但索赔方可通过发出通知将索赔提交给雇主代表, 则第 3 款【协议或决定】应适用。本通知应在索赔方知悉到另一方有不同意见 (或视为异议) 后尽快发出, 并应包括索赔方的详细情况和另一方的异议 (或视为异议)。

## 20.2 Claims for payment and/or EOT 付款和工期延长索赔

If either Party considers that he/she is entitled to any additional payment by the other Party(or, in the case of the Employer, a reduction in the Contract Price )and/or to EOT (in the case of the Contractor)or an extension of DNP (in the case of the Employer) under any Clause of these Conditions otherwise in connection with the Contract, the following Claim procedure shall apply:

根据本条件的任何条款或与合同有关的其他条款, 如果任何一方认为他 /她有权得到另一方的任何额外付款 (如是雇主, 则减少是合同价格) 和 /或工期延长 (如是承包商) 或缺陷通知期的延期 (如是业主) , 适用以下索赔程序:

### 20.2.1 Notice of claim 索赔通知

The claiming Party shall give a Notice to the other Party, describing the event or Circumstance giving rise to the cost, loss, delay or extension of DNP for which the Claim is made as soon as practicable, and no later than 28 days after the claiming Party became aware, or should have become aware, of the event or circumstance(the "Notice of Claim in these Conditions.

索赔方应向另一方发出通知, 说明引起费用、损失、延误、或延长缺陷期索赔的事件或情况, 该索赔通知应尽快在索赔方察觉或应已察觉到事件或情况后 28 天内尽快提出。

if the claiming Party fails to give a Notice of Claim within this period of 28 days, the claiming Party shall not be entitled to any additional payment, the Contract Price shall not be reduced (in the case of the Employer as the claiming Party), the Time for Completion (in the case of the Contractor as the claiming Party) or the DNP(in the case of the Employer as the claiming Party) shall not be extended, and the other Party shall be discharged from any liability in connection with the event or circumstance giving rise to the Claim.

如果索赔方未能在 28 天内发出索赔通知, 索赔方无权获得任何额外付款, 合同价格不得降低 (如业主是索赔方) , 竣工时间 (如承包商作为索赔方) 或缺陷通知期不得延长 (如业主作为索赔方) , 另一方应免除与引起索赔的事件或情况有关的任何责任。

20.2.2 initial response 初始响应

If the other Party considers that the claiming Party has failed to give the Notice of Claim within the period of 28 days under Sub -clause 20.2.1 [notice of Claim] the other Party shall, within 14 days after receiving the Notice of Claim, give a Notice to the claiming Party accordingly(with reasons).

如果另一方认为索赔方未能在第 20.2.1 款【索赔通知】规定的 28 天期限内发出索赔通知，则另一方应在收到索赔通知后 14 天内相应地通知索赔方（并说明理由）。

if the other Party does not give such a Notice within this period of 14 days,the Notice of Claim shall be deemed to be a valid Notice.

如果另一方在 14 天内未发出此类通知，则索赔通知应视为有效通知。

the claiming Party receives a Notice from the other Party under this sub-clause and disagrees with the other Party or considers there are circumstances which justify late submission of the Notice of Claim, the claiming Party include in its fully detailed Claim under Sub -clause 20.2.4 Fully detailed claim details of such disagreement or why such late submission is justified(as the case may be).

如果索赔方收到另一方根据本款发出的通知，并与另一方意见不一致，或认为有理由迟交索赔通知，索赔方应在其根据第 20.2.4 款【详细索赔】提出的完全详细的索赔中，包括此分歧的细节或迟交的理由（视情况而定）。

20.2.3 contemporary records 同期记录

In this Sub -clause 20. 2, "contemporary records means records that are prepared or generated at the same time, or immediately after, the event Circumstance giving rise to the Claim.

在本款中第 20.2 款【同期记录】是指在引起索赔的事件或情况发生时或发生后立即准备或产生的记录。

The claiming Party shall keep such contemporary records as may be necessary to substantiate the claim.

索赔方应保存有助于证实索赔的同期记录。

Without admitting the Employers liability, the Employer may monitor the Contractors contemporary records and/or instruct the Contractor to keep additional contemporary records. The Contractor shall permit the Employer to inspect all these records during normal working hours(or at other times agreed by the Contractor), and shall if instructed submit copies to the Employer. Such monitoring, inspection or instruction(if any by the Employer shall not imply acceptance of the accuracy or completeness of the Contractor's contemporary records.

雇主未承认责任前，可检查记录保持情况，并可指示承包商保持进一步的同期记录。承包商应允许雇主在正常工作时间（或承包商同意的其他时间）检查所有这些记录，并应向雇主（若

有指示要求) 提供复印件。业主的此类监督、检查或指示(如有) 不应意味着接受承包商同期记录的准确性或完整性。

#### 20.2.4 Fully detailed claim 充分详细的索赔报告

In this Sub -clause 20.2, "fully detailed Claim" means a submission which includes:

在本款第 20.2 款中【充分详细的索赔报告】是指提交包括以下内容:

(a) a detailed description of the event or circumstance giving rise to the Claim

引起索赔的事件或情况的详细描述

(b) a statement of the contractual and/or other legal basis of the Claim,

索赔的合同和 / 或其他法律依据声明

(c) all contemporary records on which the claiming Party relies; and

所有相关的同期记录

(d) detailed supporting particulars of the amount of additional payment claimed (or amount of reduction of the Contract Price in the case of the Employer as the claiming Party and/or EOT claimed (in the case of Contractor) or extension of the DNP claimed (in the case of the Employer).

索赔额外付款金额 (或业主作为索赔方时, 可以是合同价格减少), 和/或索赔的工期延长 (承包商作为索赔方时) 或缺陷期延期 (业主作为索赔方时情况下) 的详细证明资料

Within other

在以下任何一个时间内

1. 84 days after the claiming Party became aware, or should have become aware, of the event or circumstance giving rise to the Claim, or

索赔方察觉或应已察觉到引起索赔的事件或情况后 84 天内, 或

2. such other period (if any) as may be proposed by the claiming Party and agreed by the other Party

索赔方提出并经另一方同意的其他期限 (如有) 。

the claiming Party shall submit to the Employers Representative a fully detailed Claim.

索赔方向雇主代表提交充分详细的索赔报告。

If within this time limit the claiming Party fails to submit the statement under sub-paragraph (b) above, the Notice of Claim shall be deemed to have lapsed it shall no longer be considered as a valid Notice, and the Employers Representative shall, within 14 days after this time limit has expired, give a Notice to the claiming Party accordingly.

如果在此期限内, 索赔方未能提交上述 ( b ) 项下的声明, 索赔通知应被视为已失效, 不再被视为有效通知, 雇主代表应在该期限到期后 14 天内相应地通知索赔方。

If the Employers Representative does not give such a Notice within this period of 14 days, the Notice of Claim shall be deemed to be a valid Notice. If the other Party disagrees with such deemed valid Notice of Claim the other Party shall give a Notice to the Employers Representative which shall include details of the disagreement. Thereafter, the agreement or determination of the Claim under Sub -clause 20.2.5 Agreement or determination of the Claim] shall include a review by the Employers Representative of such disagreement.

如果雇主代表未在 14 天内发出此类通知，则索赔通知应视为有效通知。如果另一方不同意此类视为有效的索赔通知，则另一方应向雇主代表发出通知，其中应包括不同意的细节理由。此后，根据第 20.2.5 款【索赔的协议或决定】对索赔的商定或决定应包括业主代表对此类分歧的审查。

if the claiming Party receives a Notice from the other Party under Sub -clause 20.2.4 and if the claiming Party disagrees with such Notice or considers there are circumstances which justify late submission of the statement under sub -paragraph (b) above, the fully detailed claim shall include details of the claiming Party's disagreement or why such late submission is justified (as the case may be).

如果索赔方收到另一方根据本款第 20.2.4 款发出的通知，并且索赔方不同意该通知，或者根据上述 (b) 项有必要证明迟交声明的合理性，充分详细的的索赔报告应包括索赔方的分歧或为什么这种迟交是合理的（视情况而定）的细节。

If the event or circumstance giving rise to the Claim has a continuing effect Sub -clause 20.2.6 Claims of continuing effect shall apply.

如果引起索赔的事件或情况具有持续影响，则应适用第 20.2.6 款【索赔的连续影响】

20.2.5 Agreement or determination of the claim 索赔协议或决定

after receiving a fully detailed claim under sub -clause 20.2.4 (fully detailed claim) or an interim or final fully detailed claim as the case may be) under sub - clause 20.2.6 claims of continuing effect, the employers representative shall proceed under sub -clause 3.5 agreement or determination) to agree or determine:

在收到根据第 20.2.4 款【充分详细的索赔报告】提出的完全详细的索赔或根据第 20.2.6 款【索赔的连续影响】提出的临时或最终充分详细的索赔（视情况而定）后，雇主代表应根据第 3.5 款【协议或决定】作出商定或决定。

(a) the additional payment (if any) to which the claiming Party is entitled (or the reduction of the Contract Price (in the case of the Employer

b) the extension (if any) of the Time for Completion (before or after its expiry) under Sub -clause 8.5 Extension of Time for Completion) (in the case of the Contractor as the claiming Party, or the extension (if any) of the DNP (before its expiry under Sub -clause 11.3 Extension of Defects Notification Period (in the case of the Employer as the claiming Party)).

(a) 索赔方有权得到的额外付款（如有）（或合同价格的减少（如果业主是索赔方））；

(b)根据第 8.5 款【工程竣工延期】（如果承包商是索赔方）可延长竣工时间（工期期满之前或之后），或缺陷通知期的延期（如有）（根据第 11.3 款【缺陷通知期限的延期】，在其期满之前）（如果业主是索赔方）

to which the claiming Party is entitled under the Contract

索赔方根据合同有权得到以上

if a Notice is given under Sub-clause 20.2.2 initial response) and/or under Sub-clause 20.2.4 Fully detailed Claim), the Claim shall nevertheless be agreed or determined in accordance with this Sub-clause 20.2.5. The agreement or determination of the Claim shall include whether or not the Notice of Claim shall be treated as a valid Notice taking account of the details (if any) included in the fully detailed claim of the claiming Party's disagreement with Notice(s) or why late submission is justified (as case may be). The circumstances which may be taken into account (but shall not be binding) may include:

如果根据第 20.2.2 款【初始响应】和（或）第 20.2.4 款【充分详细的索赔报告】发出了通知，则索赔仍应根据第 20.2.5 款商定或决定。索赔的协议或决定应包括索赔通知是否应视为有效通知，同时考虑到细节（如有）包括在充分详细的索赔报告中索赔方对此类通知的异议或延迟提交的理由（视情况而定）。可考虑（但不具有约束力）的情况可包括：

whether or to what extent the other Party would be prejudiced by acceptance of the late submission;

是否或在何种程度上接受延迟提交的另一方会受到损害

the case of the time limit under Sub -clause 20.2.1 Notice of Claim), any evidence of the other Party's prior knowledge of the event or circumstance giving rise to the Claim, which the claiming Party may include in its supporting particulars; and/or

在第 20.2.1 款【索赔通知】规定的期限内，若有另一方事先知悉引起索赔的事件或情况的任何证据，索赔方可在其证明资料中包括这些证据，和 /或

in the case of the time limit under Sub -clause 20.2.4 Fully detailed Claim, any evidence of the other Party's prior knowledge of the contractual and/or other legal basis of the Claim, which the claiming Party may include in its supporting particulars.

在第 20.2.1 款【索赔通知】规定的期限内，若有另一方事先知悉索赔的合同和 /或其他法律依据的任何证据，索赔方可在其证明资料中加以说明。

if, having received the fully detailed Claim under Sub -clause 20.2.4 Full detailed Claim, or in the case of a Claim under Sub -clause 20.2.6 Claims of continuing effect an interim or final fully detailed Claim (as the case maybe), the Employers Representative requires necessary additional particulars.

如果在根据第 20.2.4 款【充分详细的索赔报告】收到充分详细的索赔报告后，或在根据第 20.2.6 款【索赔的连续影响】提出索赔的情况下，收到一项临时或最终的充分详细的索赔报告（视情况而定），雇主代表要求提供必要的附加细节：

(1) he/she shall promptly give a Notice to the Contractor, describing the additional

particulars and the reasons for requiring them;

他/她应立即向承包商发出通知，说明额外的细节和要求这些细节的原因。

(2) he/she shall nevertheless give his/her response on the contractual or other basis of the Claim, by giving a Notice to the Contractor, within the time limit for agreement under Sub-clause 3.5.3 (Time limits)

但是，根据第 3.5.3 款【规定的期限】他 /她应在协议期限内，通过向承包商发出通知，在合同或索赔的其他基础上作出答复。

(3) as soon as practicable after receiving the Notice under sub -paragraph (1)above, the Contractor Shall submit the additional particulars; and

在收到上述分段所述通知后，承包商应尽快提交附加细节

(4) the Employers Representative shall then proceed under Sub -clause 3.5 Agreement or Determination) to agree or determine the matters under sub -paragraphs (a)and/or (b)above(and, for the purpose of Sub -clause 3. 5.3 (Time limits, the date the Employers Representative receives the additional particulars from the Contractor shall be the date of commencement of the time limit for agreement under Sub -clause 3.5.3).

雇主代表然后应根据第 3.5 款【协议或决定】商定或决定上述 ( a) 项和/或 (b) 项下的事项。(并且，对于第 3.5.3 款【期限】而言，业主代表从承包商处收到附加细节的日期应为第 3.5.3 款规定的协议期限的开始日期。 )

#### 20.2.6 Claims of continuing effect 索赔的连续影响

If the event or circumstance giving rise to a claim under this sub-clause 20.2 has a continuing effect:

根据第 20.2 款如果引起索赔的事件或情况具有连续影响，则

(a) the fully detailed Claim submitted under Sub -clause 20.2.4 Fully detailed Claim shall be considered as interim;

上述充分详细的索赔报告应被视为中间的：

(b)in respect of this first interim fully detailed Claim, the Employers Representative shall give his/her response on the contractual or other legal basis of the Claim, by giving a Notice to the claiming Party, within the time limit for agreement under Sub -clause 3.5.3 [Time limits);

对于第一次详细中间索赔报告，雇主代表应在第 3.5.3 款【期限】规定的协议期限内，根据合同或索赔的其他法律依据，向索赔方发出通知，作出答复。

(c) after submitting the first interim fully detailed Claim the claiming Party shall submit further interim fully detailed Claims at monthly intervals giving the accumulated amount of additional payment claimed(or the reduction of the Contract Price, in the case of the Employer as the claiming Party), and/or extension of time claimed (in the case of the Contractor as the claiming Party) or extension of the DNP(in the case of the Employer as



the claiming Party); and

在提交第一次详细中间索赔报告后， 索赔方应按月向雇主递交进一步的中间索赔报告， 说明  
累计索赔的延误时间和（或）金额（或如业主是索赔方，则减少合同价格）和 /或索赔工期  
的延长（如承包商是索赔方）或缺陷通知期的延长（如业主是索赔方） ；

(d) the claiming Party shall submit a final fully detailed Claim within 28 days after the end  
of the effects resulting from the event or circumstance, or within such other period as may  
be proposed by the claiming Party and agreed by the other Party. This final fully detailed  
Claim shall give the total amount of additional payment claimed (or the reduction of the  
Contract Price, in the case of the Employer as the claiming Party), and/or extension of  
time claimed (in the case of the Contractor as the claiming Party) or extension of the  
DNP (in the case of the Employer as the claiming Party).

索赔方应在引起索赔的事件或情况产生的影响结束后 28 天内，或在索赔方可能建议并经另  
一方同意的其他期限内， 递交一份最终索赔报告。 该最终的充分详细索赔报告应给出索赔的  
额外付款总额（或如业主是索赔方，则减少合同价格）和 /或索赔工期的延长（如承包商是  
索赔方）或缺陷通知期的延长（如业主是索赔方）

#### 20.2.7 General requirements 一般要求

After receiving the Notice of Claim, and until the Claims agreed or determined under  
Sub-clause 20.2.5 Agreement or determination of the Claim, in each payment under  
Sub-clause 14.7 Payment the Employer shall include such amounts for any Claim as have  
been reasonably Substantiated as due to the claiming Party under the relevant provision  
of the Contract.

在收到索赔通知并根据第 20.2.5 款【索赔协议或决定】商定或决定索赔之前，根据第 14.7  
款【支付】支付的每一笔款项中，雇主应包括已根据合同有关规定合理证明是有依据的、对  
任何索赔的应付款额

The employer shall only be entitled to claim any payment from the contractor and/or to  
extend the DNP , or set off against or make any deduction from any amount due to the  
contractor, by complying with this sub -clause 20.2.

业主仅有权根据本款第 20.2 款的规定，要求承包商支付任何款项和 /或延长缺陷通知期，或  
抵消或从应付给承包商的任何款项中扣除任何款项。

The requirements of this Sub -clause 20.2 are in addition to those of any other Sub -clause  
which may apply to the Claim. If the claiming Party fails to comply with this or any other  
Sub-clause in relation to the Claim any additional payment and/or any EOT (in the case of  
the Contractor as the claiming Party) or extension of the DNP (in the case of the Employer  
as the claiming Party), shall take account of the extent (if any) to which the failure has  
prevented or prejudiced proper investigation of the Claim by the Employer's  
Representative.

本款第 20.2 款要求是对适用于索赔的任何其他条款的追加要求。如果索赔方未能达到本款  
或有关任何索赔的其他条款的要求， 对给予任何追加付款（或如业主是索赔方， 则减少合同  
价格）和/或索赔工期的延长（如承包商是索赔方）或缺陷通知期的延长（如业主是索赔方），

应考虑索赔方此项未达到要求对雇主代表索赔的彻底调查造成阻碍或影响 (如果有) 的程度。

## 21. Disputes and Arbitration 争端和仲裁

### 21.1 Constitution of the DAAB DAAB 的组成 (DAAB:争端裁定/避免董事会)

Disputes shall be decided by a DAAB in accordance with Sub-clause 21.4 [Obtaining DAAB's Decision]. The Parties shall jointly appoint the member(s) of the DAAB within the time stated in the Contract Data (if not stated, 28 days) after the date that both Parties have signed the Contract Agreement.

争端应由 DAAB 根据第 21.4 款【获得 DAAB 的决定】作出决定。双方应在双方签订合同协议之日起，在合同资料规定的时间内 (如未规定，为 28 天) 共同任命 DAAB 成员。

The DAAB shall comprise, as stated in the Contract Data, either one suitably qualified member (the "sole member") or three suitably qualified members (the "members"). If the number is not so stated, and the Parties do not agree otherwise, the DAAB shall comprise three members.

如合同资料所述，DAAB 应由一名合格成员 (“唯一成员”) 或三名合格成员 (“成员”) 组成。如果没有如此说明人数，且双方另有协议，DAAB 应由三名成员组成。

The sole member or three members (as the case may be) shall be selected from those named in the list in the Contract Data, other than anyone who is unable or unwilling to accept appointment to the DAAB.

唯一成员或三名成员 (视情况而定) 应从合同资料清单中列出的成员中选出，不能或不愿接受 DAAB 任命的成员除外。

If the DAAB is to comprise three members, each Party shall select one member for the agreement of the other Party. The Parties shall consult both these members and shall agree the third member, who shall be appointed to act as chairperson.

如果 DAAB 由三人组成，各方均应推荐一人，报他方认可，双方应同这些成员协商，并商定第三名成员，此人应任命为主席。

The DAAB shall be deemed to be constituted on the date that the Parties and the sole member or the three members (as the case may be) of the DAAB have all signed a DAAB Agreement.

DAAB 应视为在双方和唯一成员或 DAAB 的三个成员 (视情况而定) 均签署 DAAB 协议之日成立。

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DAAB consults, shall be mutually agreed by the Parties when agreeing the terms of the DAAB Agreement. Each Party shall be responsible for paying one-half of this remuneration.

唯一成员或三个成员中的每一个成员的报酬条款，包括 DAAB 咨询的任何专家的报酬，应由双方在商定 DAAB 协议条款时共同商定。各方应负责支付该报酬的一半。

If at any time the Parties so agree, they may appoint a suitably qualified person or persons to replace any one or more members of the DAAB. Unless the Parties agree otherwise, a replant DAAB appointed if a member declines to act or is unable to act as a result of death, illness, disability, resignation or termination of appointment. The replacement member shall be appointed in the same manner as the replaced member was required to have been selected or agreed, as described in this Sub -clause.

如果经双方同意，他们可以在任何时候任命一位或几位有适当资格的人员，替代 DAB 的任何一位或几位成员。除非双方另有协议，如果成员拒绝履行职责或因死亡、疾病、残疾、辞职或任命终止而无法履行职责，则任命一名替代 DAAB。替换成员的任命方式应与本款所述的被替换成员被选定或同意的方式相同。

The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone.

对任何成员的任命，可以经过双方相互协议终止，但雇主或承包商都不能单独采取行动。

Unless otherwise agreed by both Parties, the term of the DAAB (including the appointment of each member) shall expire either:

除非双方另有协议，DAAB 的期限（包括每名成员的任命）应在以下任一时间到期：

(a) on the date the discharge shall have become, or deemed to have become, effective under Sub -clause 14.12 [Discharge] or

根据第 14.12 款【解除】的规定，解除证明已经生效或认为已经生效的日期，或

(b) 28 days after the DAAB has given its decision on all Disputes, referred to it under Sub-clause 21.4 [Obtaining DAAB's Decision] before such discharge has become effective.

在 DAAB 根据第 21.4 款【获得 DAAB 的决定】就所有争端作出决定后 28 天，在该等解除生效之前。

Whichever is later

以较迟者为准

However, if the Contract is terminated under any Sub-clause of these Conditions or otherwise, the term of the DAAB(including the appointment of each member) shall expire

28 days after:

但是，如果合同根据本条件的任何子条款或其他条款终止，DAAB 的期限（包括各成员的任命）应在以下日期后 28 天到期：

1. the DAAB has given its decision on all Disputes, which were referred to it (under Sub-clause 21.4 [ Obtaining DAAB'S Decision]) within 224 days after the date of termination; or

DAAB 已在终止日期后 224 天内就提交给它的所有争端作出决定（根据第 21.4 款【获得 DAAB 的决定】；或

2. the date that the Parties reach a final agreement on all matters(including payment)in connection with the termination.

双方就与终止有关的所有事项（包括付款）达成最终协议的日期。

Whichever is earlier

以较早者为准

21.2 Failure to Appoint DAAB Member(s) 未能委任 DAAB 成员

If any of the following conditions apply, namely:

如果以下任何条件适用，即：

(a) if the DAAB is to comprise a sole member, the Parties fail to agree the appointment of this member by the date stated in the first paragraph of Sub -clause 21.1 [Constitution of the DAAB]; or

如果 DAAB 将由一名唯一成员组成，则双方未能在第 21.1 款【DAAB 的组成】第一段中规定的日期前商定该成员的任命；或

(b)if the DAAB is to comprise three persons, and if by the date stated in the first paragraph of Sub -clause 21.1 [Constitution of the DAAB];

如果 DAAB 由三人组成，并且在第 21.1 款【DAAB 的组成】第一段中规定的日期之前；

1. either Party fails to select a member(for agreement by the the other Party);

任何一方未选择成员（另一方同意）；

2. ether party fails to agree a member selected by the other Party; and/or

一方未能同意另一方选定的成员；和 /或

3. the Parties fail to agree the appointment of the third member(to act as chairperson)of the DAAB;

双方未能就 DAAB 第三位成员（担任主席）的任命达成一致意见；

(c) the Parties fail to agree the appointment of a replacement within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death illness, disability, resignation, or termination of appointment; or

在唯一成员或三名成员中的一名成员拒绝履行职责或因死亡、疾病、残疾、辞职或任命终止而无法履行职责之日起 42 天内，双方未能就替代人选的任命达成一致意见；或

(d) if, after the Parties have agreed the appointment of the member(s) or replacement, such appointment cannot be effected because one Party refuses or fails to sign a DAAB Agreement with any such member or replacement (as the case may be)within 14 days of the other Party's request to do so,

如果在双方同意任命或更换成员后，由于一方拒绝或未能在另一方要求的 14 天内与任何该等成员或更换成员（视情况而定）签署 DAAB 协议，该任命无法生效。

then the appointing entity or official named in the Contract Data shall, at the request of either or both Parties and after due consultation with both Parties appoint the member(s) of the DAAB (who, in the case of sub -paragraph (d) above, shall be the agreed member(s) or replacement). This appointment shall be final and conclusive.

然后，合同资料中指定的任命实体或官员应根据任何一方或双方的要求，并在与双方适当协商后，任命 DAAB 成员（在上述（d）项情况下，该成员应为商定的成员或替代者）。该任命应是最终的和决定性的。

Thereafter, the Parties and the member(s) so appointed shall be deemed to have signed and be bound by a DAAB Agreement under which:

此后，双方和如此任命的成员应被视为已签署并受 DAAB 协议约束，根据该协议：

1. the monthly services fee and daily fee shall be as stated in the terms of the appointment;

and

月服务费和日服务费应符合任命条款的规定；以及

2. the law governing the DAAB Agreement shall be the governing law of the Contract defined in Sub -clause 1.4 [Law and Language].

适用于 DAAB 协议的法律应为第 1.4 款【法律和语言】中定义的合同适用法律。

Each Party shall be responsible for paying one -half of the remuneration of the appointing entity or official. If the Contractor pays the remuneration in the Contractor shall include one-half of the amount of such remuneration in a Statement and the Employer shall then pay the Contractor in accordance with the contract. If the Employer pays the remuneration in full, the Employer shall include one-half of the amount of such remuneration as a deduction under sub -paragraph (b) of Sub -clause 14.6.1 [Notice of Interim Payment].

各方应负责支付指定实体或官员报酬的一半。如果承包商支付了承包商的报酬，则应在报表中包括该报酬金额的一半，然后雇主应根据合同向承包商支付报酬。如果雇主全额支付了报酬，雇主应将此类报酬的一半根据第 14.6.1 款【期中付款通知】第（b）项的规定扣除。

### 21.3 Avoidance of Disputes 避免纠纷

If Parties so agree, they may jointly request (in writing) the DAAB to provide assistance and/or informally discuss and attempt to resolve any issue or disagreement that may have arisen between them during performance of the Contract. If the DAAB becomes aware of an issue or disagreement, it may invite the Parties to make such a joint request.

如果双方同意，他们可以共同（以书面形式）请求 DAAB 提供协助和 / 或非正式讨论并试图解决双方在履行合同期间可能出现的任何问题或分歧。如果 DAAB 意识到一个问题或分歧，它可以邀请当事各方提出这样的联合请求。

Such joint request may be made at any time, except during the period that the Employers Representative is carrying out his/her duties under Sub-clause 3.5 [Agreement or Determination] on the matter at issue or in disagreement unless the Parties agree

otherwise.

这种联合请求可随时提出，但在雇主代表根据第 3.5 款【协议或决定】就有争议或有分歧的事项履行其职责期间除外，除非双方另有协议。

Such informal assistance may take place during any meeting, Site visit or otherwise. However, unless the Parties agree otherwise, both Parties shall be present at such discussions. The Parties are not bound to act on any advice given during such informal meetings, and the DAAB shall not be bound in any future Dispute resolution process or decision by any views or advice given during the informal assistance process, whether provided orally or in writing.

此类非正式协助可在任何会议、实地考察或其他过程中进行。但是，除非双方另有协议，否则双方应出席此类讨论。双方无义务根据非正式会议期间提出的任何建议采取行动，DAAB 也不受任何未来争端解决程序或决定的约束，无论是口头还是书面形式，都不受非正式援助过程中提出的任何意见或建议的约束。

#### 21.4 Obtaining DAAB's Decision 获得 DAAB 的决定

If a Dispute arises between the Parties then either Party may refer the Dispute to the DAAB for its decision (whether or not any informal discussions have been held under Sub-clause 21.3 [Avoidance of Disputes]) and the following provisions shall apply.

如果双方之间发生争议，则任何一方均可将争议提交 DAAB 决定（无论是否根据第 21.3 款【避免争议】进行了任何非正式讨论），并应适用以下规定。

##### 21.4.1 Reference of a Dispute to the DAAB 争端提交 DAAB

The reference of a Dispute to the DAAB (the reference in this Sub-clause 21.4) shall:

争端提交 DAAB（本款第 21.4 款中的提及）应：

(a) if Sub-clause 3.5 [Agreement or Determination] applied to the subject matter of the Dispute, be made within 42 days of the date of the relevant NOD under Sub-clause 3.5.5 [Dissatisfaction with Employer Representative's determination]. If Dispute is not referred to the DAAB within this period of 42 days, such NOD shall be deemed to have lapsed and no longer be valid.

如果第 3.5 款【协议或决定】适用于争议的主题，则相关的不满通知应根据第 3.5.5 款【对雇主代表的决定不满】之日起的 42 天内提出。如果争议在 42 天内未提交 DAAB，则该不满通知应视为已失效，不再有效。

(b) state that it is given under this Sub-clause ;

说明是根据本款发出的；

(c) set out the referring Party's case relating to the Disputed

列出了相关方有关争议的案例；

(d) be in writing, with a copy to the other Party; and

以书面形式，并将副本送交另一方；

(e) for a DAAB of three persons, be deemed to have been received by the DAAB on the date it is received by the chairperson of the DAAB.

对于三人的 DAAB，应视为在 DAAB 主席收到之日已被 DAAB 收到。

The reference of a Dispute to the DAAB under this Sub -clause shall, unless prohibited by law, be deemed to interrupt the running of any applicable statute of limitation or prescription period.

除非法律禁止，根据本条向 DAAB 提及争议应被视为中断任何适用的时效法规或诉讼时效的运行。

#### 21.4.2 The Parties' obligations after the reference 提交后的双方义务

Both Parties shall promptly make available to the DAAB all information access to the Site, and appropriate facilities, as the DAAB may require for the purposes of making a decision on the Dispute.

双方应立即向 DAAB 提供 DAAB 可能要求的进入现场的所有信息以及适当的设施，以便对争议作出决定。

Unless the Contract has already been abandoned or terminated, the Parties shall continue to perform their obligations in accordance with the Contract.

除非合同已被废弃或终止，否则双方应继续按照合同履行其义务。

#### 21.4.3 The DAAB'S decision DAAB 的决定

The DAAB shall complete and give its decision within:

DAAB 应在以下范围内完成并作出决定：

(a) 84 days after reference: or

提交后 84 天：或

(b) such period as may be proposed by the DAAB and agreed by both Parties.

DAAB 提出并经双方同意的期限。

However, if at the end of this period, the due date(s) for payment of any DAAB member's invoice(s) has passed but such invoice(s) remains/remains unpaid, the DAAB shall not be obliged to give its decision until such outstanding invoice(s) has/have been paid in full, in which case the DAAB shall give its decision as soon as practicable after payment has been received.

但是，如果在该期限结束时，任何 DAAB 成员发票的付款到期日已过，但该发票仍未支付，则 DAAB 无义务作出决定，直到该未付发票已全额支付为止，在这种情况下，DAAB 应在收到付款后尽快作出决定。

The decision shall be given in writing to both Parties, shall be reasoned, and shall state that it is given under this Sub -clause.

该决定应以书面形式发给双方，并应具有合理性，并应说明是根据本款作出的。

The decision shall be binding on both Parties, who shall promptly comply with it whether or not a Party gives a notice of dissatisfaction with respect to such decision under this Sub -clause.

该决定对双方均有约束力，无论一方是否就本条项下的该决定发出不满通知，该方均应立即遵守该决定。

If the decision of the DAAB requires a payment of an amount by one Party to the other Party

如果 DAAB 的决定要求一方向另一方支付一笔款项：

1. subject to sub -paragraph 2 below, this amount shall be immediately due and payable without any Statement or Notice; and

除下文第 2 款另有规定外，该笔款项应立即到期应付，无需任何声明或通知；以及

2. the DAAB may (as part of the decision), at the request of a Party but only if there are reasonable grounds for the DAAB to believe that the payee Will be unable to repay such amount in the event that the decision is reversed under Sub -clause 21.6 [Arbitration], require the payee to provide an appropriate security (at the DAAB's sole discretion) in respect of such amount.

DAAB 可（作为决定的一部分）应一方的请求，但前提是 DAAB 有合理理由相信，如果根据第 21.6 款【仲裁】的规定撤销决定，收款人将无法偿还该金额，则 DAAB 可要求收款人提供适当的担保品（由 DAAB 自行决定）对该金额进行担保。

The DAAB proceeding shall not be deemed to be an arbitration and the DAAB shall not act as arbitrator(s).

DAAB 程序不应被视为仲裁，DAAB 也不应担任仲裁员。

21.4.4 Dissatisfaction with DAAB'S decision 对 DAAB 决定的不满

If either Party is dissatisfied With the DAAB'S decision:

如果任何一方对 DAAB 的决定不满意：

(a) such Party may give a Notice of dissatisfaction to the other Party, with a copy to the DAAB

该方可向另一方发出不满通知，并将一份副本送交 DAAB。

(b) this NOD shall state that it is a "Notice of Dissatisfaction with the DAAB's Decision " and shall set out the matter in Dispute and reason(s) for dissatisfaction; and

本不满通知应说明其为“对 DAAB 决定不满通知”，并应列出争议事项和不满理由；以及

(C) this NOD shall be given within 28 days after receiving the DAAB's decision.



不满通知应在收到 DAAB 决定后 28 天内发出。

If the DAAB fails to give its decision within the period stated in Sub -clause 21.4.3 [The DAAB's decision], then either Party may, within 28 days after this period has expired, give a notice of dissatisfaction to the other Party in accordance with sub-paragraphs(a)and (b)above.

如果 DAAB 未能在第 21.4.3 款【DAAB 的决定】规定的期限内作出决定，则任何一方可在该期限到期后 28 天内，根据上述 (a) 和 (b) 项向另一方发出不满通知。

Except as stated in the last paragraph of Sub -clause 3.5.5 [Dissatisfaction with Employers Representatives determination], in Sub -clause 21.7 [Failure to Comply With DAAB's Decision] and in Sub -clause 21.8 [No DAAB In Place], neither Party shall be entitled to commence arbitration of a Dispute unless a notice of dissatisfaction in respect of that Dispute has been given in accordance with this Sub -clause 21.4.4.

除第 3.5.5 款【对雇主代表的决定的不满】的最后一段、第 21.7 款【不遵守 DAAB 的决定】和第 21.8 款【没有 DAAB 在场】所述的情况外，任何一方均无权对争议进行仲裁，除非根据本条第 21.4.4 款已就该争议发出不满通知。

If the DAAB has given its decision as to a matter in Dispute to both Parties, and no notice of dissatisfaction under this Sub -clause 21.4.4 has been given by either Party within 28 days after receiving the DAAB's decision, then the decision shall become final and binding on both Parties.

如果 DAAB 已就争议事项向双方作出决定，且任何一方在收到 DAAB 的决定后 28 天内未发出第 21.4.4 款所述不满通知，则该决定应为最终决定，对双方均具有约束力。

If the dissatisfied Party is dissatisfied with only part(s) of the DAAB's decision:

如果不满意的一方仅仅是对 DAAB 的部分决定不满意：

1. this part(s) shall be clearly identified in the notice of dissatisfaction;

该部分应在不满意通知中明确指出；

2. this part(s), and any other parts of the decision that are affected by such part(s) or rely on such part(s) for completeness, shall be deemed to be severable from the remainder of the decision: and

本部分，以及受该部分影响或依赖该部分作为完整性的本决定的任何其他部分，应被视为与本决定的其余部分可分割，以及

2. the remainder of the decision shall become final and binding on both Parties as if the notice of dissatisfaction had not been given.

如果不满意的一方只对 DAAB 决定的一部分不满意：

该决定的其余部分应成为最终决定，对双方均具有约束力，如同未发出不满通知一样。

21.5 Amicable settlement 友好解决

Where a NOD has been given under Sub -clause 21. 4 Obtaining DAAB's Decision, both Parties shall attempt to settle the Dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, arbitration may be commenced on or after the twenty -eighth(28th)day after the day on Which this NOD was given, even if no attempt at amicable settlement has been made.

如果已按照上述第 21.4 款【获得 DAAB 的决定】发出了表示不满的通知，双方应在着手仲裁前，努力以友好方式来解决争端。但是，除非双方另有协议，仲裁可以在表示不满的通知发出后第 28 天或其后着手进行，即使未曾做过友好解决的努力。

#### 21.6 Arbitration 仲裁

Unless settled amicably, and subject to Sub -clause 3.5.5 Dissatisfaction with Employer's representatives determination], Sub -clause 21, 4.4 Dissatisfaction with DAAB's decision, Sub -clause 21.7 Failure to Comply With DAAB's Decision and Sub -clause 21. 8 No DAAB In Place, any Dispute in respect of which the DAAB's decision f any) has not become final and binding shall be finally settled by international arbitration. Unless otherwise agreed by both parties:

经 DAB 对之做出的决定（如果有）未能成为最终的和有约束力的任何争端，除非已获得友好解决，根据第 3.5.5 款【对雇主代表的不满决定】，第 21.4.4 款【对 DAAB 决定的不满】，第 21.7 款【未能遵守 DAAB 的决定】以及第 21.8【无 DAAB 进行工作】，任何争议应通过国际仲裁对其作出最终裁决。除非双方另有协议：

(a) the Dispute shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce

争端应根据国际商会仲裁规则最终解决；

(b)the Dispute shall be settled by one or three arbitrators appointed in accordance with these Rules: and

争端应由按照上述规则任命的三位仲裁人负责解决；

(c)the arbitration shall be conducted in the ruling language defined Sub -clause 1.4 Law and Language.

仲裁应使用第 1.4 款【法律和语言】规定的仲裁语言。

the arbitrator(s)shall have full power to open up, review and revise any certificate, determination (other than a final and binding determination instruction, opinion or valuation of the Employer and/or of the Employer's representative, and any decision of the DAAB(other than a final and binding decision)relevant to the Dispute. Nothing shall disqualify the natural person(s)who has/have acted on behalf of the Employer under the Contracting called as witness(es)and giving evidence before the arbitrator(s)on any matter whatsoever relevant to the Dispute.

仲裁人应有权公开、审查和修改与该争端有关的雇主（或其代表）发出的任何证书、决定（除最终和有约束力的决定外）、指示、意见、或估价，以及 DAB 的任何决定。根据合同规定，代表雇主行事的自然人不得因与争议有关的任何事项而被传唤为证人并在仲裁员面前作证。

in any award dealing with costs of the arbitration, the arbitrator(s) may take account of the extent (if any) to which a Party failed to cooperate with the other Party in constituting a DAAB under Sub -clause 21.1 Constitution of the DAAB and/or Sub -clause 21.2 Failure to Appoint DAAB Member).

在处理仲裁费用的任何裁决中，根据第 21.1 款【DAAB 的组成】和 /或第 21.2 款【未能任命 DAAB 成员】，仲裁员可以考虑一方在构成 DAAB 时未与另一方合作的程度（如果有的话）。

Neither Party shall be limited in the proceedings before the arbitrator(s) to the evidence or arguments previously put before the DAAB to obtain its decision, or to the reasons for dissatisfaction given in the Party's NOD under Sub-clause 21.4 Obtaining DAAB's Decision]. Any decision of the DAAB shall be admissible in evidence in the arbitration.

任一方在仲裁人面前的诉讼中，应不受以前为获得 DAAB 的决定而向其提供的证据或论据、或根据第 21.4 款【获得 DAAB 的决定】在其表示不满的通知中提出的不满意理由的限制。

DAAB 的任何决定都应可以作为仲裁中的证据。

Arbitration may be commenced before or after completion of the Works. The obligations of the Parties to the DAAB shall not be altered by reason of any arbitration being conducted during the progress of the Works.

仲裁可在工程竣工之前或之后开始。双方的义务 DAAB 不得因工程施工期间进行的任何仲裁而改变。

if an award requires a payment of an amount by one Party to the other Party, this amount shall be immediately due and payable without any Statement or Notice.

如果裁决要求一方向另一方支付一笔款项，该款项应立即到期支付，无需任何声明或通知。

21.7 Failure to comply with DAAB 's decision 未能遵守 DAAB 的决定

In the event that a Party fails to comply with any decision of the DAAB, whether binding or final and binding, then the other Party may, without prejudice to any other rights it may have, refer the failure itself directly to arbitration under Sub -clause 21.6 Arbitration) in which case Sub -clause 21.4 Obtaining DAAB'S Decision and Sub -clause 21.5 amicable Settlement shall not apply to this reference. The arbitral tribunal (constituted under Sub-clause 21.6 Arbitration) shall have the power, by way of summary or other expedited procedure, to order, whether by an interim or provisional measure or an award (as may be appropriate under applicable law or otherwise), the enforcement of that decision.

如果一方未能遵守 DAAB 的任何决定，无论是有约束力的还是最终的和有约束力的，则另一方可以在不损害其可能拥有的其他权利的情况下，根据第 21.6 款【仲裁】的规定，将上述未遵守决定的事项提交仲裁，在此情况下，第 21.4 款【取得争端裁决委员会的决定】和第 21.5 款【友好解决】的规定应不适用。仲裁庭（根据第 21.6 款仲裁组成）应有权通过简易程序或其他快速程序是通过暂时或临时措施或裁决（根据适用法律或其他适当方式）命令执行该决定

the case of a binding but not final decision of the DAAB, such interim or provisional

measure or award shall be subject to the express reservation that the rights of the Parties as to the merits of the Dispute are reserved until they are resolved by an award,  
在 DAAB 有约束力但非最终决定的情况下， 此类暂时或临时措施或裁决应明确保留， 即保留  
双方关于争议案情的权利，直到裁决解决为止。

Any interim or provisional measure or award enforcing a decision of the DAAB which has not been complied with, whether such decision is binding or final and binding, may also include an order or award of damages or other relief.

执行 DAAB 决定的任何临时或临时措施或裁决， 如未遵守， 无论该决定是否具有约束力或最终约束力， 也可包括损害赔偿或其他免于责任的命令或裁决。

21.8 No DAAB in place 无 DAAB 进行工作

If a Dispute arises between the Parties in connection with, or arising out of the Contract or the execution of the Works and there is no DAAB in place (or no DAAB is being constituted), whether by reason of the expiry of the DAAB'S appointment or otherwise:

如果双方间因与合同或工程实施相关或由其引起的问题产生争端。且又因 DAB 任命期满或其他原因，没有 DAAB 进行工作（或 DAAB 正在组建），则：

(a) sub-clause 21.4 Obtaining DAAB's Decision and Sub-clause 21.5 Amicable Settlement shall not apply; and

第 21.4 款【取得 DAAB 的决定】和第 21.5 款【友好解决】的规定应不适用；

(b) the Dispute may be referred by either Party directly to arbitration under Sub-clause 21.6 Arbitration without prejudice to any other rights the Party may have.

任何一方均可以根据第 21.6 款【仲裁】的规定，直接提交仲裁。但不得损害双方可能享有的任何其他权利。

**PARTICULAR CONDITIONS OF CONTRACT**  
**合同专用条件**

**S0 Conditions of Contract**  
**合同条件**

The Conditions of Contract for the Contract shall mean the General Conditions, the Particular Conditions and Appendices.  
合同条件包含通用条件、专用条件及附件。

**The General Conditions means the FIDIC Conditions of Contract for EPC/ Turnkey Projects 2017 Edition.**

**通用条件是菲迪克设计采购施工/交钥匙工程合同条件(中英文) 2017 版本。**

The following Clauses of Particular Conditions of Contract shall be read in conjunction with and shall be deemed to modify the relevant Clauses of General Conditions.  
下列合同专用条件应与一般条件相关的条件一起阅读，并视为修改相关条件。

**S1 General Provisions****一般规定****S1.1 Definitions****定义**

(i) DELETE the Clause 1.1.16 and REPLACE BY the following:

删除条款 1.1.16 和更换如下:

1.1.16 “Cost” means all expenditure reasonably incurred by the Contractor on site including any on site overhead expense for undertaking the Works but does not include profit.

“成本(费用)”系指承包商在现场内发生的所有合理开支,包括承办本工程的管理费用但不包括利润。

(ii) DELETE the entire Clause 1.1.19 & 1.1.20.

删除整条条款 1.1.19 & 1.1.20.

**S1.4 Law and Language****法律与语言**

Add the followings as the last paragraph of Clause 1.4:

增加以下内容作为第 1.4 条的最后一段:

The Contractor shall make himself fully acquainted with the Laws and shall conform in all respects therewith during the continuance of the Contract. The Contractor shall conform similarly to any such Laws, which may come into force after the Contract Agreement.

承包商应使自己充分了解法律,并应在合同存续期间在所有方面遵守法律。承包商应遵守合同协议书生效之后的任何此类法律。

**S1 General Provisions (Cont'd)**  
**一般规定 (续)**

**S1 General Provisions (Cont'd)**  
**一般规定 (续)**

**S1.6 Contract Agreement**  
合同协议

Delete the words “The costs of stamp duties and similar charges (if any) .... shall be borne by the Employer.” In Sub-Clause 1.6 and replace with “The costs of stamp duties and similar charges (if any) .... shall be borne by the Contractor.”

删除第 1.6 款中的“...印花税和类似费用(如果有)应由雇主承担”，并替换为“...印花税和类似费用(如果有)应由承包商承担”。

**S.1.16 Private and Confidential Contract**  
保密合同

INSERT the following text as the new Sub-Clause 1.16  
插入以下文本作为新的第 1.16 款。

The Contractor shall treat the Contract as private and confidential, except to the extent necessary to carry out obligations under it or to comply with applicable Laws. The Contractor shall not publish, permit to be published, or disclose any particulars of the Works to any third party or in any trade or technical paper or elsewhere without the prior written agreement of the Employer.

承包商应将本合同视为私有和保密的，但履行其义务或遵守适用法律所必需的除外。未经雇主事先书面同意，承包商不得向任何第三方或在任何行业或技术文件或其他地方发布、允许发布或披露工程的任何细节。

If the Contractor discloses the Employer’s confidential information and documents, the Contractor shall be fully responsible for the damage incurred and the Employer shall be entitled to terminate this Contract.

承包商泄露雇主的保密资料和文件的，承包商应当对造成的损失负全部责任，雇主有权解除合同。

**S2 The Employer**  
**雇主**

**S2.4 Employer’s Financial Arrangement**  
雇主的资金安排

DELETE the Clause 2.4.  
删除第 2.4 条。

**S4 The Contractor****承包商****S.4.1 Contractor 's General Obligations****承包商的一般义务**

**ADD the following at the end of the Clause 4.1:**

在第 4.1 条结尾处添加以下内容:

承包商需向雇主对其建议的工程实施方案作出满足合同要求的承诺, 包括设计、管理人员配置、人员变更等, 及完全上负违约责任。

**S 4.2 Performance Security****履约担保**

**ADD the following at the end of the Clause 4.2:**

在第 4.2 条结尾处添加以下内容:

If the Contractor defaults in submitting a conforming Performance Security, the Employer reserves the right to withhold from Interim Payment Certificates an amount or amounts not exceeding the amount and currencies stated in the Appendix to Tender. The Contractor shall not be entitled to any claim for interest or any other loss or damage in respect of the withholding of any such amount.

如果承包商未能提交合格的履约保函, 雇主保留从期中付款证书中扣留不超过投标书附录中规定的金额和货币的权利。承包商无权因扣留任何此类金额而要求任何利息或任何其他损失或损害。

If the default continues, the said amount withheld shall only be released after the issuance of the Taking Over Certificate for the whole Works. Any price inserted in the Contract for fulfilling his obligations under this Clause shall also be omitted.

如果违约行为持续存在, 则只有在颁发整个工程的接收证书后, 才能释放扣留的上述金额。合同中为履行本条款规定的义务而填入的任何价格也应扣除。

**S4.4 The Subcontractors****分包商**

**REPLACE the 1<sup>st</sup> line with the followings:**

用以下替换第一行:

**The Contractors shall not subcontract the whole or part of the Works without the prior written permission /approval of the Employer.**

未经雇主事先书面许可, 承包商不得分包全部或部分工程。

**S4.5 Nominated Subcontractors****指定的分包商**

**DELETE the Clause 4.5.**

删除第 4.5 条。



**S6 Staff and Labour****员工****S6.4 Labour Laws****劳动法**

REPLACE the Clause 6.4 with the following:

用以下替换第 6.4 条:

The Contractor shall at all times comply with all the relevant /applicable labour laws, regulations and welfare schemes in Thailand in relation to the Contractor's personnel and their employment, health, safety, welfare, visa, permits, verification, etc.

承包商应随时遵守泰国所有与承包商人员、雇用、健康、安全、福利、签证、许可证、核实等有关/适用的劳动法、法规和福利计划。

The Contractor shall also comply with laws including but limited to applicable laws set out in the Appendix to Tender.

承包商也应遵守法律，包括但仅限于投标书附录中规定的适用法律。

It is clarified that the Employer shall at no time be responsible to for the actions or non-action of the Contractor in relation to compliance with any labour laws, rules and schemes applicable from time to time.

明确指出，雇主在任何时候都不应对承包商在遵守任何的劳动法、规则、方案方面的行动或不采取行动而负责。

**S6.5 Working Hours****工作时间**

DELETE the Clause 6.5 and REPLACE BY the followings:

删除第 6.5 条和更换如下:

The Contractor shall comply with current Thailand legislation or regulations regarding working hours to employees.

承包商应当遵守现有泰国法律有关员工工作时间的法规。

**S6.12 Key Personnel****关键人员**

INSERT the following text as the last paragraph of 6.12.

插入以下文本作为 6.12 款最后一段。

Key personnel shall not be changed without the consent of the Employer. If the Contractor changes key personnel without the consent of the Employer, the Employer has the right to impose a fine of 100,000 Thai baht on the Contractor.

未经雇主同意不得变更关键人员。若未经雇主同意，承包商擅自变更关键人员，雇主有权对承包商罚款 10 万泰铢。

**S8 Commencement Delay and Suspension****开工、延误和暂停****S8.2 Time for Completion****竣工时间**

ADD the following at the end of the Clause 8.2:

在第 8.2 条末端加上以下：

Including any Works being undertaken by sub-contractors.

包括分包商承担的任何工程。

**S8.5 Extension of Time for Completion****竣工时间的延长**

INSERT the following text as the second paragraph of this Sub-Clause:

插入以下文本作为本款的第二段：

The Contractor shall be entitled to the extension of the Time for Completion under the abovementioned paragraph, provided that:

- i. the Contractor has made reasonable and proper efforts to avoid or mitigate such delay; and
- ii. any such delay, which is concurrent with another delay, the cause of which is not partly or wholly due to the fault or within the responsibility of the Contractor.

承包商有权根据上述条款延长竣工时间，但条款是：

- i、承包商已作出合理和适当的努力以避免或减轻此类延误；以及
- ii、与另一次延误同时发生的任何此类延误，其原因并非部分或全部由于承包商的过失或承包商的责任。

### **13 Variations and Adjustments**

#### **变更和调整**

#### **S13.4 Provisional Sums**

##### **暂定金额**

**ADD the followings to the end of Clause 13.4:**  
在第 13.4 条结尾处添加以下内容:

**If the Employer does not issue instruction to spend the Provisional Sum, the whole amount of such Provisional Sum should be deducted from the Contract Sum.**

如果雇主没有发出暂定金额的指示，则应从合同总额中扣除全部此类暂定金额。

#### **S13.6 Adjustment for changes in Legislation**

##### **因法律改变的调整**

**DELETE the Clause 13.6 and REPLACE BY the followings:**  
删除第 13.6 条和更换如下:

**If there is a change of government Value Added Tax rate during the construction period, the Contract Price can be adjusted according to the actual situation. However, the Contract Price will not be adjusted for other changes in Legislation.**

如果施工期间有政府的增值税税率变化，合同价格可根据实际情况进行调整。但是，合同价格不会因法律的其他变化而进行调整。

#### **S13.7 Adjustment for Changes in Cost**

##### **因成本改变的调整**

**DELETE the Clause 13.7.**  
删除第 13.7 条。

**S14 Contract Price and Payment****合同价格和付款****S14.1 The Contract Price****合同价格**

Delete the whole of sub-paragraph (a) of Sub-Clause 14.1 and replace with the following:  
删除第 14.1 款 (a) 项的全部内容, 并替换为以下内容:

- (a) The Contract Price shall be the lump sum Accepted Contract Amount including all the design and construction works shown on the Employer's requirements (Concept design drawings and Specification) and be subject to adjustments in accordance with the Contract not subject to any fluctuations in the cost of labour, materials, plant and equipment, tools, services, freight charges or insurances, foreign exchange rates or taxation, other than the adjustments expressly provided for the Contract. Except for the contract rates to be applied for valuation of variation and payment, the quantities in the Schedule of Works are for reference only and the Schedule of Works shall not form part of the Contract.  
合同价格应为雇主接受的总价包干合同金额包括雇主要求 (概念设计图纸和规范) 中显示的所有设计和施工工程, 可根据合同进行调整, 不受劳动力、材料、厂房和设备、工具、服务、运费或保险、外汇汇率或税收的任何波动的影响, 但合同明确规定的调整除外。除合同单价会用作评估变更及付款价值外, 工程数量单价表的工程量仅作为参考及工程数量单价表不作为合同部分。

Delete the following words in lines 3 and 4 of sub-paragraph (b) of Sub-Clause 14.1:  
删除第 14.1 款 (b) 项第 3 行和第 4 行中的以下文字:

“except as stated in Sub-Clause 13.6 [Adjustments for Changes in Laws]”  
“除第 13.6 款 (因法律改变的调整) 说明的情况外,”

**S14.8 Delayed Payment****延误的付款**

Delete the Clause 14.8.

删除第 14.8 款。

**S14 Contract Price and Payment (Cont'd)****合同价格和付款 (续)****S14.9 Payment of Retention Money**

## 保留金的支付

DELETE the first paragraphs of Clause 14.9 and REPLACE BY the followings:

删除第 14.9 条第一段，并更换如下：

The Payment Term is mentioned in Clause 5.27(f) of Specification Preliminaries.

付款条件见《基本措施项目》第 5.27 (f) 条。

After issuing the certificate by the Engineer, the certified amount shall be paid by the Employer within 28 days.

在工程师发出付款证书 28 天内，雇主应支付付款。

**S14.16 Payment Term**

## 付款条件

ADD the followings to the end of Clause 14:

在第 14 条结尾处添加以下内容：

14.16 The payment term is mentioned in the Clause 5.27 (f) of Specification Preliminaries, which shall be read in conjunction with the clause 14 of Particular Conditions of Contract and FIDIC General Conditions of Contract. However, if there are any discrepancies among them, the Clause 5.27 (f) of Specification Preliminaries shall take precedence.

付款条件已列明于基本措施项目第 5.27 (f) 条中，应与合同专用条款和菲迪克合同通用条款第 14 条一并阅读。如果它们之间有任何差异，应以基本措施项目第 5.27 (f) 条为准。

**S16 Suspension and Termination by Contractor**  
**由承包商暂停和终止**

**S16.3 Contractor's Obligation After Termination**  
终止后承包商的义务

ADD the following to the Clause 16.3:  
第 16.3 条增加以下:

- (d) the Contractor shall remove its employees, labours, plant and machinery and belongings from the Site and vacate the Site within period of 14 days from the date of termination of the Contract by the Employer; and  
承包商应在雇主终止合同之日起 14 天内将其雇员、劳工、工厂和机械以及财产从工地移走，并撤离工地;
- (e) the Contractor shall forthwith handover the completed Works to the Employer.  
承包商应立即将已完成的工程移交给雇主。

**S16.4 Payment on termination**  
终止时的付款

DELETE sub-clause (b).  
删除第(b)条。

**S21 Disputes and Arbitration**  
**争端和仲裁**

**S21.7 Failure to Comply with DAAB's Decision**  
未能遵守争端裁决委员会的决定

DELETE the Clause 21.7 and ADD New Clause 21.7 as following:  
删除第 21.7 条及添加新的第 21.7 条如下:

**21.7 Governing Law**  
法律管辖

This Contract shall be governed by Law of Thailand.  
本合同受泰国法律管辖。

**S21.8 No DAAB in Place**  
未设立争端避免/裁决委员会

DELETE the Clause 21.8.  
删除第 21.8 条。

**Remarks:****备注:**

For this Particular Conditions of Contract, if there are discrepancies between the meanings of English and Chinese wordings, Chinese wordings shall take precedence over the English wordings.

在这合同专用条件下，如果英汉词语的含义存在差异，汉语用语应优先于英语用语。

- End -



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**SPECIFICATIONS:  
PRELIMINARIES**  
工程基本措施项目

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# PRELIMINARIES

## 基本措施项目



### 1. GENERAL 概述

#### 1.01 PRELIMINARY ITEMS 基本措施项目

- (a) The preliminary items described herein and the prices inserted by the Contractor for preliminary items shall apply to the whole of the Works.  
本文所述的基本措施项目和承包商为基本措施项目填入的价格应适用于整个工程。
- (b) All directions and instructions in these Preliminaries are directed at the Contractor which term shall also include his Nominated Subcontractor, Nominated Suppliers, Subcontractors and Suppliers. These requirements form part of the Contractor's obligations and responsibilities under the Contract.  
基本措施项目中的所有指示和指令都是针对承包商的，该术语还应包括其指定分包商、指定供应商、分包商和供应商。这些要求构成承包商在本合同项下义务和责任的一部分。
- (c) The Contractor is deemed to have included or allowed for compliance with all requirements in these Preliminaries in the Accepted Contract Amount, regardless of whether or not specific stipulations on such inclusion have been made in the Clauses herein.  
无论本合同条款中是否做出了具体规定，承包商应被视为已将遵守所有基本措施项目要求均包含在中标合同金额内。
- (d) Words in the singular include the plural and words in the plural include the singular according to the requirements of the context.  
根据上下文的要求，单数词包括复数词，复数词包括单数词。
- (e) Words importing a gender include every gender.  
表示性别的词语包括所有性别。

#### 1.02 SCOPE OF WORKS 工程范围

- (a) The Scope of Works shall be as described in the Contract Documents or reasonably inferred from it. The Contractor shall carefully study the Contract Documents and satisfy himself as to the full extent, character and nature of the Works to be performed under this Contract.  
工程范围应如合同文件所述或从中合理推断。承包商应仔细研究合同文件，并充分了解本合同项下待执行工程的全部范围、特征和性质。
- (b) Generally, the Works comprise the supply of materials, labour, plant and equipment required for the Design, Construction, Remedying Defects, Commissioning and Completion of 115kv Substation Works for GECC Production Base (Phase 2) Project at Block D61, WHA Eastern Seaboard Industrial Estate 1, Chonburi, Thailand.  
一般来说，本工程包括为泰国春武里 WHA 东海岸工业区 D61 区块泰国金鹭硬质合金生产基地（二期）项目 115kv 降压站工程的设计、施工、修补、调试和竣工所需的材料供应、劳动力、机械和设备。

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- (c) The scope of the Contract shall consist of providing a complete fully equipped 115kV Gas Insulated Substation System (GIS) including design, engineering, equipment supply, procurement, transportation, construction, erection, quality assurance, obtaining licenses, commissioning, testing, training, documentation, and other services as specified in these Technical Specifications.

合同范围应包括提供设备齐全的 115kV 气体绝缘降压站系统，包括设计、工程、设备供应、采购、运输、施工、安装、质量保证、获得许可证、调试、测试、培训、文件和本技术规范中规定的其他服务。

Whether they are specified in these Technical Specifications or not, the scope of work shall include all equipment, systems, facilities, and software and services necessary for a complete and fully operational 115kV Gas Insulated Substation System (GIS). The Works to be done by the Contractor shall comply with all applicable codes and standards and shall be acceptable by the Provincial Electricity Authority (PEA).

无论这些技术规范中是否规定，工作范围应包括完整和完全运行的 115kV 气体绝缘降压站系统所需的所有设备、系统、设施、软件和服务。承包商完成的工程应符合所有适用的规范和标准，并应得到省电力局（PEA）的认可。

The following shall be under 115kV GIS Substation's Contractor but not limited to:

以下内容应由 115kV GIS 降压站的承包商负责，但不限于：

- Preliminaries  
基本措施项目
- Major Equipment  
主要设备
- 115kV Gas Insulated Switchgear (including circuit breakers, isolators and earthing switches, VTs, CTs, surge arrester, local control panel, etc.)  
115kV 气体绝缘开关设备（包括断路器、隔离器和接地开关、电压互感器、电流互感器、电涌放电器、就地控制面板等）
- High Voltage Power Transformer  
高压电力变压器
- Neutral Grounding Resistor (NGR)  
中性接地电阻器（NGR）
- 24kV Gas Insulated Switchgear  
24kV 气体绝缘开关设备
- Associated equipment and work  
相关设备和工作
- Civil, Structure and Architectural Works  
土建、结构和建筑工程
- Attendance and Co-ordination to the Employer's Direct Contractors/Suppliers.  
照管并协调雇主的直接承包商/ 供应商。

- (d) The Contractor shall also rectify all defects for which he is liable under the Conditions of Contract during the Defects Notification Period and without prejudice to his liabilities arising at law and arising after the Defects Notification Period.

承包商还应在缺陷通知期内纠正其根据合同条件应负责的所有缺陷，且不影响其在法律上和缺陷通知期后产生的责任。

- (e) The general description of Works involved in this Contract is provided for the guidance and information of the Contractor and shall not be construed as the final and definite description of the full scope of Works.

本合同所涉及工程的一般说明仅供承包商参考，不应被解释为对整个工程范围的最终和明确说明。



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## 基本措施项目



- (f) The Contractor is required to ascertain from the Tender Drawings the detail Scope of Work and to include in his Tender Sum all Works that are necessary for the due completion of the Contract Works. Any supporting structures (where required) shall be designed and endorsed by a Professional Engineer by the Contractor.  
承包商需要从招标图纸中确定详细的工程范围，并在其投标总价中包括完成合同所需的所有工程。任何支撑结构（如需要）应由承包商的专业工程师设计和认可。
- (g) The Contract Works shall be executed to the satisfaction of the Project Manager and in strict accordance with the Specifications, Drawings and all other Documents herein collectively referred to as the Tender Documents including any other additional layout and detail Drawings subsequently issued in the course of the Contract.  
合同工程应严格按照规范、图纸和本合同中统称为招标文件的所有其他文件（包括在合同过程中随后发布的任何其他额外布置图和详图）执行，直至项目经理满意。
- (h) The Contractor shall be responsible for the sufficiency of his Tender price to provide for the full extent and nature of the Works required in this Contract.  
承包商应负责其投标价格的充分性，以提供本合同中要求的工程的全部范围和性质。
- (i) The Contractor shall allow for and obtain all necessary permits, licenses and conform to the law, codes, ordinances, regulations and orders of all authorities having jurisdiction on the performance of the work by his own expense. Should conflict arise between on document or authority and another, obtain clarifications from the Project Manager before proceeding with the Works. The employer shall authorize the contractor to act as its representative in the permit application process. This authorization grants the contractor the authority to liaise with relevant regulatory bodies, submit all required documentation, and ensure compliance with applicable laws to facilitate the process on behalf of the employer, and the contractor shall be responsible for providing all necessary control engineers including control architects.  
承包商应自费考虑并获得所有必要的许可证、执照，并遵守对工程实施有管辖权的所有当局的法律、法规、条例、规定和命令。如果文件或授权与其他文件或授权之间出现冲突，在继续进行工程之前，应从项目经理处获得澄清。雇主应授权承包商在许可证申请过程中担任其代表。该授权授予承包商与相关监管机构联络的权力，提交所有必需的文件，并确保遵守适用法律，以代表业主促进这一过程，承包商应负责提供所有必要的控制工程师，包括控制建筑师。

List of Permits are as below, but not limited to;  
许可证清单如下，但不限于：

- a. Building construction permit (AOR.1)  
建筑施工许可证（AOR.1）
  - b. Backfill permit  
回填许可证
  - c. Energization permit from the Provincial Electricity Authority (PEA)  
省电力局（PEA）的通电许可证
  - d. BOI (if required).  
BOI（如需要）。
- (j) The Employer also shall assist to provide his own necessary document to the Contractor for them to submit all applications to authorities.  
雇主还应协助向承包商提供其自己的必要文件，以便他们提交所有当局的申请。
- (k) The contractor is required to provide all disciplines site supervision endorsement at his own cost to replace original site supervision provided by the Consultants or the Employer. New site supervision endorsements shall be provided within 14 calendar days when contractor is awarded.  
承包商需要自费提供所有专业的现场监督认可，以取代顾问或雇主提供的原现场监督。新的现场监督认可应在承包商中标后 14 个日历日内提供。

# PRELIMINARIES

## 基本措施项目



### 1.03 LOCATION AND POSSESSION OF SITE

#### 现场的位置和占有

- (a) The Site is GECC Production Base (Phase 2) Project at Block D61, WHA Eastern Seaboard Industrial Estate 1, Chonburi, Thailand.  
现场为泰国春武里 WHA 东海岸工业区 1 号 D61 区块 GECC 生产基地（二期）项目。
- (b) The Contractor shall have possession of site as demarcated in the Drawings or defined elsewhere in the Contract Documents. The Contractor shall refer to the said Drawings for the exact location, dimension and area of the Site.  
承包商应拥有图纸中划定的或合同文件中其他地方定义的现场。承包商应参考上述图纸，了解现场的确切位置、尺寸和面积。
- (c) The Contractor must ascertain the nature of the Site and the surroundings and all local conditions and restrictions likely to affect the execution of the Works.  
承包商必须确定现场和周围环境的性质，以及可能影响工程实施的所有当地条件和限制。
- (d) The Contractor must accept the site and the surroundings "as found" on the date of possession. Where the Employer is unable to provide free and uninterrupted possession of the whole site, the Contractor shall accept any reasonable arrangements, by the Employer for the possession of site to be given in stages or with restrictions, provided such restricted possession does not affect the regular progress of the Works.  
承包商必须接受在进场之日“发现”的现场和周围环境。如果雇主无法免费和不间断地占用整个现场，承包商应接受雇主分阶段或有限制地占用现场的任何合理安排，前提是这种有限制的占用不影响工程的正常进度。
- (e) Subject to the approval of the Project Manager, the Contractor shall restrict and limit his site facilities, workmen, plant, vehicles, storage of materials and all other work operations within the boundaries of the areas for which he has possession at the time.  
经项目经理批准，承包商应将其现场设施、工人、装置、车辆、材料储存和所有其他工作作业限制在其当时拥有的区域范围内。
- (f) No extra payment on the ground of inadequate knowledge of site information and surroundings will be entertained.  
不会对现场信息和周围环境了解不足为由支付额外费用。
- (g) The Contractor shall at all times afford and maintain unobstructed and unrestricted access for the ingress or egress to the adjoining areas and existing buildings (where applicable) for which the Contractor has no possession.  
承包商应始终为承包商不拥有的邻近区域和现有建筑物（如适用）的进出提供并保持畅通无阻的通道。

# PRELIMINARIES

## 基本措施项目



### 1.04 TIME FOR COMPLETION

#### 竣工时间

- (a) Time for completion shall be deemed to cover for all the time necessary for the satisfactory completion of all the Works included in this Contract as well as the Provisional Sum Items and Nominated Subcontract Works.  
竣工时间应被视为包括圆满完成本合同中所有工程以及暂定金额项目和指定分包工程所需的所有时间。
- (b) Time for completion of this Contract is important and completion within the Contracted periods is essential.  
本合同的完成时间很重要，在合同期限内完成至关重要。
- (c) Tenderers are to note that if stated in the Contract Documents, the Works to be completed in Sections and each Section must be completed with all essential services, furniture, furnishing and equipment and related external Works fully functioning in advance of overall completion of all Works. The commencement and date for completion of each Section is listed in the Appendix to Tender.  
投标人应注意，如果合同文件中有规定，则必须在所有工程全面完工之前，在所有基本屋宇装备、家具、家具和设备以及相关外部工程完全正常运行的情况下，完成分段和每个分段的工程。各标段的开工和竣工日期见投标书附录。
- (d) Any restrictions or obstructions due to the presence of Other Contractors employed on site is deemed to have been considered by the Contractor and therefore no extension will be given.  
因现场雇用的其他承包商而造成的任何限制或障碍均被视为承包商已考虑在内，因此不会给予延期。
- (e) The Contractor shall prepare and submit to the Project Manager within one week of a written request for such from the Project Manager, a detailed time programme and progress chart outlining in detail how he proposes to execute the whole of the Works. He shall revise the charts and record progress during the execution of the Work as necessary and on an on going basis throughout the duration of the Contract.  
承包商应在收到项目经理的书面要求后一周内，编制并向项目经理提交一份详细的时间计划和进度图，详细说明他建议如何执行整个工程。必要时，承包商应在整个合同期间持续修改图表并记录工程执行过程中的进度。

### 1.05 PARTIES

#### 合约方

- (a) "Employer" means Golden Egret Cement Carbide (Thailand) Co., Ltd.  
“雇主”是指金鹭硬质合金(泰国)有限公司。  
of 700 Tambon Ta Sit, Si Racha District, Chon Buri 20110  
春武里市 Si Racha 区 Tambon Ta Sit 700 号，邮编 20110
- (b) "Project Manager" The Project Manager stated in this Contract is authorised representation of Project Manager as appointed by the Employer.  
“项目经理”本合同中所述的项目经理是雇主任命的项目经理的授权代表。
- (c) "Quantity Surveyor" means WT Partnership (Thailand) Ltd.  
“工料测量师”是指务腾（泰国）有限公司。  
of U1802, L18 S-Metro Building, 725 Sukhumvit Rd, Klongton Nua, Wattana, Bangkok, 10110, Thailand.  
泰国曼谷，邮编 10110，Wattana，Klongton Nua，素坤逸路 725 号，S-Metro 大厦 L18，U1802。

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## 基本措施项目



### 2. SITE, CONDITIONS OF EXISTING AND SURROUNDING, SETTING OUT 现场、现有和周边条件、放线

#### 2.01 VISIT TO THE SITE 考察现场

- (a) The Contractor is advised strongly to visit the site to ascertain the nature of the Site and the surroundings, all local conditions and restrictions likely to affect the execution of the Works. All costs and expenses incurred as a result of the site visit shall be borne by the Contractor regardless whether he is successful or not.  
强烈建议承包商参观现场，以确定现场和周围环境的性质、可能影响工程实施的所有当地条件和限制。因现场考察而产生的所有成本和费用应由承包商承担，无论其是否成功。
- (b) The Contractor shall be deemed to have made site visit, inspected and examined the Site and its surrounding and acquaint himself, amongst others, with the following: -  
承包商应被视为已对现场及其周围进行了实地考察、检查和检验，并熟悉以下内容： -
- (i) means of access including delivery of materials and goods;  
进入方式，包括材料和货物的交付；
  - (ii) the nature, character and conditions of the site, the existing and adjoining buildings and the sub-soil upon which the Works are to be carried out;  
现场的性质、特征和条件、现有和邻近的建筑物以及工程将在其上进行的底土；
  - (iii) local conditions;  
当地条件；
  - (iv) tidal flood and local drainage problem;  
潮汐洪水和当地排水问题；
  - (v) disposal of debris;  
垃圾处理；
  - (vi) the extent of working space available;  
可用工作空间的范围；
  - (vii) conditions affecting labour and materials, the storage of materials, positioning of sheds, stores, site office and plant;  
影响劳动力和材料、材料储存、棚屋、仓库、现场办公室和工厂定位的条件；
  - (viii) location of existing services;  
现有服务的位置；
  - (ix) the nearest point from which electricity and water can be connected;  
最近的水电连接点；
  - (x) any other information necessary for computing the Tenders;  
计算投标书所需的任何其他信息；
  - (xi) risk of damages to private or public property adjacent to or abutting on site, or risk of injury to the occupiers, users of, or persons employed on, such property whether or not it is in the ownership of the Employer; and  
对现场附近或毗邻的私人或公共财产造成损害的风险，或对该财产的占用人、使用人或受雇于该财产的人员造成伤害的风险，无论该财产是否属于雇主所有；和
  - (xii) any restrictions which may impede or affect the Works.  
可能阻碍或影响工程的任何限制。

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- (c) Claims will not be entertained by the Project Manager for any extra costs incurred by the Contractor in carrying out the Works if such costs, though not specified herein, could have been foreseen by him on inspection of the Site before Tendering.

如果承包商在实施工程时产生的任何额外费用（尽管本协议中没有规定）在投标前检查现场时可以预见，项目经理将不受理此类费用的索赔。

### 2.02 SOIL INVESTIGATION

#### 土方调查

- (a) The Employer bears no responsibility for the accuracy of any information contained therein and no claim for extra payment, damage or loss and expense or extension of time based on any inaccuracies will be entertained.

雇主对其中包含的任何信息的准确性不承担任何责任，也不接受因任何不准确而提出的额外付款、损坏或损失和费用或延期索赔。

- (b) The soil investigation report carried out by the specialist employed by the Employer is included in the Tender Document. The report is made available in good faith and no responsibility is taken by the Employer for its accuracy or applicable over the whole site. The information revealed are therefore to be taken as a guide only. It is at the risk of the Contractor if different conditions are actually encountered. The Contractor should consider the soil investigation is critical and deemed has carried out further soil investigation he consider necessary before submitting his Tender.

雇主聘请的专家进行的土壤调查报告包含在招标文件中。该报告是本着诚信的原则提供的，雇主对其准确性或适用于整个现场不承担任何责任。因此，所披露的信息仅供参考。如果实际遇到不同的情况，风险由承包商承担。承包商应认为土壤调查至关重要，并在提交投标书之前进行了他认为必要的进一步土壤调查。

### 2.03 EXISTING WORKS / TAKING OVER COMPLETED WORKS

#### 现有工程/接收已完工工程

- (a) The Contractor shall take over and be responsible for the Works completed earlier by other Contractors. Immediately after the award of the Works, the Contractor shall establish with the Project Manager the expiry date of the Defect Notification Period of the other Contractors Contract.

承包商应接管并负责其他承包商早些时候完成的工程。工程签订后，承包商应立即与项目经理确定其他承包商合同的缺陷通知期的到期日。

In the event the Contractor fails to carry out such Works within the Defect Notification Period of the other Contractors Contract, the Contractor shall not be entitled to any claim whatsoever including any claim for payment, compensation, loss or damage and or in respect of any extension of time for any Works that are necessary or are required to be carried out.

如果承包商未能在其他承包商合同的缺陷通知期内实施此类工程，承包商无权提出任何索赔，包括任何付款、赔偿、损失或损害索赔，也无权就任何必要或要求实施的工程的任何延期提出索赔。

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- (b) The Contractor must inspect and check the existing completed Works carried by other Contractor and satisfy himself of their condition before commencing work. Any subsequent damage to the existing Works (not attributable to any intrinsic defects of the existing Works themselves) will be assumed to be caused by his agency and shall be made good by the Contractor at his own expense.

承包商必须在开工前检查和检验其他承包商已完成的现有工程，并确保其状况良好。现有工程的任何后续损坏（不是由于现有工程本身的任何内在缺陷造成的）将被认为是由其代理造成的，并应由承包商自费修复。

### 2.04 EXISTING BUILDINGS

#### 现有建筑

- (a) The Contractor shall be responsible for the full protection and stability of the existing structures and buildings on site whether or not they are to be subsequently demolished, to remain or otherwise.

承包商应负责现场现有结构和建筑物的全面保护和稳定性，无论它们是否随后被拆除、保留或以其他方式存在。

- (b) Before commencement of any Works, the Contractor shall undertake a comprehensive pre-construction survey of all surrounding buildings, infrastructure and services.

在任何工程开工之前，承包商应对所有周围的建筑物、基础设施和服务进行全面的施工前调查。

- (c) The Contractor shall be solely responsible for ensuring that the execution of the Works does not damage, impair the safety and stability of any surrounding structure and neighboring properties.

承包商应全权负责确保工程的实施不会损坏、损害任何周围结构和邻近财产的安全性和稳定性。

- (d) (d)Where necessary, allow in the Tender for cost of shoring and strutting. Such shoring shall be so positioned or altered and adapted from time to time to maintain adequate working space for construction.

必要时，在投标书中考虑支护和支撑的费用。此类支撑应不时进行定位或更改和调整，以保持足够的施工工作空间。

- (e) Should there be any danger of possible damage to adjacent buildings or structures due to the building operations, excavation Works or the methods of construction adopted, the Contractor must arrange with the Employer and the neighbouring owners and obtain their agreement on the measures he would adopt to shore up, underpin, support and make safe such adjacent properties. Make constant checks on the structural soundness of neighbouring properties and take necessary protective measures.

如果由于建筑作业、开挖工程或采用的施工方法而可能对相邻建筑物或构筑物造成任何损坏的危险，承包商必须与雇主和相邻雇主安排，并就其将采取的措施达成一致意见，以支撑、加固、支撑和确保这些相邻财产的安全。不断检查邻近物业的结构坚固性，并采取必要的保护措施。

- (f) Any damages or other disturbances caused to the adjoining buildings and structures as a result of the commissioning of the Works and not covered by the insurance policies shall be the sole responsibility of the Contractor who will have to make good all such damages to the satisfaction of the adjoining owners and pay for any compensation claimed at his own cost.

因工程调试而对邻近建筑物和构筑物造成的任何损坏或其他干扰，如不在保险单范围内，应由承包商全权负责，承包商必须赔偿所有此类损坏，直至邻近雇主满意，并自费支付任何索赔。

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## 基本措施项目



- (g) The Contractor shall so arrange his work programme as to cause the minimum of nuisance, noise or any other disturbance or inconvenience to such neighbouring properties or to the occupants thereof or to traffic on surrounding roads and other public roads leading therefrom. 承包商应合理安排其工作计划，以尽量减少对邻近物业或其居住者或周围道路和其他公共道路交通的滋扰、噪音或任何其他干扰或不便。
- (h) Every effort must be made to reduce noise, vibration, dust or any other interference to the existing adjacent buildings in occupation and the Contractor shall as and when required by the Project Manager provide and install without additional cost, dust sheets or other material and take all measures necessary for the mitigation of noise, vibration, dust, etc. 必须尽一切努力减少噪音、振动、灰尘或对占用的现有相邻建筑物的任何其他干扰，承包商应在项目经理要求时提供并安装防尘板或其他材料，不收取额外费用，并采取一切必要措施减轻噪音、振动和灰尘等。
- (i) The Contractor shall be solely responsible for any nuisance or interference to the adjacent residents or occupants. 承包商应全权负责对邻近居民或居住者造成的任何滋扰或干扰。

In the event :-

在以下情况下： -

- (i) the Works was suspended due to stop instruction from the authorities; 由于当局的停止指示，工程暂停；
- (ii) damage claim from the adjacent residents or owner or 邻近居民或雇主的损害索赔，或
- (iii) damage to neighbouring properties has occurred 邻近财产受损

due to construction process, noise, dust or other interference, all costs, damages, loss, expenditures or claim suffered or incurred by the Employer shall be recoverable from the Contractor by the Employer and may be deducted by the Employer from any monies due or becoming due to the Contractor from the Employer or shall become a debt due to the Employer from the Contractor. Any delay caused in the carrying out of the Works shall not entitle the Contractor to any claim whatsoever, including any claim for time, payment or compensation.

由于施工过程、噪音、灰尘或其他干扰，雇主遭受或产生的所有费用、损害、损失、支出或索赔应由雇主向承包商追偿，并可由雇主从雇主应付给承包商的任何款项中扣除，或成为承包商欠雇主的债务。工程实施过程中造成的任何延误均不得使承包商有权提出任何索赔，包括任何时间、付款或赔偿索赔。

- (j) The Contractor shall ensure that the security of adjacent property is not lessened due to work activities and he must take measures to prevent trespass from adjoining properties. Take all reasonable precautions to prevent workpeople, including those employed by Subcontractors, from trespassing on adjoining owner's property or any part of the Site not affected by the Works. If the Contractor wishes to erect scaffolding or otherwise make use of adjoining land or its airspace, he shall serve notices, obtain permissions and clear away and make good any damage at his own expense and pay all costs in connection therewith. 承包商应确保邻近财产的安全性不会因工作活动而降低，并且必须采取措施防止邻近财产的侵入。采取一切合理的预防措施，防止工人（包括分包商雇用的工人）侵入邻近雇主的财产或不受工程影响的现场任何部分。如果承包商希望搭建脚手架或以其他方式使用邻近的土地或其领空，他应发出通知，获得许可，自费清理和修复任何损坏，并支付与此相关的所有费用。

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- (k) The Contractor shall regularly spray with water areas within the Site likely to create dust. Where ordered by the Project Manager, the Contractor shall spray or cover loads in transit to and from the Site.  
承包商应定期向现场内可能产生灰尘的区域喷水。在项目经理的指示下，承包商应喷涂或覆盖往返现场的运输货物。
- (l) All plant and equipment used by the Contractor shall be operated and maintained in such manner so as to minimise the emission of smoke and obnoxious fumes, and shall be effectively "sound reduced" by means of silencers, mufflers, acoustic sheds or screens or to the satisfaction of the Project Manager.  
承包商使用的所有装置和设备的操作和维护方式应尽量减少烟雾和令人讨厌的烟雾的排放，并应通过消声器、消声器、隔音棚或隔音屏有效“降噪”，或达到项目经理的满意度。

### 2.05 SURVEY OF EXISTING SERVICES AND DILAPIDATION 现有楼宇设备和破旧情况调查

- (a) Prior to the commencement of the Works, the Contractor shall survey the existing building and surrounding areas to ascertain the positions of all existing services, including underground and concealed services, and take all necessary precautionary measures to prevent damages occurring to the services during the Works.  
工程开工前，承包商应调查现有建筑和周围区域，以确定所有现有服务设施的位置，包括地下和隐蔽服务设施，并采取一切必要的预防措施，防止工程期间服务设施受损。
- (b) Where cables or services are detected, the Contractor shall peg the position of these underground services.  
如果检测到电缆或设施，承包商应确定这些地下设施的位置。
- (c) To be submitted to and approved by the Project Manager prior to commencement of the Works the Contractor shall take an adequate dilapidation survey report of any adjacent structures, which may likely be affected by the execution of the Works. Such survey should include their conditions, record of defects, extent of basement and under-slab structures and location of existing utility services.  
在工程开工前，承包商应向项目经理提交一份可能受工程实施影响的任何相邻结构的充分破损调查报告，并获得其批准。此类调查应包括其状况、缺陷记录、地下室和板下结构的范围以及现有公用设施的位置。
- (d) The Contractor shall take colour photographs size 250mm x 200mm of any adjacent structures, existing structures and/or buildings and roadways and embankments in the vicinity of the Site, before commencement of the work to keep as record of evidence of the conditions of these existing structures and/or buildings before the execution of the work. This shall include buildings located outside of the site boundary directly adjacent the site. The photographs shall be included in the first Weekly Report (complete with soft copy) to be provided to the Project Manager.  
开工前，承包商应拍摄现场附近任何相邻结构、现有结构和/或建筑物以及道路和路堤的彩色照片，尺寸为 250mm x 200mm，以记录这些现有结构和（或）建筑物在施工前的状况。这应包括位于现场边界外直接毗邻现场的建筑物。照片应包含在提交给项目经理的第一份周报中（附软拷贝）。



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- (e) Should damages to the existing structures, or adjoining building be discovered during the execution of the work, the Contractor shall be solely responsible for injury or damage caused to adjacent property and shall reinstate and make good the damaged Works at his own expense with materials and workmanship to match in every aspect with the surrounding Works to the satisfaction and approval of the Project Manager.  
如果在施工过程中发现现有结构或邻近建筑物的损坏，承包商应对邻近财产造成的伤害或损坏负全部责任，并应自费用材料和工艺恢复和修复损坏的工程，使其在各个方面与周围工程相匹配，并达到项目经理的满意和批准。
- (f) Assistance or advice, that the Employer or the Project Manager may provide shall not absolve the Contractor of any of his responsibilities. He shall indemnify the Employer in respect of any claims due to subsidence, collapse or other damage to adjacent buildings and facilities caused by or arising out of the Works in addition to providing and maintaining such temporary shoring and/or safety measures which he thinks fit.  
雇主或项目经理可能提供的协助或建议不得免除承包商的任何责任。除提供和维护其认为合适的临时支撑和/或安全措施外，承包商还应赔偿雇主因工程造成的邻近建筑物和设施的沉降、坍塌或其他损坏而提出的任何索赔。

### 2.06 JOINT INSPECTION OF ADJOINING PROPERTIES 相邻物业的联合检查

- (a) Prior to the commencement of any Works to be carried out under this Contract, the Contractor shall arrange for a joint inspection of the neighbouring properties with their owners, representative(s) of the Employer, Project Manager and the Insurance Company from which the relevant policies are taken. Photographs shall be taken of walls, floors slabs, aprons, etc. and notes of their conditions shall be taken. Dated copies of these shall be extended to all parties concerned.  
在本合同项下任何工程开工之前，承包商应安排与雇主、雇主代表、项目经理和相关保单所属的保险公司对邻近物业进行联合检查。应拍摄墙壁、楼板、护坦等的照片，并记录其状况。这些文件的注明日期的副本应发送给所有相关方。
- (b) The Contractor shall take colour photographs of existing structures and/or buildings and roadways and embankments in the vicinity of the Site, before commencement of the work to keep as record of evidence of the conditions of these existing structures and/or buildings before the execution of the work. These photographs shall be fixed in hardcopy and soft copy (flash drive) provided in 2 (two) sets to the Project Manager.  
承包商应在工程开工前拍摄现场附近现有结构和/或建筑物以及道路和路堤的彩色照片，作为工程实施前这些现有结构和（或）建筑物状况的证据记录。这些照片应以硬拷贝和软拷贝（闪存盘）的形式固定，分两（2）套提供给项目经理。
- (c) The Contractor should request the owners of neighbouring buildings to check and endorse the copies as being true and accurate description of their present condition. During the progress of the Works, the Contractor shall arrange for regular joint inspections of the neighbouring and adjoining properties.  
承包商应要求邻近建筑物的雇主检查并认可副本，以真实准确地描述其现状。在工程进展过程中，承包商应安排对邻近和毗邻的财产进行定期联合检查。

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- (d) Should damages to the existing structures, or adjoining building be discovered during the execution of the work, the Contractor shall be solely responsible for injury or damage caused to adjacent property and shall reinstate and make good the damaged Works at his own expense with materials and workmanship to match in every aspect with the surrounding Works to the satisfaction and approval of the Project Manager.  
如果在施工过程中发现现有结构或邻近建筑物的损坏，承包商应对邻近财产造成的伤害或损坏负全部责任，并应自费用材料和工艺恢复和修复损坏的工程，使其在各个方面与周围工程相匹配，并达到项目经理的满意和批准。
- (e) Assistance or advice, that the Employer or the Project Manager may provide shall not absolve the Contractor of any of his responsibilities. He shall indemnify the Employer in respect of any claims due to subsidence, collapse or other damage to adjacent buildings and facilities caused by or arising out of the Works in addition to providing and maintaining such temporary shoring and/or safety measures which he thinks fit.  
雇主或项目经理可能提供的协助或建议不得免除承包商的任何责任。除提供和维护其认为合适的临时支撑和/或安全措施外，承包商还应赔偿雇主因工程造成的邻近建筑物和设施的沉降、坍塌或其他损坏而提出的任何索赔。

### 2.07 PRE-COMMENCEMENT AND SETTING OUT 开工前工作和放线

- (a) The Contractor to accurately set out the Works. Ensure all critical co-ordinate points are marked in a manner that cannot be removed or in manner that makes any subsequent movement immediately apparent.  
承包商应准确放样工程。确保所有关键坐标点都以无法移除的方式标记，或以使任何后续移动立即可见的方式标记。
- (b) The Contractor to provide surveying equipment and labour required for setting out the whole of the Works. The Contractor to provide similar facilities to the Project Manager for checking all setting out and levels throughout the Contract period.  
承包商应提供整个工程放线所需的测量设备和劳动力。承包商应向项目经理提供类似设施，以便在整个合同期间检查所有放线和标高。
- (c) The Contractor shall be solely responsible for ensuring that the execution of the Works does not damage, impair the safety and stability of any surrounding structure and neighbouring properties.  
承包商应全权负责确保工程的实施不会损坏、损害任何周围结构和邻近财产的安全性和稳定性。
- (d) Where necessary, allow in the Tender for cost of shoring and strutting. Such shoring shall be so positioned or altered and adapted from time to time to maintain adequate working space for construction.  
必要时，在投标书中考虑支护和支撑的费用。此类支撑应不时进行定位或更改和调整，以保持足够的施工工作空间。
- (e) The Contractor to check and confirm dimensions, positions and levels of existing work completed by other Contractors, carry out detailed site survey of the existing land boundary and set out the building and submit two copies of certified survey Drawings.  
承包商应检查并确认其他承包商完成的现有工程的尺寸、位置和标高，对现有土地边界进行详细的现场测量，放样建筑物，并提交两份经认证的测量图纸。

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## 基本措施项目



- (f) Maintain all boundary markers and reference points in good order. Be responsible for replacing any lost markers. Install and maintain site datum and survey at each floor for all Contractor use.  
保持所有边界标记和参考点处于良好状态。负责更换丢失的标记。在每层楼安装和维护现场基准和测量，供承包商使用。
- (g) The Contractor to engage approved Qualified Surveyor to perform all necessary survey work and pay for all fees and expenses.  
承包商应聘请经批准的合格测量师进行所有必要的测量工作，并支付所有费用和开支。
- (h) The Contractor to accurately locate with appropriate markings the position of each column. Any errors in setting out resulting in consequential loss would be to the Contractor's account.  
承包商应使用适当的标记准确定位每根柱子的位置。任何放线错误导致的间接损失将由承包商承担。
- (i) Any assistance given by the Project Manager in setting out will not relieve the Contractor of his responsibility to set out the Works accurately.  
项目经理在放线过程中提供的任何协助都不会免除承包商准确放线工程的责任。
- (j) The information is to be submitted to the Project Manager for approval and upon approval, three (3) copies of print and one (1) copy of tracing shall be provided to the Project Manager.  
信息应提交给项目经理批准，批准后，应向项目经理提供三（3）份打印件和一（1）份跟踪件。
- (k) All survey marks and pegs shall be clearly identifiable with accurate records kept on site by the Contractor. The Contractor must also maintain accurate survey instruments on the site at all times for any checks that the Project Manager or his representative may desire to carry out.  
所有测量标记和标桩应清晰可辨，承包商应在现场保存准确的记录。承包商还必须始终在现场维护准确的测量仪器，以便项目经理或其代表进行任何检查。
- (l) The Contractor shall note that the employment of a Registered Surveyor to act on his behalf to carry out the aforesaid duties do not relieve the Contractor of his responsibilities under the terms of the Contract.  
承包商应注意，雇佣注册测量师代表其履行上述职责并不能免除承包商在合同条款下的责任。
- (m) The Contractor shall pay all Registered Surveyors' fees and allow for any cost in connection therewith.  
承包商应支付所有注册测量师费用，并考虑与此相关的任何费用。
- (n) The Contractor shall assist the Client with all permits and government authority applications required to carry out the work.  
承包商应协助客户办理开展工作所需的所有许可证和政府机构申请。

### 2.08 SERVICES DISCOVERED DURING THE COURSE OF CARRYING OUT THE WORKS

#### 工程实施过程中发现的楼宇设备

- (a) If, during the Works, the Contractor's workmen discover any services, the matter shall be reported to the Project Manager and all Works near the services in question shall be stopped until directions are received as to the manner in which the Works shall be continued.  
如果在工程期间，承包商工人发现任何楼宇设备，应将此事报告给项目经理，并应停止相关楼宇设备附近的所有工程，直至收到关于工程继续进行方式的指示。

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## 基本措施项目



- (b) In cases where the services are to be temporarily diverted or realigned or terminated, the Contractor shall give the necessary notices to the appropriate Authorities and arrange for the work to be carried out and pay all charges in connection therewith. The Contractor shall not be compensated as a result of inconvenience or delay caused by temporary diversion or realignment of underground or overhead services.  
如果楼宇设备需要临时改道、重新调整或终止，承包商应向有关当局发出必要的通知，安排开展工作，并支付所有相关费用。承包商不得因地下或架空设施的临时改道或重新调整造成的不便或延误而获得赔偿。
- (c) The cost of permanently diverting or realigning or terminating any of these services shall not be borne by the Contractor, but he shall provide and maintain at his own cost any temporary Works necessary to support or protect such services affected by his excavations to the satisfaction of the authorities concerned.  
永久转移或重新调整或终止任何这些楼宇设备的费用不应由承包商承担，但承包商应自费提供和维护任何必要的临时工程，以支持或保护受其开挖影响的此类楼宇设备，并达到有关当局的满意程度。
- (d) The Contractor shall in addition liaise with the Authorities concerned and afford them all facilities necessary (including giving the necessary notices) to enable them to undertake any work to divert or realign or terminate these services, or to prevent interruption of such services, during the progress of the Contract.  
此外，承包商应与有关当局联络，并向他们提供所有必要的设施（包括发出必要的通知），使他们能够在合同执行过程中开展任何工作，以转移、重新调整或终止这些楼宇设备，或防止这些楼宇设备中断。
- (e) The Contractor shall allow for employing licensed cable detection workers to carry out cable detection work prior to commencement of any Works on site.  
承包商应允许在现场任何工程开工前雇佣持证电缆检测工人进行电缆检测工作。
- (f) Where cables or services are detected, the Contractor shall peg the position of these underground services and protect the underground services from damage.  
如果检测到电缆或设施，承包商应确定这些地下设施的位置，并保护地下设施免受损坏。
- (g) The Contractor shall notify the Project Manager and other relevant Authorities if necessary, on the discovery of any services which are to be retained such as pipes, cables, etc., buried or exposed at the site. The Contractor shall be held responsible for any damage done during the progress of the Works and shall meet all costs of repairs and reinstatement due to such damage, including any claims, fines, etc. submitted by the Authorities and parties concerned.  
如有必要，承包商应在发现任何需要保留的楼宇设备（如埋在现场或暴露在现场的管道、电缆等）时通知项目经理和其他相关机构。承包商应对工程进展过程中造成的任何损坏负责，并承担因此类损坏而导致的所有维修和恢复费用，包括当局和有关各方提交的任何索赔、罚款等。

# PRELIMINARIES

## 基本措施项目



### 2.09 EXISTING KNOWN SERVICES TO BE TERMINATED OR DIVERTED 现有的已知楼宇设备将被终止或转移

- (a) The Contractor shall take note of the presence of existing services in the vicinity of the site. The Contractor shall prior to his commencement of work, engage the service of a services detection worker and ascertain for himself that the presence of these services shall not in any way obstruct or impede the progress of his work. Should the Contractor encounter any services at site, he shall inform the Project Manager and the Authorities and liaise with relevant Authorities. The Contractor shall provide assistance to the Authority to ensure that Works involving diversion, disconnection, termination and capping off are carried out on schedules. Fees payable to the Authorities in respect of permanent diversion, disconnection, termination and capping off shall be reimbursed by the Employer.  
承包商应注意现场附近现有楼宇设备的存在。承包商应在开工前聘请服务检测人员，并自行确定这些服务的存在不会以任何方式阻碍或妨碍其工作进度。如果承包商在现场遇到任何楼宇设备，他应通知项目经理和当局，并与有关当局联络。承包商应向管理局提供协助，以确保涉及改道、断开、终止和封顶的工程按计划进行。应向当局支付的与永久改道、断开、终止和封顶有关费用应由雇主报销。
- (b) The Contractor shall afford all attendance and facilities necessary to undertake the Works, including Works of a permanent nature.  
承包商应提供开展工程（包括永久性工程）所需的所有照管和设施。

### 2.10 EXISTING KNOWN SERVICES TO BE RETAINED 保留现有的已知楼宇设备

- (a) The Contractor shall take note of all known services to be kept in use. The Contractor shall protect and maintain all such services, such as pipes, ducts, sewers, service mains, overhead and underground cables etc., during the execution of the Works. Particular care shall be taken to avoid damage to overhead electricity and telephone mains and all brackets, posts and fittings in connection therewith and to underground electricity, telephone, gas and water mains, drains and other underground services. Any damage to mains or services shall be notified immediately to the Project Manager.  
承包商应注意所有已知楼宇设备的使用情况。承包商应在工程实施期间保护和维持所有此类楼宇设备，如管道、导管、下水道、服务干线、架空和地下电缆等。应特别注意避免损坏架空电力和电话干线以及与之相关的所有支架、柱子和配件，以及地下电力、电话、天然气和水干线、排水管和其他地下设施。任何对电源或楼宇设备的损坏都应立即通知项目经理。
- (b) The Contractor shall make good any damage due to any cause at his own expense or pay any costs and charges in connection therewith.  
承包商应自费修复因任何原因造成的任何损坏，或支付与此相关的任何费用。

# PRELIMINARIES

## 基本措施项目



### 3. CONTRACTUAL REQUIREMENTS

#### 合同要求

#### 3.01 FIRM PRICE CONTRACT

##### 固定价格合同

- (a) This is a Lump Sum Contract without adjustments due to any fluctuations in prices. No claim whatsoever shall be allowed for any variation in the cost of wages, material, constructional plant, fuel, duties, taxes, temporary Works or transport or anything else whatsoever which may occur during the term of this Contract. The Contract Sum including all the cost for design, supply and installation of the Works in accordance with the requirements of Design Intent Specification and Drawings. Except for the contract rates to be applied for valuation of variation and payment, the quantities in the Schedule of Works are for reference only and the Schedule of Works shall not form part of the Contract.

这是一份总价包干合同，不会因价格波动而进行调整。不得就本合同期限内可能发生的工资、材料、机械、燃料、关税、税款、临时工程或运输或其他任何费用的任何改变提出任何索赔。合同金额包括根据设计意向规范及图纸要求的设计、供应及安装的所有工程费用。除合同单价会用作评估变更及付款价值外，工程数量单价表的工程量仅作为参考及工程数量单价表不作为合同部分。

- (b) The Accepted Contract Amount shall only be adjusted in accordance with the provisions of the Contract. 中标合同金额只能根据合同规定进行调整。

#### 3.02 LAW GOVERNING CONTRACT

##### 合同管辖法

- (a) The Contract shall be governed by the laws for the time being in force in Thailand and the Thailand Courts shall have exclusive jurisdiction to hear and determine all actions and proceedings arising out of this Contract.

本合同应受泰国现行法律管辖，泰国法院对审理和裁定因本合同引起的所有诉讼和程序具有专属管辖权。

#### 3.03 FORM OF CONTRACT

##### 合同形式

- (a) The Conditions of Contract means the [FIDIC Conditions of Contract for EPC/ Turnkey Projects \(Chinese and English\) 2017 Edition](#).

合同条件是[菲迪克设计采购施工/交钥匙工程合同条件 2017 版](#)。

- (b) The Form of Contract which the Employer and Contractor will be required to enter into in connection with this project is attached as a part of the Tender Documents.

雇主与承包商将签订本项目合同的格式已放入招标文件作为一部分。

- (c) The Conditions of Contract shall be read conjointly with all other documents forming the Contract.

合同条件应与构成合同的所有其他文件一并阅读。

- (d) The Contractor shall allow in the Accepted Contract Amount for all expenses in compliance with the Conditions of Contract, together with all Particular Conditions, amendments, and amplification notes.

承包商应在中标合同金额中考虑符合合同条件的所有费用，以及所有专用条件、修订和补充说明。

- (e) A reference to a clause in the Conditions of Contract being a clause or sub-clause that has been amended or varied by the amendments and amplification notes shall be read as a reference to that clause or sub-clause as amended or varied.

提及合同条件中的某一条款，即经修订和补充说明修订或更改的条款或子条款，应被理解为提及经修订或更改后的条款或子条款。

# PRELIMINARIES

## 基本措施项目



### 3.04 CONSENT AND APPROVAL 同意和批准

- (a) The giving of any consent or approval by the Project Manager shall not in any way relieve the Contractor of any of his obligations under the Contract or of his duty to ensure the correctness, accuracy or suitability of the matter or thing which is the subject of the consent or approval.  
项目经理的任何同意或批准均不得以任何方式免除承包商在本合同项下的任何义务，也不得免除其确保同意或批准事项的正确性、准确性或适用性的责任。
- (b) Failure by the Project Manager to disapprove or object to any matter or thing shall not prejudice his power subsequently to take action under the Contract in connection therewith.  
项目经理未能反对或反对任何事项或事情，不得损害其随后根据合同采取相关行动的权力。

### 3.05 NOTICE REQUIRED FOR OBTAINING INFORMATION 获取信息需要的通知

- (a) A minimum of fourteen (14) day notice is required to be given by the Contractor for any information he may need.  
承包商需要至少提前十四（14）天通知其可能需要的任何信息。
- (b) Any negligence or failure on the part of the Contractor in obtaining reliable information pertaining to any matters which may affect the execution and completion of the Works shall not relieve him from any risks, liabilities or responsibility in executing, completing and handing over the Works or any relevant parts thereof.  
承包商在获取可能影响工程执行和竣工的任何事项的可靠信息方面的任何疏忽或失败，不得免除其在执行、完成和移交工程或其任何相关部分时的任何风险、责任或义务。

### 3.06 METHOD OF MEASUREMENT 测量方法

- (a) The Principles of Measurement (International) For Works of Construction June 1979 printed by the Royal Institution of Chartered Surveyors shall be adopted for the preparation of any variations or remeasurement.  
任何变更或重新测量的准备应采用英国皇家特许测量师学会 1979 年 6 月出版的《建筑工程测量原理（国际）》。

### 3.07 SCHEDULE OF RATES AND SCHEDULE OF WORKS 工程数量单价表

- (a) All the Works included in these Documents shall be taken as new unless otherwise distinctly stated.  
除非另有明确说明，否则这些文件中包含的所有工程应视为新的。
- (b) The prices and rates set down by the Contractor against each item in the Schedule of Rates/Schedule of Works shall include all costs for:  
承包商为单价表中的每个项目制定的价格和单价应包括以下所有费用：
  - (i) all cost, expenses, charges and expenditure arising out of complying with the Specification, Preambles and all other Sections of this Document, etc.;因遵守规范、前言和本文件所有其他章节等而产生的所有成本、费用、收费和支出；

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## 基本措施项目



- (ii) transport, delivery, unloading, storing and placing, carriage and cartage, cutting and hoisting in position;  
运输、交付、卸载、储存和放置、运输和搬运、切割和吊装到位;
  - (iii) all waste on materials;  
所有损耗;
  - (iv) hoisting, fitting and fixing in position;  
吊装、装配和固定到位;
  - (v) use of plant, tools, machinery and equipment and existing scaffolding;  
大型机器、工具、机械、设备和现有脚手架的使用;
  - (vi) protection, cleaning and making good Works disturbed;  
保护、清洁和修复受干扰的工程;
  - (vii) supervision, overheads and profits;  
监督、管理费用和利润;
  - (viii) all duties, taxes, levies and authority fees;  
所有关税、税款、征税和授权费;
  - (ix) all other labour and materials necessary for the due and proper execution of each item; and  
正确执行每个项目所需的所有其他劳动力和材料; 和
  - (x) all work and expenditure whether permanent or temporary, which will be either indispensably necessary in any event to complete the Works as described in or to be inferred from the Drawings, Specifications, Schedule of Rates, or other Contract Documents taken as a whole, or which may contingently become necessary to overcome difficulties and bring the said Works so described to satisfactory completion.  
所有工作和支出, 无论是永久性的还是临时性的, 在任何情况下, 都是完成图纸、规范、单价表或其他合同文件中所述或推断的工程所必需的, 或者是克服困难并使所述工程圆满完成所必需的。
- (c) Where the Contractor leaves any item in the Preliminaries or any item in the Schedule of Works unpriced or inserted with “N.A.”, “excluded”, “included” or a dash against it, the value thereof shall be deemed to have been included in the overall Tender price and he shall not be entitled to any claim whatsoever.  
如果承包商在基本措施费中的任何项目或工程单价表中的任何项未定价或插入“N.A.”、“排除”、“包括”或破折号, 则其价值应被视为已包含在投标总价中, 他无权提出任何索赔。
- (d) Where provisional allowances have been provided for items of Works which are to be adjusted, or where Provisional Sums have been allowed for in the Schedule of Works, such Works done shall not be covered up until the Project Manager has been notified and has taken measurements and other information.  
如果为需要调整的工程提供了暂定项目, 或者在工程单价表中预留了暂定金额, 则在通知项目经理并进行测量和其他信息之前, 不会涉及已完成的工程。
- (e) All items in the Schedule of Rates/Schedule of Works shall be realistically priced. The Contractor shall substantiate his rates and prices, if so requested by the Project Manager.  
单价表中的所有项目应已实际报价。如果项目经理要求, 承包商应提供其单价和价格的明细。
- (f) Unit rates quoted by the Contractor in the Schedule of Rates (or in the Schedule of Works where applicable) shall be used as the basis for valuation of interim valuations, variations, re-measurements and computations of final accounts (or final statement).  
承包商在单价表中引用的单价应作为中期估价、变更、重新测量和决算 (或最终报表) 计算的估价依据。



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## 基本措施项目



- (g) Any errors or omission in the 'Schedule of Rates' submitted by the Contractor shall be rectified by the Quantity Surveyors after acceptance of Tender but before the formalisation of Contract. The adjusted rates shall be the basis for the assessment of interim valuations and variations under this Contract.

承包商提交的单价表中的任何错误或遗漏应由工料测量师在接受投标后但在合同正式生效之前进行纠正。调整后的单价应作为评估本合同项下中期估价和变更的依据。

### 3.08 FIX ONLY ITEMS

#### 仅修复项目

- (a) The word "Fix Only" or "Lay Only", where used in this Contract Documents in connection with any material or goods supplied by Nominated Suppliers (unless otherwise included in Attendance on Nominated Suppliers) shall be understood to include for:-

本合同文件中与指定供应商提供的任何材料或货物相关的“仅固定”或“仅铺设”一词（除非在指定供应商出席会议中另有说明）应理解为包括： -

- (i) Taking delivery from supplier, provide storage facility, protect and taking from store; 从供应商处提货，提供存储设施，保护并从仓库中提货；
- (ii) Obtaining all necessary information from the supplier on installation details, etc; 从供应商处获得有关安装细节等的所有必要信息；
- (iii) Placing in position including all handling and hoisting, etc; 就位，包括所有搬运和吊装等；
- (iv) Assembling (and/or dismantling and re-assembling if necessary) and fixing, including providing all accessories required for complete assembly or finished product; and 组装（和/或必要时拆卸和重新组装）和固定，包括提供完整组装或成品所需的所有配件；和
- (v) All fittings, grouting etc necessary for the work. 工程所需的所有配件、灌浆等。

### 3.09 PRIME COST (PC) SUPPLY RATES

#### 主要材料暂定供应单价

- (a) Where Prime Cost (PC) Supply Rates are stated in the Schedule of Works, the Contractor shall include the PC Supply Rates as the price of the supply components in his build-up of the unit rates or prices for the respective items.

如果工程单价表中规定了主要材料暂定供应单价，承包商应将主要材料暂定供应单价作为供应组件的价格纳入其各项目的单价或价格。

- (b) Materials which are the subject of PC Supply Rates shall be selected by the Project Manager at a price agreed between the Project Manager and the Subcontractor. Such Subcontractors shall be selected by the Project Manager and when employed by the Contractor following receipt of the Project Manager's instruction, The Contractor shall accept any person or persons selected by the Project Manager for the supply of these materials.

主要材料暂定供应单价所涉及的材料应由项目经理按照项目经理和分包商之间商定的价格进行选择。此类分包商应由项目经理选择，在收到项目经理的指示后由承包商雇用，承包商应接受项目经理选择的任何人员供应这些材料。

- (c) The Contractor shall be required to enter into a Direct Supply Agreement with the selected supplier based on the agreed prices, terms and conditions. The Contractor shall separately order sufficient extra quantities in each case to cater for all breakages, wastages, etc.

承包商应根据商定的价格、条款和条件与选定的供应商签订直接供应协议。承包商应在每种情况下单独订购足够的额外数量，以应对所有破损、损耗等。

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## 基本措施项目



- (d) Upon execution of the Direct Supply Contract, determine and agree with the supplier the supply and delivery schedule, including the total quantities required for the Works.  
在执行直接供应合同后，确定并与供应商商定供应和交付时间表，包括工程所需的总数量。
- (e) The P.C Supply Rate of material (delivered to site) selected shall be the net price (after deduct all trade discount).  
所选材料（交付至现场）的主要材料暂定供应单价应为净价（扣除所有贸易折扣后）。
- (f) The quantities of all P.C Supply Rated items stated in the Contract are deemed to be net (i.e. as fixed or laid in place) and subject to the provisions of the Contract, shall be used for the adjustment of P.C Supply Rated Items.  
合同中规定的所有主要材料暂定供应单价项目的数量被视为净数量（即固定或铺设到位），应根据合同规定用于调整主要材料暂定供应单价项目。
- (g) The P.C. Supply Rates will be adjusted against the actual supply rate of the selected materials supplied and delivered to site. The same percentage addition for profit and wastage as allowed for by the Contractor in pricing of each item will be added back to the actual rate for each item of supply of material.  
主要材料暂定供应单价将根据供应和交付到现场的选定材料的实际供应价格进行调整。承包商在每个项目的定价中允许的利润和损耗的相同百分比将加回到每个材料供应项目的实际单价中。
- (h) The above percentage addition shall be deemed to include the Contractor's profit and administrative charges, finance charges, wastage including additional quantities necessary for cutting, loss, provision for making good defective and/or damaged areas and the like.  
上述百分比增加应被视为包括承包商的利润和行政费用、财务费用、损耗，包括切割、损失、修复缺陷和/或损坏区域所需的额外数量等。
- (i) Ensure that all materials required are on site in adequate time for the Works.  
确保工程所需的所有材料在现场有足够的时间。

### 3.10. ERRORS IN TENDER DISCOVERED AFTER FORMALIZATION OF CONTRACT DOCUMENTS

#### 合同文件正式后发现的投标错误

- (a) Any errors in the arithmetical computation of the Accepted Contract Amount or in the rates or prices discovered after formalization of the Contract Documents shall not be corrected and shall continue to be reflected in the Accepted Contract Amount payable, except where in the case of any obvious errors in the rates and prices submitted by the Contractor resulting in grossly excessive or inadequate rates or prices, the Project Manager/Quantity Surveyor shall apply a reasonable rate or price, in line with the Contractor's general levels of rates or prices to the valuation of variations (Accepted Contract Amount maintained unchanged).  
在合同文件正式后发现的中标合同金额或单价或价格的算术计算中的任何错误均不得纠正，并付款应继续按中标合同金额，除非承包商提交的单价和价格存在任何明显错误，导致单价或价格严重过高或过低，项目经理/工料测量师应根据承包商的一般单价或价格水平，采用合理的单价或价格来评估变更帐（中标合同金额不变）。

# PRELIMINARIES

## 基本措施项目



### 3.11 DRAWINGS

#### 图纸

- (a) The Contractor shall be deemed to have examined the Drawings prior to submission of his Tender, no claims for extra costs consequent upon non examination of Drawings will be considered.  
承包商应被视为在提交投标书之前已经检查了图纸，不考虑因未检查图纸而产生的额外费用索赔。
- (b) The Contractor shall check all the dimensions on site and if any discrepancy is found between the Drawings and conditions on site or between the various Drawings within the Contract Documents, he shall notify the Project Manager immediately and request for instructions/clarifications. The Contractor shall not scale from Drawings but shall obtain from the Project Manager any dimensions required but which are not given in figures on the Drawings.  
承包商应在现场检查所有尺寸，如果发现图纸和现场条件之间或合同文件中的各种图纸之间存在任何差异，他应立即通知项目经理并要求指示/澄清。承包商不得根据图纸进行缩放，但应从项目经理处获得图纸上未给出的任何所需尺寸。

### 3.12 AS-BUILT DRAWINGS

#### 竣工图

- (a) The Contractor shall prepare as-built Drawings for all concealed Works and services installation. Six (6) sets of the finalised, approved and co-ordinated as-built Drawings and one (1) set of certified tracings and USB flash-drives with softcopy of each Drawing shall be handed over to the Project Manager on completion of the Works. The Contractor shall obtain the Project Manager's approval as to the size of Drawings, quality of tracings, method of Drawing, format and information required, prior to the preparation of the Drawings.  
承包商应为所有隐蔽工程和服务设施安装绘制竣工图。工程竣工后，应向项目经理移交六（6）套最终确定、批准和协调的竣工图以及一（1）套经认证的描摹图和 USB 闪存盘，并附上每份图纸的软拷贝。在绘制图纸之前，承包商应获得项目经理对图纸尺寸、描记质量、绘制方法、格式和所需信息的批准。
- (b) All such As Built Drawings and manuals are to be submitted to the Project Manager before the commencement of the Defects Notification Period. It is to be noted that there shall be no release of Performance Security until the above submissions and any necessary training to the Operations Team are made to the satisfaction of the Project Manager.  
所有竣工图和手册应在缺陷通知期开始前提交给项目经理。需要注意的是，在上述提交文件和对运营团队的任何必要培训达到项目经理的满意度之前，不得释放履约保证金。

# PRELIMINARIES

## 基本措施项目



### 3.13 CONTRACTOR'S DESIGN PORTION OF THE WORKS 承包商设计工程部分

(a) General  
概述

Where the Contract either expressly or by implication leaves:  
如果合同明确或隐含地规定：

- (i) the complete design of parts of the Works (temporary or permanent); and/or  
工程各部分（临时或永久）的完整设计；和/或
- (ii) the design development of parts of the Works (temporary or permanent),  
工程部分（临时或永久）的设计开发，

to the Contractor (and/or any Designated or Nominated Subcontractor or Supplier or any Subcontractor or Supplier), the Contractor shall ensure that his proposals, hereafter referred to as “the Contractor’s Proposals”, comply fully with all the requirements, stipulations, conditions, obligations and procedures contained in these Tender Documents.

对于承包商（和/或任何指定或提名的分包商或供应商或任何分包商/供应商），承包商应确保其建议方案（以下简称“承包商建议方案”）完全符合这些招标文件中包含的所有要求、规定、条件、义务和程序。

(b) The Contractor shall also be responsible for:  
承包商还应负责：

- (i) engaging suitably qualified design professionals to carry out his design obligations;  
聘请具有适当资格的设计专业人员履行其设计义务；
- (ii) ensuring that his proposals do not depart or affect, in any way, those parts of Works which are not designed by the Contractor. The cost of implementing any changes or amendments to the Works not designed by the Contractor resulting from his proposals shall be borne by the Contractor;  
确保其建议方案不会以任何方式偏离或影响非承包商设计的工程部分。因承包商的建议而对非承包商设计的工程进行任何变更或修改的费用应由承包商承担；
- (iii) coordinating the proposals to ensure consistency and compliance with the different design disciplines and trades;  
协调各项建议，以确保一致性和符合不同的设计专业和行业；
- (iv) submitting comprehensive details of the proposals such as Drawings, design details, Specifications, assumptions, calculations, statements on the methods of construction and details of any associated Works such as piling systems, etc, together with a breakdown of quantities, prices and rates;  
提交方案的全面细节，如图纸、设计细节、规范、假设、计算、施工方法说明和打桩系统等任何相关工程的细节，以及工程量、价格和单价的明细；
- (v) providing further designs and/or modifications to the proposals arising from any inadequacy, insufficiency, errors, defects, failures or faults discovered at anytime in the proposals or as a result of any variations issued under the Contract;  
因建议方案中随时发现的任何不足、不充分、错误、缺陷、失效或故障，或因合同项下发布的任何变更而对建议方案进行进一步的设计和/或修改；

# PRELIMINARIES

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- (vi) ensuring that the Contractor's Proposals conform with all applicable laws, rules and bye-laws, including all relevant building codes, etc;  
确保承包商的建议方案符合所有适用的法律、规则和细则，包括所有相关的建筑规范等；
- (vii) ensuring that all consents, approvals and permits pertaining to the Contractor's Proposals are obtained from the relevant authorities;  
确保从有关当局获得与承包商建议方案有关的所有同意、批准和许可；
- (viii) ensuring that the Contractor's Proposals are, where required, endorsed and/or supervised by Professional Engineers;  
确保承包商的建议方案在需要时得到专业工程师的认可和/或监督；
- (ix) carrying out the Works related to the Contractor's Proposals within the Contract completion dates;  
在合同竣工日期内实施与承包商建议方案有关的工程；
- (x) carrying out all Works associated with the Contractor's Proposals without any adjustments to the Accepted Contract Amount unless otherwise agreed; and  
除非另有约定，否则在不对中标合同金额进行任何调整的情况下，执行与承包商建议方案相关的所有工程；和
- (xi) keeping the Employer fully indemnified against all costs claims, actions, proceedings, expenses, loss and damages that the Employer may suffer howsoever (including any consequential damages to or cost of rectification of any part of the Works under this Contract), arising from or in connection with any inadequacy, insufficiency, errors, defects, failures or faults in the Contractor's Proposals.  
使雇主免受因承包商建议方案中的任何不足、不充分、错误、缺陷、失败或错误而导致或与之相关的所有费用索赔、诉讼、程序、费用、损失和损害赔偿（包括本合同项下工程任何部分的任何间接损害赔偿或整改费用）。

No extension of time shall be granted and no claims for any cost, damages, expenses and/or loss shall be made in respect of the above requirements.  
不得就上述要求延长时间，也不得就任何费用、损害、开支和/或损失提出索赔。

Notwithstanding the foregoing, it shall be at the entire discretion of the Employer and/or the Consultants whether or not to accept or approve the Contractor's Proposals. Such consent, approval, acceptance, permission or endorsement, where given, shall not afford the Contractor any recourse whatsoever against the Employer and no consent, approval, acceptance, permission or endorsement of the Employer or his Consultants shall relieve or discharge the Contractor from his responsibility for the adequacy and/or fitness of the Contractor's Proposals as the case may be and for the observance of all his obligations under the Contract.

尽管有上述规定，雇主和/或顾问应全权决定是否接受或批准承包商的建议方案。此类同意、批准、接受、许可或认可（如有）不得使承包商对雇主有任何追索权，雇主或其顾问的任何同意、批准、接受、允许或认可均不得免除或解除承包商对承包商建议方案的充分性和/或适用性（视情况而定）以及遵守其在本合同项下所有义务的责任。

# PRELIMINARIES

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Upon the termination of the Contractor's employment, the Contractor shall, notwithstanding any other provisions to the contrary, immediately deliver to the Employer, for his retention and use until the completion of the Works, 2 copies of the Contractor's Proposals and all other relevant design information and approvals and/or permits granted by the relevant authorities in order to enable the Employer to complete the Works. The Employer may also appoint his own design consultants or qualified persons or the Contractor's consultants or qualified persons to continue with the design of the Works and to act as the consultants and qualified persons for the Works.

在承包商雇佣关系终止后，尽管有任何其他相反的规定，承包商应立即向雇主交付承包商建议方案和所有其他相关设计信息以及有关当局授予的批准和/或许可的 2 份副本，供其保留和使用，直至工程竣工，以便雇主能够完成工程。雇主还可以任命自己的设计顾问或合格人员，或承包商的顾问或合格人士，继续进行工程的设计，并担任工程的顾问和合格人员。

(c) **Contractor's Design Responsibilities**  
承包商的设计责任

The Contractor shall be deemed to have warranted that the Contractor's proposed design (including any further designs or modifications which the Contractor has to carry out as aforementioned) is fit for its intended purpose and is to the level or standard normally expected of such a development.

承包商应被视为已保证其拟定的设计（包括承包商必须按照上述规定进行的任何进一步设计或修改）适合其预期目的，并达到此类开发通常预期的水平或标准。

The Contractor shall take full responsibility for the adequacy, suitability, integrity, durability and practicability of the Contractor's proposed design".

承包商应对其拟议设计的充分性、适用性、完整性、耐用性和实用性负全部责任”。

### 3.14 COMPLIANCE WITH ENVIRONMENTAL IMPACT REQUIREMENT

#### 遵守环境影响评价要求

(a) The Contractor shall comply strictly to the Mitigation Measures and Monitoring Programmes for the Environmental Impact throughout the Contract period.

承包商应在整个合同期间严格遵守环境影响缓解措施和监测计划。

(b) In particular, but not limit to, Contractor shall note and as much as possible by his own cost to limit the following pollutions during the construction phase:-

特别是但不限于，承包商应注意并尽可能自费在施工阶段限制以下污染： -

- dust and exhaust gas emission from on-site mechanical equipment and vehicles during construction;  
施工期间现场机械设备和车辆的粉尘和废气排放；
- noise emission from on-site mechanical equipment and vehicles during construction;  
施工期间现场机械设备和车辆的噪声排放；
- vibration caused by the Works;  
工程引起的振动；
- visual impacts;  
视觉影响；
- consideration of project location against the City Planning Act;  
根据《城市规划法》考虑项目位置；
- potential health and safety impact on people residing in neighbouring areas, construction workers and those involved in construction;  
对邻近地区居民、建筑工人和参与建筑的人员的潜在健康和安全隐患；

# PRELIMINARIES

## 基本措施项目



- construction and general solid wastes generation and disposal; and  
建筑和一般固体废物的产生和处置；和
  - wastewater from construction worker's activities.  
建筑工人活动产生的废水。
- (c) The Contractor shall do a Daily Environment Monitoring including take note weekly and formal report monthly.  
承包商应进行每日环境监测，包括每周记录和每月正式报告。

### 3.15 SUSPENSION OF WORK

#### 暂停工程

- (a) On the Project Manager's written instruction, the Contractor shall suspend the Works or any part thereof for such duration and in the manner directed. The Contractor shall, for the duration of such suspension, properly protect and secure the Works as may be reasonably instructed by the Project Manager.  
根据项目经理的书面指示，承包商应按照指示的时间和方式暂停工程或其任何部分。在暂停期间，承包商应按照项目经理的合理指示，妥善保护和保障工程。
- (b) Any cost incurred by the Contractor in giving effect to the Project Manager's instruction under this Clause shall be borne and paid by the Employer unless such suspension is :  
承包商在执行本条款规定的项目经理指示时产生的任何费用应由雇主承担和支付，除非此类暂停是：
- (i) necessary for the proper execution of the Works;  
正确执行工程所必需的；
  - (ii) caused by weather conditions which endanger or severely comprise the safety or quality of the Works;  
由危及或严重影响工程安全或质量的天气条件造成的；
  - (iii) caused by a default on the part of the Contractor, causing the Works to be impractical to continue; or  
由承包商违约造成，导致工程无法继续进行；或
  - (iv) the safety of the Works or any part thereof or the safety of adjacent buildings or properties are adversely affected by the continued execution of the Works.  
工程或其任何部分的安全或相邻建筑物或财产的安全因工程的继续实施而受到不利影响。
- (c) Provided always that the Contractor shall give notice to the Project Manager in writing of his intention to claim within one month of the Project Manager's instruction.  
前提是承包商应在项目经理发出指示后一个月内书面通知项目经理其索赔意向。

### 3.16 APPROVED INSURERS

#### 经批准的保险公司

- (a) The Contractor shall procure and submit the Contractor's All Risks (CAR's) Insurance and Third-Party Liability Insurance prior to the Commencement Date and shall comply with the requirements of the Contract. The Contractor also shall procure and submit the insurance policies for Workmen's Compensation Insurance and all other requisite insurances specified in the Contract Documents prior to the Commencement Date and shall comply with the requirements of the Contract.  
承包商应在开工日期前购买并提交承包商一切险（CAR）和第三方责任险，并应遵守合同要求。承包商还应在开工日期前购买并提交工伤赔偿保险和合同文件中规定的所有其他必要保险的保单，并应遵守合同的要求。

# PRELIMINARIES

## 基本措施项目



- (b) The Contractor has agreed to be fully responsible for any occurrence that has exceeded the limit and aggregate of the Contractor's All Risk Insurance at any amount including deductibles with no limit of occurrences for any loss, damage, death or bodily injury which may occur to any physical property or to any person which may arise out of the Contractor's performance of the Contract and occurring before the issue of the Performance Certificate.  
承包商已同意对超出承包商一切险限额和总额的任何事件负全部责任，包括在履约证书签发之前发生的任何有形财产或任何人可能因承包商履行合同而发生的任何损失、损坏、死亡或人身伤害的免赔额，且不设发生限额。

### 3.17 PERFORMANCE SECURITY

#### 履约保证

- (a) The Contractor shall submit a Performance Security in accordance with the requirements of the Contract Conditions. The amount of Performance Security is 10% of the Accepted Contract Amount.  
承包商应按照合同条件的要求提交履约保函。履约担保金额为中标合同金额的 10%。
- (b) The submission of a conforming performance security shall be a condition precedent to the Contractor being entitled to receive any payment under the Contract, notwithstanding the passing of the stipulated Contract Commencement Date and the issuance by the Project Manager of any Certificate certifying payment to the Contractor for work carried out under the Contract. The Contractor shall not be entitled to any claim for interest or any other loss or damage in respect of any delay in payment so caused. Or the Employer at his discretion may withhold the full amount of the bond and release the balance to the Contractor.  
提交符合要求的履约保函应是承包商有权根据合同获得任何付款的先决条件，尽管规定的合同开工日期已经过去，项目经理也颁发了任何证书，证明承包商已根据合同完成工作。承包商无权就由此造成的任何付款延误提出任何利息或任何其他损失或损害索赔。或者，雇主可自行决定扣留保证金的全部金额，并将余额退还给承包商。
- (c) In the event of the Contractor's failure to perform the Contract due to bankruptcy or any other reason the amount of the Performance Security will be utilized to off set any additional cost or expenditure in :-  
如果承包商因破产或任何其他原因未能履行合同，履约保证金的金额将用于抵消以下方面的任何额外成本或支出： -
- (i) obtaining another Contractor to carry out and complete the Works; and  
获得另一承包商来实施和完成工程； 和
  - (ii) completing the Works.  
完成工程。
- (d) The Performance Security shall be released or refunded to the Contractor on the date of issuance of the Taking-Over Certificate for the whole of the Works or upon the satisfactory submission of all written warranties, as-built Drawings and manuals specified herein, whichever is the later.  
履约保证金应在颁发整个工程的接收证书之日或在圆满提交本合同规定的所有书面保证、竣工图和手册之日（以较晚者为准）退还给承包商。
- (e) The Contractor shall be responsible for the cost in connection with extending the validity period of the security in the event the Contractor fails to complete the Works by the Time for Completion / extended completion date fixed in accordance with the Conditions of Contract.  
如果承包商未能在根据合同条件确定的竣工时间/延长竣工日期前完成工程，承包商应负责延长保证金有效期的相关费用。



# PRELIMINARIES

## 基本措施项目



### 3.18 KEY DATE ACHIEVEMENT / DELAY DAMAGES / MILESTONES / SECTIONS 关键日期实现/拖期赔偿费/里程/分段工程

- (a) The Contractor is required to provide an overall Programme establishing key Milestone and Completion Date for the various sections of the Works as per specified in the Contract.  
承包商需要根据合同规定提供一份总体计划，确定工程各部分的关键里程碑和竣工日期。

The Commencement Date will be specified in the Contract, or in the Letter of Acceptance. the Milestone and Completion Date shall be as follows:

合同或中标函中会规定开工日期。里程碑和竣工日期应如下：

The Contract Period is **365 calendar days** (from and including the Commencement Date stated in the Employer's Instruction).

合同总工期为 **365 日历天**（自开工令签发之日起计）。

Key Milestone Date:

关键节点：

- Approval of construction drawings: within 120 days after signing contract/ Letter of Acceptance  
施工图审批通过：合同/ 中标通知书签订后 120 日内
- Main structure capping: within 180 days after signing contract/ Letter of Acceptance  
主体结构封顶：合同/ 中标通知书签订后 180 日内
- Equipment installation completed: within 270 days after signing contract/ Letter of Acceptance  
设备安装完成：合同/ 中标通知书签订后 270 日内
- System integration commissioning completed: within 330 days after signing contract/ Letter of Acceptance  
系统联调完成：合同/ 中标通知书签订后 330 日内

- (b) Should the Contractor fail to achieve any Milestone Date due to any reason which does not entitle the Contractor to an Extension of Time in accordance with the Provisions of the Contract, the Contractor shall pay or allow to the Employer the Penalty amount(s) at a rate of 0.02% of Accepted Contract Amount per calendar day (or part thereof) of delay beyond Milestone Date.

如果承包商因任何原因未能实现任何里程碑日期，且承包商无权根据合同规定获得延期，则承包商应向雇主支付或预留雇主支付违约金，违约金按里程碑日期后每延迟一个日历日（或部分日历日）中标合同金额的 0.02% 计算。

- (c) Should the Contractor fail to achieve the Time for Completion due to any reason which does not entitle the Contractor to an Extension of Time in accordance with the Provisions of the Contract, the Contractor shall pay or allow to the Employer the Delay Damages at a rate of 0.1% of Accepted Contract Amount per calendar day up to a maximum sum of 10 % of Accepted Contract Amount.

如果承包商因任何原因未能达到竣工时间，且承包商无权根据合同规定获得延期，则承包商应向雇主支付或允许雇主支付误期损害赔偿金，单价为每个日历日中标合同金额的 0.1%，最高为中标合同金额的 10%。

- (d) The Penalty for failing achieve each Milestone Date shall be calculated separately.  
未能实现每个里程碑日期的罚款应单独计算。

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## 基本措施项目



- (e) The Penalty amounts are totally separate from, and in addition to, any amount(s) included elsewhere in the Contract for Delay Damages for delay beyond the Completion Date.  
罚款金额与合同中其他地方包含的任何金额完全分开，并且是对竣工日期后延误的延误损害赔偿金的补充。
- (f) Should the Contractor can complete (catch up) each Milestones, the Employer shall return immediately one hundred percent (100%) of the total prior Penalties imposed from the previous delayed Milestones.  
如果承包商能够完成（赶上）每个里程碑，则雇主应立即退还之前因之前延迟的里程碑而征收的罚款总额的百分之百（100%）。
- (g) The Delay Damages imposed by the Employer is not returnable.  
雇主收取的误期损害赔偿金不予退还。

### 3.19 VISUAL MOCK-UP (Not Applicable) 视觉模型（不适用）

## 4. TEMPORARY WORKS AND SITE OPERATION 临时工程和现场作业

### 4.01 SITE OFFICE AND TEMPORARY BUILDINGS 现场办公室和临时建筑

- (a) The Contractor shall submit for the Project Manager's approval within 7 days of the award of Contract (whether by a Letter of Acceptance or otherwise) a site layout plan indicating the location of all temporary buildings and welfare facilities to be installed on site.  
承包商应在合同授予后 7 天内（无论是通过中标函还是其他方式）提交一份现场布局图，说明现场安装的所有临时建筑和福利设施的位置，供项目经理批准。
- (b) Storage, Yards and Laydown Areas:  
储存、堆场和堆放区：
  - The Contractor may be allowed to utilise the space within the site boundary area as needed to complete the Works.  
承包商可以根据需要使用现场边界区域内的空间来完成工程。
  - The available space for storage of materials shall be limited within this area. Any off site storage provisions must be arranged by the Contractor and all costs paid by the Contractor.  
材料储存的可用空间应限制在该区域内。任何场外储存规定必须由承包商安排，所有费用由承包商支付。
  - The Contractor will not be permitted to use any land outside the site boundary for storage areas or laydown areas without written permission from the Project Manager and the Developer.  
未经项目经理和开发商书面许可，承包商不得将现场边界外的任何土地用作储存区或堆放区。
- (c) There shall not be any sleeping quarters for workers on site.  
现场不得有工人宿舍。
- (d) The temporary buildings, with their contents, shall be maintained in a clean and orderly condition.  
临时建筑及其内容物应保持干净有序。
- (e) These buildings shall be dismantled and removed and the sites made good within one (1) week of receipt of an order from the Project Manager for the removal of the said buildings.  
应在收到项目经理拆除上述建筑物的命令后一（1）周内拆除这些建筑物并修复现场。

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## 基本措施项目



### 4.02 TEMPORARY ROAD 临时道路

- (a) Provide and maintain all necessary temporary roads, hardstandings, culverts and crossings within the Site. Remove same when no longer required and reinstate areas of ground disturbed.  
提供并维护现场内所有必要的临时道路、硬质地面、涵洞和十字路口。不再需要时将其拆除，并恢复受干扰的地面区域。
- (b) The Contractor shall ensure that none of the aforementioned temporary work shall obstruct or impede the drainage systems.  
承包商应确保上述临时工程不会妨碍或阻碍排水系统。

### 4.03 EXISTING ROADS AND TRAFFIC SAFETY 现有道路和交通安全

- (a) The Contractor must ensure that the roads, pavements etc. leading to and around the Site are kept free from obstruction, earth, debris at all times, brought about by the work on the Site and in no way shall he cause any inconvenience or hindrance to traffic or persons either by his own vehicles or by his workmen, scaffolding, plant, materials etc. The Contractor will be responsible for cleaning all vehicles and plant (regardless of ownership) before they leave the Site to ensure that no earth, mud, debris, etc. is deposited by them on roads. For this purpose he shall install a wheel washing facility at every exit from the Site, to the Project Manager satisfaction, and remove on completion of the Works.  
承包商必须确保通往现场及其周围的道路、人行道等始终不受现场工作带来的障碍物、泥土、碎片的影响，并且不得因其自己的车辆或其工人、脚手架、设备、材料等对交通或人员造成任何不便或阻碍。承包商将负责在所有车辆和设备（无论所有权如何）离开现场之前对其进行清洁，以确保其不会在道路上沉积泥土、泥浆、碎屑等。为此，他应在现场的每个出口安装一个车轮清洗设施，直至项目经理满意，并在工程完工后拆除。
- (b) All such roads and pavements etc. must be used only for the passage of vehicles traffic. Under no circumstances may they be used as a temporary storage area.  
所有此类道路和人行道等必须仅用于车辆通行。在任何情况下，它们都不得用作临时存储区。
- (c) The Contractor shall employ responsible personnel to provide suitable traffic management at all access and egress points to the Site.  
承包商应雇佣负责人员，在现场的所有出入口提供适当的交通管理。
- (d) The Contractor is responsible for ensuring that all vehicles (regardless of ownership) leaving the Site are safely loaded and sheeted to prevent any spillage or loss of materials during transit.  
承包商负责确保所有离开现场的车辆（无论所有权如何）都安全装载和覆盖，以防止运输过程中材料溢出或丢失。
- (e) The Contractor shall be responsible for any damage caused by his or his Subcontractors' or his suppliers' transport vehicles or workmen to any existing streets and roads and shall repair or reinstate same to their original condition to the satisfaction of the Project Manager or alternatively shall bear the cost of such repair or restoration.  
承包商应对其或其分包商或其供应商运输车辆或工人对任何现有街道和道路造成的任何损坏负责，并应将其修复或恢复到原始状态，直至项目经理满意，或者应承担此类修复或恢复的费用。

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- (f) Provide, maintain and remove on completion all necessary temporary traffic guide rails, fences, signs, warning lamps, lighting, etc., for the safety of all pedestrian and motorists and requirement of the Traffic Control Authorities.  
提供、维护并在完工后拆除所有必要的临时交通导轨、围栏、标志、警示灯、照明等，以确保所有行人和驾驶者的安全，并满足交通管制部门的要求。

#### 4.04 ACCESS AND EGRESS

##### 出入口

- (a) The Contractor shall provide any temporary access and egress and shall allow here for all necessary Works involved, including the design, construction, maintenance, repair, shifting and adapting, and keeping the access and egress in good conditions at all times.  
承包商应提供任何临时通道和出口，并应允许进行所有必要的工程，包括设计、施工、维护、修理、转移和调整，并始终保持通道和出口的良好状态。
- (b) The Contractor is required to adhere strictly to the access and egress points shown on the Drawings or such other access and egress points approved by the Authorities and/or Project Manager.  
承包商必须严格遵守图纸所示的进出点或当局和/或项目经理批准的其他进出点。
- (c) In using the access route, the Contractor is to exercise the greatest care and take adequate precautions not to damage the pavements, roads and adjacent areas. The Contractor shall be required to reinstate and make good at his own expense all Works disturbed or damaged, to the satisfaction of the Project Manager and the Authorities.  
在使用进场路线时，承包商应格外小心，并采取足够的预防措施，以免损坏路面、道路和邻近区域。承包商应自费恢复和修复所有受干扰或损坏的工程，直至项目经理和当局满意。
- (d) All access and egress shall be subject to the approval of the Project Manager and the relevant Authorities and where required, be endorsed and submitted for the approval of the relevant Authorities by a Professional Engineer employed by the Contractor. The Contractor shall allow for any necessary applications, submissions and payment of fees and deposits required for the approval of such access and egress by the relevant Authorities.  
所有进出口均应经项目经理和有关当局批准，并在需要时由承包商雇用的专业工程师认可并提交有关当局批准。承包商应考虑相关当局批准此类出入所需的任何必要申请、提交和支付费用和押金。
- (e) The Contractor is required to share the access and egress points, roads and parking with others to reach their site accommodation, Direct and Other Contractors engaged by the Employer. As parking may not be authorised at or on the site the Contractor may need to operate a facility where off-site parking can be provided with vehicular transfers being provided to the site. The requirement and operation of such is to be discussed and agreed with the Project Manager prior to the Commencement of Works. No claims will be entertained in respect of any inconvenience or hindrance met by the Contractor due to the sharing of the access and egress points with Other Contractors.  
承包商需要与其他人共享进出点、道路和停车场，以到达他们的现场住所、雇主雇佣的直接承包商和其他承包商。由于现场或现场可能不允许停车，承包商可能需要运营一个设施，在该设施中可以提供场外停车，并向现场提供车辆接送服务。开工前，应与项目经理讨论并商定此类要求和操作。对于承包商因与其他承包商共享出入口而遇到的任何不便或阻碍，将不受理任何索赔。

# PRELIMINARIES

## 基本措施项目



- (f) The Contractor shall permit prospective buyers or renters access to the Site to view the show unit and shall provide temporary footways, hoardings, staircases, barriers, lighting and the like to enable proper and safe passage to the show unit.  
承包商应允许潜在买家或租户进入现场查看展示单位，并提供临时人行道、围板、楼梯、障碍物、照明等，以便能够正确安全地进入展示单位。

### 4.05 AREAS OF OPERATIONS 运营区域

- (a) The Contractor to allow areas for the Contractor's temporary buildings, storage and plant within the Site during the Contract. The Contractor to obtain prior approval for proposed locations from the Project Manager.  
承包商应在合同期间为现场内的承包商临时建筑、仓库和工厂留出区域。承包商应事先获得项目经理对拟议位置的批准。
- (b) Should additional space outside the boundary of the Site be required, the Contractor shall obtain the necessary wayleave from the Owners or Local Authorities. The Contractor to pay all fees and charges for same.  
如果需要现场边界外的额外空间，承包商应从雇主或地方当局获得必要的通行权。承包商应支付所有相关费用。
- (c) The Contractor shall arrange all operations and Works so as not to interfere with the free use of any existing buildings, walkways, public footpaths, roads or any other area on or adjoining the Site.  
承包商应安排所有作业和工程，以免干扰任何现有建筑物、人行径、公共人行道、道路或现场或邻近区域的自由使用。
- (d) No worker camp is allowed on site.  
现场不允许有工人营地。

### 4.06 OTHER CONTRACTORS AND SUPPLIERS ON SITE 现场其他承包商和供应商

- (a) The Contractor has to share the Site for temporary office and storage space with Direct and Other Contractors and Suppliers engaged or to be engaged by the Employer to carry out work not forming part of this Contract and shall exercise care in carrying out his work without causing inconvenience to others. He shall also work in close co-ordination with these Contractors and Suppliers and incorporate their work programs into his own so that the project is fully and efficiently coordinated.  
承包商必须与雇主雇佣或即将雇佣的直接和其他承包商和供应商共享现场作为临时办公和存储空间，以开展不属于本合同一部分的工作，并应谨慎开展工作，不得给他人造成不便。他还应与这些承包商和供应商密切协调，并将他们的工作计划纳入自己的工作计划，以便全面有效地协调项目。
- (b) The Contractor shall, in particular, liaise with these Direct and Other Contractors and Suppliers on matters of shared access, common security, keeping roads, accessways and drains free of mud and co ordination of their work to minimise obstructions and hindrances.  
承包商应特别与这些直接和其他承包商和供应商就共享通道、共同安全、保持道路、通道和排水沟无泥以及协调其工作以尽量减少障碍和阻碍等事项进行联络。
- (c) No claims will be entertained in respect of any inconvenience or hindrance met by the Contractor due to the presence of such Direct and Other and Suppliers on or around the Site.  
对于承包商因现场或周围有此类直接和其他供应商而遇到的任何不便或阻碍，将不受理任何索赔。

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## 基本措施项目



- (d) The Contractor shall interface, programme, organize and liaise with all other Contractors with regard to access and handing over procedures for various part of the Works for them to carry out their Works. Such handing over of part or parts of the Works will not constitute Partial Possession or Sectional Completion under the meaning of Conditions of Contract. Such possession will not involve the issue of the Taking-Over Certificate nor will it relieve the Contractor of any of his obligation with regard to delay damages, defect notification period, care of the Works and insurance of the Works.
- 承包商应就工程各部分的进入和移交程序与所有其他承包商进行接口、规划、组织和联络，以便他们开展工程。根据合同条件，对部分工程的此类处理不构成部分占有或分段竣工。此类占有不会涉及颁发接收证书，也不会免除承包商在延迟损害赔偿、缺陷通知期、工程照管和工程保险方面的任何义务。

### 4.07 TEMPORARY SCAFFOLDING

#### 脚手架

- (a) The Contractor shall provide, maintain and remove when directed by the Project Manager and to make good thereafter, all adequate temporary scaffoldings with stagings, planked footways, guardrails, etc., all material shall be of good quality, well maintained and without defects in accordance with the requirements of the Project Manager and the Authorities.
- 承包商应按照项目经理和当局的要求，在项目经理的指示下提供、维护和拆除所有足够的临时脚手架，包括脚手架、木板人行道、护栏等，并在此后进行修复。所有材料应质量良好，维护良好，无缺陷。
- (b) The Contractor shall provide for any modification and/or re-erection to the foregoing or special scaffoldings if necessary.
- 如有必要，承包商应提供对上述脚手架或特殊脚手架的任何修改和/或重新安装。
- (c) The Contractor shall liaise with all Nominated or Domestic Subcontractors and direct Contractors engaged by the Employer and to ensure that all their Works requiring the use of scaffolding are completed before dismantling the same. If the Contractor strikes any of his scaffolding prematurely and it is subsequently required by any Subcontractor, he shall re-erect it at his own expense.
- 承包商应与所有指定或国内分包商以及雇主雇用的直接承包商联络，并确保在拆除脚手架之前完成所有需要使用脚手架的工程。如果承包商过早地撞击了任何脚手架，并且随后任何分包商要求，承包商应自费重新搭建脚手架。

### 4.08 PASSANGER HOISTS

#### 乘客升降机

- (a) Provide adequate passenger hoists of approved capacity to facilitate vertical transportation during the construction.
- 提供足够的经批准容量的乘客升降机，以方便施工期间的垂直运输。
- (b) Allow free use of passenger hoists to Nominated Subcontractors and Suppliers, the Project Manager, Consultants and the Employer.
- 允许指定分包商和供应商、项目经理、顾问和雇主免费使用客梯。

# PRELIMINARIES

## 基本措施项目



### 4.09 PERMANENT LIFTS FOR TEMPORARY CONSTRUCTION USE 临时施工用永久电梯

- (a) The Elevator Contractor Agreement will include provision for the temporary use of the adequate elevators for building construction duration and include maintenance and overhaul of said elevators prior to handover. The Main Contractor shall be responsible for all costs incurred such as the monthly usage fees, operation, maintenance, protection and overhaul for any additional elevator months required over and above the provision.  
电梯承包商协议将包括在建筑施工期间临时使用足够电梯的规定，并包括在移交前对上述电梯进行维护和检修。总承包商应负责所有产生的费用，如每月的使用费、运营、维护、保护和大修，以及超出规定的额外电梯月数。

### 4.10 TOWER CRANE AND MOBILE CRANE 塔式起重机和移动式起重机

- (a) The Contractor shall provide sufficient number of tower cranes and mobile crane of adequate capacity for all Works including hoisting heavy equipment forming part of Nominated Subcontractor and Direct Contractor Works.  
承包商应为所有工程提供足够数量的塔式起重机和足够容量的移动式起重机，包括吊装构成指定分包商和直接承包商工程一部分的重型设备。
- (b) The Contractor shall assess the requirements regularly and increase the equipment if necessary at no additional cost to meet the Project Schedule. The Contractor should consider downtime for maintenance and re-locating in their assessment to ensure the work can progress.  
承包商应定期评估要求，并在必要时增加设备，且不收取额外费用以满足项目进度。承包商应在评估中考虑维护和重新定位的停机时间，以确保工作能够进展。

### 4.11 PROJECT SIGNBOARDS (NOT APPLICABLE) 项目标志牌（不适用）

# PRELIMINARIES

## 基本措施项目



### 4.12 TEMPORARY FENCINGS (NOT APPLICABLE) 临时围栏（不适用）

### 4.13 HOARDINGS AROUND UNFINISHED WORKS 未完工工程周围的围板

- (a) In circumstances of Phased/Stage Completion and/or Partial Occupation, the Contractor shall allow for hoarding up areas where incomplete Works remain in progress, including putting up barricades, warning signs and directional signs, etc. to prevent the public or the occupants of the premises from entering the 'Work-Areas'.  
在分阶段/阶段竣工和/或部分占用的情况下，承包商应允许在未完成工程仍在进行的区域进行围堵，包括设置路障、警告标志和方向标志等，以防止公众或房屋居住者进入工作区。
- (b) The passage ways into these work areas in the building shall also be hoarded. All workers shall be confined to the work areas and shall enter and exit by designated passage ways.  
建筑物内通往这些工作区的通道也应进行围板。所有工人应被限制在工作区域内，并应通过指定的通道进出。
- (c) All cost associated with painting, including Drawing murals and graphics on the protective hoarding, shifting, adapting and working around these hoardings as work proceed shall be deemed to be included in the Tender Sum.  
与涂漆相关的所有费用，包括在防护围板上绘制壁画和图形，在施工过程中移动、调整和围绕这些围板工作，应被视为包含在投标总价中。

### 4.14 TEMPORARY LIGHTING 临时照明

- (a) Provide all necessary temporary lighting for use on the Works.  
为工程提供所有必要的临时照明。
- (b) Provide all temporary cables, mains, sub mains, wiring, fittings, etc. for the above, clear away and make good on completion and pay all fees and charges.  
为上述工程提供所有临时电缆、干线、次干线、接线、配件等，完工后清理并修复，并支付所有费用。



# PRELIMINARIES

## 基本措施项目



- (c) Temporary lighting at adequate illumination level shall be provided for the following locations and purposes:  
应为以下位置和目的提供足够照度的临时照明：
- (i) Internal enclosed room and internal passages where natural lighting is completely absent;  
完全没有自然采光的内部封闭房间和内部通道；
  - (ii) Safe passages where adequate lighting is essential at all times to ensure the safety of all workmen and visitors;  
安全通道，始终需要充足的照明，以确保所有工人和访客的安全；
  - (iii) All locations where night work is to be carried out;  
所有需要进行夜间工作的地点；
  - (iv) Outlets for more localised use of lighting in confined spaces e.g. service ducts, lift shafts, etc; and  
在密闭空间内更本地化地使用照明的插座，如服务管道、电梯井等；和
  - (v) Lighting at the perimeter of the Site at night to safeguard the security of the Site as well as to ensure the safety of members of the public.  
夜间现场周边的照明，以保障现场的安全，并确保公众的安全。

#### 4.15 TEMPORARY POWER AND WATER SUPPLY

##### 临时供电供水

- (a) The Contractor shall provide at his own expense all necessary temporary electrical power and water supply required for the Works.  
承包商应自费提供工程所需的所有必要的临时电力和供水。
- (b) All temporary electrical power and water supplies must be from an approved source. The temporary electrical and water supplies must comply with relevant standards and codes of practice for the respective installations.  
所有临时电力和供水必须来自批准的来源。临时供电和供水必须符合相应设施的相关标准和行为规范。
- (c) The Contractor may arrange for the use of any temporary electrical and water supplies existing on the site (if available) or may arrange from other available sources if approved by the Project Manager and/or Authorities. All expenses and payments incurred in this connection shall be borne by the Contractor.  
承包商可以安排使用现场现有的任何临时电力和供水（如果可用），或者在项目经理和/或当局批准的情况下，可以从其他可用来源进行安排。与此相关的所有费用和付款应由承包商承担。
- (d) The Contractor shall alter, adapt and remove all temporary installation as and when directed by the Project Manager and make good thereafter.  
承包商应按照项目经理的指示更改、调整和拆除所有临时设施，并在之后进行修复。
- (e) The Contractor shall arrange separate and sufficient supply for testing of mechanical and electrical installations included in the Works. The detailed testing requirement shall meet the specialist requirements of each installations.  
承包商应为工程中包括的机械和电气装置的测试安排单独和充足的供应。详细的测试要求应满足每个装置的专业要求。

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## 基本措施项目



- (f) Where the Employer's existing permanent electrical and/or water supplies (if available) are permitted to be used for the Works, all expenses, payments and utilities charges consumed for the execution, testing, commissioning and maintenance of the Works during the Contract and the Defects Notification Period shall be borne by the Contractor. The amount shall be ascertained and determined by the Project Manager. The Contractor shall either reimburse the Employer or the Employer shall deduct such amount from monies due to the Contractor under the Contract.

如果允许雇主现有的永久性电力和/或供水（如有）用于工程，则合同和缺陷通知期内工程的执行、测试、调试和维护所消耗的所有费用、付款和公用事业费用应由承包商承担。金额应由项目经理确定。承包商应向雇主偿还或雇主应从合同项下应付给承包商的款项中扣除该金额。

#### 4.16 ACCESS TRACKS, WASH BAYS, ETC. 通道、洗涤间等。

- (a) The Contractor shall design, construct and maintain all access tracks, wash bays, etc., including submission by a Professional Engineer in accordance with all statutory requirements.  
承包商应设计、建造和维护所有通道、洗脸间等，包括由专业工程师根据所有法定要求提交。
- (b) During the Works, all access tracks to the work site should be thoroughly paved with granite chips or hardcore. A paved wash bay shall be provided for washing all vehicles leaving the site to the Public Roads.  
在工程期间，通往工地的所有通道应彻底铺设花岗岩碎片或硬底层。应提供铺砌的洗车间，用于清洗所有离开现场前往公共道路的车辆。

#### 4.17 TEMPORARY DRAINAGE AND SPECIAL SILT CONTROL 临时排水和特殊淤泥控制

- (a) The Contractor shall provide all necessary temporary drainage within and around the site to adequately keep the site free from water, including flood water. The Contractor shall also take over and maintain those temporary drainage facilities constructed by other Contractors, if any.  
承包商应在现场内外提供所有必要的临时排水设施，以充分保持现场无水，包括洪水。承包商还应接管和维护其他承包商建造的临时排水设施（如有）。
- (b) Where water is likely to be discharged into roadside drains and beach, the Contractor shall construct silt-traps or setting tanks or other means of removing sediments.  
如果水可能排入路边排水沟和海滩，承包商应建造淤泥收集器或沉淀池或其他清除沉积物的方法。
- (c) The planning, design and construction activities shall be in compliance with the relevant authorities' regulations.  
规划、设计和施工活动应符合有关部门的规定。
- (d) The Contractor shall maintain these Works in proper conditions and if required repair, reinstate, divert or improve the facilities to the satisfaction of the Authorities and Project Manager.  
承包商应将这些工程保持在适当的状态，并在必要时对设施进行维修、恢复、改道或改进，直至当局和项目经理满意。

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## 基本措施项目



- (e) All temporary drainage and silt control measures must be submitted by a Professional Engineer to the relevant department for approval before commencement of work. The Contractor is to allow for the cost of this requirement.  
所有临时排水和淤泥控制措施必须在开工前由专业工程师提交给相关部门批准。承包商应考虑此要求的费用。
- (f) The execution of the Works shall not disrupt, fill, block or disturb the existing overland flow, existing drains, temporary diversion drains or perimeter cut-off drains.  
工程的实施不得破坏、填充、堵塞或扰乱现有的地表径流、现有的排水沟、临时导流排水沟或周边截水沟。
- (g) Adequate measures, including the provision of proper barricades between the work areas and existing drains, must be taken to ensure that construction materials are not discharged or washed into the drains. The silt traps, drains and sump shall be desilted regularly to the satisfaction of the Authorities.  
必须采取适当措施，包括在工作区和现有排水沟之间设置适当的路障，以确保建筑材料不会被排放或冲入排水沟。淤泥收集器、排水沟和集水坑应定期进行除泥，直至当局满意。
- (h) Any monies/deposits required by the authorities are to be borne by the Contractor.  
当局要求的任何款项/存款均由承包商承担。
- (i) Upon completion of the Works, the Contractor shall demolish these temporary drainage and silt control measures and reinstate the ground to the satisfaction of the Project Manager.  
工程竣工后，承包商应拆除这些临时排水和淤泥控制措施，并恢复地面，直至项目经理满意。

#### 4.18 MAINTENANCE OF ROADS AND DRAINS AT AND ADJACENT TO THE SITE 现场及附近道路和排水沟的维护

- (a) The Contractor shall take all precautions to prevent spillage of soil and debris on public roads and footpaths and shall clean away any spillage which does occur. In the event that earth spillage occurs, such earth should be removed at his own expense.  
承包商应采取一切预防措施，防止泥土和碎屑溢出公共道路和人行道，并应清除任何溢出物。如果发生泥土溢出，应自费清除这些泥土。
- (b) The Contractor shall divert as required, all drains and other waterways encountered during the progress of the Works. Where such diversions are temporary, the Contractor shall subsequently reinstate to the approval of the Project Manager.  
承包商应按要求改道工程进展过程中遇到的所有排水沟和其他水道。如果此类改道是暂时的，承包商应随后恢复原状，以获得项目经理的批准。

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## 基本措施项目



- (c) The Contractor shall be responsible for the maintenance of and making good any damage to existing roads, kerbs, footpaths, drains crossings, culverts, etc; caused by his workmen, vehicle or plant or that of Nominated Subcontractor and Nominated Suppliers approaching or leaving the site, and to maintain, repair and reinstate the aforesaid to the original condition. If so damaged, the Project Manager will examine the damage, even to the extent of examining the sub-grade and road base and order the Contractor to do all rectification Works to his full satisfaction.  
承包商应负责维护和修复现有道路、路缘石、人行道、排水沟交叉口、涵洞等的任何损坏；因其工人、车辆或设备或指定分包商和指定供应商的工人、车辆和设备接近或离开现场，以及维护、修理和恢复上述设备至原始状态而造成的。如果损坏，项目经理将检查损坏情况，甚至检查路基和路基，并命令承包商进行所有整改工程，以使其完全满意。
- (d) The Contractor shall verify with the Authorities whether any restrictions exist on the free passage, at any time, of vehicles, plant or his workmen approaching or leaving the site, and shall provide against any limitation of such free passage. He shall also allow for parking fees if any, levied by the Authorities in and around the vicinity of the Works.  
承包商应随时与当局核实车辆、设备或其工人进出现场的自由通行是否受到任何限制，并应防止此类自由通行受到任何限制。他还应考虑到当局在工程附近和附近征收的停车费（如有）。
- (e) All operations necessary for the execution of the Works and for the construction of any temporary Works shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with the public traffic.  
只要符合合同要求，工程实施和任何临时工程施工所需的所有作业都应进行，以免不必要或不适当地干扰公共交通。
- (f) The Contractor is solely responsible for obtaining all necessary approvals from the relevant Authorities in respect of any extra ordinary road traffic and special loads necessary for transportation. No claims whatsoever will be entertained by the Employer in this respect.  
承包商全权负责就任何特殊道路交通和运输所需的特殊负载从有关当局获得所有必要的批准。雇主将不受理这方面的任何索赔。
- (g) The Contractor shall include here the cost of employing a professional Engineer for submission, endorsement and supervision, for any work relating to roads opening, all to the satisfaction of the relevant Authorities.  
承包商应在此处包括雇佣专业工程师提交、背书和监督与道路开放有关的任何工作的费用，所有这些费用均应达到有关当局的要求。
- (h) The Contractor shall indemnify the Employer in respect of all claims, demand proceedings, damages, cost, charges and expenses whatsoever arising out of or in relation to the aforesaid matters.  
承包商应赔偿雇主因上述事项引起的或与之相关的所有索赔、要求诉讼、损害赔偿、成本、费用和开支。

# PRELIMINARIES

## 基本措施项目



### 4.19 PERIODIC CLEANING UP AND PROTECTION OF WORKS 定期清理和保护工程

- (a) Allow for cleaning up of the Works during the progress of the Contract, from time to time as directed by the Project Manager.  
考虑在合同执行期间，按照项目经理的指示不时清理工程。
- (b) The Contractor is required to provide proper bulk bins of adequate size at site for storage of construction waste and debris and to make necessary arrangements for the disposal of the waste and debris to approved disposal grounds.  
承包商需要在现场提供足够大小的合适散装箱，用于储存建筑垃圾和碎片，并为将垃圾和碎片处置到批准的处置场做出必要的安排。
- (c) The Contractor shall provide full and adequate protection (including the provisions of plywood protection panels, polythene sheets, canvases, etc) for all finished surfaces and for all materials which are easily susceptible to damage if not so protected and shall be responsible for making good all damage done to such finished surfaces and materials until Taking Over of the Works is achieved and the work is handed over to the Employer.  
承包商应为所有完工表面和所有不受保护容易损坏的材料提供全面和充分的保护（包括胶合板保护板、聚乙烯板、帆布等），并负责修复对这些完工表面和材料造成的所有损坏，直至工程接收并移交给雇主。
- (d) This protection must be applied or provided as soon as a surface is finished and/or materials arrive on the site or as may be otherwise desirable and such protection shall be maintained throughout the course of the Works.  
一旦表面完成和/或材料到达现场，或根据其他需要，必须立即施加或提供这种保护，并且在整个工程过程中应保持这种保护。
- (e) For the purpose of inspections, the Contractor should make allowance for the removal and re-instatement of protection as necessary.  
为了进行检查，承包商应考虑必要时拆除和恢复保护措施。

### 4.20 DEBRIS CHUTES 碎屑斜槽

- (a) For the purpose of removing debris and superfluous material from the upper levels of the Works the Contractor shall provide sufficient number of debris chutes at locations to be agreed with the Project Manager.  
为了清除工程上层的碎屑和多余材料，承包商应在与项目经理商定的位置提供足够数量的碎屑槽。
- (b) The Contractor is also required to undertake all necessary precautionary measures to ensure that the discharge of rubbish and superfluous material from rubbish chutes does not cause any nuisance to the public and owners of the adjoining buildings.  
承包商还需要采取一切必要的预防措施，以确保垃圾槽排放的垃圾和多余材料不会对公众和邻近建筑物的雇主造成任何滋扰。

# PRELIMINARIES

## 基本措施项目



### 4.21 DISPOSAL OF SITE REFUSE

#### 现场垃圾处理

- (a) The Contractor shall allow here for the disposal of site refuse at authorized location and pay all charges hereto.  
承包商应允许在授权地点处理现场垃圾，并支付所有费用。

## 5. SITE ADMINISTRATIVE REQUIREMENTS

### 现场管理要求

### 5.01 SITE SUPERVISORY AND CONTRACTOR'S SITE STAFF

#### 现场监督和承包商现场工作人员

- (a) The Contractor shall provide adequate and competent experienced and qualified staff to manage and supervise all Domestic and Nominated Subcontractor to maintain the Project schedule including:-  
承包商应提供足够的、有能力的、经验丰富的合格人员来管理和监督所有自身和指定分包商，以维持项目进度，包括： -
- (i) a qualified and experienced Project Director to be overall in charge of the whole site operation for the full duration of the Contract. The Project Director shall be a professional Engineer, having a comprehensive theoretical background, suitable qualifications and **fifteen (15)** years minimum relevant on site experience and assumed to be approx. 50 years old or above. He shall be fluent in spoken and written Chinese and English, have an aptitude for organising and controlling men, be able to think quickly and decisively and deal courteously and tactfully with other members of the building team. He shall be constantly on the Works and shall devote his whole time to the superintendence of same;  
一名合格且经验丰富的项目总监，在整个合同期间全面负责整个现场运营。项目总监应为专业工程师，具有全面的理论背景、适当的资格和至少**十五（15）**年的相关现场经验，假设年龄约为 50 岁或以上。他应精通中英语口语和书面语，具有组织和控制人员的能力，能够快速果断地思考，礼貌得体地与建筑团队的其他成员打交道。承包商应持续参与工程，并将其全部时间用于监督工程；
- (ii) qualified and experienced Project Managers, suitable qualifications and **fifteen (15)** years minimum relevant on site experience and assumed to be approx. 45 years old or above to manage each major Section of work or major Subcontractor;  
合格且经验丰富的项目经理、适当的资格和至少**十五（15）**年的相关现场经验，假设年龄约为 45 岁或以上，可以管理每个主要工程部分或主要分包商；
- (iii) qualified and experienced Deputy Project Managers, suitable qualifications and **fifteen (15)** years minimum relevant experience and assumed to be approx. 40 years old or above to assist each Project Manager;  
合格且经验丰富的副项目经理、适当的资格和至少**十五（15）**年的相关经验，假设年龄约为 40 岁或以上，以协助每位项目经理；
- (iv) qualified and experienced Engineers. He shall be responsible for organising, coordinating, supervising, directing, programming and monitoring the Works. He is required to resolve all the site problems pertaining to structural matters;  
合格且经验丰富的工程师。他应负责组织、协调、监督、指导、规划和监督工程。他需要解决所有与结构问题有关的现场问题；

# PRELIMINARIES

## 基本措施项目



- (v) Provide at all times on the Site for the full duration of the Contract a registered licensed Engineer to sign all Local Authority supervision forms.  
在整个合同期间，始终在现场提供一名注册持证工程师，以签署所有地方当局的监督表格。
- (vi) adequate full-time experienced general foreman;  
足够的全职经验丰富的总领班；
- (vii) adequate full time assistant foreman, experienced site supervisors, experienced coordinating draftsman and all necessary support staff;  
足够的全职助理领班、经验丰富的现场监督员、经验丰富、协调起草人和所有必要的支持人员；
- (viii) a qualified lifting supervisor who is responsible for all lifting operations of any crane or tower crane and  
一名合格的起重监督员，负责任何起重机或塔式起重机的所有起重作业，以及
- (ix) a qualified safety staff as required to manage the work. Employ additional safety, security and cleaning staff during the transition stages between Construction and Operation.  
管理工作所需的合格安全人员。在施工和运营之间的过渡阶段雇佣额外的安全、安保和清洁人员。
- (x) staff to liaise and resolve community/neighbour issues resulting from the Construction Work.  
工作人员联络并解决施工工程引起的社区/邻居问题。
- (xi) Provide at all times management and supervision of each Direct and Nominated Subcontractor to ensure coordination, safety and schedule  
随时对每个直接分包商和指定分包商进行管理和监督，以确保协调、安全和进度

If any Contractor fails to adequately manage or supervise their work, the Contractor shall assume the responsibility. Any additional cost may be levied to the Contractors account.  
如果任何承包商未能充分管理或监督其工作，承包商应承担 responsibility。任何额外费用可由承包商承担。

- (b) On Commencement of the Works, a list of Contractors' key personnel's emergency contact numbers, including mobile numbers shall be submitted to the Project Manager and Employer within seven (7) days from the date of award of this Contract.  
工程开工后，应在本合同授予之日起七（7）天内向项目经理和雇主提交承包商关键人员的紧急联系电话清单，包括手机号码。

# PRELIMINARIES

## 基本措施项目



- (c) The Contractor shall provide an organisation chart showing a detailed list of his site supervisory staff for the approval of Project Manager. The list shall include all relevant details of each staff member including his functions, position, duties, qualification, experience, age and length of employment with the Contractor. The provision of such organisation chart and the Project Manager's approval thereof shall not limit the Contractor's responsibilities and obligations in respect of adequate staffing at the Site. In the event additional staffs are considered necessary to properly and effectively supervise the execution of the Works, the Contractor shall provide such additional staffs at no extra cost to the Employer.  
承包商应提供一份组织结构图，显示其现场监督人员的详细名单，供项目经理批准。该清单应包括每位员工的所有相关细节，包括其职能、职位、职责、资格、经验、年龄和在承包商的工作时间。提供此类组织结构图和项目经理的批准不应限制承包商在现场配备足够人员方面的责任和义务。如果认为需要额外的人员来正确有效地监督工程的执行，承包商应提供额外的人员，而雇主不承担额外费用。
- (d) The Contractor's site personnel and supervisory staffs must be constantly on site during all working hours and whenever deemed necessary by the Project Manager.  
承包商现场人员和监督人员必须在所有工作时间以及项目经理认为必要时随时在现场。
- (e) Once appointed and approved, the site staffs shall not be changed without giving ample notice to the Project Manager.  
一旦任命和批准，未经充分通知项目经理，不得更换现场工作人员。
- (f) The Project Manager reserves the right to order the Contractor to increase his site staff or to obtain better staff. Should the Contractor fail to comply with the Project Manager's directions in this respect, the Employer may engage adequate site supervisors and shall deduct their salaries including overtime pay and expenses incurred from any monies due or which may become due to the Contractor.  
项目经理保留命令承包商增加其现场人员或获得更好人员的权利。如果承包商未能遵守项目经理在这方面的指示，雇主可以聘请足够的现场监督员，并应从应付给承包商的任何款项中扣除他们的工资，包括加班费和产生的费用。
- (g) The Project Manager may issue his Instruction to request the Contractor to change his site personnel and/or supervisory staffs based on the Project Manager satisfaction. The Contractor must act replace his personnel and/or supervisory staffs within 14 days by prior approval of The Project Manager. The Contractor have no right to claim for any additional cost and time for this case.  
项目经理可发出指示，要求承包商根据项目经理的满意度更换其现场人员和/或监督人员。承包商必须在项目经理事先批准的 14 天内更换其人员和/或监督人员。承包商无权为此索赔任何额外费用和时间。

### 5.02 PROGRAMME 计划

- (a) The Master Programme has to be provided in MS project format which demonstrates all critical paths at an adequate detail level for monthly monitoring. The actual progress will be reported by showing the original baselines compared to the actual progress line at the report date.

主计划必须以 MS project 格式提供，该格式以足够的细节级别展示所有关键路径，以便进行月度监控。实际进度将通过显示原始基线与报告日期的实际进度线进行比较来报告。



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## 基本措施项目



- (b) The Contractor shall prepare and submit, a detailed Programme for the execution of the Works to the Project Manager and make subsequent revisions as required. The Programme is to be approved by the Project Manager, otherwise it is not valid.

承包商应编制并向项目经理提交一份详细的工程实施计划，并按要求进行后续修订。该计划需经项目经理批准，否则无效。

- (c) The Programme shall be summarized into the form of a bar chart derived from a critical path analysis accompanied by all the necessary schedules, and shall show the programmed dates for the commencement and completion on a stage by stage basis of the Works in a sequence including dates related to each Relevant Part as applicable. The critical path analysis shall also be submitted with the Programme and any subsequent revisions thereto.

该计划应总结为条形图的形式，该条形图来自关键路径分析，并附有所有必要的时间表，并按顺序显示工程的分阶段开工和竣工的计划日期，包括与每个相关部分相关的日期（如适用）。关键路径分析也应与计划及其任何后续修订一起提交。

- (d) The Programme shall be in sufficient detail to permit precise comparison between the Works as programmed and the actual progress of the Works and shall show Taking Over of the Works by the due date or earlier.

该计划应足够详细，以便对计划中的工程和工程的实际进度进行精确比较，并应显示在到期日或更早的日期之前接收工程。

- (e) The Programme shall be in the following form:

该计划应采用以下形式：

- (i) Bar chart format set out on a stage by stage (i.e. in phases of the Works or other separately identifiable stage or Section) and operation by operation basis in sequence. The operations must be separated to at least the level of detail of the separate trades, Subcontracts and work operations.

按阶段（即工程的各个阶段或其他可单独识别的阶段或部分）和顺序按操作列出的柱状图格式。操作必须分开，至少要达到单独行业、分包合同和工作操作的详细程度。

- (ii) Works on the critical path. work which is the subject matter of provisional or Prime Cost sums and work by Nominated Subcontractors must be separately identified.

在关键路径上工作。作为暂定或主要成本金额标的工程和指定分包商的工程必须单独确定。

- (iii) The Contractor must at all times allow in programming the work for provision of reasonable times for completion in respect of work by Domestic or Nominated Subcontractor and other Contractors engaged by the Employer.

承包商在规划工作时必须始终考虑到为国内或指定分包商以及雇主雇用的其他承包商的工作提供合理的竣工时间。

- (iv) The Contractor must also allow in programming the work provision of reasonable times for submission approvals and inspections.

承包商还必须在规划工作时为提交批准和检查提供合理的时间。

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## 基本措施项目



- (f) Major items of plant such as personnel, material hoists, tower cranes, CTU lift, and the like must be separately identified.  
设备的主要项目，如人员、材料起重机、塔式起重机、CTU 升降机等，必须单独标识。
- i. The programmed dates for the commencement and completion and the duration of each stage and operation must be given.  
必须给出开始和完成的计划日期以及每个阶段和操作的持续时间。
- ii. It shall be in sufficient detail to permit week-by-week precise comparison between the work as programmed and the actual progress of the Works, and shall show Taking Over of the Works by the due date or earlier.  
它应足够详细，以便每周对计划的工作和工程的实际进度进行精确比较，并应显示在到期日或更早的日期接收工程。
- (g) The Programme shall not be amended except after consultation with and reviewed by the Project Manager.  
除非与项目经理协商并经其审查，否则不得修改该计划。
- (h) A current copy of the Programme shall be available at the Site office at all times.  
现场办公室应随时提供该计划的最新副本。
- (i) Notwithstanding the submission and approval of the Programme, the Contractor is in no way relieved from his responsibility to complete the Works by the Date for Completion or extension of time granted in pursuance to the Conditions of Contract.  
尽管提交并批准了该计划，但承包商仍有责任在竣工日期或根据合同条件授予的延期之前完成工程。
- (j) The Programme should include all Nominated Subcontractors and Direct Contractors Works. Contractor shall plan, co-ordinate, agreed and incorporate their programme into the Programme.  
该计划应包括所有指定分包商和直接承包商的工程。承包商应计划、协调、商定并将其计划纳入主计划。

### 5.03 SITE MEETINGS

#### 现场会议

- (a) The Contractor's authorised representative, his site agent and/or his site staff shall attend and ensure attendance by the required Subcontractors to all site meetings called by the Project Manager.  
承包商授权代表、其现场代理人和/或其现场工作人员应出席并确保所需分包商出席项目经理召开的所有现场会议。
- (b) Persons designated by the Contractor to attend and participate in site meetings shall have the required authority to commit the Contractor to solutions agreed upon at the meetings.  
承包商指定参加现场会议的人员应具有所需的权力，使承包商承诺采取会议上商定的解决方案。
- (c) The Contractor shall submit to the Project Manager and other Project Manager's Representatives before each meeting an agenda listing site problems, variations or extra Works instructed by the Project Manager, progress of the Works and any other matters for discussion during the meeting.  
承包商应在每次会议前向项目经理和其他项目经理代表提交一份议程，列出项目经理指示的现场问题、变更或额外工程、工程进度以及会议期间讨论的任何其他事项。

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## 基本措施项目



- (d) The Contractor shall record the minutes of meeting for all site co-ordination/ technical meetings with Subcontractors and submit to the Employer and Project Manager's Representatives after each meeting.  
承包商应记录与分包商举行的所有现场协调/技术会议的会议纪要，并在每次会议后提交给雇主和项目经理代表。

### 5.04 CASH FLOW

#### 现金流量

- (a) The Contractor shall prepare and issue to the Project Manager a cash flow statement showing the Contract Value broken down into the values of the anticipated interim payments based upon the approved Works programme and Contract payment provisions.  
承包商应编制并向项目经理发布一份现金流量表，根据批准的工程计划和合同付款规定，将合同价值细分为预期中期付款的价值。
- (b) The cash flow shall be prepared and submitted together with the detailed Works programme.  
现金流应与详细的工程计划一起编制和提交。
- (c) The cash flow statement shall be for information only.  
现金流量表仅供参考。

### 5.05 LABOUR, PLANT AND TOOLS

#### 劳动力、设备和工具

- (a) The Contractor shall provide all necessary labour, plant and tools for the proper and efficient execution of the Works. He shall provide for all transport for labour and for the movement of plant and equipment to and from site, erection, dismantling, moving about site as necessary and including allowance for all idle time.  
承包商应提供所有必要的劳动力、设备和工具，以正确有效地执行工程。承包商应提供所有劳动力运输以及往返现场的装置和设备的运输、安装、拆卸、必要时在现场移动，并包括所有空闲时间的余量。
- (b) The Contractor shall not install and/or use any electrical installations, machines or apparatus that may cause heavy power surge, high frequency voltage and current, air borne noise, vibration or any electrical or mechanical interference or disturbance whatsoever which may prevent in any way the service or use of any communication system or affect the operation of other equipment, installations, machinery, apparatus or plants.  
承包商不得安装和/或使用任何可能引起严重电涌、高频电压和电流、空气传播噪声、振动或任何电气或机械干扰或扰动的电气装置、机器或设备，这些干扰或扰动可能以任何方式阻止任何通信系统的服务或使用，或影响其他设备、装置、机器、设备或装置的运行。

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## 基本措施项目



### 5.06 OVERTIME AND BONUS PAYMENTS

#### 加班费和奖金

- (a) The Contractor shall allow in his Tender for all bonus payments, other incentive payment schemes and payment for overtime work.  
承包商应在其投标书中考虑所有奖金、其他激励付款计划和加班费。
- (b) If in the opinion of the Project Manager the progress of the Works is behind schedule, the Project Manager shall have the right to instruct the Contractor to increase his plant and labour force and/or to continue work beyond normal working hours, including night work, in order to maintain the progress of the work to his satisfaction. The Contractor shall bear the extra cost for complying with the Project Manager's Instruction to perform such work necessary to adhere to the agreed Works Programme and no claim for extra payment for working beyond normal working hours will be entertained.  
如果项目经理认为工程进度落后于计划，项目经理有权指示承包商增加其设备和劳动力和/或在正常工作时间之外继续工作，包括夜班，以保持工程进度令他满意。承包商应承担遵守项目经理指示的额外费用，以执行遵守商定的工程计划所需的工作，并且不接受对正常工作时间以外工作的额外付款的索赔。

### 5.07 WORKING DAYS AND WORKING HOURS

#### 工作日和工作时间

- (a) The Contractor shall, in respect of working hours for Employees, comply with all relevant labour Laws, EIA's and Authority's regulations into operation throughout Thailand.  
承包商应在雇员的工作时间方面遵守泰国各地实施的所有相关劳动法、环境影响评价和当局规定。
- (b) Work can only be performed during the working hours permitted by the Authorities. No work shall be executed on the site within such periods as prohibited by the Project Manager or the Authorities.  
工作只能在当局允许的工作时间内进行。在项目经理或当局禁止的期限内，不得在现场执行任何工作。

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## 基本措施项目



### 5.08 CONSTRUCTION MANAGER'S NORMAL WORKING HOURS 施工经理正常工作时间

- (a) No work requiring "standing" supervision shall be carried out without the presence of the Construction Manager staff.  
未经施工经理人员在场，不得进行任何需要“长期”监督的工作。
- (b) Any work which requires "standing" supervision shall be organised and programmed within the stipulated working hours of the Construction Manager staff.  
任何需要“长期”监督的工作都应在施工经理员工规定的工作时间内组织和规划。
- (c) In order to complete the necessary works during the contract period, the Main Contractor shall provide at its own expense all the additional services required for night work and overtime work, including all night time lighting charges that may be required during the contract period (except those for the works which were specifically requested by the Employer to be completed earlier than the date set out in the schedule agreed between the Parties).  
为了在合同期内完成必要的工程，总承包商应自费提供夜间工作和加班所需的所有额外服务，包括合同期内可能需要的所有夜间照明费用（雇主特别要求在双方商定的时间表规定的日期之前完成的工程除外）。
- (d) In order to carry out night construction, the Main Contractor shall be responsible for handling the relevant formalities with the relevant government departments and obtaining permission from the Employer. All costs required for this shall be deemed to have been included in the Contract Sum. The Working hours shall comply with EIA requirements in Thailand.  
为进行夜间施工，总承包商应负责向相关政府部门办理相关手续，并获得雇主的许可。为此所需的所有费用应被视为已包含在合同金额中。工作时间应符合泰国的环境影响评价要求。

### 5.09 DAILY SITE RECORDS 每日现场记录

- (a) The Contractor shall prepare and submit to the Project Manager a properly documented and dated job diary.  
承包商应编制并向项目经理提交一份有适当记录和注明日期的工作日记。
- (b) Maintain proper daily records on the Works progress, weather conditions, number of workmen employed, quantity and type of plant in use, instructions received, detailed records of material tested and any other records specifically required by the Project Manager.  
对工程进度、天气状况、雇佣的工人数量、使用的设备数量和类型、收到的指示、测试材料的详细记录以及项目经理特别要求的任何其他记录进行适当的日常记录。

# PRELIMINARIES

## 基本措施项目



### 5.10 PROGRESS REPORT 进度报告

- (a) The Contractor shall submit at agreed dates to the Project Manager a monthly progress report indicating individual component progress made in the preceding month. Such reports shall show cumulative progress towards scheduled completion, expressed as a percentage of all items shown in the approved Works programme and shall also include a summary of the progress achieved through every phase of the Contract.  
承包商应在约定日期向项目经理提交一份月度进度报告，说明上个月各组成部分的进度。此类报告应显示计划竣工的累计进度，以批准的工程计划中显示的所有项目的百分比表示，还应包括合同每个阶段取得的进度摘要。
- (b) Reports shall relate to key date achievement and indicate the degree of criticality on each activity. Any delays or potential delays shall be clearly identified and a statement given as to the measures being taken or to be taken to maintain the key dates.  
报告应与关键日期成就相关，并指出每项活动的关键程度。应明确指出任何延误或潜在延误，并就为保持关键日期而采取或将要采取的措施发表声明。
- (c) The progress reports shall include projected work activities for at least one (1) week ahead of those being reported upon with date on labour strength and equipment to be employed.  
进度报告应包括在报告之前至少一（1）周的预计工作活动，并注明劳动力和所用设备的日期。
- (d) The monthly progress report shall be in a format approved by the Project Manager.  
月度进度报告应采用项目经理批准的格式。

(i) **Programme Progress Updates and Projections**  
计划进度更新和预测

The overriding requirements of any progress reporting is for the Contractor to provide a factual and realistic assessment of the current progress achieved and forecast the affect this progress will have a on the Contract milestones/Sections.  
任何进度报告的首要要求是承包商对当前取得的进度进行事实和现实的评估，并预测这一进度将对合同里程碑/章节产生的影响。

The Contractor shall be required to submit progress updates of the current Preliminary or Master Programme with each monthly progress report.  
承包商应在每月进度报告中提交当前初步或总体计划的进度更新。

The update shall record actual progress (starts and finishes) achieved at the reporting date, whilst progress of Works underway shall be calculated using the realistic period required on site to complete the remaining work within the scope of the activity. Progress calculated on percentage completed may not give a realistic completion forecast; therefore Time Remaining shall be used.

更新应记录报告日期实现的实际进度（开始和结束），而正在进行的工程进度应使用现场完成活动范围内剩余工作所需的实际时间进行计算。按完成百分比计算的进度可能无法给出现实的完成预测；因此，应使用剩余时间。

The approved baseline will be shown below the progress bar and the start and finish variance columns comparing actual/forecast and baseline will be shown.  
批准的基线将显示在进度条下方，并显示比较实际/预测和基线的开始和结束差异列。

# PRELIMINARIES

## 基本措施项目



The programme status or each Contractual milestone will be clearly stated in the monthly progress report in whole weeks. Forecasts showing a delay will be reported as – (minus) weeks, whilst forecasts showing early completions will be shown as + (plus) weeks.

项目状态或每个合同里程碑将在整周的月度进度报告中明确说明。显示延迟的预测将报告为-（负）周，而显示提前完工的预测将显示为+（正）周。

It is incumbent upon the Contractor to ensure the progress forecast accurately reflects the progress and sequence of Works progressing on site (either actual or anticipated). If the originally planned sequence has been amended or changed on site, then the Contractor is solely responsible for ensuring that original programme logic network (relationships, leads and lags, etc.) are amended to reflect these changes. Progress updates/forecasts that do not reflect site conditions will be rejected.

承包商有责任确保进度预测准确反映现场工程进度和顺序（实际或预期）。如果最初计划的顺序在现场被修改或更改，则承包商全权负责确保原始程序逻辑网络（关系、领先和滞后等）被修改以反映这些更改。不反映现场条件的进度更新/预测将被拒绝。

### (ii) Progress Meetings 进度会议

The Contractor will be required to attend Progress Meetings as directed by the Project Manager to report the progress of the design, procurement and construction Works. The Contractor will be required to submit a detailed progress report supported by an updated programme 24 hours prior to the meeting. The report shall describe:

承包商将被要求按照项目经理的指示参加进度会议，报告设计、采购和施工工程的进度。承包商将被要求在会议前 24 小时提交一份详细的进度报告，并附上更新的计划。报告应描述：

- Design information required/outstanding  
所需/未完成的设计信息
- Procurement Status  
采购状态
- Programme Status  
项目状态
- Approval of Submittals  
批准提交文件
- Progress of Works  
工程进度
- Coordination Issues  
协调问题
- Programme Review  
方案审查
- Mitigation of Delays  
减少延误
- Variations  
变化
- Payments  
付款

# PRELIMINARIES

## 基本措施项目



(ii) **Contractors Monthly Report**  
承包商月度报告

The Contractor is to issue a detailed monthly report to the Project Manager on the twenty-fifth day of each month (or next working day), recording progress achieved by the last Saturday in the preceding month. The format and contents shall be as per the Employer's approved monthly report templates. The report shall include:  
承包商应在每月的第 25 天（或下一个工作日）向项目经理提交一份详细的月度报告，记录截至上月最后一个星期六的进度。格式和内容应符合雇主批准的月度报告模板。报告应包括：

- **Contract status dashboard**  
合同状态仪表板
  - **Contract commencement date**  
合同生效日期
  - **Contract completion date**  
合同完成日期
  - **Forecast completion date and Programme Status**  
预测完成日期和计划状态
  - **Reasons for delay and actions taken to mitigate the delay**  
延误的原因和为缓解延误而采取的行动
  - **Extension of time requested/awarded**  
请求/授予的延期
  - **Summary of the progress of the Works**  
工程进度总结
  - **Subcontractor and Material procurement schedules**  
分包商和材料采购计划
  - **Outstanding information/approvals**  
未完成的信息/批准
  - **Key information required in the next four weeks**  
未来四周所需的关键信息
  - **Outline Statement of Final Account (or Final Statement)**  
决算概要（或决算表）
  - **Schedule of Provisional Sums status**  
暂定金额状态表
  - **Payments**  
付款
  - **Monthly Master Programme progress updated and forecast**  
每月主课程进度更新和预测
  - **Associated Documents monthly progress update**  
相关文件每月进度更新
  - **Progress photographs**  
进度照片
- (e) The coming 3 weeks plan and progress in a format approved by the Project Manager has to be weekly submitted and report in the weekly progress meeting.  
必须每周提交项目经理批准格式的未來 3 周计划和进度，并在每周进度会议上报告。
- (f) The daily report in an approved format by the Project Manager has to be submitted to Project Manager on the following working day.  
项目经理批准格式的每日报告必须在下一个工作日提交给项目经理。



# PRELIMINARIES

## 基本措施项目



The Contractor shall submit with the Contractors Monthly Report an updated Master Programme to show progress against the baseline and a commentary on the reasons for any delays, measured against the accepted programme.

承包商应随承包商月度报告提交一份更新的主计划，以显示与基线的进度，并根据已接受的计划对任何延误的原因进行评论。

The Contractor shall submit, with the Contractors Monthly Report, recommendations for maintaining the Contract on programme. The Project Manager may request that the Contractor submit weekly reports for Sections of the Works where the Project Manager considers such Sections of work crucial to the overall progress of the Works.

承包商应与承包商月度报告一起提交按计划维持合同的建议。项目经理可要求承包商提交项目经理认为对工程整体进度至关重要的工程部分的周报。

The Contractor shall submit to the Project Manager for his review all Subcontractors procurement, manufacturing, fabrication and delivery programmes. The programme submitted by the Contractor is to reflect the dates shown in the Subcontractors programmes. As Subcontractors are progressively engaged, the Contractor is to update the programme to reflect the dates agreed with the Subcontractors.

承包商应向项目经理提交所有分包商的采购、制造、装配和交付计划供其审查。承包商提交的计划应反映分包商计划中显示的日期。随着分包商的逐步参与，承包商将更新计划，以反映与分包商商定的日期。

Note: Approval by the Project Manager, of the Contractors and Subcontractors programmes, shall only confirm the conformance to the overall project requirements. Such approval by the Project Manager does not relieve the Contractor of any of their responsibilities whatsoever for the feasibility, logic, duration and resources applicable to the activities indicated in the programme

注：项目经理对承包商和分包商计划的批准仅应确认其符合总体项目要求。项目经理的此类批准并不免除承包商对适用于计划中所示活动的可行性、逻辑、持续时间和资源的任何责任。

### 5.11 PROGRESS PHOTOGRAPHS

#### 进度照片

- (a) Before commencement and thereafter on a monthly basis until completion of the Works, the Contractor shall furnish 3 sets of the progress photographs i.e. an average of 36 coloured photographs per set to the Project Manager as part of the records of the progress of Works on the site. In addition, the Contractor shall email the digital progress photographs plus send softcopies sets of the progress photographs in one USB flash drive to the Project Manager. The locations and the subject of the photographs shall be as directed by the Project Manager.

开工前以及此后每月直至工程竣工，承包商应向项目经理提供 3 套进度照片，即每套平均 36 张彩色照片，作为现场工程进度记录的一部分。此外，承包商应将数字进度照片通过电子邮件发送给项目经理，并将进度照片的软拷贝放在一个 USB 闪存驱动器中发送给项目管理员。照片的位置和主题应按照项目经理的指示。

- (b) Prints shall be standard commercial quality on single-weight glossy paper of size 3R inserted back to back in clear plastic envelopes designed for the purpose. Photographs shall be submitted in digital copies also. The ownership and copyrights of all photographs, negatives and slides shall be vested in the Employer and these shall not be used for any purpose whatsoever without the Project Manager's approval.

印刷品应为标准商业质量，印在 3R 尺寸的单重光泽纸上，背对背插入为此目的设计的透明塑料信封中。照片也应以数字副本的形式提交。所有照片、底片和幻灯片的所有权和版权应归雇主所有，未经项目经理批准，不得用于任何目的。

# PRELIMINARIES

## 基本措施项目



### 5.12 METHOD STATEMENTS 施工方案

- (a) Included in the Contractor's Tender should have been an Outline Method Statement covering the schedule of items as described in the Section entitled Project Overview, as part of the Tender Documents.  
承包商的投标书中应包括一份施工方案大纲，其中涵盖了标题为“项目概述”的章节中所述的项目进度表，作为招标文件的一部分。
- (b) Within 14 days of the award of Contract (whether by Letter of Acceptance or otherwise) the Contractor shall submit a General Method Statement describing how each stage of the Project is to be designed (if there is any Contract Design), procured, constructed, commissioned and handed over.  
在授予合同（无论是通过中标函还是其他方式）后 14 天内，承包商应提交一份总体施工方案，说明如何设计（如果有任何合同设计）、采购、施工、调试和移交项目的每个阶段。
- (c) The General Method Statement is to be supplemented during the duration of the Contract by Detail Method Statements that describe how key elements of the Work are to be designed (if applicable), installed and commissioned.  
在合同期间，一般施工方案将由详细施工方案补充，详细施工方案描述了如何设计（如适用）、安装和调试工程的关键要素。

In addition to the above all hazardous work activities are to be described by the issue of Detail Method Statement.

除上述内容外，所有危险工作活动都将通过发布详细施工方案进行描述。

All Method Statements are to be issued to the Project Manager for his consent.  
所有施工方案均应提交给项目经理征求同意。

Each Method Statement shall be structured and prepared by the Contractor in the following format;

承包商应按照以下格式构建和编制每份施工方案：

- Scope of Works (including Provisional and PC Sums if any)  
工程范围（包括暂定金额和指定金额（如有））
- Access/Egress  
出入口
- Lighting  
照明
- Safety Lighting  
安全照明
- Task Lighting  
任务照明
- Plant and Equipment  
机器和设备
- General  
概述
- Plant and Equipment Schedule  
机器和设备一览表
- Temporary Works  
临时工程
- Personal protective Equipment  
个人防护装备

# PRELIMINARIES

## 基本措施项目



- Temporary power and water  
临时用电、用水
- Working Platforms  
工作平台
- Materials  
材料
- Sequence/Method of work  
工作顺序/方法
- Programme  
计划
- Risks and Controls  
风险和控制
- Hazards/Risks  
危害/风险
- Control Measures/Permits  
控制措施/许可
- Third party protection  
第三方保护
- Environmental Considerations  
环境考虑因素
- Technical Information  
技术信息
- Emergency Arrangements  
应急安排
- General  
概述
- Fire Precautions  
消防措施
- Communication  
沟通
- Training  
培训
- Supervision  
监督
- Working Hours  
工作时间
- Housekeeping  
后勤服务
- Other Information  
其他信息

- (d) In addition to the foregoing, the Contractor shall amplify the provisions of the Method Statements with layout Drawings, site plans, design Drawings, sequence Drawings, craneage plans and traffic management.  
除上述规定外，承包商还应通过布局图、现场平面图、设计图、顺序图、起重计划和交通管理来补充施工方案的规定。
- (e) The Contractor is to take due cognisance of the instructions regarding the Outline Method Statement contained within the Project Overview Tender Document.  
承包商应充分考虑项目概述招标文件中关于施工方案大纲的指示。

# PRELIMINARIES

## 基本措施项目



### 5.13 MATERIALS AND GOODS

#### 材料和货物

- (a) The Contractor is not to alter or amend any of the descriptions of materials in these documents, except as provided hereinafter.  
除非下文另有规定，否则承包商不得更改或修改这些文件中的任何材料描述。
- (b) All materials and fittings shall be in accordance with the latest revised A.S. or B.S. or Thailand Standards current at the time of Tendering. Should no standard be quoted the materials or fittings shall be to the approval and satisfaction of the Project Manager.  
所有材料和配件应符合投标时最新修订的 A.S.或 b.S.或泰国标准。如果没有引用标准，材料或配件应得到项目经理的批准和满意。
- (c) The Contractor is also solely responsible for all import/export regulations and pay all fees, taxes and charges in connection therewith.  
承包商还全权负责所有进出口规定，并支付与此相关的所有费用、税款和收费。

### 5.14 SUBSTITUTION OF MATERIALS

#### 材料替代

- (a) Manufacturers' catalogue references quoted in the Contract Documents are indicative of type and quality only. Other manufacturers' products may be accepted provided they are equal or better in all respects to those specified and approved by the Project Manager. Where possible, however, the specified proprietary materials or goods shall be used.  
合同文件中引用的制造商目录参考仅表示类型和质量。其他制造商的产品可以被接受，只要它们在所有方面与项目经理指定和批准的产品相同或更好。然而，在可能的情况下，应使用指定的专有材料或货物。
- (b) Where the Contractor considers that any of the work can be done quicker, better or more effectively by the substitution of material or methods other than those specified, he shall submit the proposal to the Project Manager for consideration, in advance of time (minimum 3 months) stating the credit or extra expenditure to be incurred and providing supporting data and sample.  
如果承包商认为通过替换规定以外的材料或方法可以更快、更好或更有效地完成任何工作，他应提前（至少 3 个月）向项目经理提交建议方案，说明将产生的信贷或额外支出，并提供支持数据和样本。
- (c) Any acceptance of substitution shall not relieve the Contractor from responsibility for compliance with all the requirements of the Contract Documents. He shall bear the costs of any changes in other parts of the work caused by the substitution.  
接受任何替换都不应免除承包商遵守合同文件所有要求的责任。承包商应承担因替换而导致的工程其他部分的任何变更费用。
- (d) Where the phrases "equal and approved" or "approved equivalent" appear after a material or product specified by trade name or manufacturer's catalogue reference, the same procedure as stipulated in the preceding paragraphs shall apply should the Contractor propose to use a material or product other than that specified by the trade name or the manufacturer's catalogue reference.  
如果“同等且经批准”或“经批准的同等产品”出现在商品名或制造商目录参考中指定的材料或产品之后，如果承包商建议使用商品名或制造商标录参考中指定以外的材料或产物，则应适用前述段落中规定的相同程序。

# PRELIMINARIES

## 基本措施项目



- (e) Any delay in the construction due to late ordering/delivery of the materials will be the Contractor's responsibility and no extension of time will be entertained.  
因材料订购/交付延迟而导致的任何施工延误将由承包商负责，不接受任何延期。
- (f) The Contractor shall employ suitable systems of work that allow tracking of all batched materials and their final location in the Works.  
承包商应采用合适的工作系统，以便跟踪所有分批材料及其在工程中的最终位置。

### 5.15 ORDERING OF MATERIALS

#### 材料订购

- (a) The Contractor shall place his orders for specified materials at the earliest possible date after notification of acceptance of Tender or at such time as may be specifically stated elsewhere herein for any particular materials. The Contractor will be held responsible for any delay occasioned through any failure to do so.  
承包商应在收到中标通知后尽早订购指定材料，或在本合同其他地方特别规定的任何特定材料的时间订购。承包商将对因未能这样做而造成的任何延误负责。
- (b) Immediately inform the Project Manager should there be any delays in delivery and where possible, suggest alternative sources of supply.  
如果交付出现任何延误，应立即通知项目经理，并在可能的情况下建议替代供应来源。
- (c) The Schedules of Rates and/or Works shall not be used as the basis for material ordering.  
单价表和/或工程表不得用作材料订购的依据。
- (d) The Contractor must not order materials or fittings from the quantities or sizes stated in these documents but must base his order and calculations on Drawings. All dimensions must be checked and verified by the Contractor on site before ordering.  
承包商不得根据这些文件中规定的数量或尺寸订购材料或配件，但必须根据图纸订购和计算。订购前，承包商必须在现场检查 and 验证所有尺寸。
- (e) The Contractor shall not enter into any agreement for the supply of materials to the site unless written approval has been given by the Project Manager on those materials which are required to have the approval of the Project Manager. In addition, the Employer shall not be held responsible for rejected materials delivered to site and for materials which have been over ordered by the Contractor.  
除非项目经理对需要项目经理批准的材料给予书面批准，否则承包商不得就向现场供应材料签订任何协议。此外，雇主对交付到现场的拒收材料和承包商超额订购的材料不承担责任。
- (f) Where a choice of manufacturer or source of supply is allowed for any particular product or material, the whole quantity required to complete the Work must be of the same type, manufacture or source.  
如果允许为任何特定产品或材料选择制造商或供应来源，则完成工程所需的全部数量必须是同一类型、制造商或来源。

# PRELIMINARIES

## 基本措施项目



- (g) If the Contractor fails for any reason to supply any material which he had Contracted to supply or if he fails to supply any such material in sufficient time to enable the Contract to be completed by the agreed Time for Completion then in either event the Employer may supply any portion, or all of such material. If the Employer supplies such material the cost in respect thereof to be borne by the Contractor shall be :

如果承包商因任何原因未能提供其合同规定的任何材料，或者未能在足够的时间内提供任何此类材料，使合同能够在约定的竣工时间内完成，则在任何一种情况下，雇主都可以提供任何部分或全部此类材料。如果雇主提供此类材料，承包商应承担的相关费用为：

EITHER the current market rates

无论是当前的市场价格

OR the actual cost to the Employer at the date of supply including overhead and any other charges,

或雇主在供应之日的实际成本，包括管理费用和任何其他费用，

WHICHEVER IS THE GREATER

以较大者为准

- (h) Where quantities are marked "provisional", the Contractor shall take even greater discretion than usual when ordering. No entitlement to extra payment will be allowed due to loss in over or under ordering.

如果数量标记为“暂定”，承包商在订购时应比平时更加谨慎。不允许因订购过多或过少造成的损失而获得额外付款。

### 5.16 QUOTA AND IMPORT/EXPORT OF MATERIALS AND EQUIPMENT

#### 材料和设备的配额和进出口

- (a) The Contractor shall be fully responsible for the Import and Export of any materials and equipment required for the Works including submission, liaison, obtaining import quota/license etc., to/from the Authorities. All duties, custom clearance fees, inspection fees, gratuities etc, are to be fully paid for by the Contractor. Any liaison required with the Authorities in this regard shall be the full responsibility of the Contractor. The Contractor shall employ a competent person to deal with the customs department, etc. to ensure that all imported materials and equipment are "cleared" without affecting the programme of the Works. The Contractors' responsibilities in this regard shall extend to cover materials and equipment of all domestic and Nominated Subcontractor and suppliers. No claims for extras will be entertained should any material and goods are subsequently banned from import, or subject to restrictions or quotas, or increase in duties or taxes during the duration of the Contract.

承包商应全权负责工程所需的任何材料和设备的进出口，包括向当局提交、联络、获得进口配额/许可证等。承包商应全额支付所有关税、清关费、检验费、小费等。承包商应全权负责与当局在这方面进行的任何联络。承包商应雇佣一名合格人员与海关等部门打交道，以确保所有进口材料和设备在不影响工程计划的情况下“清关”。承包商在这方面的责任应扩展到包括所有国内和指定分包商和供应商的材料和设备。如果任何材料和货物随后被禁止进口，或受到限制或配额，或在合同期间增加关税或税款，雇主则不接受额外索赔。

# PRELIMINARIES

## 基本措施项目



- (b) The Contractor must obtain the necessary import licenses before ordering certain material from overseas. Failure to make proper arrangements may result in delays or additional costs for which the Contractor will be entirely responsible.  
承包商在从海外订购某些材料之前，必须获得必要的进口许可证。未能做出适当安排可能会导致延误或额外费用，承包商将对此承担全部责任。
- (c) All material and goods imported by the Contractor for use in connection with this Contract will be liable to such import duty, tariffs and taxes, etc. as are provided for in the Customs Regulations, and such duty, tariffs and taxes, etc., shall be paid by the Contractor and shall not be recoverable.  
承包商进口的与本合同有关的所有材料和货物将承担此类进口关税、关税和税款等。根据海关条例的规定，此类关税、关税和税款等应由承包商支付，不得追回。
- (d) Throughout the duration of the Contract, the Contractor is to bear all increases in import duty, tariffs and taxes, etc. that may arise and such increases are not recoverable from the Employer.  
在整个合同期间，承包商应承担进口关税、关税和税款等的所有增加。这可能会产生，并且此类增加无法从雇主处收回。
- (e) The Contractor shall ascertain for himself in respect of any ban on imported material and goods which may be imposed by the Government from time to time. In the event of any such ban being imposed on any imported material or goods intended for use on the Works, the Contractor shall obtain the supply of such material or goods locally and any increased costs arising therefrom are not recoverable from the Employer.  
承包商应自行确定政府可能不时对进口材料和货物实施的任何禁令。如果对拟用于工程的任何进口材料或货物实施任何此类禁令，承包商应在当地获得此类材料或货物的供应，由此产生的任何增加的费用均不得向雇主追偿。
- (f) The Contractor shall not be reimbursed for any additional costs which may arise resulting from any prohibitive orders or ban on imported material or goods intended for use on the Works. Contractor shall not be reimbursed for any additional costs which may arise resulting from any prohibitive orders or ban on imported material or goods intended for use on the Works.  
承包商不得报销因禁止进口用于工程的材料或货物而产生的任何额外费用。

### 5.17 WARRANTY OF TITLE

#### 所有权保证

- (a) No materials and equipment for the work shall be purchased subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier.  
不得根据任何动产抵押或有条件出售或其他协议购买工程所需的材料和设备，根据这些协议，卖方或供应商保留了其中或任何部分的权益。
- (b) The Contractor warrants good title to all materials and equipment installed or incorporated in the Work, and agrees, upon completion of all work, to deliver the premises together with all improvements constructed or placed thereon by him to the Owner free from any claims, lien or charges.  
承包商保证对工程中安装或包含的所有材料和设备拥有良好的所有权，并同意在所有工程完工后，将房屋连同其建造或放置的所有改进交付给雇主，不受任何索赔、留置权或费用的影响。

# PRELIMINARIES

## 基本措施项目



### 5.18 SAMPLES 样品

- (a) The Contractor shall allow here for the provision of all samples which are to be submitted to the Project Manager for approval at the earliest possible date after acceptance of Tender and before any order or bulk delivery.  
承包商应预备在接受投标后和任何订单或批量交付前尽早提供所有样品，提交给项目经理批准。
- (b) Sample panels of proposed materials and workmanship where required by the Specification shall also be submitted to the Project Manager for his approval.  
规范要求的拟议材料和工艺的样板也应提交给项目经理批准。
- (c) The accepted samples shall be kept by the Project Manager who shall reject all such materials and goods and condemn such workmanship that do not correspond with the accepted samples.  
接受的样品应由项目经理保存，项目经理应拒绝所有此类材料和货物，并谴责与接受的样品不符的工艺。
- (d) All samples shall be properly labelled, dated and mounted on plywood boards.  
所有样品应正确标记、注明日期并安装在胶合板上。

### 5.19 COST OF TESTS 测试成本

- (a) The Contractor shall allow for and bear all the cost of making any test on materials (materials to be Supplied by the Contractor) for the Works. In addition, the Contractor shall also bear all the cost of other tests which are clearly intended for or provided for in the Tender Documents.  
承包商应考虑并承担对工程材料（承包商提供的材料）进行任何测试的所有费用。此外，承包商还应承担招标文件中明确规定或规定的其他测试的所有费用。
- (b) Where tests under loads or tests to ascertain whether the design of any finished or partially finished Works is appropriate for the purposes which it was intended to fulfill are particularised in the Tender Documents in sufficient detail to enable the Contractor to price or allow in his rates, such tests shall be deemed to have been allowed for in the Tender price.  
如果招标文件中详细说明了负载下的测试或确定任何已完工或部分完工工程的设计是否适合其预期目的的测试，以便承包商能够定价或允许其单价，则此类测试应被视为已包含在投标价格中。

If any test is ordered by the Project Manager which is either :-  
如果项目经理要求进行以下任一测试： -

- (i) not so intended by or provided for; or  
并非如此意图或规定；或
- (ii) (in the cases above mentioned) if not so particularized;  
(在上述情况下) 如果没有详细说明；

then the cost of such tests shall be borne by the Contractor if the costs show that the materials or workmanship are not in accordance with the provisions of the Contract.

如果费用表明材料或工艺不符合合同规定，则此类测试的费用应由承包商承担。



# PRELIMINARIES

## 基本措施项目



- (c) The Contractor shall provide all requisite apparatus and equipment and experienced staff for the purpose of carrying out all tests at the Site required by the Project Manager.  
承包商应提供所有必要的仪器和设备以及经验丰富的工作人员，以便在项目经理要求的现场进行所有测试。
- (d) Any apparatus and equipment required for the tests to be carried out on site shall be made available in good working condition.  
现场测试所需的任何仪器和设备应处于良好工作状态。

### 5.20 QUALITY ASSURANCE (QA) 质量保证

- (a) The Contractor shall be solely responsible for the quality control of the project and shall operate and maintain a QA Programme to ensure the Contract is completed in accordance with the Contract Documents.  
承包商应全权负责项目的质量控制，并应实施和维护质量保证计划，以确保合同按照合同文件完成。
- (b) The Contractor shall implement the QA Programme to provide detailed procedures for management of the following aspects :  
承包商应实施质量保证计划，为以下方面的管理提供详细的程序：
  - (i) Design;  
设计；
  - (ii) Procurement, manufacture and packaging; and  
采购、制造和包装；和
  - (iii) Construction, erection, and fit-out  
施工、安装和装修
  - (iv) Commissioning  
调试
  - (v) Inspections prior to Taking Over of the Works.  
工程接收前的检查。
- (c) The Contractor shall consider the following issues as part of their Quality Assurance Program :  
承包商应将以下问题视为其质量保证计划的一部分：
  - (i) Monitoring and control of off site activities.  
监控场外活动。
  - (ii) Shop Drawing production approval and implementation.  
施工图制作批准和实施。
  - (iii) Review procedures format for records and follow up.  
审查记录的程序格式并跟进。
  - (iv) Management procedures for Quality Assurance personnel.  
质量保证人员管理程序。
  - (v) Testing procedures during commissioning.  
调试期间的测试程序。
  - (vi) Procedures for rectification of faulty workmanship self regulatory by Contractor.  
承包商自律的缺陷工艺整改程序。
  - (vii) Procedures for finishes/materials during the Works.  
工程期间的饰面/材料程序。
  - (viii) The QA Procedures for Subcontractors.  
分包商的质量保证程序。
  - (ix) Defects rectification during defects rectification period.  
缺陷整改期间的缺陷整改。

# PRELIMINARIES

## 基本措施项目



- (d) The QA Program shall be developed to provide and implement QA procedures. These procedures shall be described in a QA Plan. This QA Plan shall be submitted by Contractor in two parts. The first part shall address all QA activities planned for the first months after Contract Award. This shall be submitted to Project Manager at the mobilisation meeting. The second part of the Plan shall be submitted to Project Manager within the first two (2) week after commencement on site addressing all QA Procedures until final completion.
- 应制定质量保证计划，以提供和实施质量保证程序。这些程序应在质量保证计划中加以说明。承包商应分两部分提交本质量保证计划。第一部分应说明合同授予后前几个月计划的所有质量保证活动。这应在动员会议上提交给项目经理。计划的第二部分应在现场开工后的前两（2）周内提交给项目经理，说明所有质量保证程序，直至最终完工。

### 5.21 WORKMANSHIP

#### 工艺

- (a) The Contractor shall execute work in accordance with the highest quality standards of the industry by skilled workers qualified in their respective trades, under supervision of a competent foreman.
- 承包商应在主管领班的监督下，由各自行业合格的技术工人按照行业最高质量标准执行工作。
- (b) The Contractor shall use, install and handle manufactured materials, equipment and appliances in accordance with manufacturer's directions.
- 承包商应按照制造商的指示使用、安装和处理制造的材料、设备和器具。

### 5.22 DEFECTS

#### 缺陷

- (a) The Contractor is required to adopt a positive attitude towards the treatment of defects.
- 承包商需要对缺陷的处理采取积极的态度。
- (b) The Contractor's objective shall be to deliver the Works (part or parts thereof) on the completion date (Sectional or otherwise) defect free. In order to achieve this position the Contractor shall introduce a system of staged checklists and all stage defects shall be corrected as on ongoing process.
- 承包商的目标应是在竣工日期（分段或其他）无缺陷地交付工程（部分或部分）。为了实现这一目标，承包商应引入分阶段检查表系统，所有阶段缺陷应按照正在进行的过程进行纠正。
- (c) The Contractor shall not release Subcontractors from their Works until their work has been thoroughly inspected by the Contractor's own management and then offered to the Project Manager for inspection.
- 在承包商自己的管理层彻底检查分包商的工作并将其提供给项目经理进行检查之前，承包商不得将其从工程中释放出来。
- (d) The Contractor will be required to offer the bulk of the completed Works for the Project Manager's inspection four weeks prior to the completion date. All the defects arising shall be cleared and signed off prior to the completion date (including the part or parts of the Works to be taken over by the Employer)
- 承包商将被要求在竣工日期前四周提供大部分已完工工程供项目经理检查。所有产生的缺陷应在竣工日期前清理并签字（包括雇主接管的工程部分）

# PRELIMINARIES

## 基本措施项目



### 5.23 REJECTED WORK 拒收工程

- (a) Defective work, whether the result of poor workmanship, use of defective materials or products, or damage through carelessness or other act or omission on the part of the Contractor and whether incorporated in the Work or not, which has been rejected by Project Manager as failing to conform to the Contract Documents, shall be removed promptly from the place of the work by the Contractor and replaced or re executed promptly in accordance with the Contract Documents at the Contractor's expense.  
有缺陷的工程，无论是由于工艺不良、使用有缺陷的材料或产品，还是由于承包商的疏忽或其他行为或疏忽造成的损坏，无论是否纳入工程，只要项目经理因不符合合同文件而拒绝，承包商应立即将其从工程地点移走，并按照合同文件立即更换或重新执行，费用由承包商承担。
- (b) Other work destroyed or damaged by such removals or replacements shall be made good promptly at the Contractor's expense.  
因此类拆除或更换而毁坏或损坏的其他工程应立即修复，费用由承包商承担。
- (c) If in the opinion of Project Manager it is not expedient to correct defective work or work not performed in accordance with the Contract Documents, the Project Manager may deduct from the Acceptance Contract Amount the difference in value between the work as performed and that called for by the Contract Documents, the amount of which will be determined in the first instance by Project Manager.  
如果项目经理认为纠正有缺陷的工作或未按照合同文件执行的工作不方便，项目经理可以从验收合同金额中扣除已执行工作与合同文件要求的工作之间的价值差额，其金额将首先由项目经理确定。
- (d) The Contractor will be held responsible for delays caused by rejected work.  
承包商将对因拒收工程造成的延误负责。

### 5.24 ADVERTISING 广告

- (a) The Employer reserves the sole right of advertising upon or adjacent to the Works. The Contractor shall not allow and must ensure that no advertisement is displayed without the written consent of the Project manager.  
雇主保留在工程上或工程附近进行广告宣传的唯一权利。未经项目经理书面同意，承包商不得允许并必须确保不展示任何广告。

### 5.25 MEDIA RELEASES 媒体发布

- (a) The Contractor or his Subcontractors shall not issue any information, publications, document or article for publication concerning the Project or the Works in any media without the prior approval of the Employer and Project manager. All such issues shall be directed through the Project manager.  
未经雇主和项目经理事先批准，承包商或其分包商不得在任何媒体上发布与项目或工程有关的任何信息、出版物、文件或文章。所有此类问题应通过项目经理进行指导。

# PRELIMINARIES

## 基本措施项目



### 5.26 VISITORS 访客

- (a) The Contractor shall take all necessary precaution not to allow unauthorised visitors access to the Works. Authorised visitors shall be directed to the Contractor's site office on arrival for identification and must have the prior approval of the Employer before being allowed on the Works.
- 承包商应采取一切必要的预防措施，不允许未经授权的访客进入工程。授权访客应在抵达时被引导到承包商现场办公室进行身份识别，并且必须事先获得雇主的批准才能进入工程。

### 5.27 INTERIM VALUATIONS 中期估价

- (a) At the time of every valuation of the Works, the Contractor is to submit to the Quantity Surveyor and copy to the Project Manager: -  
在每次工程估价时，承包商应向工料测量师提交以下文件，并抄送项目经理： -
- (i) detailed progress payment claim including details of unfixed materials on site;  
详细的进度付款申请，包括现场未固定材料的详细信息；
  - (ii) a detailed statement from each Nominated/Designated Subcontractor showing the gross amount claimed and the amounts received from the Contractor to date; and  
每个指定/指定分包商的详细声明，显示索赔总额和迄今为止从承包商收到的金额；和
  - (iii) any other information as may be required by the Project Manager's Representatives  
项目经理代表可能要求的任何其他信息
- (b) The Quantity Surveyor shall redistribute any inconsistent or "loaded" rates and/or prices submitted by the Contractor but without amending the Accepted Contract Amount. Valuation of the Works shall then be based on the redistributed rates and/or prices so as to accurately reflect the actual value of Works properly executed.
- 工料测量师应重新分配承包商提交的任何不一致或“加载”的单价和/或价格，但不得修改中标合同金额。然后，工程的估价应基于重新分配的单价和/或价格，以准确反映正确执行的工程的实际价值。

(i) Cost Meetings  
成本会议

To facilitate the cost certainty of the Project, the Contractor will be required to attend cost meetings with the Project Manager and the Quantity Surveyor. The cost meetings will be held monthly. The Contractor will be required to submit a Cost Report 48 hours prior to the meeting. The reports will describe:

为确保项目的成本确定性，承包商将被要求与项目经理和工料测量师一起参加成本会议。成本会议将每月举行一次。承包商将被要求在会议前 48 小时提交一份成本报告。报告将描述：

- Accepted Contract Amount  
中标合同金额
- Status of Variation Account  
变更账户状态
- Statement of Final Account (or Final Statement)  
决算表（或最终报表）
- Status of payment Account  
付款账户状态

# PRELIMINARIES

## 基本措施项目



- Commercial Issues  
商业问题
- Instructions Required  
所需指令

(ii) Monthly Cost Report  
月度成本报告

The Contractor is required to submit the agreed Monthly Cost Report arising from the Cost Meetings mentioned in item (i) above as part of the Contractor's Monthly Report which shall include:

承包商需要提交上述第 (i) 项所述成本会议产生的商定月度成本报告，作为承包商月度报告的一部分，其中应包括：

- Outline Statement of Final Account (or Final Statement)  
决算概要 (或决算表)
- Schedule of provisional Sums  
暂定金额表
- Payments  
付款
- Planned v actual cash flow with earned value analysis  
计划现金流与实际现金流以及挣值分析

(iii) Cost Management Procedures  
成本管理程序

The Contractor is to adhere to the conditions of Contract and in addition comply with the Employer's cost management procedures to enable strict cost control on the Project and his Works.

承包商应遵守合同条件，并遵守雇主的成本管理程序，以便对项目及其工程进行严格的成本控制。

(iv) Cost Management Resource  
成本管理资源

The Contractor will employ experienced and suitably qualified cost management staff to the satisfaction of the Project Manager.

承包商将雇佣经验丰富且具有适当资格的成本管理人员，以满足项目经理的要求。

- (c) The Contractor shall produce for inspection/retention all time sheets, delivery notes, invoices, accounts, receipts, test certificates and such other vouchers and records as the Quantity Surveyor may require in connection with the preparation of the Interim Payment Certificates and Final Payment Certificate to ascertain the validity of any monetary claims.  
承包商应出示所有时间表、交货单、发票、账目、收据、测试证书以及工料测量师可能要求的与编制期中付款证书和最终付款证书有关的其他凭证和记录，以供检查/保留，以确定任何货币申请的有效性。
- (d) The Contractor is required to submit his monthly claim application for Interim Payment Certificate to the Project Manager on a determined date of each month.  
承包商需要在每月确定的日期向项目经理提交期中付款证书的月度付款申请。

# PRELIMINARIES

## 基本措施项目



Upon receipt of the Contractor's monthly progress claim, the Quantity Surveyor shall review and recommend the total value of the work properly executed to the Project Manager for his Interim Payment Certificate approval and issuance by not later than fourteen (14) days from the date of receipt of the Contractor's application.

收到承包商的月度进度付款申请后，工料测量师应在收到承包商申请之日起十四（14）天内审查并向项目经理推荐正确执行的工作的总价值，以供其批准和颁发期中付款证书。

- (e) Period of honouring Payment shall be thirty (30) days after receipt of the submitted correct Tax Invoice by the Contractor together with the Interim Payment Certificate signed by the Project Manager.

付款期限应为承包商收到提交的正确税务发票以及项目经理签署的期中付款证书后三十（30）天。

- (f) Payment Term  
付款方式

- (1) Advance payment: 10% of the total contract price (paid with advance payment guarantee)

预付款：合同总价的 10%（凭预付款保函支付）

- (2) Progress payment:  
进度款

- Payment of 20% of the contract price upon completion of the structural and architectural works

土建结构完成支付至合同价 20%

- Payment of 40% of the contract price upon the main equipment arrival to site

主要设备到场支付至合同价 40%

- Payment of 65% of the contract price upon completion of the MEP works

安装工程完成支付至合同价 65%

- Payment of 80% of the contract price upon completion of system commissioning

系统调试完成付至合同价 80%

- (3) Payment for completion and handover: 95% of the settlement price shall be paid after obtaining the PEA acceptance certificate and delivering electricity

竣工验收款：取得 PEA 验收证书并送电后支付至结算价的 95%

- (4) Retention: The remaining 5% will be used as a retention for quality guarantee (defects Rectification period of 24 months).

This retention shall be released by the Employer after completion of making good the defects and expiry of defects Rectification period (whichever is later).

质保金：剩余 5% 作为质量保证金（质保期 24 个月）

在完成修复缺陷和缺陷整改期届满（以较晚者为准）后，业主应支付此质保金。

# PRELIMINARIES

## 基本措施项目



完成

### 5.28 PAYMENT OF PRELIMINARIES

#### 支付基本措施费

- (a) If any abnormally high amount is inserted against an item in the Preliminaries for which whole payment or substantially whole payment is requested to be or would normally be made at the beginning of the Contract and if the Contractor is unable to substantiate such amount, payment for any unsubstantiated amount will be hold over the period of the Contract.  
如果在合同开始时要求或通常会支付全部或几乎全部款项的初步工作中的某个项目插入任何异常高的金额，并且如果承包商无法证实该金额，则任何未经证实的金额的付款将在合同期间暂停。
- (b) If, after reference to the programme and the actual progress of the Works, delay has occurred in the progress of the Works, the Quantity Surveyor may adjust the cash flow of and any payments included for Preliminaries in Interim Certificates to reflect the revised anticipated duration.  
如果在参考工程进度计划和实际进度后，工程进度出现延误，工料测量师可以调整中期证书中初步工作的现金流和任何付款，以反映修订后的预期工期。

### 5.29 REIMBURSEMENT FOR POWER AND WATER CONSUMED BY NOMINATED SUBCONTRACTOR AND DIRECT CONTRACTORS

#### 指定分包商和直接承包商消耗的电力和水的报销

- (a) Monthly metered electricity and water charges shall be paid by the Contractor. Reimbursement from the Nominated Subcontractors, Direct Contractors, where applicable, shall be recovered direct by the Main Contractor/Contractor.  
承包商应支付每月计量的电费和水电费。指定分包商、直接承包商（如适用）的报销应由总承包商/承包商直接收回。
- (b) Agree method of reimbursement with respective Nominated Subcontractors and Direct Contractors.  
与各指定分包商和直接承包商商定报销方法。
- (c) The Contractor shall arrange separate metering system for assessing the charges for testing and commissioning of mechanical, electrical and other specialist installations  
承包商应安排单独的计量系统，以评估机械、电气和其他专业装置的测试和调试费用。

# PRELIMINARIES

## 基本措施项目



### 5.30 SHOP DRAWINGS 施工图

- (a) "Shop Drawings" are Drawings, diagrams, schedules and other data specially prepared for the Works by the Contractor or any Nominated Subcontractor, Manufacturer, Supplier or distributor to illustrate some portion of the Works and are Drawings produced by the Contractor.  
“深化施工图”是承包商或任何指定分包商、制造商、供应商或分销商为工程专门准备的图纸、图表、时间表和其他数据，用于说明工程的某些部分，是承包商绘制的图纸。
- (b) Shop Drawings are not to be considered Contract Documents. They are to facilitate progress of work. Departure from Contract requirements so minor as to involve no change in cost may be accepted if it is in the Employer's interest to do so.  
深化施工图不应被视为合同文件。它们是为了促进工作的进展。如果符合雇主的利益，可以接受对合同要求的轻微偏离，以至于不涉及成本变化。
- (c) The Contractor shall program for the preparation of any coordinated shop/working Drawings required by the Contract Documents, and the completion of all such Drawings, in good time, for checking and inspection by the Project Manager and any subsequent amendments, resubmission and re-inspection. The Contractor shall provide copies to the Project Manager and other Consultants.  
承包商应制定计划，准备合同文件要求的任何协调的车间/施工图，并及时完成所有此类图纸，供项目经理检查和检验，以及任何后续的修改、重新提交和重新检查。承包商应向项目经理和其他顾问提供副本。
- (d) Approval of shop Drawings by the Project Manager does not necessarily mean that subsequent claims will be entertained, however, if Contractor is of the opinion that he is entitled to such claims, he should present the claim in writing at time of submitting the shop Drawings for the Project Manager's consideration.  
项目经理对施工图的批准并不一定意味着后续的索赔将被受理，但是，如果承包商认为他有权获得此类索赔，他应在提交施工图供项目经理考虑时以书面形式提出索赔。
- (e) The Contractor is to note that inspections by and comment of the Project Manager on the shop Drawings:-  
承包商应注意，项目经理对施工图的检查和评论： -
- (i) will not relieve the Contractor of his responsibility for compliance with the Contract requirements;  
不会免除承包商遵守合同要求的责任；
  - (ii) is not an approval of additional claims or expenditure by the Project Manager;  
不是项目经理对额外索赔或支出的批准；
  - (iii) will not relieve the Contractor from his obligations and responsibilities under the Contract such as to design, suitability, quality or performances of his work or materials or goods.  
不会免除承包商在本合同项下的义务和责任，例如其工程或材料或货物的设计、适用性、质量或性能。
- (f) The Contractor shall submit three (3) sets of Shop Drawings that the Project Manager has "no objection" to during the Contract Period in a sequence and timing compatible with the Contractor's Master Programme and so as to cause no delay to the Works.  
承包商应在合同期内提交三（3）套项目经理“无异议”的施工图，其顺序和时间应与承包商主计划相一致，以免延误工程。



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- (g) No extension of time will be granted nor will any consideration be given to monetary claims arising out of the Contractor's failure to submit Shop Drawings, Product Data, Samples or related submissions in accordance with the agreed programme or without adequate lead time for the Project Manager's review, revision, re submission and subsequent review by the Project Manager.
- 对于因承包商未能按照商定的计划提交施工图、产品数据、样品或相关提交文件，或没有足够的准备时间供项目经理审查、修订、重新提交和项目经理后续审查而引起的，将不予延长时间，金钱索赔也不予考虑。

### 5.31 CO-ORDINATION DRAWINGS

#### 协调图

- (a) "Co-ordination Drawings" are Drawings which illustrate the relationships of the Works of the Contractor and the various Nominated Subcontractors and Direct Contractor with one another, and which provide for the proper installation, operation and appearance of the Works.
- “协调图”是说明承包商与各指定分包商和直接承包商的工程相互关系的图纸，并规定了工程的正确安装、操作和外观。
- (b) Co-ordination Drawings are not to be considered Contract Documents. They are to facilitate progress of work. Departure from Contract requirements so minor as to involve no change in cost may be accepted if it is in the Employer's interest to do so.
- 协调图纸不应被视为合同文件。它们是为了促进工作的进展。如果符合雇主的利益，可以接受对合同要求的轻微偏离，以至于不涉及成本变化。
- (c) The Contractor shall be responsible for the preparation of any other co-ordination Drawings for Nominated/Designated Subcontract Works as required by the Project Manager.
- 承包商应负责按照项目经理的要求，为指定/指定分包工程准备任何其他协调图纸。
- (d) The Contractor is to ascertain the format and details of such Drawings from the Project Manager.
- 承包商应从项目经理处确定此类图纸的格式和细节。
- (e) All "co-ordination" Drawings shall be submitted in triplicate and as soon as possible after the commencement date, and in any case, in sufficient time to permit the review, amendments (if such are deemed necessary) and approved by the Project Manager. The Drawings submitted shall be amended as necessary and be re-submitted for final approval. Allowance must be made for all necessary copies for distribution to the other Consultants and Subcontractors.
- 所有“协调”图纸应在开工日期后尽快提交一式三份，在任何情况下，都应有足够的时间进行审查、修改（如果认为有必要）并获得项目经理的批准。提交的图纸应进行必要的修改，并重新提交以供最终批准。必须预留所有必要的副本，以便分发给其他顾问和分包商。
- (f) The Contractor and/or his Subcontractors shall not proceed with any work until all such Drawings affecting that part of the Works have been approved by the Project Manager.
- 在项目经理批准所有影响该部分工程的图纸之前，承包商和/或其分包商不得继续任何工作。
- (g) No extension of time will be granted for delay caused by late submission of co-ordination Drawings or repeated amendment of Drawings due to inadequate or inaccurate details.
- 对于因协调图纸延迟提交或因细节不充分或不准确而反复修改图纸造成的延误，将不予延期。

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- (h) Approval of Drawings by the Project Manager does not exonerate the Contractor from any responsibility under the Contract terms and conditions.  
项目经理对图纸的批准并不免除承包商在合同条款和条件下的任何责任。
- (i) The cost of preparing and producing all such Drawings shall be deemed to be included in the Accepted Contract Amount.  
编制和制作所有此类图纸的费用应被视为包含在中标合同金额中。

### 5.32 BUILDING INFORMATION MODEL (BIM) (NOT APPLICABLE) 建筑信息模型（不适用）

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### 5.33 DOCUMENT CONTROL

#### 文件控制

- (a) The Contractor shall submit all Site Administrative requests (RFI, RFA etc.), records, reports Controlled Documents in provided Document Management System. These documents are to be approved by the Project Manager in the system (BIM36ODOCS), otherwise it is not valid.  
承包商应在提供的文件管理系统中提交所有现场管理请求（RFI、RFA 等）、记录、报告和受控文件。这些文件需经系统（BIM36ODOCS）中的项目经理批准，否则无效。
- (b) The Contractor shall coordinate BIM model and Drawings submission in provided BIM36ODOCS. The autoCAD files and PDF files will be directly exported form the Revit models. These drawing are to be approved by the Project Manger in the system, otherwise it is not valid.  
承包商应在提供的 BIM36ODOCS 中协调 BIM 模型和图纸的提交。autoCAD 文件和 PDF 文件将直接从 Revit 模型导出。这些图纸需经系统中的项目经理批准，否则无效。

## 6. SAFETY AND PROTECTION MEASURES

### 安全防护措施

### 6.01 SITE SAFETY REGULATIONS

#### 现场安全规定

- (a) Before the commencement of any Works, the Contractor must first obtain the "Certificate of Registration".  
在任何工程开工之前，承包商必须首先获得“注册证书”。
- (b) In carrying out the Works, the Contractor shall also comply with all relevant Statutory Acts, Regulations, Ordinances and Bye-laws pertaining to site safety such as storage, transport, use of plant, material, equipment, work processes and any other site operations. In particular, the Contractor shall comply fully with the Factories Acts and the Safety Regulations, including any amendments or re-enactments, as promulgated by the authorities.  
在实施工程时，承包商还应遵守与现场安全有关的所有相关法令、条例、条例和细则，如储存、运输、使用装置、材料、设备、工作流程和任何其他现场作业。特别是，承包商应完全遵守《工厂法》和《安全条例》，包括当局颁布的任何修正案或重新颁布的条例。
- (c) The Contractor's attention is also drawn to the stipulations contained in the "Mitigation Measure and Monitoring Programmes for the Environmental Impact Assessment (for both Project Operation & Construction Phases).  
承包商还应注意“环境影响评估的缓解措施和监测计划（项目运营和施工阶段）”中的规定。
- (d) The Contractor is to allow for all costs, expenses and fees for complying with these relevant acts and regulations, including any additional costs, expenses and fees that may arise from any amendments and re-enactments thereto. The Contractor shall not be entitled to any claims, monetary or otherwise, or extension of Contract Period in connection with compliance with the above requirements.  
承包商应考虑遵守这些相关法案和法规的所有成本、费用和收费，包括任何修订和重新颁布可能产生的任何额外成本、费用。承包商无权因遵守上述要求而提出任何索赔、金钱或其他形式的索赔，也无权延长合同期限。

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- (e) In the absence of specific statutory acts or regulations, the Contractor shall comply with any Project manager's directions relating to site safety measures.  
在没有具体法令或法规的情况下，承包商应遵守项目经理关于现场安全措施的指示。
- (f) In the event of the Contractor worker's death by incidents due to the construction matter within the job site. The Contractor shall be pay additional compensation at THB500,000 per person directly to their parent or family within three (3) working days. If it is not enough to make up for the loss, it should be supplemented by the Contractor.  
如果承包商工人因施工现场内的施工事项而死亡。承包商应在三（3）个工作日内直接向其父母或家人支付每人 500,000 泰铢的额外补偿，不足以弥补损失的承包商应予补足。

### 6.02 SITE SECURITY AND SECURITY GUARD

#### 现场安保和保安

- (a) The Contractor shall provide watchmen, lighting, warning lights, temporary fencing and barricade/barrier, warning signs at all access points and conspicuous positions and temporary gate control system, etc., as may be necessary or requested by the Project Manager for the security and protection of the site.  
承包商应根据需要或项目经理的要求，在所有出入点和显眼位置提供看更人员、照明、警示灯、临时围栏和路障/屏障、警告标志和临时门控系统等，以确保现场的安全和保护。
- (b) The Contractor shall be held solely responsible for the security of the Works and the safety of all his own materials, fixed or unfixed, and all plant, machinery and tools and scaffolding and shall provide additional protective and safety measures if he is of the opinion that the above are inadequate.  
承包商应对工程的安全以及其所有固定或非固定材料、所有装置、机械和工具以及脚手架的安全负全部责任，如果他认为上述措施不足，则应提供额外的保护和安全措施。
- (c) Provide a method of security check and manpower record for all personnel entering and leaving the site – such as electronic ID card or hand-scan device etc.  
为所有进出现场的人员提供安全检查和人力记录的方法，如电子身份证或手部扫描设备等。
- (d) Provide resources and a method of recording and controlling health checks to minimize the risk of virus on site.  
提供资源和记录和控制健康检查的方法，以尽量减少现场病毒的风险。
- (e) The Contractor shall provide suitable number of security guards for secure all the site properties, and for facilitate the Employer's representative can enter to/exit from the site conveniently. These security guards shall be Thai persons, stay all times at a site and having a good ethics and good communication skills for be ready to do their job as the professionals.  
承包商应提供适当数量的保安，以保护所有现场财产，并方便雇主代表方便进出现场。这些保安人员应为泰国人，始终留在现场，具有良好的道德操守和良好的沟通技巧，随时准备作为专业人员开展工作。
- (f) Prior start working, The Contractor shall provide site CCTV Cameras for at least 2 external time lapse cameras with weatherproof enclosures installed at as high as possible high level poles with hard disks recording 24/7 with adequate capacity to record the video and back-up at least once a month. The video shall be made as a time-lapse video file for one week per file. The system shall have UPS back-up and the continuity of power supply for 24-hours.  
在开始工作之前，承包商应为至少 2 台外部延时摄像机提供现场闭路电视摄像机，这些摄像机应具有防风雨外壳，安装在尽可能高的高层杆上，并配有硬盘，全天候记录，

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## 基本措施项目



硬盘容量足以记录视频并至少每月备份一次。视频应制作作为延时视频文件，每个文件一周。该系统应具有 UPS 备份和 24 小时的电源连续性。

### 6.03 PROTECTION OF THE WORKS

#### 工程保护

- (a) The Contractor shall cover up as necessary and take all reasonable precautions to prevent loss or damage by weather, accident, theft or any other cause to the Works, its contents, all materials and goods, including his own Subcontractors and all materials supplied by the Employer, fixed or unfixed, or any part thereof including the work of Nominated Subcontractor for the full duration of the Contract.

承包商应在必要时进行遮盖，并采取一切合理的预防措施，防止因天气、事故、盗窃或任何其他原因对工程、其内容、所有材料和货物造成损失或损坏，包括其自己的分包商和雇主提供的所有材料，无论是固定的还是非固定的，或其任何部分，包括指定分包商在整个合同期间的工作。

- (b) Should such protection be omitted or ineffective and damage occurs, such appliances or surfaces shall be replaced by the Contractor at his own expenses.

如果此类保护被省略或无效并发生损坏，承包商应自费更换此类器具或表面。

### 6.04 TEMPORARY MECHANICAL VENTILATION

#### 临时机械通风

- (a) Provide where necessary temporary mechanical ventilation and dust free working environment to all enclosed work areas for the safety of the workmen. Special measures are to be taken during fitting out work when the façade envelope is closed. The Main Contractor should outline specific measures in the Tender submission.

必要时，为所有封闭的工作区域提供临时机械通风和无尘工作环境，以确保工人的安全。在装修过程中，当立面围护结构关闭时，应采取特殊措施。总承包商应在投标书中概述具体措施。

### 6.05 SAFETY MEASURES FOR CONSTRUCTION OF BUILDING

#### 建筑施工安全措施

- (a) Provide and maintain Buildings or Works Protection as required by Authorities and EIA. Protection should prevent materials falling from the building and should be relocated inside the building so as not to obstruct façade installation when necessary. This should be maintained by the Contractor and designed to be easily operable for exterior façade access as necessary.

按照当局和环境影响评估的要求提供和维护建筑物或工程保护。保护措施应防止材料从建筑物上掉落，并应在必要时重新安置在建筑物内，以免阻碍立面安装。这应由承包商维护，并设计为在必要时易于操作，以便进入外立面。

- (b) Define, mark and maintain safe passages throughout the Works. The safe passages shall have adequate headroom and lighting, free of all obstructions and shall be properly enclosed against falling objects.

在整个工程中定义、标记和维护安全通道。安全通道应具有足够的净空高度和照明，无任何障碍物，并应适当封闭，防止坠物。

- (c) Provide timber barricades and platform covers to openings at lift cores, ducts, edges of unenclosed floors, etc. at positions where deemed necessary by the Project Manager.

在项目经理认为必要的位置，为电梯核心、管道、未封闭地板边缘等处的开口提供木路障和平台盖。

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- (d) In all cases, the Contractor is to submit his own proposed protective systems for the review of the Project Manager before fabrication and erection.  
在所有情况下，承包商应在制造和安装之前提交自己提出的保护系统供项目经理审查。
- (e) The Contractor is solely responsible for the complete adequacy of the protective systems and the Project Manager's review of any safety measures shall not relieve the Contractor from this responsibility.  
承包商全权负责保护系统的完全充分性，项目经理对任何安全措施的检查不应免除承包商的这一责任。

### 6.06 PROTECTION OF ADJOINING PROPERTIES

#### 保护邻近财产

- (a) The Contractor shall carry out the Works in such a manner so as to avoid causing damage to adjoining and adjacent properties. He will be liable for and must indemnify the Employer in respect of any claim or proceedings arising out of neglect in taking reasonable care to avoid damage to adjoining and adjacent properties when carrying out the Works.  
承包商应以避免对邻近和邻近财产造成损害的方式实施工程。承包商将负责并必须赔偿雇主因在实施工程时疏忽合理注意避免损坏邻近和邻近财产而引起的任何索赔或诉讼。

### 6.07 LIGHTNING PROTECTION SYSTEM

#### 防雷系统

- (a) Provide an efficient temporary lightning protection system for the structure during construction and for all the hoists and cranes. The lightning protection system is to be of the type which conveys any lightning discharge safely to the ground without danger to the building, machinery or occupants and to the requirements of the Authority.  
在施工期间为结构和所有起重机和吊车提供高效的临时防雷系统。防雷系统的类型应能将任何雷击放电安全地传输到地面，而不会对建筑物、机械或居住者构成危险，并符合管理局的要求。

### 6.08 SAFETY PROVISIONS FOR BUILDING OPERATIONS

#### 建筑作业安全规定

- (a) The Contractor shall provide and maintain the Employer, Project Manager and their Consultants on site with safety helmets, rubber boots, safety shoes, waterproof coats and hats, umbrellas, protective apparel and any other necessary safety devices and equipment for all the workmen, Contractor's Site Staff, Resident Supervisory Staff, Consultants and their representatives and all authorised visitors to site.  
承包商应向现场的雇主、项目经理及其顾问提供并维护安全帽、橡胶靴、安全鞋、防水外套和帽子、雨伞、防护服和任何其他必要的安全装置和设备，供所有工人、承包商现场工作人员、驻地监督人员、顾问及其代表以及所有授权的现场访客使用。

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### 6.09 SPECIAL PRECAUTIONS 特殊预防措施

- (a) The Contractor's attention is particularly drawn to the following special precautions :-  
承包商应特别注意以下特殊预防措施： -
- (i) Existing Features: prevent damage to existing buildings, fences, gates, walls, roads, paved areas and other site features which are to remain in position during the execution of the Works. The Contractor shall provide for the protection of shores and embankments if any and for the prevention of earth-slip, erosion of soil and failure of slopes expeditiously in a workman-like manner and to the satisfaction of the Project Manager.  
现有特征：防止对现有建筑物、围栏、大门、墙壁、道路、铺砌区域和其他在工程实施过程中保持原位的现场特征造成损坏。承包商应以专业的方式迅速保护海岸和路堤（如有），并防止滑坡、土壤侵蚀和边坡破坏，直至项目经理满意。
- (ii) Adjoining Properties: take all reasonable precautions to prevent damage to adjoining properties. Obtain permission as necessary from the owners of the adjoining properties if scaffolding is required to be erected on or close to the adjoining properties, and pay all charges. Clear away and make good on completion or when directed.  
邻近物业：采取一切合理的预防措施，防止损坏邻近物业。如果需要在邻近物业上或附近搭建脚手架，请获得邻近物业所有者的必要许可，并支付所有费用。完成后或收到指示时，清理并修复。
- (iii) Traffic Control and Road Safety: provide for all necessary traffic and directional signs, barriers, warning lamps, rubber cones, etc. to guide and inform the public that the working area is closed or partially closed to all traffic (vehicular as well as pedestrians) during the Contract Period and shall replace/ re-site or remove all those signs etc. as directed by the Project Manager or the Police and other relevant authorities  
交通管制和道路安全：提供所有必要的交通和方向标志、障碍物、警示灯、橡胶锥等，以引导和通知公众在合同期间工作区域对所有交通（车辆和行人）关闭或部分关闭，并应按照项目经理或警方和其他相关机构的指示更换/重新安置或拆除所有这些标志等

### 6.10 SITE FIRE PREVENTION AND FIRE FIGHTING FACILITIES 现场防火和消防设施

- (a) The Contractor shall implement fire safety measures for fire prevention and fire fighting facilities on the site  
承包商应实施现场防火和消防设施的消防安全措施
- The Contractor, shall :-  
承包商应： -
- (i) keep entrances, gangways, hydrants or other water supply points clear and ensure that access to upper floors does not become impeded by stacked materials.  
保持入口、过道、消防栓或其他供水点的畅通，并确保通往上层的通道不会受到堆放材料的阻碍。

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- (ii) maintain at least 1 staircase clear of obstructions for safe access and egress from all levels at all times during construction. Provide Signage and information.  
在施工期间，保持至少 1 个楼梯无障碍物，以便随时从各个楼层安全进出。提供标识和信息。
- (iii) provide separate metal containers for each form of flammable waste and organise regular collection and disposal.  
为每种形式的易燃废物提供单独的金属容器，并组织定期收集和处置。
- (iv) make daily fire inspection, once in the morning and the other just as work is completed for the day, to ensure stores are locked, windows are closed, no lighted cigarette ends are left about in any of the temporary buildings and all gas cylinders and flammable liquid are returned to store.  
每天早上进行一次消防检查，另一次在当天工作结束时进行，以确保仓库上锁，窗户关闭，任何临时建筑内都没有点燃的烟头，所有气瓶和易燃液体都归还仓库。
- (v) install a suitable form of fire alarm system.  
安装合适形式的火灾报警系统。
- (vi) Install temporary smoke alarm systems where the Works are nearing completion and maintain until the permanent alarm systems are in operation.  
在工程即将完工的地方安装临时烟雾报警系统，并进行维护，直到永久报警系统投入运行。
- (vii) provide all other facilities to meet the requirements of the Authorities including arrange the fire drill/firefighting training if required.  
提供所有其他设施以满足当局的要求，包括在需要时安排消防演习/消防培训。

### 6.11 LOADING IN EXCESS OF DESIGN LOAD 超过设计荷载

- (a) The Contractor will be responsible for the stability and structural integrity of the Works, plant, equipment, cranes, scaffolding, props, etc during construction and shall provide such support as necessary and in particular, to avoid over-loading.  
承包商将负责施工期间工程、装置、设备、起重机、脚手架、支柱等的稳定性和结构完整性，并提供必要的支撑，特别是避免超载。
- (b) No loading in excess of the design loading shall be placed on any portion of the structure without the written permission of the Project Manager. If such permission is granted, structural members subjected to loading other than the design loading shall be strengthened and supported to the satisfaction of the Project Manager and the Contractor will bear all additional expenditure, including making good any damage caused to the permanent Structure.  
未经项目经理书面许可，不得在结构的任何部分施加超过设计载荷的载荷。如果获得此类许可，应加强和支撑承受设计荷载以外的荷载的结构构件，直至项目经理满意，承包商将承担所有额外费用，包括修复对永久结构造成的任何损坏。



# PRELIMINARIES

## 基本措施项目



### 6.12 POLICE REGULATIONS 警察条例

- (a) The Contractor shall observe and comply with any police regulations governing the loading/unloading of or waiting by vehicles on public roads, highways and the like including the special transportation and carriage of any materials, protective covering, warning displays, etc., and shall include for all costs involved.  
承包商应遵守并遵守任何关于车辆在公共道路、高速公路等上装卸或等待的警察规定，包括任何材料、防护罩、警告标志等的特殊运输和运输，并应包括所有相关费用。

### 6.13 OCCUPATIONAL HEALTH & SAFETY 职业健康与安全

- (a) Project Specific Health and Safety Plan  
项目特定健康和计划

The Contractor is required to demonstrate a positive attitude to health and Safety through the implementation of a preventive management style. The Contractor will be required to submit:  
承包商需要通过实施预防性管理风格来表现出对健康和安全的积极态度。承包商将被要求提交：

- Company H&S Policy  
公司健康与安全政策
- Summary of their recorded accident statistics for the last five years  
过去五年记录的事故统计摘要
- One copy of their company H&S Procedures Manual  
一份公司健康与安全程序手册

The Contractor shall submit to the Project Manager a Project Specific Health and Safety Plan in the following format within 28 calendar days of the award of Contract (whether by. The health and Safety Plan will detail the following provisions to be implemented during the Contract:

承包商应在合同授予后 28 个日历日内，按照以下格式向项目经理提交一份项目特定的健康和计划（无论是否通过。健康和计划方案将详细说明在合同期间实施的以下规定：

- Organisation  
组织
- Company Health and Safety Policy statement  
公司健康与安全政策声明
- Statement of Intent  
意向声明
- Statement of Commitment  
承诺声明
- Date of Policy  
保单日期
- Director Responsible  
负责人
- Arrangement  
安排
- Project scope of Works  
项目工程范围

# PRELIMINARIES

## 基本措施项目



- Training  
培训
- Control of Subcontractors  
分包商的控制
- Environmental Issues (dust, noise, pollution)  
环境问题（灰尘、噪音、污染）
- Distribution of information and communication  
信息和通信的分发
- Protective Equipment  
防护设备
- First Aid  
急救
- Fire Precautions/Fir Plan  
防火措施/火灾计划
- Emergency Procedures/Evacuation  
应急程序/疏散
- Accident Reporting and Audit  
事故报告和审计
- Record Keeping  
记录保存
- Method Statements  
施工方案
- Risk Assessments  
风险评估
- COSHH  
COSHH

(b) Residual Risks  
剩余风险

The Contractor in compiling the Operations and Maintenance Manual will be required to identify any residual risks resulting from the design and construction of the building that are to be taken into account in the proper operational management of the building.  
承包商在编制操作和维护手册时，需要确定建筑物的设计和施工产生的任何剩余风险，这些风险将在建筑物的适当运营管理中予以考虑。

(c) Meetings/Audits/Inspection - the Contractor will be required to arrange the following meetings at regular intervals during the Contracts:  
会议/审计/检查-承包商将被要求在合同期间定期安排以下会议：

Tool Box Talks - 2 time a day (before and after worked)  
工具箱讲座 - 每天 2 次（工作前后）  
Health and Safety Inspections - 2 time a week  
健康和安全检查 - 每周 2 次  
Health and Safety Meetings - 2 time a week  
健康与安全会议 - 每周 2 次  
Health and Safety Plan Audit - every 1 month  
每 1 个月进行一次健康和计划审核  
Safety Policy Review - every 3 months  
安全政策审查 - 每 3 个月一次

# PRELIMINARIES

## 基本措施项目



All the above Meetings/Inspections will be documented by the Contractor and issued to the Project Manager.

所有上述会议/检查将由承包商记录并提交给项目经理。

A schedule of the Meeting/Audits/Inspections shall be issued to the Project Manager within 28 calendar days of the award of Contract (whether by Letter of Acceptance or otherwise) 应在合同授予后 28 个日历日内向项目经理发布会议/审计/检查时间表（无论是通过中标函还是其他方式）

The Contractor will be responsible for the provision of Tool Box talks to the directly employed and Subcontractors' workforce.

承包商将负责为直接雇佣的员工和分包商的员工提供工具箱讲座。

The Contractor will be responsible for the provision of Safety Induction Training to the every new coming worker for both directly employed or Subcontractor's workforce.

承包商将负责为直接雇佣或分包商的每一名新员工提供安全入职培训。

(d) **Accident Reporting**  
事故报告

All accidents shall be reported to the Project Manager immediately. The Contractor shall submit a formal report to the Project Manager following the occurrence of the accident detailing the following information:

所有事故应立即报告给项目经理。事故发生后，承包商应向项目经理提交一份正式报告，详细说明以下信息：

- **Accident Reporting**  
事故报告
- **Date of accident**  
事故发生日期
- **Location of accident**  
事故发生地点
- **Name, address, nationality of injured party**  
受害方的姓名、地址、国籍
- **Nature of injuries sustained**  
所受伤害的性质
- **Treatment rendered including hospital report**  
提供的治疗包括住院报告
- **Accident investigation**  
事故调查
- **Record photographs**  
记录照片
- **Remedial measures to be implemented**  
待实施的补救措施
- **Delay to programme**  
节目延迟
- **Lost working hours**  
损失的工作时间
- **Accident rating**  
事故等级
- **Insurance claim details**  
保险索赔明细

# PRELIMINARIES

## 基本措施项目



- Close-Out Report  
收尾报告
- Date injured operative returned to work  
受伤手术人员返回工作岗位的日期
- Other details  
其他详细信息

The Contractor shall issue the completed written Accident Report to the Project Manager within 24 hours of the accident occurring.

承包商应在事故发生后 24 小时内向项目经理及雇主出具完整的书面事故报告。

The Contractor shall issue the complete Close-Out Report to the Project Manager within three working days or when all the injured operatives return to work.

承包商应在三个工作日内或所有受伤作业人员返回工作岗位后，向项目经理提交完整的收尾报告。

The Contractor is responsible for ensuring that their Subcontractors comply with the HSE reporting requirements.

承包商负责确保其分包商遵守 HSE 报告要求。

- (e) Notification of Contractor's Insurance Company  
承包商保险公司通知

The Contractor shall forward all Accident Reports and Incident reports to the Contractor's Insurance Company by copy to the Project Manager.

承包商应将所有事故报告和事件报告转发给承包商的保险公司，并抄送项目经理。

With regard to other insurance incidents, the Contractor shall report all incidents to the Contractor's Insurance Company by copy to the Project Manager immediately and provide a report to the Project Manager within 24 hours of the occurrence of the incident detailing:

对于其他保险事故，承包商应立即向承包商的保险公司报告所有事故，并在事故发生后 24 小时内向项目经理提供一份报告，详细说明：

- Incident Report  
事故报告
- Date of incident  
事件发生日期
- Location of incident  
事故发生地点
- Investigation of incident  
事件调查
- Record photographs  
记录照片
- Cause of incident  
事故原因
- Loss of working hours  
工作时间损失
- Estimate of financial loss  
财务损失估算
- Proposed remedial measures and programme  
拟议补救措施和方案

# PRELIMINARIES

## 基本措施项目



- Estimate cost of remedial measures  
估计补救措施的成本
- Close-Out Report  
收尾报告
- Date remedial Works completed  
补救工程完成日期
- Engineers approval  
工程师批准
- Loss Adjusters approval  
损失理算师批准

(f) Personal Protective Equipment  
个人防护装备

The Contractor and Subcontractors are to supply all workmen with a safety hat, safety footwear and a coloured overall indicating the company name. This condition is mandatory for entry onto site.

承包商和分包商应为所有工人提供安全帽、安全鞋和标明公司名称的彩色整体。进入现场必须满足此条件。

The Contractor and Subcontractor will ensure that each workman is provided with the safety equipment necessary to undertake all hazardous tasks in safety.

承包商和分包商将确保为每个工人提供安全执行所有危险任务所需的安全设备。

The Contractor's responsibility will extend to the control of the Subcontractors.  
承包商的责任将延伸到对分包商的控制。

The Contractor shall inform the Project Manager in advance of all safety provisions and procedures that will require the compliance of the Employer or his representatives when visiting the site.

承包商应提前通知项目经理所有安全规定和程序，这些规定和程序要求雇主或其代表在访问现场时遵守。

The Contractor shall provide protective clothing and/or equipment for the Employer and his representative's use as appropriate. This shall exclude the provision of Safety Hats and Safety Footwear (i.e. provided by others).

承包商应酌情为雇主及其代表提供防护服和/或设备。这不包括提供安全帽和安全鞋（即由他人提供）。

(g) Fire Prevention  
防火

The Contractor shall take all necessary precautions to prevent personal injury, death and damage to the Works and other property from fire. The Contractor shall comply with the 'Joint Code of Practice for Fire Prevention on Construction Sites' required by Thai law.

承包商应采取一切必要的预防措施，防止火灾造成人身伤害、死亡以及工程和其他财产的损坏。承包商应遵守泰国法律要求的“施工现场消防联合实施规范”。

# PRELIMINARIES

## 基本措施项目



### (h) Fire Plan 消防计划

The Contractor will provide a Project Specific Fire Plan for the Project. This may be a dedicated Section within the H&S Plan. This plan will detail:

承包商将为该项目提供一份项目特定的消防计划。这可能是健康与安全计划中的一个专门章节。该计划将详细说明：

- What to do in the event of a fire  
发生火灾时该怎么办
- Who to contact  
联系谁
- The location of fire points  
火灾点的位置
- Method of Alarm (fire bell)  
报警方法（火警铃）
- The means of escape  
逃生途径
- Location of assembly point  
装配点位置
- Fire warden and duties  
消防安全员和职责
- Evacuation procedure and plans  
疏散程序和计划
- Training  
培训
- Communication  
沟通
- Reporting  
报告

In all circumstances the upper floors of the building are to be served by a minimum of at least two clear, safe, well-lit operational staircases. Such staircases shall be located within a reasonable travel distance from the Work activity. Where the permanent staircases are not available the Contractor must provide temporary stairs (ladders are not acceptable).

在所有情况下，建筑物的上层至少应有两个清晰、安全、光线充足的操作楼梯。此类楼梯应位于距离工程活动合理的行程距离内。如果没有永久楼梯，承包商必须提供临时楼梯（不接受梯子）。

### (i) Fire Points 火灾点

The Contractor shall provide within the temporary accommodation and the Permanent Works a series of Fire Points that will contain as a minimum:

承包商应在临时住所和永久工程内提供一系列消防点，至少包括：

- CO2 extinguishers  
二氧化碳灭火器
- Foam extinguishers  
泡沫灭火器
- Fire blanket  
防火毯

# PRELIMINARIES

## 基本措施项目



- Eye wash kit  
洗眼套装

This equipment is to be located in “Fire Boxes” that will be painted red and will display the “Escape Route” from the site to the “Assembly Point”.

该设备将放置在“消防箱”中，消防箱将涂成红色，并显示从现场到“集合点”的“逃生路线”。

The Fire Points are to be located on the Contractors site location plan and at all levels in the building.

消防点应位于承包商现场位置图和建筑物的各个楼层。

- (j) No Smoking  
禁止吸烟

All areas of the Works are deemed to be “No Smoking” areas.

工程的所有区域均被视为“禁止吸烟”区域。

All Contractors’ and Subcontractors’ offices are deemed “No Smoking” offices. The Contractor shall define a smoking area outside the buildings for those employees who wish to smoke. The Contractor shall provide litterbins with sandy trays at these locations, which are to be cleaned on a daily basis.

所有承包商和分包商的办公室均被视为“禁止吸烟”办公室。承包商应在建筑物外为希望吸烟的员工划定一个吸烟区。承包商应在这些位置提供带沙盘的垃圾箱，每天进行清洁。

- (k) Fuel Storage  
燃料储存

No fuel is to be stored within or adjacent to the Permanent Works (buildings).

永久工程（建筑物）内或附近不得储存燃料。

All fuel storage tanks are to be located 30m from the Permanent Works (\*buildings). The storage tanks are to be elevated and be contained within concrete bunds equal to 125% of the storage capacity of the tank. The fuel dispensing tap or nozzle shall be lockable and located over a sand filled watertight container to collect any spillage. The sand container will be replaced by the Contractor once a week or as needed.

所有燃料储罐应位于距离永久工程（\*建筑物）30米处。储罐将被抬高，并被容纳在混凝土堤岸内，相当于储罐储存容量的125%。燃料分配龙头或喷嘴应可锁定，并位于装满沙子的水密容器上方，以收集任何溢出物。承包商将每周或根据需要更换一次砂箱。

The Contractor will be responsible for the immediate removal and replacement of all contaminated ground resulting from the leak or spillage of fuel at his own expense and the disposal of the contaminated material at a licence treatment facility.

承包商将负责立即自费清除和更换因燃料泄漏或溢出而造成的所有污染地面，并在许可证处理设施处置污染材料。

# PRELIMINARIES

## 基本措施项目



### (l) Safety Signage 安全标志

The Contractor shall display at the entrance to the Project and at the entrance to the buildings official safety signage in English, Thai and any other language deemed appropriate by the Project Manager, indicating:

承包商应在项目入口处和建筑物入口处展示英语、泰语和项目经理认为合适的任何其他语言的官方安全标志，表明：

- Safety hats  
安全帽
- Safety footwear  
安全鞋
- No smoking  
禁止吸烟
- No food  
没有食物

In other designated work areas where other hazards are presented the Contractor will provide the following signage:

在存在其他危险的其他指定工作区域，承包商将提供以下标志：

- Eye protection  
眼部防护
- Ear defender  
护耳器
- Other appropriate signage and screens  
其他适当的标志和屏幕

The Contractor will provide Emergency Exit signage indicating a clear, well lit, safe route out of the building of the Assembly Points that will be identified with signage.

承包商将提供紧急出口标志，指示一条清晰、光线充足、安全的离开集合点建筑的路线，该路线将用标志标识。

### 6.14 SAFETY OFFICERS 安全员

- (a) The Contractor shall appoint full-time qualified site safety officers who shall be responsible for safety supervision and on promoting the safe conduct of work within the site, as required by the relevant authorities.

承包商应任命全职合格的现场安全员，负责安全监督，并按照有关当局的要求促进现场内工作的安全进行。

### 6.15 SAFETY AUDIT 安全审计

- (a) The Contractor shall employ an approved independent safety consultancy company to conduct inspections and audits on the safety measures implemented and maintained at the project site. Such inspections and audits shall be carried out at quarterly interval or other agreed intervals for the duration of the Contract Period.

承包商应雇佣一家经批准的独立安全咨询公司，对项目现场实施和维护的安全措施进行检查和审计。此类检查和审计应在合同期内每季度或其他商定的时间间隔进行一次。



# PRELIMINARIES

## 基本措施项目



- (b) The Contractor shall deliver the safety inspection and audit reports to the Project Manager within seven (7) days from the date of receipt of each of the reports from the safety consultancy company. Such reports shall include the observations (and corrective actions required) and the recommendations necessary for construction safety. Such recommendations for the improvement of the site safety shall be implemented immediately by the Contractor.

承包商应在收到安全咨询公司的每份报告之日起七（7）天内向项目经理提交安全检查和审计报告。此类报告应包括观察结果（以及所需的纠正措施）和施工安全所需的建议。承包商应立即实施此类改善现场安全的建议。

- (c) The safety inspection and audit shall not, in any way whatsoever, relieve the Contractor of his duty to comply with all requirements of any statutory act or regulation and any amendment or re-enactment thereto or any additional measures that may be required to ensure the adequacy and sufficiency of the safety provisions at the site.

安全检查和审计不得以任何方式免除承包商遵守任何法令或法规及其任何修订或重新颁布的所有要求的义务，也不得免除承包商为确保现场安全规定的充分性和充分性而可能需要采取的任何额外措施的义务。

### 7. RELEVANT ACTS OF PARLIAMENTS

议会的相关法案

#### 7.01 EMPLOYMENT OF FOREIGN WORKERS

雇用外籍工人

- (a) The Contractor has to ensure that all employees and workers whether directly employed by him or by his Subcontractors or suppliers (whether nominated or domestic) working on the site hold valid work permits and comply with the requirements of the relevant immigration laws and regulations. The Contractor shall also be responsible for obtaining necessary work permits from the relevant Authorities.

承包商必须确保在现场工作的所有员工和工人，无论是直接由其雇佣还是由其分包商或供应商（无论是指定的还是国内的）雇佣，均持有有效的工作许可证，并遵守相关移民法律法规的要求。承包商还应负责从有关当局获得必要的工作许可证。

- (b) The Employer absolves himself from all responsibility pertaining to this matter.  
雇主免除与此事有关的所有责任。

#### 7.02 HEALTH & WELFARE OF WORK PEOPLE & WORK SITES

工作人员和工作场所的健康和福利

- (a) The Contractor shall comply with all requirements of the local Health and Welfare and Regulations pertaining to work sites and all work people employed thereon.

承包商应遵守当地健康和福利的所有要求以及与工作现场和所有工作人员有关的法规。

#### 7.03 COMPLIANCE WITH STATUTORY ENACTMENTS AND BY-LAWS

遵守成文法和附则

- (a) The Contractor is to comply with all current statutory enactments and any latest amendments thereof together with all Bye-Laws and Regulations pertaining to preconstruction survey, precautionary and monitoring measures, safety measures, site welfare and work operations in the building industry.

承包商应遵守所有现行法令及其任何最新修订，以及与建筑行业施工前调查、预防和监测措施、安全措施、现场福利和工作操作有关的所有细则和条例。

# PRELIMINARIES

## 基本措施项目



### 7.04 DISORDERLY CONDUCT, ETC 行为不检等

- (a) The Contractor shall at all times take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his workmen and preserve the peace in the neighborhood.  
承包商应始终采取一切合理的预防措施，防止其工人或工人之间的任何非法、骚乱或扰乱治安的行为，并维护附近的治安。
- (b) The Contractor shall be responsible for restricting his workmen only to the site of the Works and shall prevent trespassing into adjoining properties and he shall undertake to reinstate and make good all damages and indemnify the Employer against all claims for damages. All workmen shall carry security passes on them at all times.  
承包商应负责将其工人限制在工程现场，并应防止侵入邻近的财产，承包商应承诺恢复和修复所有损坏，并赔偿雇主所有损坏索赔。所有工人应始终随身携带安全通行证。

### 7.05 TAXATION 税收

- (a) The Contractor shall pay tax profits made by him and due in accordance with any tax laws which are in force or which may come into force and the Contractor's employees shall be liable to pay income tax in respect of their salaries chargeable in accordance with any tax laws as aforesaid. The Accepted Contract Amount shall be deemed to include for complying with all such tax laws in force in Thailand.  
承包商应按照现行或可能生效的任何税法支付其应得的税收利润，承包商员工有责任根据上述任何税法支付工资的所得税。中标合同金额应被视为包括遵守泰国现行所有税法的费用。
- (b) The Accepted Contract Amount shall be deemed to include for payment of all taxes by the Contractor in whatever manner stipulated by the relevant laws include all stamp duties/duties.  
中标合同金额应被视为包括承包商以相关法律规定的任何方式支付的所有税款，包括所有印花税/关税。
- (c) The Contractor shall include in his Tender for contribution to Provident Fund and all other funds and Taxes in respect of all construction workmen employed by him in connection with the Works.  
承包商应在其投标书中纳入其雇佣的与工程有关的所有建筑工人的公积金和所有其他资金和税款。

### 7.06 VALUE ADDED TAX (VAT) 增值税

- (a) The Accepted Contract Amount (including all rates and prices) shall include all VAT under the provisions of the applicable laws. Any VAT which may become payable on taxable goods and services supplied under the Contract shall be paid by the Contractor.  
中标合同金额（包括所有单价和价格）应包括根据适用法律规定的所有增值税。根据合同提供的应税货物和服务可能应缴纳的任何增值税应由承包商支付。

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- (b) The Contractor shall allow for all cost and expenses relating to VAT on the purchase of goods and services necessary for the execution, completion and maintenance of the Contract Works. Such cost and expenses shall extend to, but not limited to, all administrative cost, financial charges and any loss or Input Tax, etc., relating to VAT payable by the Contractor to all his suppliers and Subcontractors (domestic or otherwise). All such cost and expenses shall be deemed to be included in the Accepted Contract Amount.
- 承包商应考虑在购买合同工程执行、竣工和维护所需的货物和服务时的增值税的所有成本和费用。此类成本和费用应包括但不限于与承包商应向其所有供应商和分包商（自身的或其他的）支付的增值税有关的所有行政成本、财务费用和任何损失或进项税等。所有此类成本和费用应被视为包含在中标合同金额中。

### 8. PREVENTION OF NUISANCE AND POLLUTION

#### 防止滋扰和污染

#### 8.01 LIABILITY FOR NUISANCE

##### 妨害责任

- (a) The Contractor shall be solely responsible in carrying out the Works and during the progress of the Works for any damage, accident, annoyance or disturbance that may arise to existing premises, owners or occupiers of adjoining properties by any of the operations arising from the carrying out to the Works under this Contract.
- 承包商应全权负责工程的实施以及工程进展过程中，因本合同项下工程的实施而对现有房屋、邻近财产的所有者或占用人造成的任何损坏、事故、烦恼或干扰。

#### 8.02 CONTROL OF NOISE, POLLUTION AND ALL OTHER STATUTORY OBLIGATIONS

##### 控制噪音、污染和其他法定义务

- (a) The Contractor is to take all necessary steps and comply with any directions and requirements from any Authority to restrict the nuisance of dust, noise limits or other pollution.
- 承包商应采取一切必要措施，遵守任何当局的任何指示和要求，以限制灰尘、噪音限制或其他污染的滋扰。
- (b) The Contractor is to take all necessary steps and comply with the Company Green Construction/ Green Clean Policy and other relevant policies to enhance and promote the environmental and sustainability performance of the Company.
- 承包商应采取一切必要措施，遵守公司绿色施工/绿色清洁政策和其他相关政策，以提高和促进承包商的环境和可持续发展绩效。
- (c) Pneumatic drills shall be fitted with silencer. Compressors shall run quietly and shall be placed away from adjoining premises. The Contractor shall take frequent and appropriate measures to abate the nuisance.
- 气动钻机应配备消声器。压缩机应安静运行，并应远离邻近场所。承包商应采取频繁和适当的措施来减少滋扰。
- (d) The Contractor shall ensure that noise generated at the site will not exceed the levels stipulated under the nuisance noise control regulation and notification including the requirements under the Environmental Impact Assessment Regulation.
- 承包商应确保现场产生的噪音不超过出生噪音控制法规和通知规定的水平，包括环境影响评估法规的要求。
- (e) No open fires will be permitted on Site. The Contractor shall immediately make good any damage to adjacent buildings caused by dust, noise or other pollution to the satisfaction of the Project Manager.

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现场不允许使用明火。承包商应立即修复因灰尘、噪音或其他污染对邻近建筑物造成的任何损坏，直至项目经理满意。

- (f) The Contractor shall indemnify the Employer against any claims, demands, proceedings, damages, court charges, penalties or fines and expenses whatsoever arising out of the breach or breaches of these obligations.  
承包商应赔偿雇主因违反这些义务而产生的任何索赔、要求、诉讼、损害赔偿、法庭指控、处罚或罚款和费用。
- (g) Mechanical plant and equipment which emits excessive noise, water, smoke, fumes and/or obnoxious liquids or gasses in excess of any Authorities' regulations will not be allowed to be used on Site.  
(g) 不允许在现场使用发出超过任何当局规定的过量噪音、水、烟、烟雾和/或令人讨厌的液体或气体的机械装置和设备。
- (h) The Contractor is to provide all necessary dust sheets, barriers, signs, notices and other temporary protection.  
(h) 承包商应提供所有必要的防尘板、屏障、标志、通知和其他临时保护。

### 8.03 ANTI-POLLUTION MEASURES

#### 防污染措施

- (a) The Contractor shall take precautions to prevent nuisance from noise. All plant and equipment shall meet the noise limit set down by the relevant Authorities or fitted with noise suppressor to reduce the level of noise to the prescribed limit.  
承包商应采取预防措施，防止噪音造成的滋扰。所有装置和设备应符合有关当局规定的噪声限值，或配备噪声抑制器，以将噪声水平降低到规定的限值。
- (b) The Contractor is required to minimise the pollution caused by dust on site. Adequate measures must be introduced to limit these pollution.  
承包商需要尽量减少现场灰尘造成的污染。必须采取适当措施限制这些污染。
- (c) The Contractor is required to minimise the pollution caused by dust in association with construction material and equipment transportation. Adequate measures must be introduced to limit these pollution.  
承包商需要尽量减少与建筑材料和设备运输相关的灰尘污染。必须采取适当措施限制这些污染。

### 8.04 MOSQUITO PREVENTION

#### 防蚊

- (a) All excavation and portions of Site where water stagnates or accumulates must be kept dry by pumping, bailing or other methods.  
所有开挖和现场积水或积水的部分必须通过抽水、舀水或其他方法保持干燥。

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- (b) The Contractor has to allow for precautions to prevent breeding of mosquitoes and refrain from dumping or depositing rubbish, spoil, unused materials, empty bottles, cans and other containers capable of collecting liquids. He will be held responsible for mosquito nuisance at the site and surroundings and shall pay all fines imposed by the Authorities for mosquito breeding. He also has to comply with the Authorities and the Project Manager's directions on measures to eradicate or eliminate mosquito breeding.  
承包商必须考虑采取预防措施，防止蚊子滋生，并避免倾倒或堆放垃圾、弃土、未使用的材料、空瓶、罐和其他能够收集液体的容器。他将对现场和周围的蚊子滋扰负责，并应支付当局因蚊子滋生而征收的所有罚款。他还必须遵守当局和项目经理关于根除或消除蚊子滋生的措施的指示。
- (c) The precaution and prevention on infestations of termites and the like shall deemed to be included as part of this clause  
白蚁等侵扰的预防和预防应被视为本条款的一部分。

### 8.05 PEST CONTROL

#### 害虫防治

- (a) The Contractor shall throughout the duration of the Contract engage an approved pest control service to undertake regular checks and treatment of the site and the Works in accordance with the requirements of the authorities and/or the Project Manager. The Contractor shall submit certificates prepared by the approved pest control service stating that inspection and treatment have been effected at intervals as directed by the Authorities and/or the Project Manager.  
承包商应在整个合同期间聘请经批准的虫害防治服务，根据当局和/或项目经理的要求定期检查和处理现场和工程。承包商应提交经批准的虫害防治服务机构编制的证书，说明已按照当局和/或项目经理的指示定期进行检查和处理。
- (b) Any health nuisances caused by the lack of pest control to the Works and the adjoining properties shall be dealt with to the satisfaction of the Authorities and the Project Manager at the Contractor's own expense.  
因缺乏虫害防治而对工程和邻近财产造成的任何健康危害应由承包商自费处理，直至当局和项目经理满意。
- (c) If, in the opinion of the Project Manager, the Contractor fails to provide adequate pest control measures then the Employer will appoint a specialist and contra-charge the Contractor accordingly.  
如果项目经理认为承包商未能提供足够的虫害防治措施，则雇主将任命一名专家，并相应地向承包商收取费用。

### 8.06 PERIODIC CLEANING UP

#### 定期清理

- (a) The Contractor remove all debris, rubbish and superfluous material from the Site on a daily basis during the progress of the Contract.  
在合同执行期间，承包商每天从现场清除所有碎片、垃圾和多余材料。
- (b) In the event that the progress of the Works is impeded by over accumulation of debris, etc. due to default on the part of the Contractor the right is reserved by the Employer to arrange for the debris, etc. to be removed from the Site and to deduct such expenses incurred from any sums due to the Contractor.  
如果由于承包商违约导致碎片等过度堆积，阻碍了工程进度，则雇主有权安排将碎片等从现场清除，并从应付给承包商的任何款项中扣除由此产生的费用。

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### 9. COMPLETION REQUIREMENTS

#### 竣工要求

#### 9.01 PROTECTION OF COMPLETED WORKS

##### 已完工工程的保护

- (a) The Contractor shall provide full and adequate protection for all finished surfaces and for all materials subject to injury or staining and shall be responsible for making good all damage done to such finished surfaces and materials until the Works are handed over completely. The protection must be applied or provided as soon as a surface is finished and/or materials arrived on site or as may be otherwise desirable and such protection shall be maintained in effective condition throughout the course of the Works.

承包商应为所有完工表面和所有可能受伤或染色的材料提供充分保护，并负责修复对此类完工表面和材料造成的所有损坏，直至工程完全移交。一旦表面完成和/或材料到达现场，或根据其他需要，必须立即施加或提供保护，并且在整个工程过程中应保持这种保护的有效状态。

#### 9.02 PREREQUISITES FOR ISSUANCE OF TAKING OVER CERTIFICATE

##### 签发接管证书的先决条件

The Taking-Over Certificate shall not be issued until:-  
在以下情况之前，不得颁发接收证书： -

- (a) The following are met: -  
满足以下条件： -
- (i) All Contracts Works under the construction phases are completed by the Contractor, partly or whole inspected and satisfied for Taking-Over by the Employer and/or the Project Manager;  
施工阶段的所有合同工程均由承包商完成，部分或全部经过雇主和/或项目经理的检查和验收；
  - (ii) Any remaining defects are minor in nature and shall not prevent the handover and the practical usage of the Works; and  
任何剩余缺陷本质上都是轻微的，不应妨碍工程的移交和实际使用；以及
  - (iii) All as-built documentation including O&M Manuals, Warranties and training is complete and handed over to the Employer.  
所有竣工文件，包括运维手册、保修和培训，均已完成并移交给雇主。
- (b) the Project Manager is satisfied that the Contractor has complied fully with his previous directions to make good, remedy, replace or reconstruct items of work, goods or materials which did not comply with the Contract in any respect;  
项目经理确信承包商已完全遵守其先前的指示，对在任何方面不符合合同的工程、货物或材料进行修复、补救、更换或重建；
- (c) submission and approval of all maintenance/operating manuals and associated technical data and Drawings necessary for the efficient operation and maintenance of all installations. Such information shall be prepared and produced in conjunction with the respective Subcontractors and other contractors and shall include, but not be limited to, the following data: -  
提交和批准所有装置高效运行和维护所需的所有维护/操作手册、相关技术数据和图纸。此类信息应与各分包商和其他承包商一起准备和制作，并应包括但不限于以下数据： -

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- (i) names of suppliers and manufacturers together with addresses and telephone numbers;  
供应商和制造商的名称以及地址和电话号码;
  - (ii) a general description of all systems and installations with a separate detail description for each system and installation;  
所有系统和装置的一般说明，每个系统和装置都有单独的详细说明;
  - (iii) equipment details; and  
设备细节; 和
  - (iv) maintenance requirements, etc.;  
维护要求等;
- (d) submission of the required number of sets of certified "as-constructed" or "as-built" Drawings for all concealed Works, services and installations, together with one (1) set of the certified tracings of each Drawing or computer files in the format as instructed by the Project Manager;  
提交所有隐蔽工程、服务和安装所需数量的经认证的“竣工”或“竣工”图纸，以及一（1）套符合项目经理指示格式的每份图纸或计算机文件的经认证描摹图;
- (e) submission of the required number of sets of all updated shop Drawings;  
提交所需数量的所有更新施工图;
- (f) submission of all executed joint warranties stipulated in the Contract; and  
提交合同中规定的所有已执行的共同保证; 和
- (g) any other information and documents which are required to be submitted by the Contractor upon completion of the Works.  
承包商在工程竣工后需要提交的任何其他信息和文件。

### 9.03 CLEANING AND OTHER WORKS UPON COMPLETION

#### 完工后的清洁和其他工作

The Contractor shall leave the Works in a clean and tidy condition at completion of the Works. Immediately prior to the issue of the Taking-Over Certificate of the Works, the Contractor shall :-  
承包商应在工程竣工时保持工程干净整洁。在颁发工程接收证书之前，承包商应： -

- (a) remove all rubbish from the building and the Site, and leave the Works clean and ready for immediate occupation and practical usage.  
清除建筑物和现场的所有垃圾，保持工程清洁，随时可供占用和实际使用。
- (b) clean all exposed concrete, brick, timber, and all other Works surfaces;  
清洁所有外露的混凝土、砖、木材和所有其他工程表面;
- (c) wash, clean and dry and polish all Works surface, wall and floor finishes (in addition to any previous polishing required by the Specifications);  
清洗、清洁、干燥和抛光所有工程表面、墙壁和地板饰面（除规范要求的任何先前抛光外）;
- (d) make good all cracks in plaster, etc;  
修补灰泥等上的所有裂缝;

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- (e) clean and polish all glass, glazed tiles, stainless steel surfaces;  
清洁并抛光所有玻璃、釉面砖、不锈钢表面;
- (f) ensure that all services and equipment are functioning efficiently if any;  
确保所有屋宇设施和设备（如有）高效运行;
- (g) clean drains, gutters, downpipes, etc., and clear all obstructions;  
清洁排水沟、排水沟、落水管等，清除所有障碍物;
- (h) provide and lay top soil or relay top soil and turfing disturbed during the carrying out of the Works;  
提供并铺设表土，或在工程实施过程中扰动表土和草皮;
- (i) clean out water tanks, sanitary wares and fittings and maintain them hygienically if any; and  
清理水箱、卫生洁具和配件，并对其进行卫生维护（如有）；和
- (j) all other Works and remedial action which may reasonably be directed by the Project Manager.  
项目经理合理指示的所有其他工程和补救措施。

Upon the issue of the Taking-Over Certificate, the Contractor shall remove as quickly as possible all plant, building appliances, apparatus or equipment at his own cost. All services, temporary buildings, sheds, barriers, scaffolding, etc., required in the Works are to be disconnected and dismantled. Trenches and excavations in connection with the plant, are to be filled in a proper manner, levelled off and closely turfed and the site left in a clean and orderly condition.

在颁发接收证书后，承包商应尽快自费拆除所有装置、建筑器具、仪器或设备。工程中所需的所有屋宇设施、临时建筑、棚屋、障碍物、脚手架等均应断开并拆除。与工厂相关的沟槽和开挖应以适当的方式填充，平整并铺上紧密的草皮，使现场保持干净有序的状态。

Should the Contractor fail to execute any of the above stated items of work, the Project Manager will be empowered to employ a third party to carry out or complete the items of work and the cost so incurred will be deducted in accordance with the provisions of the Conditions of Contract. The Project Manager will not be held responsible or liable for any materials or plant left upon the site.

如果承包商未能执行上述任何工作项目，项目经理将有权聘请第三方执行或完成这些工作项目，由此产生的费用将根据合同条款的规定扣除。项目经理对留在现场的任何材料或设备不承担任何责任。

### 9.04 MAINTENANCE AND MAKING GOOD

#### 维护和修复

The Contractor is to maintain the Works, at no additional cost, from the Completion Date stated in the Taking-Over Certificate for the Works or for the respective Phase or Stage or Section (where applicable) and make good any defects arising thereof until the issuance of the Performance Certificate for the whole Works, all to the entire satisfaction of the Project Manager.

承包商应自工程或各阶段或分段（如适用）的接收证书中规定的竣工日期起，在不收取额外费用的情况下维护工程，并修复由此产生的任何缺陷，直至颁发整个工程的履约证书，所有这些都应使项目经理完全满意。



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### 9.05 TESTS 测试

Arrange for the supervised field tests and accredited laboratory tests on materials and workmanship based on the Specifications, to be carried out progressively during the course of the Contract as instructed by the Project Manager and submit test certificates/reports to the Project Manager.  
根据规范，安排在合同期间按照项目经理的指示逐步进行材料和工艺的监督现场测试和认证实验室测试，并向项目经理提交测试证书/报告。

The cost of carrying out and arranging for all tests and submission of test certificates/reports shall be borne by the Contractor when applicable.  
在适用的情况下，承包商应承担进行和安排所有测试以及提交测试证书/报告的费用。

The Consultant Fees including any transportation, accommodation and living expense (if applicable) shall be levied to the Contractor account in the event performance tests require re-testing or if more than 1 re-submission of Drawing or calculations require review due to the Contractors failure.  
如果性能测试需要重新测试，或者由于承包商的失败，需要重新提交一次以上的图纸或计算书进行审查，则顾问费，包括任何交通、住宿和生活费用（如适用），应由承包商承担。

### 9.06 TESTING AND COMMISSIONING OF SERVICES USING PERMANENT SUPPLIES 使用永久性供应品对楼宇设备进行测试和调试

(a) The Contractor's attention is drawn to the fact that major services equipment installed will require water and electricity from permanent supplies for testing and commissioning, ahead of the Completion Date and the Contractor shall ensure that these are available. No claims for delay or extra cost will be considered due to the Contractor's failure to co-ordinate this aspect of the work with the Authorities or relevant Nominated Subcontractor. The Contractor shall provide these services to any location within the Works irrespective of the location of the permanent supplies.

- (a) 承包商应注意，在竣工日期之前，安装的主要服务设备将需要永久供应的水电进行测试和调试，承包商应确保这些设备可用。由于承包商未能与当局或相关指定分包商协调这方面的工作，因此不会考虑对延误或额外费用的索赔。承包商应向工程内的任何位置提供这些服务，无论永久性供应品的位置如何。

### 9.07 TESTING APPLICATION FOR PERMANENT SUPPLIES 永久供应品的测试申请

(a) The Contractor shall notify the Project Manager as soon as the Works have reached the stage where the Authorities will provide permanent supplies. Application for permanent water and electricity supplies shall be in the name of the Employer (or his nominees).  
一旦工程达到当局将提供永久供应的阶段，承包商应立即通知项目经理。永久水电供应申请应以雇主（或其指定人）的名义提出。

(b) The Contractor shall apply, pay for all "deposits" and "fees" and obtain all necessary certificates and approval from Metropolitan Electrical Authority for the provisions of, connection to and turning on of the permanent supplies. The Employer shall only reimburse the Contractor the "deposits" and "turning on" and/or "connection fee" for obtaining the permanent supplies.

承包商应申请、支付所有“押金”和“费用”，并从大都会电力局获得所有必要的证书和批准，以提供、连接和打开永久电源。雇主只应向承包商偿还获得永久供应品的“押金”和“开启”和/或“连接费”。

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### 9.08 TESTING AND COMMISSIONING OF M&E SERVICES AND INSTALLATIONS AFTER "TURNING-ON" OF SERVICES

#### 楼宇设备“开启”后机电的测试和调试

- (a) The Contractor shall carry out all necessary testing and commissioning procedures comprising tests at maker's Works, site tests during construction, commissioning, Factory Acceptance Test, Site Acceptance Test and Integrated System Tests all as specified.  
承包商应按照规定执行所有必要的测试和调试程序，包括在制造商工厂进行的测试、施工期间的现场测试、调试、工厂验收测试、现场验收测试和集成系统测试。
- (b) Tests shall be carried out in accordance with the appropriate Standards, Code of Practice and the relevant regulations.  
应按照适当的标准、行为准则和相关规定进行测试。
- (c) All tests may be witnessed by the Employer and/or the Employer's Agent. In the case of tests at the manufacturer's Works, the tests may be witnessed by parties nominated by the Employer. Not less than fourteen days' notice shall be given by the Contractor for this purpose. 所有测试均可由雇主和/或雇主代理人见证。在制造商工厂进行测试的情况下，测试可由雇主指定的各方见证。为此，承包商应至少提前十四天发出通知。
- (d) The Contractor shall remain solely responsible for the cost of utilities consumed and all other payments and expenses including any minimum charges, surcharges, refuse fees, sanitary application fees, water borne fees, VAT, administrative cost, taxes, etc. levied by the Authorities for the period commencing from the Authorities' permanent connection up to the taking over by the Employer.  
承包商应全权负责所消耗的公用事业费用以及所有其他付款和费用，包括当局在从当局永久连接到雇主接管期间征收的任何最低费用、附加费、垃圾费、卫生申请费、水费、增值税、行政成本、税款等。
- (e) The Contractor shall settle such bills direct with relevant Authorities on the Employer's behalf, and where in default, the Employer shall deduct such sum or sums direct from all monies due to the Contractor under the Contract.  
承包商应代表雇主直接与有关当局结算此类账单，如有违约，雇主应直接从本合同项下应付给承包商的所有款项中扣除该笔或多笔款项。
- (f) In addition, during the Defects Notification Period, the Contractor shall also be liable for the cost of all utilities consumed for re-testing and re-commissioning of services. The amount owing to the Employer shall be ascertained and determined by the Project Manager. The Contractor shall either reimburse the Employer or the Employer shall deduct such sums from monies due to the Contractor under the Contract.  
此外，在缺陷通知期内，承包商还应负责重新测试和重新调试服务所消耗的所有公用设施的费用。欠雇主的金额应由项目经理确定。承包商应向雇主报销，或者雇主应从合同项下应付给承包商的款项中扣除此类款项。

# PRELIMINARIES

## 基本措施项目



### 9.09 INSURANCE FOR WORKS DURING THE DEFECTS NOTIFICATION PERIOD 缺陷通知期内的工程保险

- (a) The Contractor shall before the commencement of the Defects Notification Period ensure that there is in force a general insurance policy indemnifying the Employer, the Contractor and all Subcontractors from all Public Liability and Liabilities under the Workmen's Compensation Act or any statutory modification or reenactment thereof and from all costs and expenses incidental or consequential thereto arising out of claims for any work carried out during the Defects Notification Period. The Contractor shall produce on demand any such policy to the Project Manager before the commencement of the Defects Notification Period. Provided always that if the Contractor shall at any time fail to effect such policy as aforesaid the Project Manager may do all things necessary to effect or maintain such insurance and deduct any monies expended by him for that purpose from any monies due or become due to the Contractor.

承包商应在缺陷通知期开始前确保有一份有效的一般保险单，赔偿雇主、承包商和所有分包商在《工人赔偿法》或其任何法定修改或重新颁布下的所有公共责任和责任，以及因缺陷通知期内进行的任何工作的索赔而产生的所有附带或间接费用和开支。承包商应在缺陷通知期开始前按要求向项目经理出示任何此类保单。前提是，如果承包商在任何时候未能按照上述规定办理此类保单，项目经理可以采取一切必要措施办理或维持此类保险，并从应付给承包商的任何款项中扣除其为此目的支出的任何款项。

### 9.10 DEFECTS RECTIFICATION DURING DEFECTS NOTIFICATION PERIOD 缺陷通知期内的缺陷整改

- (a) During the Defects Notification Period and before the issuance of the Performance Certificate, the Contractor shall provide a maintenance crew comprising at least a Project Manager and a M&E Services Engineer, who shall be available on an 'on-call' basis to tackle defects rectification and to attend to and co-ordinate emergency repairs.

在缺陷通知期内和颁发履约证书之前，承包商应提供至少由一名项目经理和一名机电服务工程师组成的维护人员，他们应随时待命，处理缺陷整改，并参加和协调紧急维修。

- (b) All rectification Works carried out shall be executed in the presence of a competent supervisor approved by the Project Manager.

所有整改工程应在项目经理批准的合格监督员在场的情况下进行。

- (c) When the Contractor receives any complaint from the occupants, he shall notify the Project Manager and the Employer and obtain directions from the Project Manager before carrying out any rectification work.

当承包商收到居住者的任何投诉时，他应通知项目经理和雇主，并在进行任何整改工作之前获得项目经理的指示。

- (d) The Contractor shall provide electricity and water from his own sources for carrying out the rectification Works and for the watering of roadside turf and trees during the Defects Notification Period. Should these be taken from the Employer's or the occupants' source, the Contractor shall reimburse all cost and expenses in connection to the Employer or the respective occupants.

承包商应自行提供电力和水，以便在缺陷通知期内进行整改工程和浇灌路边草皮和树木。如果这些费用来自雇主或居住者，承包商应报销与雇主或各自居住者有关的所有费用和开支。

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## 基本措施项目



- (e) The Contractor has to comply with the Project Manager's notification within a reasonable time failing which the Employer may employ other contractors to effect compliance with the said notification. In the event of an emergency or any situation arising which requires the immediate attendance of the Contractor, the Contractor shall comply with the Project Manager's notification, whether verbal or written, within 3 hours of such notification, failing which the consequence of non-compliance shall apply.  
承包商必须在合理的时间内遵守项目经理的通知，否则雇主可以雇佣其他承包商来遵守上述通知。如果发生紧急情况或任何需要承包商立即出席的情况，承包商应在收到通知后 3 小时内遵守项目经理的口头或书面通知，否则将适用不遵守的后果。
- (f) The Defects Notification Period for this Works is **24 Months** (after the date stated in the Taking over certificate).  
缺陷通知期限为 **24 个月**（在接收证书上注明的日期之后）。

### 9.11 PRODUCT AND WORKMANSHIP INDEMNITIES AND WARRANTIES 产品和工艺赔偿和保证

- (a) The Contractor, Nominated Subcontractors and/or specialist Subcontractors, shall provide the product and workmanship indemnities and warranties for the items of work and for the periods of warranty as listed in the Appendices Section of the Contract. The product and workmanship indemnities and warranties shall be executed under seal by the Contractor, or on a joint and several basis by the Contractor and Nominated Subcontractor, or by the Contractor and domestic specialist Subcontractor, as the case may be, and shall comply strictly with the prescribed forms set out in the Contract and/or accordance with the format approved by the Project Manager for use under this Contract.  
承包商、指定分包商和/或专业分包商应为合同附录部分所列的工作项目和保修期提供产品和工艺赔偿和保修。产品和工艺赔偿和保证应由承包商盖章执行，或由承包商和指定分包商或承包商和国内专业分包商共同执行，视情况而定，并应严格遵守合同中规定的格式和/或项目经理批准的本合同项下使用的格式。
- (b) The indemnities and warranties, all duly executed under seal and on a joint and several basis, as the case may be, shall be submitted within 30 days from the award of the Contract and in the case of the Nominated Subcontract Works, from the award of the respective Subcontract. All shall be submitted before the Main Contract Taking-Over Certificate.  
根据具体情况，所有经盖章正式签署的赔偿和保证应在合同授予后 30 天内提交，如果是指定分包工程，则应在各分包合同授予后的 30 天内交付。所有文件应在主合同接收证书之前提交。
- (c) The indemnities and warranties shall be executed under seal and the affixation of the common seal shall be witnessed by two company directors or a company director and the company secretary.  
赔偿和保证应加盖印章，加盖公章应由两名公司董事或一名公司董事和公司秘书见证。
- (d) When submitting the indemnities and warranties, the Contractor shall be required to provide, and shall cause the Nominated Subcontractor and/or specialist Subcontractor to provide, a copy of the Board of Directors' resolution confirming that:  
在提交赔偿和保证时，承包商应提供并应促使指定分包商和/或专业分包商提供一份董事会决议副本，确认：
- (i) The signatories are the respective company directors or a company director and the company secretary of the Contractor, the Nominated Subcontractor and the specialist Subcontractor, as the case may be; and  
签字人是承包商、指定分包商和专业分包商的各自公司董事或公司董事和公司秘书，视情况而定；和

# PRELIMINARIES

## 基本措施项目



- (ii) They are authorised to execute the indemnities and warranties and witness the affixing of the common seal.  
他们有权签署赔偿和保证，并见证公章的加盖。

### 9.12 FINAL STATEMENT 结算

- (a) Prior to the preparation of the draft final statement, the Contractor shall attend regular meetings as and when arranged by the Quantity Surveyor throughout the Time for Completion and the Defects Notification Period to discuss and agree variations.  
在编制最终报表草案之前，承包商应在竣工时间和缺陷通知期内参加工料测量师安排的定期会议，讨论和商定变更。
- (b) The draft final statement to be submitted to the Project Manager with a copy to the Quantity Surveyor, shall include  
提交给项目经理的最终报表草案应包括
  - (i) The final statement showing the value of all work done in accordance with the Contract including variations and such other amounts which he considers to be due to him under the Contract;  
显示根据合同完成的所有工作价值的最终报表，包括变更和他认为根据合同应支付给他的其他金额；
  - (ii) Original Subcontract final statements from all Nominated Subcontractors showing the value of all work done in accordance with the Subcontracts including variations and such other amounts which they consider to be due to them under their respective Subcontracts;  
所有指定分包商的原始分包合同最终报表，显示根据分包合同完成的所有工作的价值，包括变更和他们认为根据各自的分包合同应支付给他们的其他金额；
  - (iii) Supporting documents such as statements showing agreement on variations, invoices, receipts, vouchers and other documents including that relating to the Works of Nominated Subcontractors; and  
证明文件，如表明同意变更的声明、发票、收据、凭证和其他文件，包括与指定分包商工程有关的文件；和
  - (iv) Any other information as may be requested by the Project Manager and/or Quantity Surveyor to support the value of all work done in accordance with the Contract including variations and any other entitlements that may have been included in the final statement.  
项目经理和/或工料测量师可能要求的任何其他信息，以支持根据合同完成的所有工作的价值，包括变更和最终报表中可能包含的任何其他权利。

# PRELIMINARIES

## 基本措施项目



### 10. PRIME COST SUM ITEMS - WORKS BY NOMINATED SUBCONTRACTOR / WORKS BY DIRECT CONTRACTORS

指定金额项目 - 指定分包商的工程/直接承包商的工程

#### 10.01 NOMINATED SUBCONTRACTS

指定分包合同

- (a) All specialists, tradesmen and other Subcontractors carrying out any work or supplying and/or fixing any goods for which Prime Cost Sums or Provisional Sums have been allowed or arising from Project Manager's instructions shall be selected by the Project Manager and when employed by the Contractor shall be referred to as Nominated Subcontractors, as the case may be.  
所有执行任何工作或供应和/或固定任何货物的专家、商人和其他分包商，如果允许支付指定金额或暂定金额，或根据项目经理的指示产生，则应由项目经理选择，当被承包商雇用，应称为指定分包商（视情况而定）。
- (b) The Conditions of Subcontract to be used for all Subcontracts entered into between the Contractor and the respective Nominated Subcontractor is attached as a part of the Tender Documents.  
承包商与各指定分包商之间签订的所有分包合同所使用的分包合同条件作为招标文件的一部分附后。
- (c) The Contractor shall refer to and be deemed to have full knowledge of the terms, conditions, amendments and all implications of the Conditions of SubContract.  
承包商应参考并被视为完全了解分包合同条件的条款、条件、修订和所有影响。
- (d) Upon receipt of a written notice from the Employer, the Contractor shall enter into a novation agreement with the Employer and the respective Nominated SubContractor whereby the Contractor shall take the place of the Employer as the party Contracting with the Nominated SubContractor in respect of the Nominated subContract Works.  
在收到雇主的书面通知后，承包商应与雇主和各指定分包商签订更新协议，根据该协议，承包商应取代雇主成为与指定分包承包商就指定分包工程签订合同的一方。
- (e) Unpriced sets of the tender documents for the Nominated SubContract Works may be inspected at the Project Manager's office by the Contractor prior appointment. The Contractor shall not be absolved from his responsibility for any breach of Contract, repudiation, default or failure of the part of any of the Nominated SubContractors arising from his failure or refusal to inspect the unpriced tender documents.  
承包商可在任命前在项目经理办公室检查指定分包工程的未定价招标文件。承包商不得免除其因未能或拒绝检查未定价的招标文件而导致的任何指定分包商的违约、拒绝、违约或失败的责任。
- (f) The Contractor shall not be absolved from his responsibility for any breach of Contract, repudiation, default or failure of the part of any of the Nominated SubContractors arising from his failure or refusal to inspect the unpriced tender documents.  
承包商不得免除其因未能或拒绝检查未定价的招标文件而导致的任何指定分包商的违约、拒绝、违约或失败的责任。
- (g) The Contractor shall not be entitled to any claims for ignorance of the extent, nature, scope and requirements of and the conditions under which the Nominated subContract Works are to be carried out and incorporated into the Works.  
承包商无权因不了解指定分包工程的范围、性质、范围和要求以及实施和纳入工程的条件而提出任何索赔。

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## 基本措施项目



### 10.02 DIRECT CONTRACTORS / SUPPLIERS EMPLOYED BY EMPLOYER

#### 雇主雇用的直接承包商/供应商

- (a) The Contractor shall allow for coordination, interfacing, programming and sequencing of the Works with such other Contractors, specialists and tradesmen (the “Direct Contractors”) employed by the Employer under separate Contractual arrangements.  
承包商应考虑与雇主根据单独的合同安排雇用的其他承包商、专家和商人（“直接承包商”）协调、对接、规划和排序工程。
- (b) Such coordination, interfacing, programming and sequencing shall include doing all things necessary and affording whatever assistance, attendance, facilities and access to ensure that the Direct Contractors complete their respective Works in a timely manner.  
此类协调、接口、编程和排序应包括做所有必要的事情，并提供任何协助、照管、设施和通道，以确保直接承包商及时完成各自的工程。
- (c) The Contractor shall as such obtain and include the Direct Contractors’ programmes into his Works programme. Modify and update the Works programme from time to time to reflect progress of all Works on the Site.  
承包商应获取直接承包商的计划，并将其纳入其工程计划。不时修改和更新工程计划，以反映现场所有工程的进度。
- (d) On completion of the Works by the Direct Contractors, the Contractor shall make good all the Works disturbed including providing necessary covers, protection, casing up and temporary Works to ensure that the Works installed by the Direct Contractors are protected against losses, breakages, damage, theft and vandalism.  
在直接承包商完成工程后，承包商应修复所有受干扰的工程，包括提供必要的覆盖、保护、套管和临时工程，以确保直接承包商安装的工程免受损失、破损、损坏、盗窃和故意破坏。

### 10.03 RESPONSIBILITIES OF CONTRACTOR FOR NOMINATED AND DIRECT CONTRACTORS OR SUPPLIERS

#### 承包商对指定和直接承包商或供应商的责任

- (a) The Contractor shall be fully responsible for ensuring that the Nominated Subcontractor and/or Suppliers are fully aware of, and conform with the terms and conditions of this Contract. The Contractor shall be wholly liable for the acts, defaults or breach of any terms and conditions of this Contract by the Nominated Subcontractor and/or Suppliers on their part in the same way as for his own or those of other Subcontractors or suppliers engaged by himself.  
承包商应全权负责确保指定分包商和/或供应商充分了解并遵守本合同的条款和条件。承包商应对指定分包商和/或供应商的行为、违约或违反本合同任何条款和条件承担全部责任，其方式与承包商或其聘用的其他分包商或供应商的方式相同。
- (b) In the event of repudiation or abandonment of any Subcontract by Nominated Subcontractor or Suppliers, or the determination of the employment of a Nominated Subcontractor or Supplier for any reason whatsoever under the Subcontract, the Contractor shall:  
如果指定分包商或供应商拒绝或放弃任何分包合同，或根据分包合同因任何原因决定雇用指定分包商都应：
  - (i) with the consent of the Project Manager (such consent not to be unreasonably withheld) employ another competent Subcontractor or supplier to complete the Subcontract; or  
经项目经理同意（不得无理拒绝），雇佣另一家合格的分包商或供应商完成分包合同；或

- (ii) himself undertake to complete the Subcontract.  
自己承诺完成分包合同。
- (c) Provided that in any of such event the Contractor is entitled to be paid the said sum for the work or services to be executed or materials and goods to be supplied, as would have been payable had the original Nominated Subcontractor or Supplier completed the Subcontract without any default on their part.  
前提是，在任何此类情况下，承包商有权获得上述待执行的工作或服务或待供应的材料和货物的付款，就像原始指定分包商或供应商在没有违约的情况下完成分包合同一样。
- (d) The Contractor shall not be responsible for the Works of the Direct Contractors and Direct Suppliers, except to the extent that the Contractor shall be responsible to manage and co-ordinate all Subcontractors and Direct Suppliers and provide attendance which is defined elsewhere in this Preliminaries.  
承包商不对直接承包商和直接供应商的工程负责，除非承包商负责管理和协调所有分包商和直接供应商，并提供基本措施项目其他部分规定的照管。
- (e) The Contractor shall be responsible for ensuring that all Nominated and Direct Subcontract Works are properly programmed, executed and completed within the Contract period for the Main Contract Works. No extensions of the Contract period shall be allowable in respect of delay by the Nominated and Direct Subcontractors or Suppliers for any reason whatsoever.  
承包商应负责确保所有指定和直接分包工程在主合同工程的合同期限内得到适当的规划、执行和完成。对于指定和直接分包商或供应商因任何原因造成的延误，不允许延长合同期限。
- (f) All instructions given by the Project Manager to the Contractor referring to the work of the Nominated / Direct Subcontractor or Suppliers shall be forwarded directly to the Nominated / Direct Subcontractor or Suppliers without delay and the Contractor shall ensure that the instructions are carried out promptly.  
项目经理就指定/直接分包商或供应商的工作向承包商发出的所有指示应立即直接转发给指定/直接的分包商和供应商，承包商应确保这些指示得到及时执行。

#### 10.04 ATTENDANCE UPON NOMINATED SUBCONTRACTOR AND DIRECT CONTRACTORS

##### 指定分包商和直接承包商的照管

- (a) The Contractor shall provide the following attendances (unless stated otherwise free of charges) to the Direct Contractors and Nominated Subcontractor:  
承包商应向直接承包商和指定分包商提供以下服务（除非另有说明，否则免费）：
  - (i) Ascertaining from Direct Contractors and Nominated Subcontractor all particulars relating to their work in regard to sizes and positions in which chases, mortices, block outs, pipe sleeves and similar items are required to be formed or left in and providing same. The Contractor will be responsible for any additional cost incurred as a result of any omission on his part in this respect.  
从直接承包商和指定分包商处确定与其工作有关的所有细节，包括需要形成或留下沟槽、榫眼、封堵、管套和类似物品的尺寸和位置，并提供这些细节。承包商将负责因其在这方面的任何疏忽而产生的任何额外费用。



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- (ii) Affording free and full use of existing standing scaffolding, messrooms, sanitary accommodation and welfare facilities.  
免费和充分利用现有的立式脚手架、餐厅、卫生设施和福利设施。
- (iii) Providing reasonable amount of space on site for the Direct Contractor and Nominated Subcontractor to erect his own office accommodation and storage.  
在现场为直接承包商和指定分包商提供合理数量的空间，以搭建自己的办公场所和仓库。
- (iv) Providing all general lighting and water for the Direct Contractor's and Nominated Subcontractor's work. The Direct Contractors and Nominated Subcontractor shall be responsible for paying reasonable charges for water consumed.  
为直接承包商和指定分包商的工作提供所有一般照明和水。直接承包商和任命分包商应负责支付合理的用水费用。
- (v) Supplying all setting out and survey information including giving all necessary dimensions and taking responsibility for their accuracy at each floor and area as required.  
提供所有放线和测量信息，包括提供所有必要的尺寸，并按要求对每个楼层和区域的精度负责。
- (vi) Providing hoisting facilities and loading platforms for Direct Contractor's and Nominated Subcontractor's goods, materials and plant and tools belonging to the Direct Contractors and Nominated Subcontractor and other bulky and/or heavy equipment which forms part of the Direct Contractor's and Nominated Subcontractor's installation.  
为直接承包商和指定分包商的货物、材料、装置和工具以及构成直接承包商和任命分包商安装一部分的其他笨重和/或重型设备提供起重设施和装载平台。
- (vii) Providing temporary propping and strengthening of structure and leave down walls etc. where necessary to facilitate the safe handling of bulky and/or heavy equipment to their permanent positions.  
在必要时提供临时支撑和结构加固，并留出墙壁等，以方便将笨重和/或重型设备安全搬运到其永久位置。
- (viii) Providing free use of passenger hoists or the like to Direct Contractor's and Nominated Subcontractor's workmen.  
向直接承包商和指定分包商的工人免费提供乘客升降机等。
- (ix) Providing temporary power supplies required for the execution of the Direct Contractor's and Nominated Subcontractor's Works. This is in addition to the Contractor's own requirement. The Direct Contractors and Nominated Subcontractor shall be responsible for running distribution cables and paying reasonable charges for the electrical consumption.  
提供执行直接承包商和指定分包商工程所需的临时电源。这是承包商自身要求的补充。直接承包商和指定分包商应负责铺设配电电缆并支付合理的用电费用。

# PRELIMINARIES

## 基本措施项目



- (x) Arranging for any special power supplies to the Site required by Direct Contractors and Nominated Subcontractor particularly for all testing, commissioning and operation test running. The Direct Contractors and Nominated Subcontractor shall be responsible for paying all charges on the special power supplies and paying for all current consumed.  
安排直接承包商和指定分包商要求的现场专用电源，特别是所有测试、调试和运行试运行。直接承包商和指定分包商应负责支付专用电源的所有费用，并支付所有消耗的电流。
- (xi) Removing debris from collection points at each floor or working area to Contractor's own disposal dump. Adequate number of collection points shall be designated and agreed with the Project Manager.  
将各楼层或工作区收集点的碎片清除至承包商自己的垃圾场。应指定足够数量的收集点，并与项目经理达成一致。
- (xii) Cutting and forming holes, recesses, etc. for ductwork, pipes, conduits and fittings through walls, special partitions, floors, ceilings, roofs, etc. and making good after the Direct Contractor's and Nominated Subcontractor's Works are sufficiently advanced. The Direct Contractors and Nominated Subcontractor shall be responsible for chasing of walls and floors for pipes, conduits and fittings but making good shall be by the Contractor. However the Direct Contractors and Nominated Subcontractor shall be responsible making good if the wall have already been plastered.  
切割和形成穿过墙壁、特殊隔墙、地板、天花板、屋顶等的管道系统、管道、导管和配件的孔、凹槽等，并在直接承包商和指定分包商的工程充分推进后进行修复。直接承包商和指定分包商应负责管道、导管和配件的墙壁和地板的冲洗，但应由承包商进行修复。但是，如果墙壁已经抹灰，直接承包商和指定分包商应负责修复。
- (xiii) Filling, grouting and making good under lift door entrance sills, around lift doorways and casings for buttons and indicators, etc.  
填充、灌浆和修复电梯门入口门槛下、电梯门口周围以及按钮和指示器外壳等。
- (xiv) Building-in or casting-in of inserts, bolts, sleeves for pipes, ducts, trunking, guide rails, equipment, curtain walling, cladding, suspension system and the like. The Direct Contractors and Nominated Subcontractor shall provide the inserts, bolts, sleeves, etc. and will locate on Drawing for the Contractor the correct position for these fittings. Sealing between the sleeve and the pipe, duct, trunking etc. shall be executed by the Direct Contractors and Nominated Subcontractor whereas sealing between sleeve and building structure (i.e. floors, walls) will be by the Contractor.  
管道、导管、线槽、导轨、设备、幕墙、覆层、悬吊系统等的嵌件、螺栓、套筒的内置或浇筑。直接承包商和指定分包商应提供插入件、螺栓、套筒等，并在图纸上为承包商确定这些配件的正确位置。套管和管道、导管、线槽等之间的密封应由直接承包商和指定分包商执行，而套管和建筑结构（即地板、墙壁）之间的密封将由承包商执行。
- (xv) Securing the building and building Works in such a manner that the Direct Contractor's and Nominated Subcontractor's Works in progress are not subject to damage by construction activity such as falling debris or water seepage.  
确保建筑和建筑工程的安全，使正在进行的直接承包商和指定分包商工程不会受到施工活动（如坠落碎片或渗水）的损坏。

# PRELIMINARIES

## 基本措施项目



- (xvi) Protecting, casing up and accepting full responsibility for loss or damage to the Direct Contractor's and Nominated Subcontractor's Works which have been fully, finally and properly incorporated into the Contractor's Works.  
保护、保护和承担直接承包商和指定分包商工程的损失或损坏的全部责任，这些工程已完全、最终和适当地纳入承包商工程。
- (xvii) Coordinating actively the Direct Contractor's and Nominated Subcontractor's Works including but not limited to closely monitoring their Works progress, procuring their preparation of shop Drawings, delivery of product data and samples, organizing and chairing regular meeting among all Direct Contractors, Nominated Subcontractor and Nominated Suppliers and shall submit to the Project Manager the minutes of meetings. Report to the Project Manager regularly the performance of their Works to ensure that the overall building programme is met.  
积极协调直接承包商和指定分包商的工程，包括但不限于密切监控其工程进度，促使其编制施工图，交付产品数据和样品，组织和主持所有直接承包商、指定分包商都和指定供应商之间的定期会议，并应向项目经理提交会议纪要。定期向项目经理报告其工程绩效，以确保满足整体建筑计划。
- (xviii) Assisting in taking delivery, unloading, carrying in, storing, handling, and placing or lowering materials, goods, plant and equipment etc., in position. The term "assisting" when used in this Clause will be held to mean providing supervision, directions, and general co-ordination, it will not extend to providing physical assistance in unloading, carrying in etc., or providing special plant in connection therewith except as otherwise specified.  
协助提货、卸货、搬运、储存、搬运以及将材料、货物、装置和设备等放置或降低到位。本条款中使用的“协助”一词将被视为提供监督、指导和一般协调，除非另有规定，否则不包括在卸货、搬运等方面提供物理协助，也不包括提供与此相关的特殊设备。
- (b) The Contractor should coordinate rebar and tendons away from piles cut off level.  
承包商应协调钢筋和钢筋束于截桩的切割水平。
- (c) The Contractor shall install all embed brackets, sleeves, box-outs and brackets for Direct Contractors and Nominated Subcontractor. The direct Contractor or Nominated Subcontractor shall be responsible to provide all insets, bolts, sleeves etc. and location on the Drawings. The Contractor will be responsible for correct survey and positioning on site.  
承包商应为直接承包商和指定分包商安装所有预埋支架、套筒、接线盒和支架。直接承包商或指定分包商应负责提供图纸上的所有插图、螺栓、套筒等和位置。承包商将负责现场的正确测量和定位。
- (d) The Contractor should include the grouting of all embed brackets and cast-ins to structural slab level / surface once the installation work is completely installed and aligned.  
一旦安装工程完全安装和对齐，承包商应将所有预埋支架和铸件灌浆到结构板水平/表面。

# PRELIMINARIES

## 基本措施项目



### 10.05 DIRECT CONTRACTOR'S AND NOMINATED SUBCONTRACTOR'S RESPONSIBILITIES

#### 直接承包商和指定分包商的责任

- (a) The Direct Contractors and Nominated Subcontractor will be instructed to include in their respective Direct Contract Amount and Nominated Subcontract Amount, inter alia, the costs in connection with the following:  
将指示直接承包商和指定分包商在其各自的直接合同金额和指定分合同金额中包括与以下内容相关的费用:
- (i) Unloading, getting in, storing, handling and hoisting of goods and material plant and tools belonging to the Direct Contractor and Nominated Subcontractor and bulky and/or heavy equipment which forms part of the Direct Contractor's and Nominated Subcontractor's installation. The Direct Contractors and Nominated Subcontractor may make the necessary arrangement to use the Contractor's hoisting facilities free of charge for hoisting materials, goods, plants, bulky and/or heavy equipment and material. The Direct Contractors and Nominated Subcontractor shall inform the Contractor of the proposed route of movement of bulky and/or heavy equipment to allow the Contractor to organize and strengthen the existing structure. Bulky and/or Heavy Equipment shall be as determined by the Project Manager.  
卸载、进入、储存、搬运和吊装属于直接承包商和指定分包商的货物和材料装置和工具，以及构成直接承包商和任命分包商安装一部分的笨重和/或重型设备。直接承包商和指定分包商可以做出必要的安排，免费使用承包商的起重设施来吊装材料、货物、装置、笨重和/或重型设备和材料。直接承包商和指定分包商应将笨重和/或重型设备的拟议移动路线告知承包商，以便承包商组织和加强现有结构。大型和/或重型设备应由项目经理决定。
- (ii) Provision, erection, maintenance and removal of all his temporary office and storage accommodation including paying all assessment and other charges.  
提供、安装、维护和拆除其所有临时办公室和存储设施，包括支付所有评估和其他费用。
- (iii) Connection to temporary power supplies, made available by the Contractor for the execution of the Works, supplying and running distribution cables for connection to Contractor's network, leads and electrical gear required and paying reasonable charges for the electrical consumption. Provide licensed electrical engineers to design and make such connections and carry out regular inspections.  
承包商为施工提供的临时电源连接，供应和运行连接承包商网络的配电电缆、所需的引线和电气设备，并支付合理的用电费用。提供持有执照的电气工程师来设计和制造此类连接，并进行定期检查。
- (iv) Connection of special power supplies arranged by the Contractor, supplying and running distribution cables for connection to the source arranged, leads and electrical gear required and paying all charges on the special power supplies and paying for all current consumed.  
承包商安排的专用电源的连接，提供和运行连接到所安排电源的配电电缆，所需的引线和电气设备，支付专用电源的所有费用，并支付所有消耗的电流。
- (v) Taking full responsibility for any loss of, or damage to his own plant, tools, equipment and other property on the Site.  
对其在现场的机器、工具、设备和其他财产的任何损失或损坏承担全部责任。

# PRELIMINARIES

## 基本措施项目



- (vi) Keeping his work areas free from accumulation of debris at all times and moving debris to collection points as directed by the Contractor at an agreed frequency.  
始终保持其工作区域无碎屑堆积，并按照承包商的指示，以商定的频率将碎屑运送到收集点。
- (vii) Take full responsibility for the protection of partially or fully completed materials and work as is reasonably possible until Practical Completion and Final Handover. Replace any damaged materials at the Contractors own expense prior to Handover.  
在实际竣工和最终移交之前，尽可能全面负责保护部分或全部完工的材料和工程。在移交之前，承包商应自费更换任何损坏的材料。
- (viii) Indemnify the Contractor against the same liabilities in respect of the Subcontract Works as those for which the Contractor is liable to indemnify the Employer under this Contract.  
赔偿承包商在分包工程方面的责任，与承包商根据本合同有责任赔偿雇主的责任相同。
- (ix) Indemnify the Contractor against claims in respect of any negligence, omission, or default of such domestic or Nominated Subcontract, his servants or agents or any misuse by him or them of any scaffolding or other plant, and shall insure himself against any such claims and produce the policy or policies and receipts in respect of premiums paid as and when required by either the Project Manager or the Contractor.  
赔偿承包商因国内或指定分包合同、其雇员或代理人的任何疏忽、遗漏或违约，或其滥用任何脚手架或其他设备而引起的索赔，并应为自己投保，以防任何此类索赔，并在项目经理或承包商要求时出示与支付的保费有关的保单和收据。

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## **一、 general provision**

1.1 This document, together with the corresponding construction drawings, report confirmation renderings, and technical documents, constitutes a complete set of requirements for the scope of work, to be read together and cross-referenced, and all parts are indispensable and must be performed.

1.2 The Contractor shall read all documents and drawings carefully, and the contents of all documents provided by the Contractor will have an impact on the quotation; if contradictions are found between documents, the Contractor shall be notified in a timely manner; otherwise, any errors in the quotation due to misunderstanding shall be borne by the Contractor itself.

1.3 The Contractor fully understands the Bidding Documents provided by the Offeror.

1.4 The Contractor shall explore the site and surroundings independently and fully understand the scope of the work to be done, and shall inform the Contractor's representative directly of any problems and suggestions before bidding, and shall not use the lack of knowledge of the site and surroundings as a reason for any additional costs for subsequent construction.

## **二、 Project Profile and Scope of Works**

2.1 Project Name: Thailand Golden Heron Cemented Carbide Production Base Phase II Project  
115KV Substation EPC Project

2.2 Project Overview:

The project is located in Rayong Industrial Park, Thailand.

This project is to build a new 115kV step-down station with the following scale and basic configuration (115kV transformer, 115kV and 22kV distribution units are all indoor arrangements, see the annexed drawings for the basic scheme)-

1, the configuration of a SZ20 type 20MVA oil-immersed voltage-regulated three-phase double-winding transformer, to GB20052-2020 level 2 energy efficiency, voltage level 115/22kV.

2, the use of double circuit into the line, which: a 115kV into the line, the other back for the 22kV into the line, the two for each other as a standby; the main wiring form for the single busbar segmented wiring, 115kV into the line switch using 115kV combination of appliances gas-insulated GIS, 22kV into the line switch using KYN28 type 22kV switchgear.

3. External (PEA) metering is configured according to the requirements of the local power supply

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bureau to meet its metering requirements; the rest is our internal metering, which is unified with the transformer substation using a multi-function meter.

4, the project supporting the construction of detuning (22kV side configuration capacitor reactive power compensation device), protection, control, communication, security, intelligent auxiliary systems.

**5, municipal double circuit into the line to the buck station is mainly overhead lines, only the factory gate to the factory section of about 55 metres for the cable; cable engineering volume in the scope of this tender, the contractor needs to negotiate with the PEA communication.**

6. The station is equipped with a station transformer (shared with grounding transformer, reaching GB20052-2020 Grade II energy-efficiency standard), which meets the demand of low-voltage power loads in the station (lighting, utility power distribution, station working power supply, etc.); and sets up a dual-power supply for the backstage of the security, fire-fighting, and integrated self-systems, medium-voltage and high-voltage switching power supply, and lighting power supply.

2.3 Duration requirements: 13 months

2.3.1 The Contractor must ensure the overall schedule target and shall not delay the schedule for any reason except for the Contractor's explicit request for stoppage of work; if the schedule is delayed for any reason by the Contractor, the Contractor shall bear the responsibility for breach of contract, and the Contractor retains the right of final interpretation of the schedule.

2.4 Other items: (e.g. safety and civilisation items, finished product protection items, etc., optional)

2.4.1 The project construction site for the normal construction area, please consider the construction unit of the contracting authority to visit the needs of the other contractors, the impact of cross-construction and the later existence of staff commuting to use the demand for safe and civilised construction, need to be considered comprehensively during the construction period due to the contracting authority to visit the requirements of the emergency stoppages, sanitation and clean-up, the costs arising from the cost of this cost is included in the project risk costs, the settlement of the settlement will not be adjusted.

2.4.2 This project does not provide any office and accommodation space, so please consider this cost on your own.

2.4.3 If there is any production at the construction site of the project at a later stage, it is necessary to consider the temporary enclosure to do the differentiation and isolation, and the costs incurred, which are included in the project risk costs, and the settlement will not be adjusted.

2.5 Quality standards: The scope, standards, design drawings, technical data and technical conditions in the design documents agreed in the contract are the basis for the procurement of engineering

equipment, the quality of construction and the quality of the building as completed. All engineering design, procurement and construction and other contents agreed by both parties must meet the functional requirements.

### **三、 Project content**

3.1 This project is an overall EPC turnkey project for 115kV Bucking Station, and the Contractor is responsible for all the works from municipal pylons and poles to the bucking station. The project includes but not limited to design, procurement, construction, testing, commissioning, commissioning and training, etc. The Contractor is fully responsible for the safety, quality, technology, schedule and cost of the project, and finally submits to the Contractor a project that has passed the acceptance test, meets the requirements for use, and has the conditions for commissioning.

The Contractor is responsible for providing all the documents for the design review stage, intermediate inspection stage, completion and acceptance stage, and grid connection stage of the project, such as design documents for submission for review and approval of the programme, and ensuring that the review requirements of the local power supply company, government agencies and other departments are met, and is responsible for the processing of all relevant formalities.

**The Contractor's main implementation includes, but is not limited to, the following, if there are missing items the bidder must add their own:**

serial number	sports event	explicit description
"one" radical in Chinese characters (Kangxi radical 1)	Direct works component	
1	Civil and ancillary works	Achieve GB20052-2020 level 2 energy efficiency and above standards
1.1	civil engineering	Main construction (including piling, site levelling, tamping, etc.) and renovation of station buildings
1.1.1		Supporting facilities such as station area fencing, oil catchment basin, peripheral greening, etc.. The colour of the station building shall be approved by the contractor, and the overall colour of the building shall be consistent with that of the whole plant.



1.2	communal facilities	Achieve GB20052-2020 level 2 energy efficiency and above standards
1.2.1	Water Supply and Drainage	Station water supply and drainage system (station equipped with washrooms and toilets)
1.2.2	HVAC	Station ventilation, air-conditioning system
1.3	fire engineering	Supporting fire protection facilities that meet local design and acceptance standards: Fire hydrant extinguishing systems; Automatic fire extinguishing systems (automatic sprinkler, water spray, gas extinguishing, etc.); Fire extinguisher configuration; Fire alarm system (independent alarm controller in the station and networked with the whole plant fire control room);
1.4	IT Engineering	Station network system, access control system, video surveillance system
1.5	Interfacing with in-plant utility systems	Reserve interfaces for station utility systems to interface with the plant: Fire hydrant system: Reserve the interface to 1.5m outside the external wall of the station building; 2. Water supply and drainage system: Reserve the interface to 1.5m outside the outer wall of the station house; 3. Rainwater and sewage system: Reserve the interface to 1.5m outside the outer wall of the station building; 4. IT systems; 5. Fire alarm system: fire alarm controller is set up in the station, the interface with the alarm host of the whole plant fire control centre is reserved, and the pipe is buried to the outdoor pipe well.
1.6	the rest	Other ancillary projects
2	electrical engineering	Achieve GB20052-2020 level 2 energy efficiency and above standards
2.1	Double-circuit feed	Lines from municipal pylons or poles to 115kV and 22kV junction points within 115kV step-down stations; 2. Cable wells, poles, pipe trenches, bridges and foundations required for laying the above lines;
2.2	Primary power system	1, 115kV transformer; 2, 115kV combination appliance GIS, including SF6 online monitoring; 3, 22kV substation, including 22kV switchgear, arcing coil and grounding transformer (shared with station transformer) integration device; 4. 22kV reactive power compensation device; 5. Others.

2.3	Power secondary system	<ol style="list-style-type: none"> <li>1. Bucking station protection and integrated automation system;</li> <li>2. Dispatch communications system;</li> <li>3. Measurement systems;</li> <li>4. Intelligent auxiliary control system;</li> <li>5. Integrated power supply system;</li> <li>6. Others.</li> </ol>
2.4	Electrical packages	<p>Supporting electrical facilities for normal and emergency use of the site, which have been reviewed by local organisations such as IEAT and PEA:</p> <p>Lighting (including emergency lighting, the lamps and lanterns all use high-efficiency LED light source);</p> <p>Integrated cabling system with sockets, network ports, etc;</p> <ol style="list-style-type: none"> <li>2. Low-voltage distribution system;</li> <li>3. Lightning protection and grounding system.</li> </ol>
2.5	Laying and interfacing of 22kV power cables, control and communication and network cables from the bucking station to the in-plant substation	<p>The 22kV power supply circuit in the plant mainly adopts the bridge to extend the aerial pipe corridor for overhead laying, and the Contractor needs to set up cable manholes, bridges, etc. in the outdoor of the Bucking Station to facilitate the docking of the Bucking Station and the aerial pipe corridor as appropriate according to the layout of the aerial pipe corridor provided by the Contractor, that is, the following: Bucking Station→ Cable manholes/bridges→ Aerial pipe corridor→ Electricity transformer substation.</p>
2.6	the rest	<ol style="list-style-type: none"> <li>1. Other necessary implementation elements must be added by the bidder;</li> <li>2. In addition to the above work content, if the contractor has not supplemented the omitted work content offer, all work content offer is considered to be included in the overall offer of the project.</li> <li>3. If the above works can be optimally implemented in the local area, the contractor shall clearly state it in the quotation document, otherwise it is considered that its price is included in the overall quotation, and the contractor shall not refuse to implement it because it is not listed in the quotation list.</li> </ol>
二	Indirect Works	
1	Electricity Application and Delivery Plan	<p>The Contractor is responsible for the following and will implement them in the following phases:</p> <ol style="list-style-type: none"> <li>1. Phase I: The municipal government provides a 22kV power supply as the plant into the line II back, to ensure that the whole plant equipment for production debugging and small-scale production. Latest date for completion of all work under this phase: 30 March 2026</li> <li>2. Phase II: On the basis of the first stage, the municipal government provides a</li> </ol>

		<p>115kV power supply as the plant inlet I back, through a 115/22kV transformer step-down to the busbar power supply;</p> <p>The feeder I back (115kV) is the regular power supply, and the feeder II back (22kV) is the standby power supply; the feeder II back is in the hot standby state everyday, when the feeder I back is disconnected, the system automatically switches to the feeder II back for power supply to ensure normal operation of the whole plant's important loads.</p> <p>Latest date for completion of all work under this phase: 30 May 2026</p>
2	Design, review and approval	<p>Drawing design according to local design and acceptance standards, including all design contents of direct works of this project;</p> <p>2, drawings according to local regulations for review, and through the PEA, IEAT and other relevant departments to review, complete the signature, review and construction procedures; the engineering process information must be complete, the contractor is responsible for collating the project information, and get the relevant project file acceptance information. At the same time move the information to the contractor and construction unit.</p> <p>3、 Drawing submission should include editable CAD files and stamped PDF drawings, language including Chinese and English.</p> <p>4. For each stage of power application and power delivery, the design should have a reasonable plan for the operation mode of each section of busbar and the whole station;</p> <p>5. The programme drawings provided by the contractor are for reference only, and the bidder can carry out reasonable optimization and deepening, and the optimization content must be specially explained in the offer document.</p>
3	Equipment/systems commissioning	<p>Cooperate with PEA in accordance with local standards and specifications and technical requirements, combined with the actual situation of the project configuration of the bucking station power supply and distribution system for parameter setting and other operations, the programme through the PEA and the relevant units to review, and complete the system commissioning, to ensure that to meet the power supply and use of the entire plant demand.</p>
4	Testing, inspection, acceptance of power delivery	<p>In conjunction with local requirements, carry out inspection and testing of station equipment and wiring, and pass the acceptance of the local PEA and other departments for normal power delivery;</p>
5	Technical Services	<p>1. For the operation, operation and maintenance of station equipment and systems, the Contractor shall provide necessary training to the Contractor/Owner to ensure that the Owner is skilled in operation and maintenance after delivery of the project;</p> <p>2. Prior to the formal handover of the project to the Owner, the Contractor</p>

		<p>shall provide on-site duty, operation and maintenance;</p> <p>3, after the delivery of the project, timely response and solve the problems encountered by the contractor in the trial and operation and maintenance process, after receiving the repair notice: within 2 hours to the scene, within 48 hours to restore.</p> <p>4. Provide recommended spare parts, consumables and special tools for commissioning, start-up and performance testing.</p> <p>5. Provide a list of recommended spare parts for operation and a list of preventive maintenance and prices for years 1 to 10 of operation.</p>
6	brand name	The main electrical equipment brands should be selected from the list of brands provided by the contractor.
7	the rest	Other necessary implementation elements
	note	The implementation of this project requires the necessary protection of finished products involving municipal facilities and civil and utility facilities within this plant, and restoration to their original condition at the end of the project.

### 3.2 Number of outgoing lines required.

The construction of the 115kV step-down station double-circuit feeder (one circuit each for 115kV and 22kV) shall be the responsibility of the contractor; the contractor shall ensure that the design of the 22kV outgoing line of the step-down station meets the demand of power consumption of the whole plant, and the construction of the line shall be the responsibility of the contractor; the power supply scheme shall be implemented only after the final and official confirmation of the contracting authority.

### 3.3 General quality requirements:

The construction (including civil and electrical) and procurement of equipment and materials must meet both the latest local Thai and Chinese national standards and current industry specifications.

### 3.4 Other:

1. For the water and electricity demand of on-site construction, the corresponding access point shall be provided by the contractor in the factory (billed according to the actual consumption and settled monthly), and the rest shall be solved by the contractor itself.

2. On-site office, food and accommodation needs of construction personnel shall be resolved by the contractor itself.

### 3.5 Drawings and design requirements.

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As an attachment to the EPC Contract, the Contractor's Bidding Documents are required to contain the necessary programmes and drawings, the contents of which must include, but are not limited to, the following:

1. Bucking station station area planning and general layout
2. Electrical primary
3. Electrical secondary
4. Civil construction
5. Cost control
6. Progress programme arrangements and service safeguards
7. Staffing

The above is confirmed by the signature of the contractor's on-site project manager and is attached to the contract and the basis for acceptance and delivery.

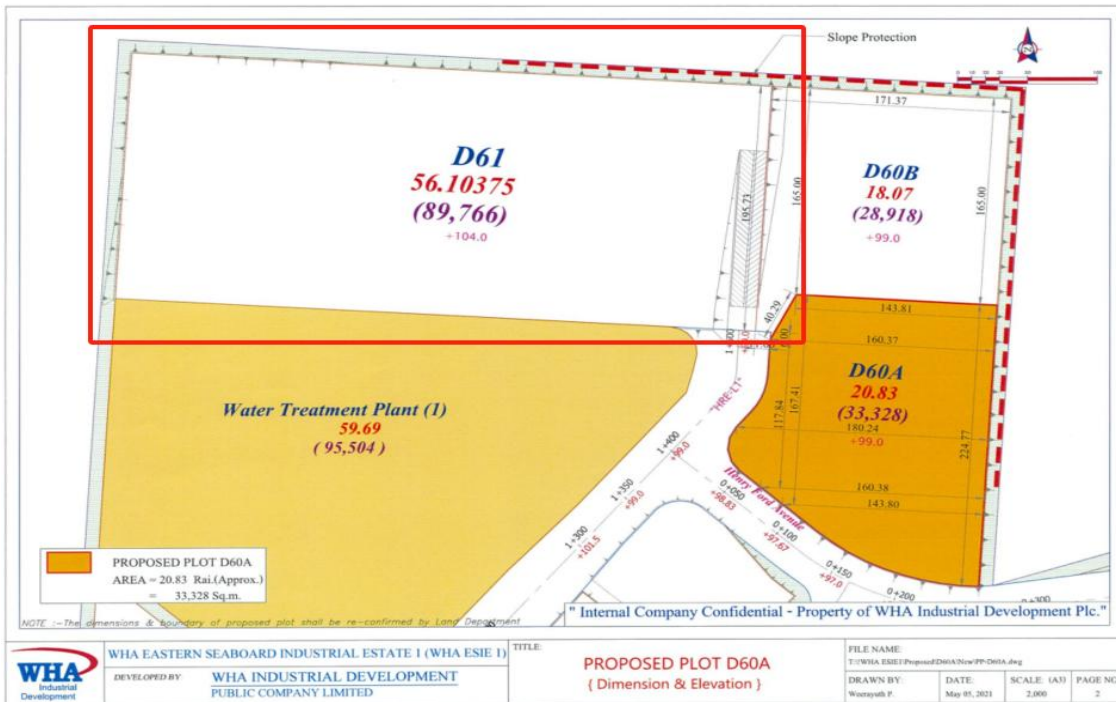
The design shall meet the requirements of the technical specifications of the tender, as well as the latest Thai local and Chinese national standards and the current specifications of the industry, with a 100% pass rate of the finished design.

## 四、 Information Annex

### 4.1 Plant layout



### 4.2 Plant plot map



### 4.3 Electrical diagram of the plant and system diagram of the Bucking Station scheme (see annex for details)

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## 一、总则

1.1 本文件与相应的施工图纸、汇报确认效果图、技术文件共同组成一套完整的工作范围要求，共同阅读，互相参照，所有部分都是不可缺少的和必须执行的。

1.2 承包商应仔细阅读所有文件和图纸，发包方提供的所有文件内容都会对报价产生影响，如果发现各文件之间存在矛盾，应及时通知发包方；否则因理解失误造成的报价失误均由承包商自行承担。

1.3 承包商完全理解发包方提供的投标文件。

1.4 承包商自主勘探现场和周围环境并完全理解所要完成的工作范围，任何存在的问题和建议在投标前直接告知发包方代表，后续施工不得以不清楚现场及周边环境为理由追加任何费用。

## 二、工程概况及工程范围

2.1 项目名称：泰国金鹭硬质合金生产基地二期项目 115KV 变电站 EPC 工程

2.2 工程概况：

本工程位于泰国罗勇工业园区内。

本工程新建一座 115kV 降压站，规模及基本配置如下（115kV 变压器、115kV 及 22kV 配电装置均为户内布置，基本方案见附件图纸）——

1、配置 1 台 SZ20 型 20MVA 油浸式有载调压三相双绕组变压器，达到 GB20052-2020 二级能效，电压等级 115/22kV。

2、采用双回路进线，其中：一回为 115kV 进线，另一回为 22kV 进线，二者互为备用；主接线形式为单母线分段接线，115kV 进线开关采用 115kV 组合电器气体绝缘 GIS，22kV 进线开关采用 KYN28 型 22kV 开关柜。

3、外部（PEA）计量按当地供电局要求进行配置，以满足其计量要求；其余为我司内部计量，与变电所统一采用多功能电表。

4、项目配套建设消谐（22kV 侧配置电容无功补偿装置）、保护、控制、通信、安防、智能辅助等系统。

**5、市政双回路进线至降压站主要为架空线路，仅厂区大门口至厂区段约 55 米为缆化；缆化工程量在本次招标范围内，承包方需自行与 PEA 交涉沟通。**

6、站内自行配置一台站用变（与接地变共用，达到 GB20052-2020 二级能效标准），满足站内低压用电负荷需求（照明、公用配电、站内工作电源等）；对于安防、消防、综自系统

后台、中压及高压开关操作电源、照明电源等，设置双电源供电。

2.3 工期要求：13 个月

2.3.1 承包方必须确保总体工期目标，除发包方明确提出停工要求的，承包方不得以任何理由延迟工期，如因承包方原因延误工期的，承包方应承担违约责任，发包方对工期保留最终解释权。

2.4 其他项：（例如安全文明项、成品保护项等，选填）

2.4.1 项目施工地为正常施工区内，请施工单位考虑发包方参观需求、与另外包商的交叉施工的影响及后期存在员工上下班使用需求进行安全文明施工，需综合考量在施工期间由于发包方参观要求的紧急停工、卫生清理、所产生的费用，此费用包含在项目风险费用，结算不做调整。

2.4.2 本项目不提供任何办公及住所场所，请各单位自行考虑此项费用。

2.4.3 项目施工地后期如有生产，需考虑临时围挡做区分隔离，所产生的费用，此费用包含在项目风险费用，结算不做调整。

2.5 质量标准: 合同约定的范围、标准、设计图纸、设计文件中的技术数据和技术条件是工程设备采购、施工质量及建筑物竣工验收质量的依据。所有工程设计、采购和施工及双方约定的其他内容，必须达功能需求。

### 三、工程内容

3.1 本工程为 115kV 降压站整体 EPC 交钥匙工程，承包方负责市政塔架及电杆至降压站的所有工程内容。工程内容包括但不限于设计、采购、施工、试验、调试、投运及培训等，承包方对工程的安全、质量、技术、进度、费用等全面负责，最终向发包方提交一个经验收合格、满足使用需求、具备投运条件的工程。

承包方负责提供本项目的报审设计文件、方案审批等设计审核阶段、中间检查阶段、竣工验收阶段、并网接电阶段的全部文件，并保证满足当地供电公司、政府机构及其他部门的审查要求，并负责所有相关手续的办理。

**承包方主要实施的内容包含但不限于以下内容，如有缺项投标方须自行补充：**

序号	项目	具体描述
—	直接工程部分	
1	土建及配套工程	达到 GB20052-2020 二级能效及以上标准
1.1	土建工程	站房主体施工(包含桩基、场地平整、夯实等)及装修



1.1.1		站区围栏、集油池、周边绿化等配套设施。其中站房外观颜色应需发包方认可，整体保持和整个厂区建筑颜色风格一致。
1.2	公用配套	达到 GB20052-2020 二级能效及以上标准
1.2.1	给排水配套	站房给水、排水系统 (站内配置盥洗间和卫生间)
1.2.2	暖通配套	站房通风、空调系统
1.3	消防工程	满足当地设计及验收标准的配套消防设施： 消火栓灭火系统； 自动灭火系统 (自动喷淋、水喷雾、气体灭火等) ； 灭火器配置； 消防报警系统 (站内独立设置报警控制器, 并与全厂消防控制室联网) ；
1.4	IT 工程	站内网络系统、门禁系统、视频监控系统
1.5	厂内公用系统接口对接	预留站内公用系统与厂区的对接接口： 消火栓系统：预留接口至站房外墙外 1.5m； 2、给排水系统：预留接口至站房外墙外 1.5m； 3、雨、污水系统：预留接口至站房外墙外 1.5m； 4、IT 系统； 5、消防报警系统：站内设置消防报警控制器，预留与全厂消防控制中心报警主机的接口，并埋管至室外管井。
1.6	其他	其他配套工程
2	电气工程	达到 GB20052-2020 二级能效及以上标准
2.1	双回路进线	从市政塔架或电杆至 115kV 降压站内的 115kV 及 22kV 接线点的线路； 2、敷设以上线路所需的电缆井、电线杆、管沟、桥架及基础；
2.2	电力一次系统	1、115kV 变压器； 2、115kV 组合电器 GIS, 含 SF6 在线监测； 3、22kV 变电所, 包括 22kV 开关柜、消弧线圈及接地变 (与站用变共用) 一体化装置等； 4、22kV 无功补偿装置； 5、其他。

2.3	电力二次系统	<ol style="list-style-type: none"> <li>1、降压站保护及综合自动化系统;</li> <li>2、调度通信系统;</li> <li>3、计量系统;</li> <li>4、智能辅助控制系统;</li> <li>5、一体化电源系统;</li> <li>6、其他。</li> </ol>
2.4	电气配套	<p>满足本站正常及应急使用的配套电气设施，并通过当地 IEAT 及 PEA 等机构的审查：</p> <p>照明（含应急照明，灯具均采用高效 LED 光源）；</p> <p>综合布线系统，含插座、网口等；</p> <ol style="list-style-type: none"> <li>2、低压配电系统;</li> <li>3、防雷接地系统。</li> </ol>
2.5	降压站至厂内变电所的 22kV 电力电缆、控制和通信及网络等线缆的敷设及对接	<p>厂区内 22kV 供电回路主要采用桥架延空中管廊架空敷设，承包方需根据发包方提供的空中管廊布局在降压站户外酌情设置电缆井、桥架等便于降压站与空中管廊进行对接，即：降压站→电缆井/桥架→空中管廊→变电所。</p>
2.6	其他	<ol style="list-style-type: none"> <li>1、其他必要的实施内容，投标单位须自行补充;</li> <li>2、以上工程内容之外，如承包方未补充遗漏工作内容报价，均视为所有工作内容报价包含在本项目的整体报价内。</li> <li>3、以上工程内容，如在当地可优化实施，承包方需在报价文件中明确说明，否则均视为其价格包含在整体报价内，承包方不得以报价清单中未列项而拒绝实施。</li> </ol>
二	间接工程部分	
1	用电申请及送电计划	<p>承包方负责以下内容，并按如下阶段实施：</p> <ol style="list-style-type: none"> <li>1、第一阶段： 市政提供一回 22kV 电源作为厂区进线Ⅱ回，保证全厂设备进行生产调试及小规模生产。 本阶段所有工作最晚完成时间： 2026 年 03 月 30 日</li> <li>2、第二阶段：</li> </ol>

		<p>第一阶段基础上, 市政提供一回 115kV 电源作为厂区进线 I 回, 经一台 115/22kV 变压器降压后给母线供电;</p> <p>进线 I 回 (115kV) 为常规电源, 进线 II 回 (22kV) 为备用电源; 进线 II 回日常处于热备用状态, 当进线 I 回断电时, 系统自动切换至进线 II 回供电, 确保全厂重要负荷正常运行。</p> <p>本阶段所有工作最晚完成时间: 2026 年 05 月 30 日</p>
2	设计、报审	<p>按当地设计及验收标准进行图纸设计, 包含本项目的直接工程的所有设计内容;</p> <p>2、图纸按当地规定进行报审, 并通过 PEA、IEAT 及其他相关部门审查, 完成签字、报审、报建手续; 工程过程资料必须齐全, 承包人负责整理工程资料, 并拿到相关工程档案验收资料。同时移资料给发包人及建设单位。</p> <p>3、图纸提交需包含可编辑的 CAD 文件及盖章的 PDF 图纸, 语言包含中、英文。</p> <p>4、对于用电申请及送电的各个阶段, 设计对于各段母线及全站的运行方式应有合理预案;</p> <p>5、发包方提供的方案图纸仅供参考, 投标方可以进行合理优化、深化, 优化内容必须在报价文件中专项说明。</p>
3	设备/系统调试	<p>配合 PEA 按当地标准规范及技术要求, 结合项目配置实际情况对降压站供配电系统进行参数设置等作业, 方案通过 PEA 及相关单位审核, 并完成系统调试, 确保满足全厂区供用电需求。</p>
4	试验、检测、验收送电	<p>结合当地要求, 进行站内设备、线路的检测、试验, 并通过当地 PEA 及其他部门的验收, 正常送电;</p>
5	技术服务	<p>1、针对站内设备及系统的操作、运维, 承包方需对发包方/业主进行必要培训, 确保工程交付后业主能熟练运维;</p> <p>2、在工程正式交接给业主之前, 承包方须提供现场的值班、运维工作;</p> <p>3、工程交付后, 及时响应并解决发包方在试用及运维过程遇到的问题, 接到报修通知后: 2 小时内到场, 48 小时内恢复。。</p> <p>4、提供推荐的备件、耗材和特殊工具用于调试、启动和性能测试。</p>

		5、提供推荐的运营备件清单和预防性维护清单及第 1 至第 10 年运营的价格。
6	品牌	主要电气设备品牌需在发包方提供的品牌库清单里面选择
7	其他	其他必要的实施内容
	备注	本工程实施需对涉及到市政设施及本厂区内的土建、公用设施进行必要的成品保护，并于工程结束时恢复原样。。

### 3.2 出线数量需求:

115kV 降压站双回路进线(115kV 和 22kV 各一回), 施工均由承包方负责; 降压站 22kV 出线, 承包方需确保其设计满足全厂区用电需求, 其施工由发包方负责; 供电方案需由发包方最终正式确认后方可实施。

### 3.3 一般质量要求:

工程施工(含土建、电气)、设备物资采购等, 必须同时满足最新的泰国当地和中国的国家标准及行业现行规范要求。

### 3.4 其他:

1、现场施工的水、电需求, 相应的接入点由发包方在厂区内提供(按实际用量计费并月结), 其余由承包方自行解决。

2、现场办公、施工人员食宿等需求, 由承包方自行解决。

### 3.5 图纸及设计要求:

作为 EPC 合同附件, 承包方投标文件需包含必要的方案及图纸, 其内容必须包含但不限于以下内容:

- 1、降压站站区规划及总平布置
- 2、电气一次
- 3、电气二次
- 4、土建
- 5、造价控制
- 6、进度计划安排及服务保障措施
- 7、人员配置

以上内容经发包方现场项目经理签字确认, 并作为合同附件及验收交付依据。

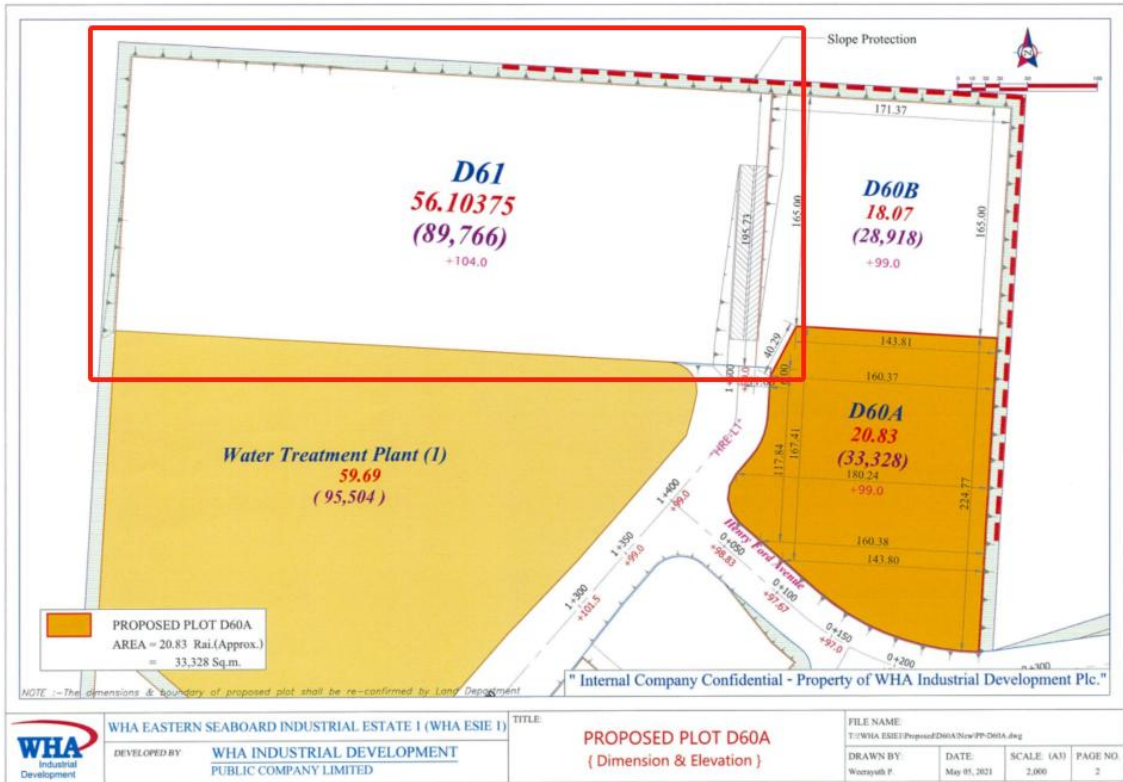
设计应满足招标技术规范要求, 同时满足最新的泰国当地和中国国家标准及行业现行规范要求, 设计成品合格率 100%。

## 四、资料附件

### 4.1 厂区布置图



### 4.2 厂区地块图



4.3 厂区电气图及降压站方案系统图 (详见附件)

## Engineering Quality Warranty

Building units

Offeror:

Contractor:

The contractor and the contractor, by consensus, sign a quality warranty for the work.

### I. Scope and content of engineering quality warranty

The Contractor shall bear the responsibility for the quality warranty of the Project during the quality warranty period in accordance with the provisions of relevant laws, regulations and rules and the tripartite agreement.

The quality warranty covers the civil works of the substation (foundation works, main structural works, roof waterproofing works, leakage prevention of bathrooms, rooms and external wall surfaces with waterproofing requirements, heating and cooling systems, electrical pipelines, water supply and drainage pipelines, equipment installation and decoration works), electrical installation and transmission line works as well as other items as agreed by the parties.

The content of the specific warranty is agreed as follows: in accordance with the relevant provisions of the State, the industry, the State Grid Corporation Limited and the provincial companies.

### II. Quality warranty period

1. In accordance with the PEA and government regulations and relevant provisions of the project site in Thailand, it is agreed that the quality warranty period of the project is as follows:

- (1) The foundation work and the main structural work shall be the reasonable service life of the work as specified in the design documents;
- (2) Leakage prevention for roof waterproofing works, bathrooms, rooms and external wall surfaces with waterproofing requirements is 5 years;
- (3) Two years for substation civil renovation work, electrical piping, water supply and drainage piping, and equipment installation;
- (4) 2 years for electrical installation and transmission line work;
- (5) The heating and cooling system is for 2 heating and cooling periods;
- (6) Supporting works such as water supply and drainage facilities, roads, etc. are for two years;
- (7) The warranty period for the grounding electrode project is 2 years.
- (8) The warranty period for other items is agreed as follows: 2 years for equipment (the scope of equipment is based on the List of Major Electrical Equipment).

2. The quality warranty period shall be calculated from the date of issuance of the certificate of completion of the work.

### III. Quality warranty responsibilities

1. For items belonging to the scope and content of the warranty, the Contractor receives the warranty notice and arrives at the site of the project within 2 hours, and the Contractor shall send someone to repair the item within 2 days from the date of receipt of the warranty notice. If the Contractor does not send someone for warranty repair within the agreed period of time, the Contractor may entrust someone else to repair the work, and the management costs, engineering costs and third-party auditing costs incurred as a result shall be borne by the Contractor, and the Contractor may charge the Contractor an agency fee of 10 per cent of the total amount of the costs incurred. If the Contractor refuses to bear the above costs, the Contractor has the right to deduct them directly from the warranty money that the Contractor has reserved with the Contractor.

2. In the event of an emergency repair accident, the contractor shall arrive at the scene of the accident immediately after being notified of the accident to carry out repairs.

3. For quality problems involving structural safety, immediately report them to the competent project authorities and take timely safety precautions in accordance with the relevant

provisions of the State, the industry and the PEA Company; the original design unit or a design unit with the appropriate qualification level shall put forward a warranty programme, and the contractor shall implement the warranty.

4. Upon completion of the quality warranty, acceptance will be organised by the Supervisor.

**IV. Warranty costs**

The cost of the warranty shall be borne by the party responsible for causing the quality defect. For quality defects not caused by the contractor, the contractor shall have the right to recover the costs incurred from the responsible party after fulfilling its warranty obligations. If the defects are caused by the design, the relevant responsibility shall be borne by the design unit; if the defects are caused by unqualified building materials, components and equipment, such as those procured by the contractor, or those procured by the contractor and not inspected by the contractor according to the regulations and used in the project, the relevant responsibility shall be borne by the contractor; if the defects are procured by the contractor, and the contractor has raised objections to the quality of the products, and the contractor has insisted on the use of the products without qualified appraisal, the relevant responsibility shall be borne by the contractor. The responsibility shall be borne by the contractor.

**V. Other**

1. The quality warranty of the project shall be jointly signed by the contractor and the contractor before the completion and acceptance, and shall be attached as an annex to the construction contract, and shall be valid until the expiry of the warranty period.

Contractor (stamp): Contractor (stamp):  
 (Signed): Legal representative (Signed):  
 or proxy (signature): or proxy (signature):  
 Date: Date:

<b>Electrical list of major equipment</b>		
<b>serial number</b>	<b>Name</b>	<b>note</b>
1	115kV Transformer	
2	115kV Neutral Point Complete Set	
3	115kV GIS	Provide SF6 online monitoring system
4	22kV reactive power compensation device	
5	22kV switchgear	
6	Grounding transformer and arcing coil complete set	
7	115kV protection and integrated substation automation	Including fault recording, clock synchronisation, etc.



8	Integrated Power System	SCADA System
9	Intelligent Auxiliary Control System	
10	Cable accessories	
11	High and low voltage cables	
12	Movement control communications system	
13	vacuum interrupter	

## 附件 2：工程质量保修书

### 工程质量保修书

建设单位：\_

发包人：

承包人：

发包人、承包人，经协商一致，对工程签订质量保修书。

#### 一、工程质量保修范围和内容

承包人在质量保修期内，按照有关法律、法规、规章规定和三方约定，承担本工程质量保修责任。

质量保修范围包括变电站土建工程（地基基础工程、主体结构工程，屋面防水工程、有防水要求的卫生间、房间和外墙面的防渗漏，供热与供冷系统，电气管线、给排水管道、设备安装和装修工程）、电气安装和输电线路工程以及双方约定的其他项目。

具体保修的内容，约定如下：按照国家、行业、国家电网有限公司、省级公司有关规定执行。

#### 二、质量保修期

1. 根据泰国项目所在地 PEA 及政府管理条例及有关规定，约定本工程的质量保修期如下：

- (1) 地基基础工程和主体结构工程为设计文件规定的该工程合理使用年限；
- (2) 屋面防水工程、有防水要求的卫生间、房间和外墙面的防渗漏为 5 年；
- (3) 变电站土建装修工程、电气管线、给排水管道、设备安装为 2 年；
- (4) 电气安装、输电线路工程为 2 年；
- (5) 供热与供冷系统为 2 个采暖期、供冷期；
- (6) 给排水设施、道路等配套工程为 2 年；
- (7) 接地极工程保修期为 2 年；
- (8) 其他项目保修期限约定如下：设备保修期 2 年（设备范围以《主要电气设备清单》为准）。

2. 质量保修期自颁发工程竣工证书之日起计算。

#### 三、质量保修责任

1. 属于保修范围、内容的项目，承包人收到保修通知并在 2 小时内到达工程现场，承包人应当在接到保修通知之日起 2 天内派人保修。承包人不在约定期限内派人保修的，发包人可委托他人修理，由此产生的管理费用、工程费用、第三方审核费用等由承包人承担，且发包人可按所发生费用总额的 10% 向承包人收取代办费。如承包人拒不承担上述费用，发包人有权从承包人预留于发包人处的**质保金**中直接抵扣。

2. 发生紧急抢修事故的，承包人在接到事故通知后，应当立即到达事故现场抢修。

3. 对于涉及结构安全的质量问题，按照国家、行业、PEA 公司有关规定，立即向项目主管部门报告，及时采取安全防范措施；由原设计单位或者具有相应资质等级的设计单位提出保修方案，承包人实施保修。

4. 质量保修完成后，由监理人组织验收。

#### 四、保修费用

保修费用由造成质量缺陷的责任方承担。非雇主原因造成的质量缺陷，雇主有权要求承包商赔偿，承包人在履行保修义务后，有权就所发生的费用向责任方追偿。因设计方面的原因造成的，**相关责任由承包商承担（本合同包设计及施工）**；因建筑材料、构配件和设备质量不合格等原因造成的，如属承包人采购的，或由发包人采购而承包人不按规定进行检验用于工程的，相关责任由承包人自负；如属发包人采购，承包人曾提出质量异议而发包人未经鉴定合格坚持使用的，相关责任由发包人承担。

#### 五、其他

1. 本工程质量保修书，由发包人、承包人在竣工验收前共同签署，作为施工合同附件，其有效期限至保修期满。

发包人（盖章）：  
法定代表人(签名)：  
或委托代理人(签名)：  
日期：

承包人（盖章）：  
法定代表人(签名)：  
或委托代理人(签名)：  
日期：

主要设备电气清单		
序号	名称	备注
1	115kV 变压器	
2	115kV 中性点成套装置	
3	115kV GIS	配套提供 SF6 在线监测系统
4	22kV 无功补偿装置	
5	22kV 开关柜	
6	接地变压器及消弧线圈成套装置	
7	115kV 保护及变电站综合自动化	含故障录波、时钟同步对时等
8	一体化电源系统	SCADA System
9	智能辅助控制系统	
10	电缆附件	
11	高低压电缆	
12	调度通信系统	
13	真空断路器	

serial number	Name	Recommended Brands									note
		Brand I	Brand 2	Brand III	Brand IV	Brand V	Brand VI	Brand VII	Brand VIII	Brand IX	
1	115kV Transformer	ABB	Siemens	Schneider	Shandong Taikai	TBEA	Shandong Power Equipment	Baosteel Electric	Jiangsu Huapeng		
2	115kV Neutral Point Complete Set	Baosteel Electric	Siemens	Shandong Taikai							
3	115kV GIS (indoor)	ABB	Siemens	Schneider	China Western Electricity Company (CWEC)	Shandong Taikai	level off	Sieyuan	TBEA	Xinbei	ProvideSF6online monitoring system
4	22kV reactive power compensation device	ABB	Shandong Taikai	Sieyuan	Hitachi Energy	Schneider	Hop Yung Electric	Nissin Electric (Wuxi)			
5	22kV switchgear	ABB (original cabinet)	Siemens (original cabinet)	Schneider (original cabinet)							
6	Grounding transformer and arcing coil complete set	ABB	Siemens	Sieyuan	Shandong Taikai	Baosteel Electric	Hop Yung Electric	Xuji Electric			
7	115kV protection and integrated substation automation	Nanrui JIU	Beijing Quartet	Naganuma Senryu (1933-), Japanese politician, prime minister 1997-1998	Siemens	ABB	Xuji Electric				Including fault recording, clock synchronisation, etc.
8	Integrated power systems	ABB	Siemens	Zhuhai Titan	Hangzhou Zhongheng	Xuji Electric					SCADA System
9	Intelligent Auxiliary Control System	Zhejiang Rixin	Siemens	Fujian Udi	Hersheng High-Tech						
10	Cable accessories	3M	TE	Prysmian							
11	High and low voltage cables	Jiangsu Shangshang	Jiangsu Far East	Shanghai Baosheng							
12	Movement control communications system	Siemens	CPT	Utah	Timpano	Precise	Or equivalent	Fujian Jusi New Energy Technology			
13	vacuum interrupter	ABB VD4 Series	Schneider HVX Series	Siemens 3AE8 Series							

Note: Brand table does not describe the material or the need to replace the brand, need to be all owners agree to confirm before replacement.

序号	名称	推荐品牌									备注
		品牌一	品牌二	品牌三	品牌四	品牌五	品牌六	品牌七	品牌八	品牌九	
1	115kV变压器	ABB	Siemens	Schneider	山东泰开	特变电工	山东电力设备	保变电气	江苏华鹏		
2	115kV中性点成套装置	保变电气	Siemens	山东泰开							
3	115kV GIS(室内)	ABB	Siemens	Schneider	中国西电	山东泰开	平高	Sieyuan	特变电工	新东北	配套提供SF6在线监测系统
4	22kV无功补偿装置	ABB	山东泰开	Sieyuan	Hitachi Energy	Schneider	合容电气	日新电机(无锡)			
5	22kV开关柜	ABB(原厂柜)	Siemens(原厂柜)	Schneider(原厂柜)							
6	接地变压器及消弧线圈成套装置	ABB	Siemens	Sieyuan	山东泰开	保变电气	合容电气	许继电气			
7	115kV保护及变电站综合自动化	南瑞继保	北京四方	长圆森瑞	Siemens	ABB	许继电气				含故障录波、时钟同步对时等
8	一体化电源系统	ABB	Siemens	珠海泰坦	杭州中恒	许继电气					SCADA System
9	智能辅助控制系统	浙江日新	Siemens	福建优迪	和盛高科						
10	电缆附件	3M	TE	普睿司曼							
11	高低压电缆	江苏上上	江苏远东	上海宝胜							
12	调度通信系统	Siemens	CPT	Utah	Timpano	Precise	Or equivalent	福建聚实新能源科技			
13	真空断路器	ABB VD4系列	Schneider HVX系列	Siemens 3AE8系列							

备注：品牌表中未描述的材料或需要更换品牌，需均业主同意确认后，方可更换。



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业主签名 SIGNATURE 日期 DATE

建筑师

ARCHITECTS

核实的结构工程师

VERIFIED STRUCTURAL ENGINEERS

结构工程师

STRUCTURAL ENGINEERS

工程师

ENGINEERS

机电工程师

ELECTRICAL ENGINEERS

卫生工程师

SANITARY ENGINEERS

图纸检查 DRAWING CHECKED

检查 CHECKING 签名 SIGNATURE 日期 DATE

建筑 ARCHITECTURE

结构 STRUCTURE

图例 DRAWING

文字 WORDING

建设单位 CLIENT

金鹭硬质合金 (泰国) 有限公司

GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.

项目名称 PROJECT

泰国金鹭硬质合金生产基地二期项目设计

Phase II Project of Thailand Golden Egret Cement Carbide Production Base

子项名称 BUILDING

降压站

Power station

图样名称 DRAWING TITLE

平面图

Building plans

审 定 AUTHORIZED

设计总负责人 DESIGN MANAGER

审 核 APPROVAL

校 对 CHECK

设计负责人 DISCIPLINE LEAD

设 计 DESIGNER

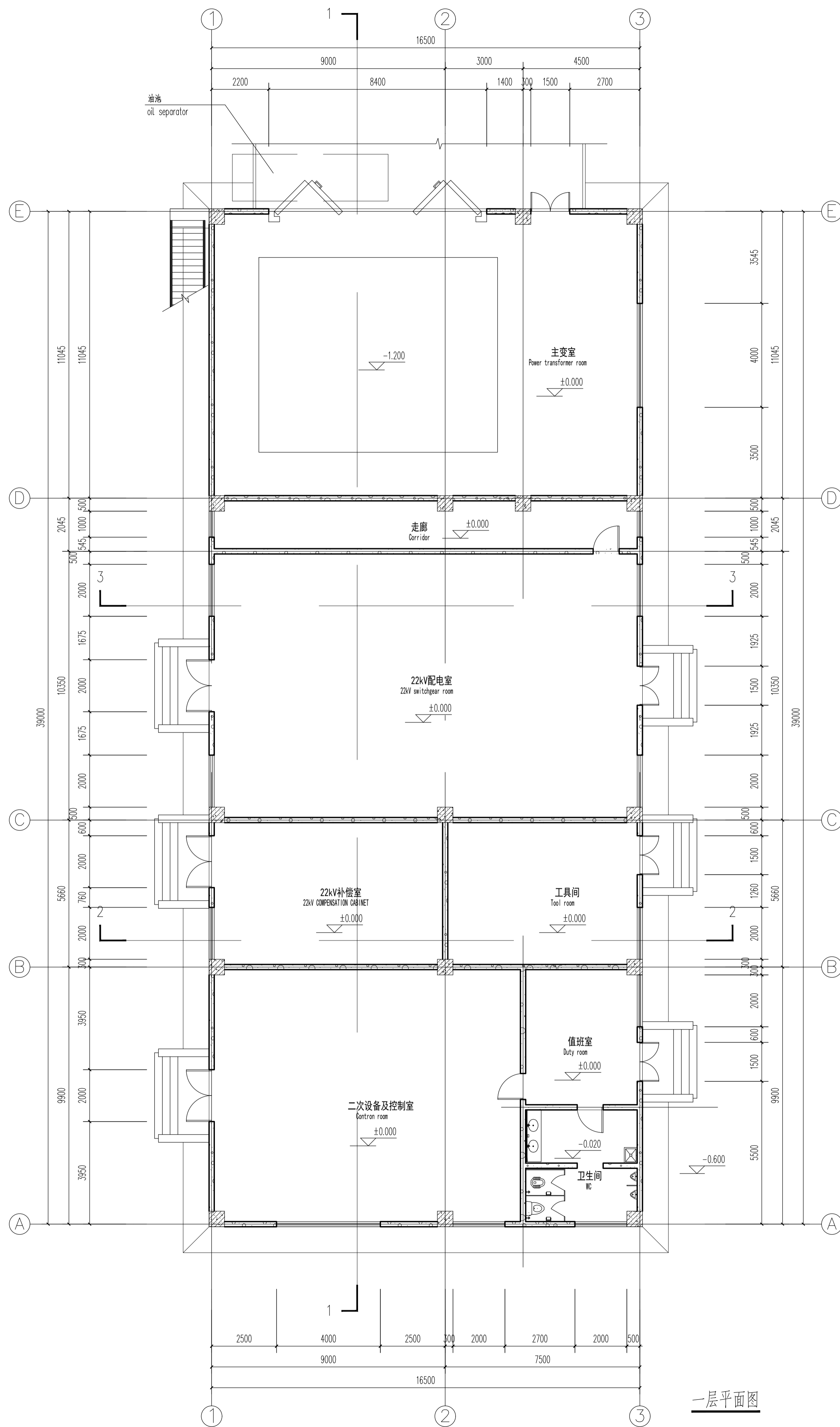
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专 业 DISCIPLINE 阶 段 STAGE

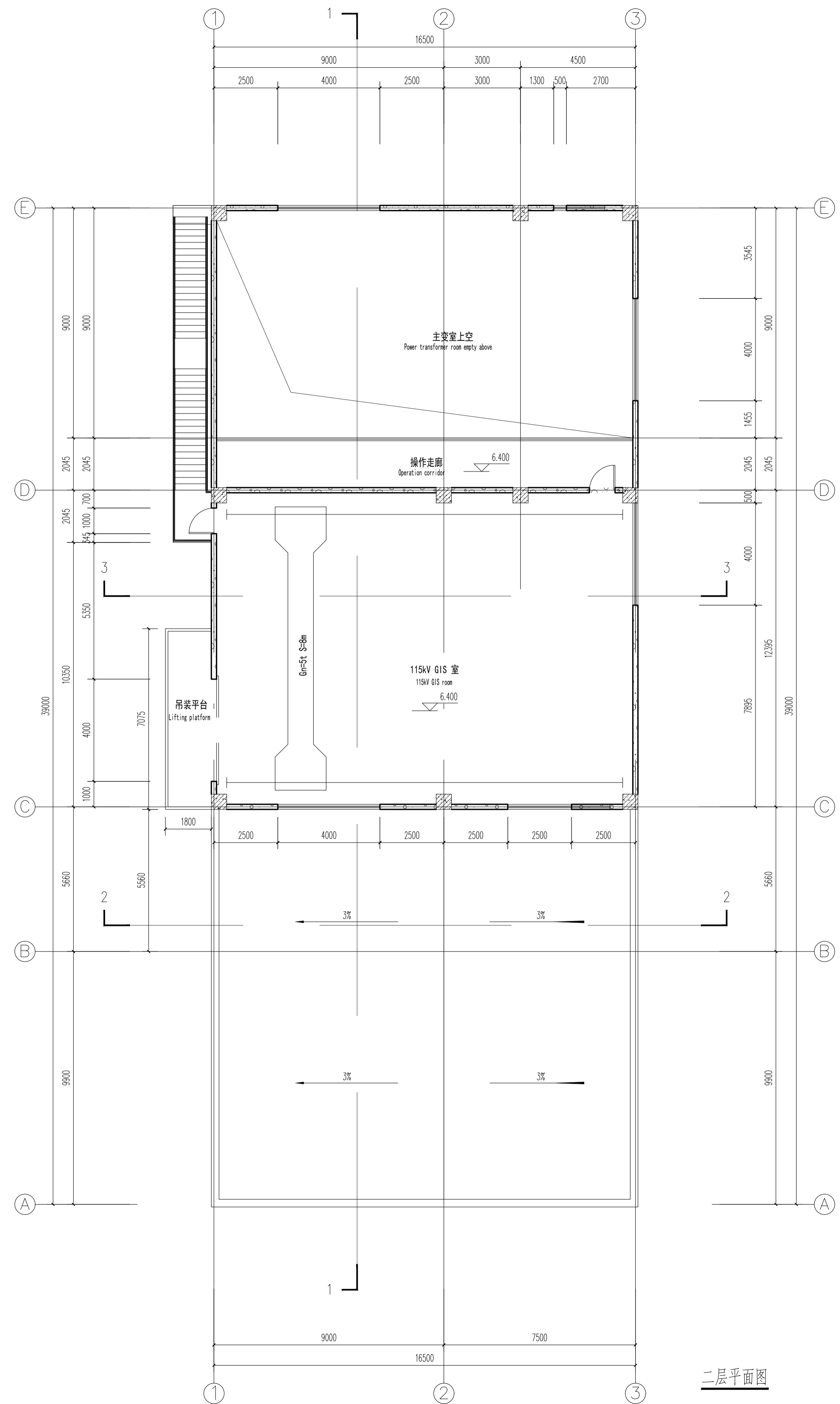
比 例 SCALE 版 次 REVISION A

图 号 DRAWING NO. 7A-01

总 第 页

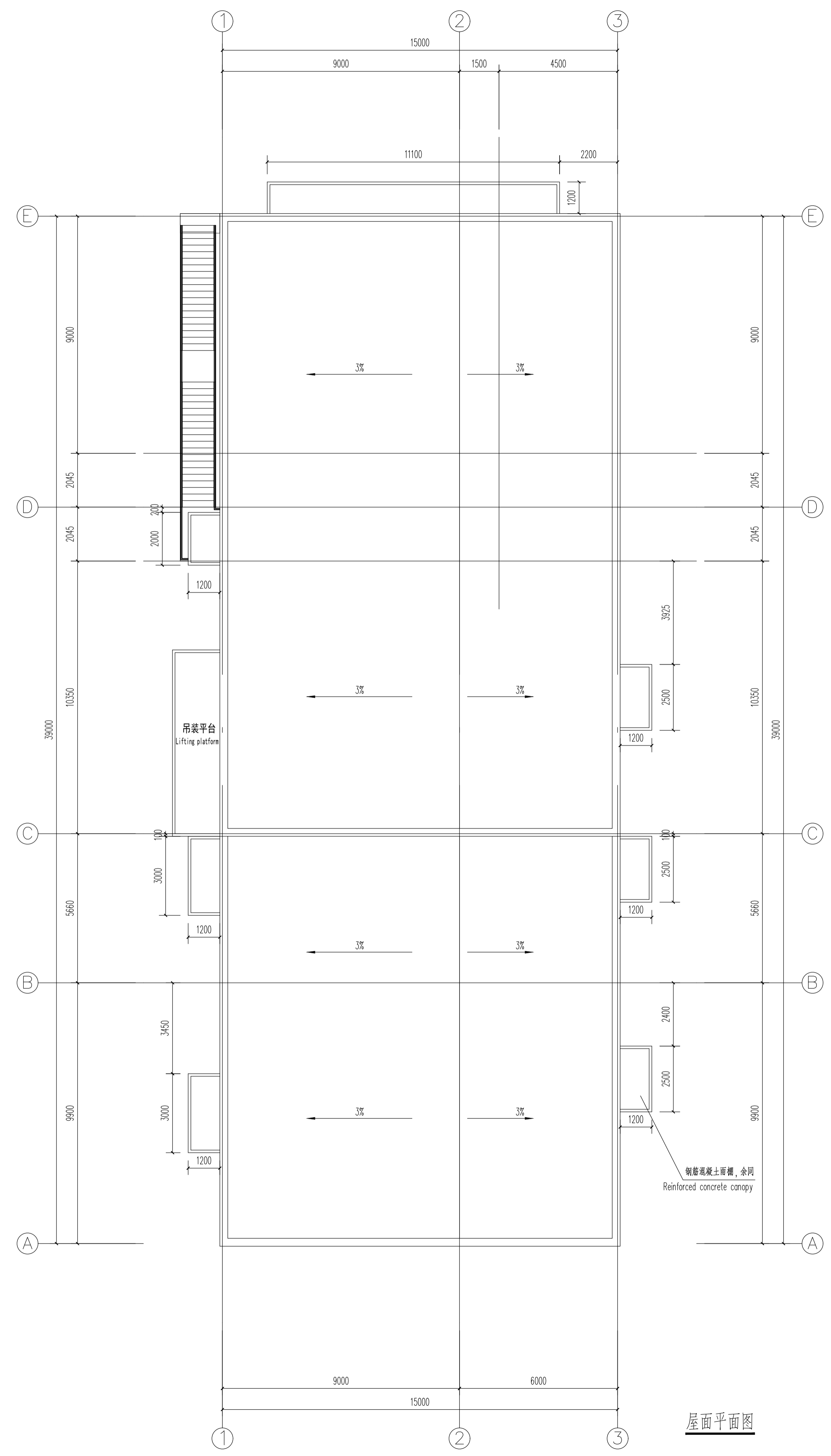


一层平面图

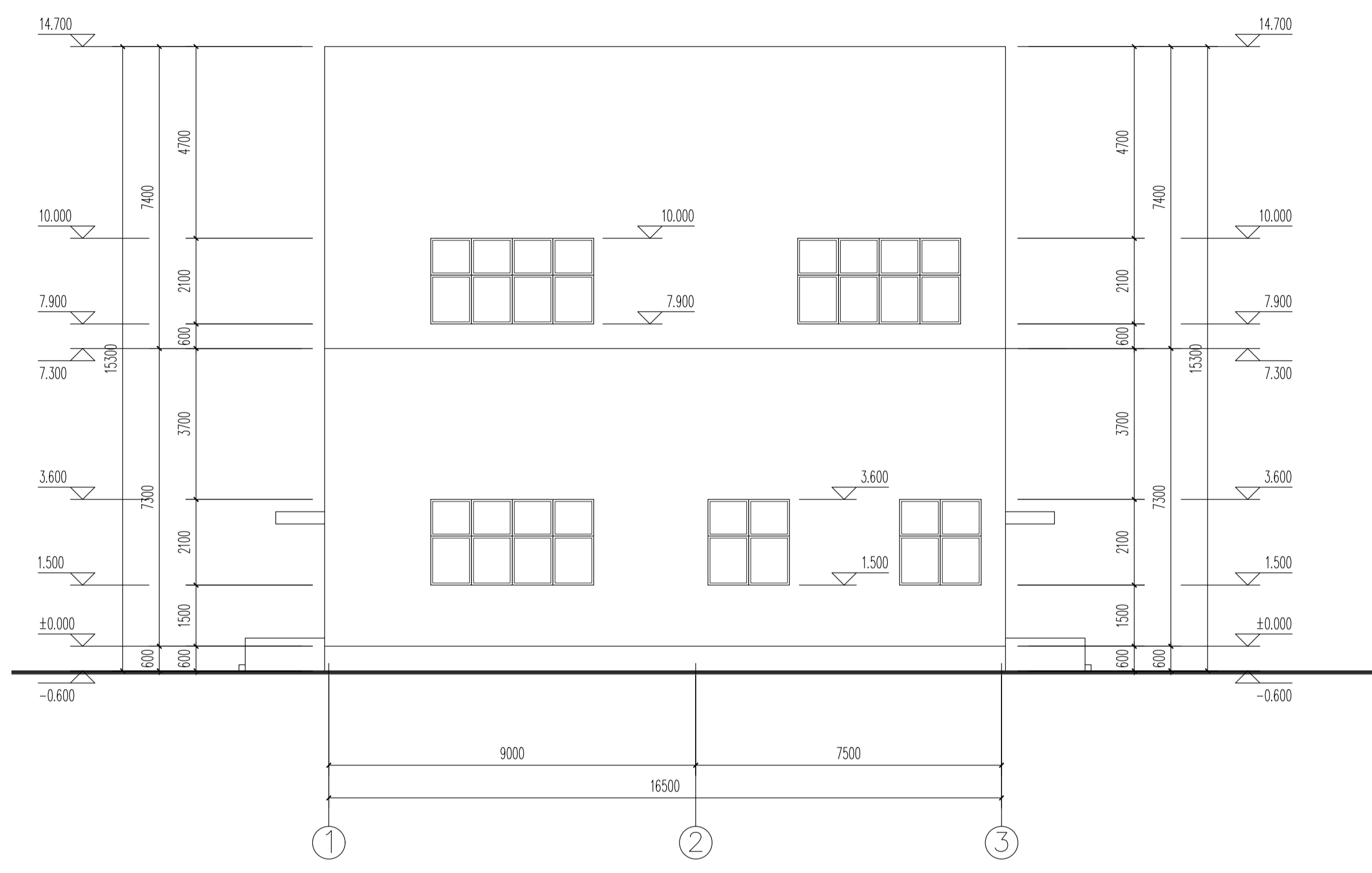


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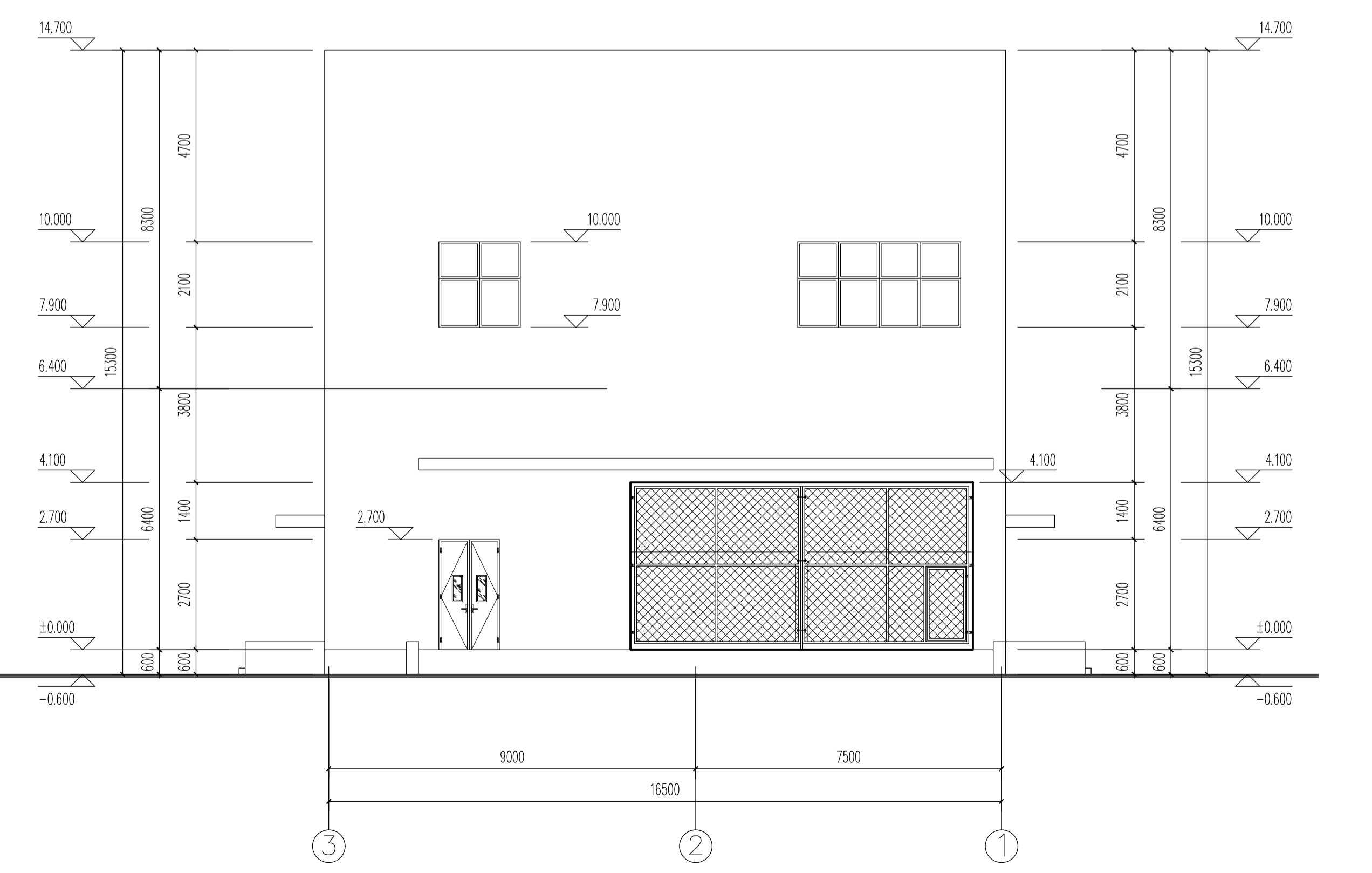
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 Tambon Pluakdaeng, Amphur Pluakdaeng, Rayong  
 Postal Code: 21140 E-mail: Scivic@scivic.com.cn



屋面平面图



1~3立面图



3~1立面图

业主批准 OWNER APPROVED  
 业主签名 SIGNATURE 日期 DATE

建筑师 ARCHITECTS

核审结构工程师 VERIFIED STRUCTURAL ENGINEERS

结构工程师 STRUCTURAL ENGINEERS

工程师 ENGINEERS

机电工程师 ELECTRICAL ENGINEERS

卫生工程师 SANITARY ENGINEERS

图纸检查 DRAWING CHECKED

核审 CHECKING 签名 SIGNATURE 日期 DATE

建筑 ARCHITECTURE

结构 STRUCTURE

图例 DRAWING

文字 WORDING

建设单位 CLIENT  
 金鹭硬质合金 (泰国) 有限公司  
 GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO. LTD.

项目名称 PROJECT  
 泰国金鹭硬质合金生产基地二期项目设计  
 Phase II Project of Thailand Golden Egret Cement Carbide Production Base

子项名称 BUILDING  
 降压站  
 Power station

图样名称 DRAWING TITLE  
 屋面平面图、立面图  
 Roof plan and elevation

审 定 AUTHORIZED  
 设计总负责人 DESIGN MANAGER

审 核 APPROVAL

校 对 CHECK  
 设计负责人 DISCIPLINE LEAD

设 计 DESIGNER

日 期 DATE

专 业 DISCIPLINE 阶 段 STAGE

比 例 SCALE 版 次 REVISION A

图 号 DRAWING NO. 7A-02



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业主签名 SIGNATURE 日期 DATE

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结构工程师

VERIFIED STRUCTURAL ENGINEERS

结构工程师

STRUCTURAL ENGINEERS

工程师

ENGINEERS

机电工程师

ELECTRICAL ENGINEERS

卫生工程师

SANITARY ENGINEERS

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检查 CHECKING 签名 SIGNATURE 日期 DATE

建筑 ARCHITECTURE

结构 STRUCTURE

图板 DRAWING

文字 WORDING

建设单位 CLIENT

金鹭硬质合金 (泰国) 有限公司

GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.

项目名称 PROJECT

泰国金鹭硬质合金生产基地二期项目设计

Phase II Project of Thailand Golden Egret Cement Carbide Production Base

子项名称 BUILDING

降压站

Power station

图样名称 DRAWING TITLE

电气设备平面布置图

Electrical equipment layout

审 定 AUTHORIZED

设计总负责人 DESIGN MANAGER

审 核 APPROVAL

校 对 CHECKING

设计负责人 DISCIPLINE LEAD

设 计 DESIGNER

日 期 DATE

专 业 DISCIPLINE

阶 段 STAGE

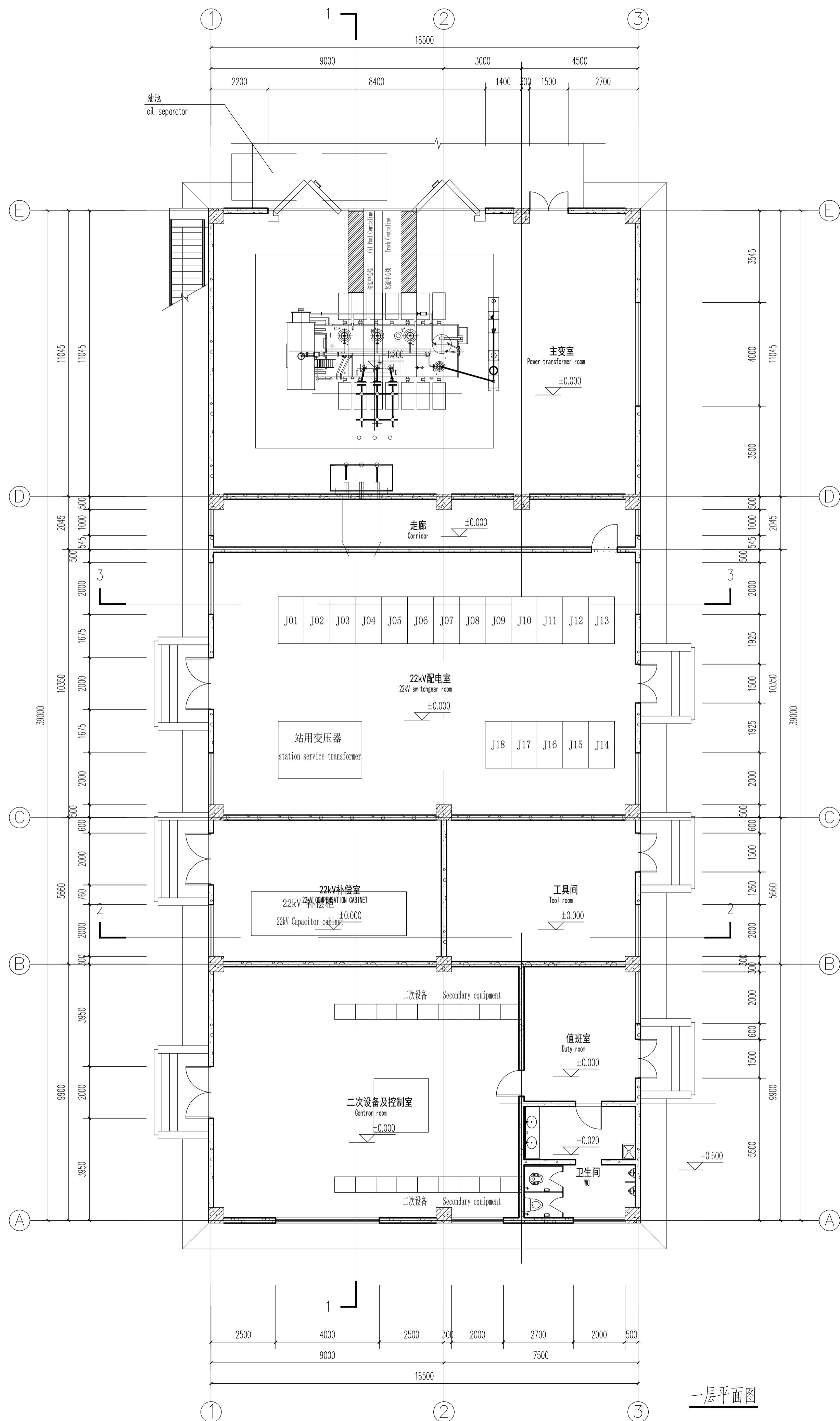
比 例 SCALE

展 次 REVISION

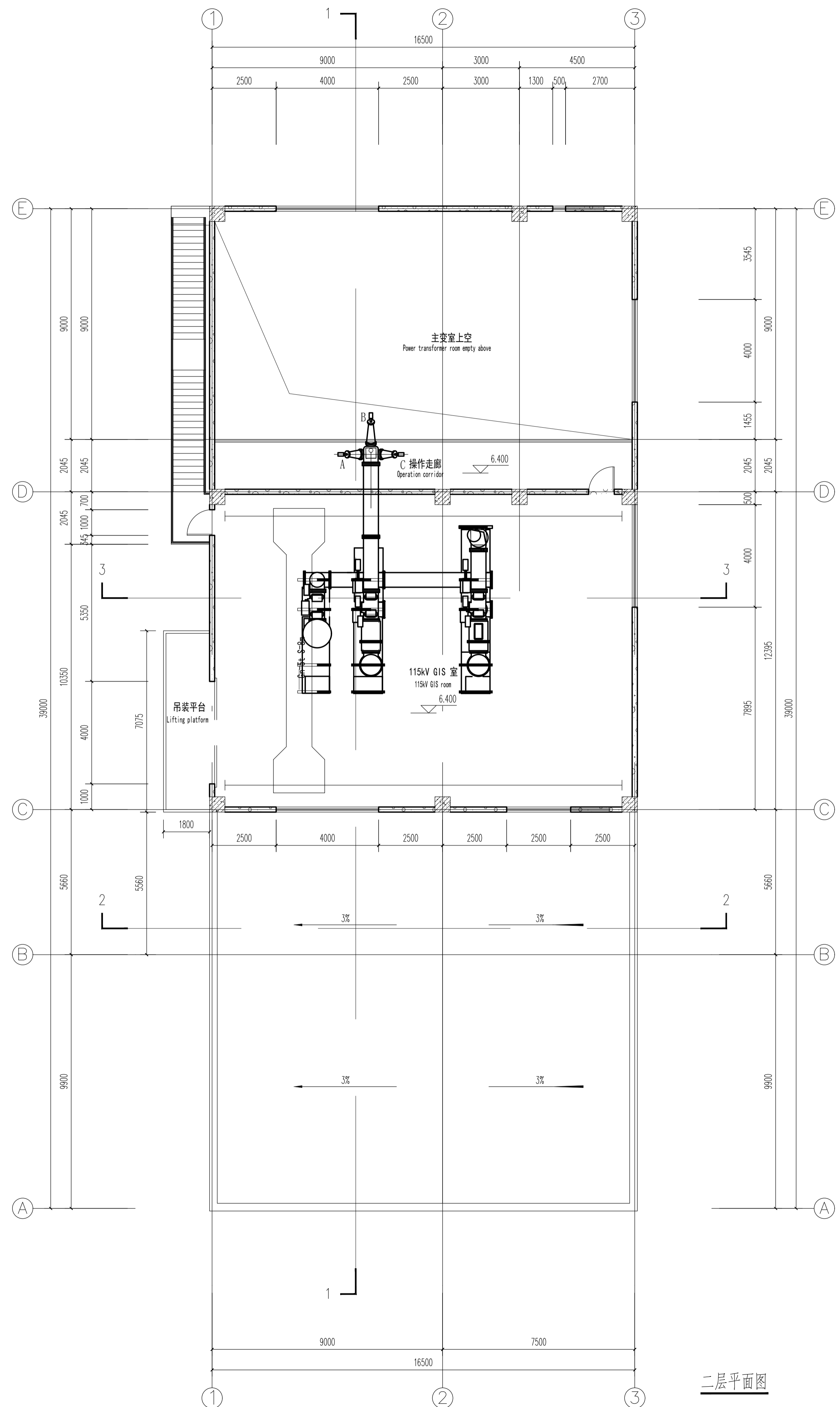
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7A-03

总第 页



一层平面图



二层平面图





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业主签名 SIGNATURE 日期 DATE

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ARCHITECTS

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VERIFIED STRUCTURAL ENGINEERS

结构工程师  
STRUCTURAL ENGINEERS

工程师

ENGINEERS

机电工程师  
ELECTRICAL ENGINEERS

卫生工程师  
SANITARY ENGINEERS

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建筑 ARCHITECTURE

结构 STRUCTURE

图纸 DRAWING

文字 WORDING

建设单位 CLIENT

金鹭硬质合金(泰国)有限公司

GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.

项目名称 PROJECT

泰国金鹭硬质合金生产基地二期项目设计

Phase II Project of Thailand Golden Egret Cement Carbide Production Base

子项名称 BUILDING

降压站

Power station

图样名称 DRAWING TITLE

立面图

Elevation

审 定 AUTHORIZED

设计总负责人 DESIGN MANAGER

审 核 APPROVAL

校 对 CHECK

设计负责人 DISCIPLINE LEAD

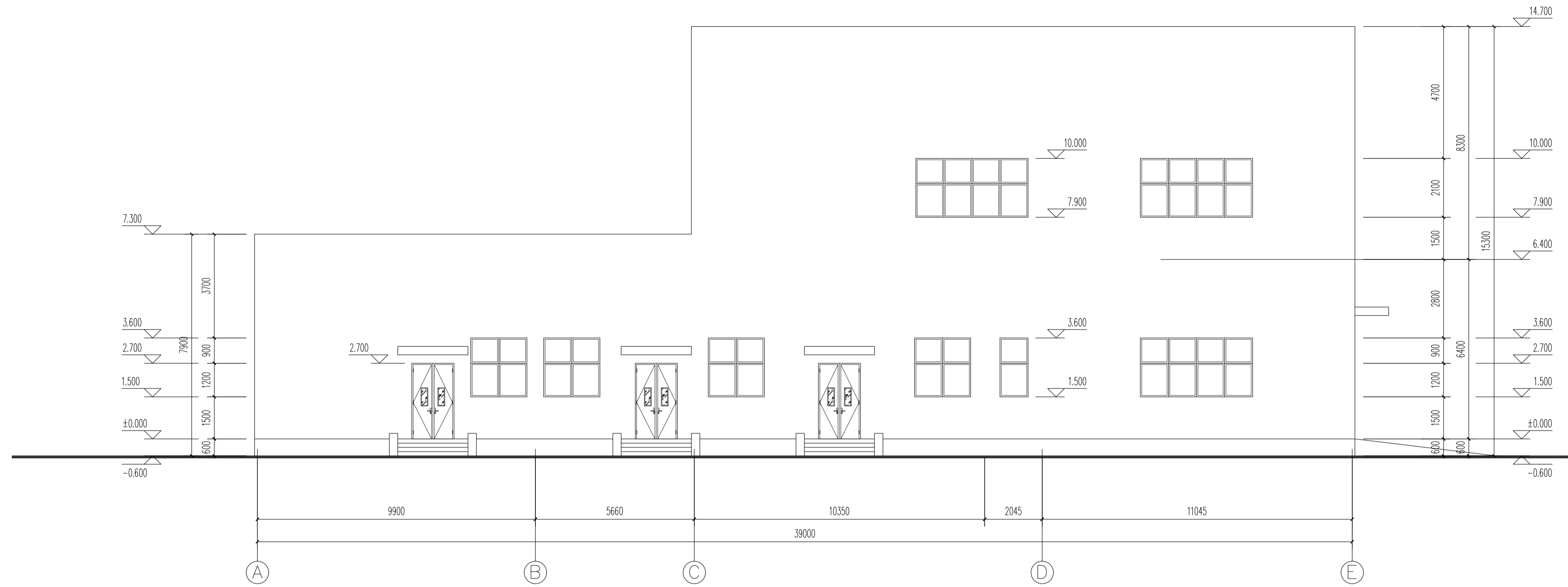
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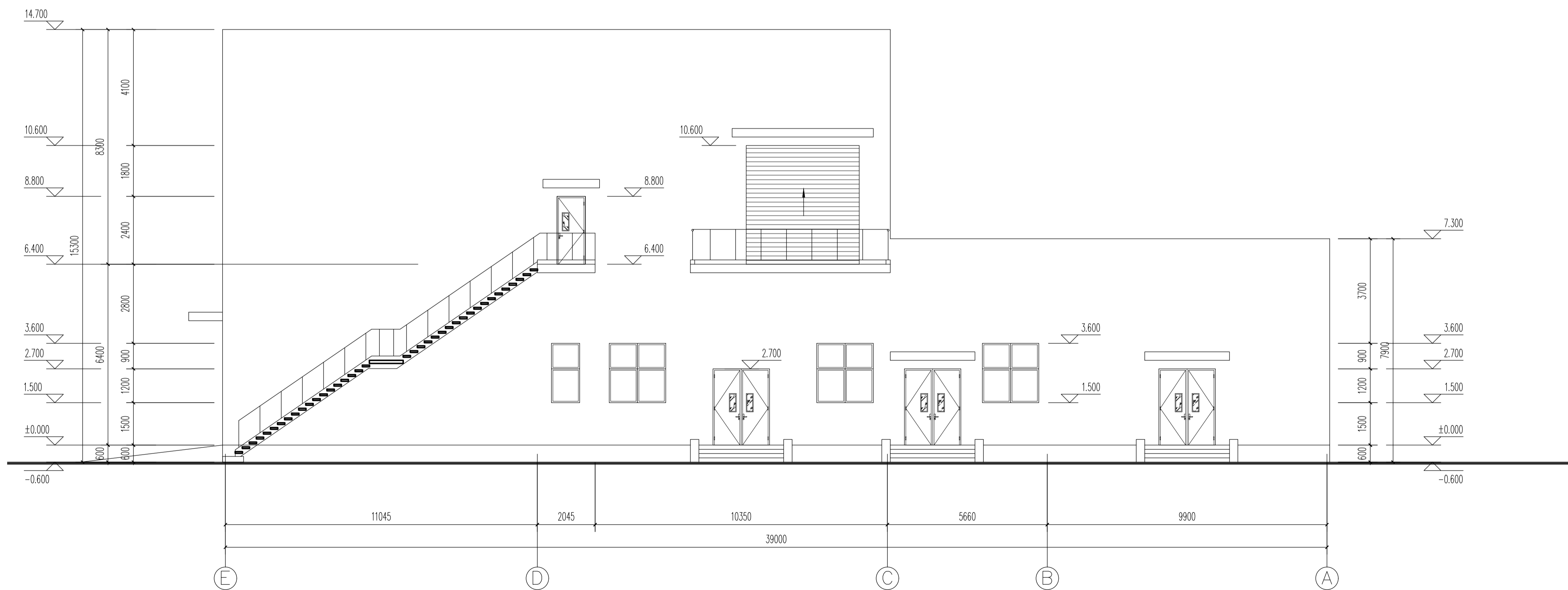
专 业 DISCIPLINE 阶 段 STAGE

比 例 SCALE 版 次 REVISION A

图 号 DRAWING NO. 7A-04



A~E立面图



E~A立面图



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建筑师 ARCHITECTS

结构工程师 VERIFIED STRUCTURAL ENGINEERS

结构工程师 STRUCTURAL ENGINEERS

工程师 ENGINEERS

机电工程师 ELECTRICAL ENGINEERS

卫生工程师 SANITARY ENGINEERS

图纸检查 DRAWING CHECKED

检查 CHECKING 签名 SIGNATURE 日期 DATE

建筑 ARCHITECTURE

结构 STRUCTURE

文字 WORDING

建设单位 CLIENT

金鹭硬质合金 (泰国) 有限公司

GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.

项目名称 PROJECT

泰国金鹭硬质合金生产基地二期项目设计

Phase II Project of Thailand Golden Egret Cement Carbide Production Base

子项名称 BUILDING

降压站

Power station

图样名称 DRAWING TITLE

剖面图

Section

审 定 AUTHORIZED

设计总负责人 DESIGN MANAGER

审 核 APPROVAL

校 对 CHECK

设计负责人 DISCIPLINE LEAD

设 计 DESIGNER

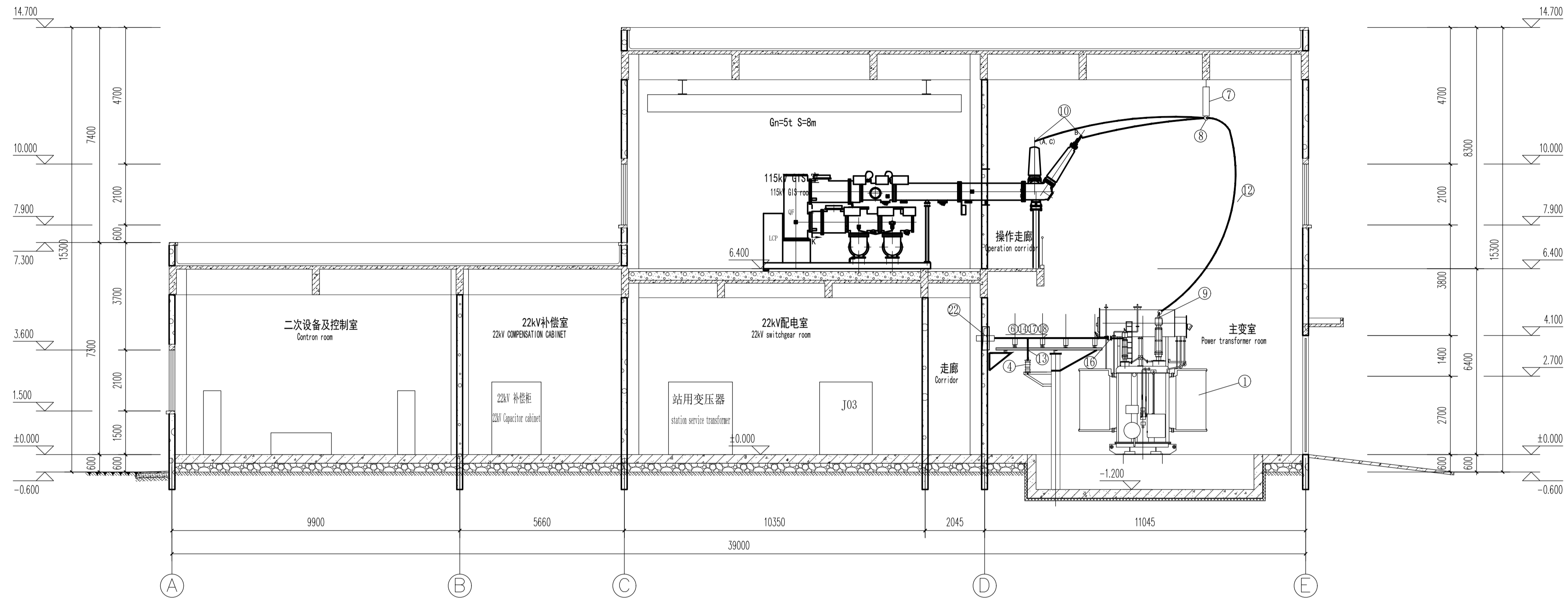
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专 业 DISCIPLINE 阶 段 STAGE

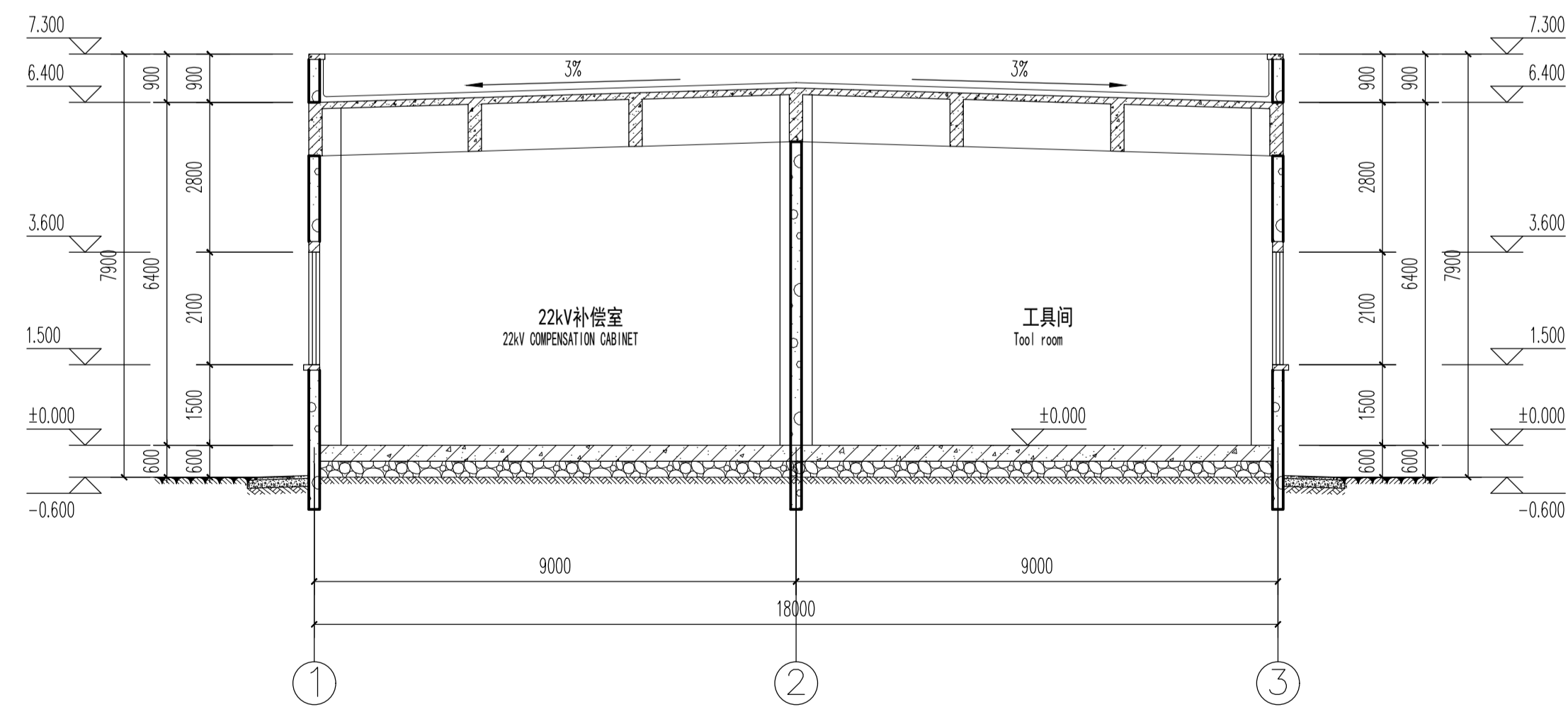
比 例 SCALE 版 次 REVISION A

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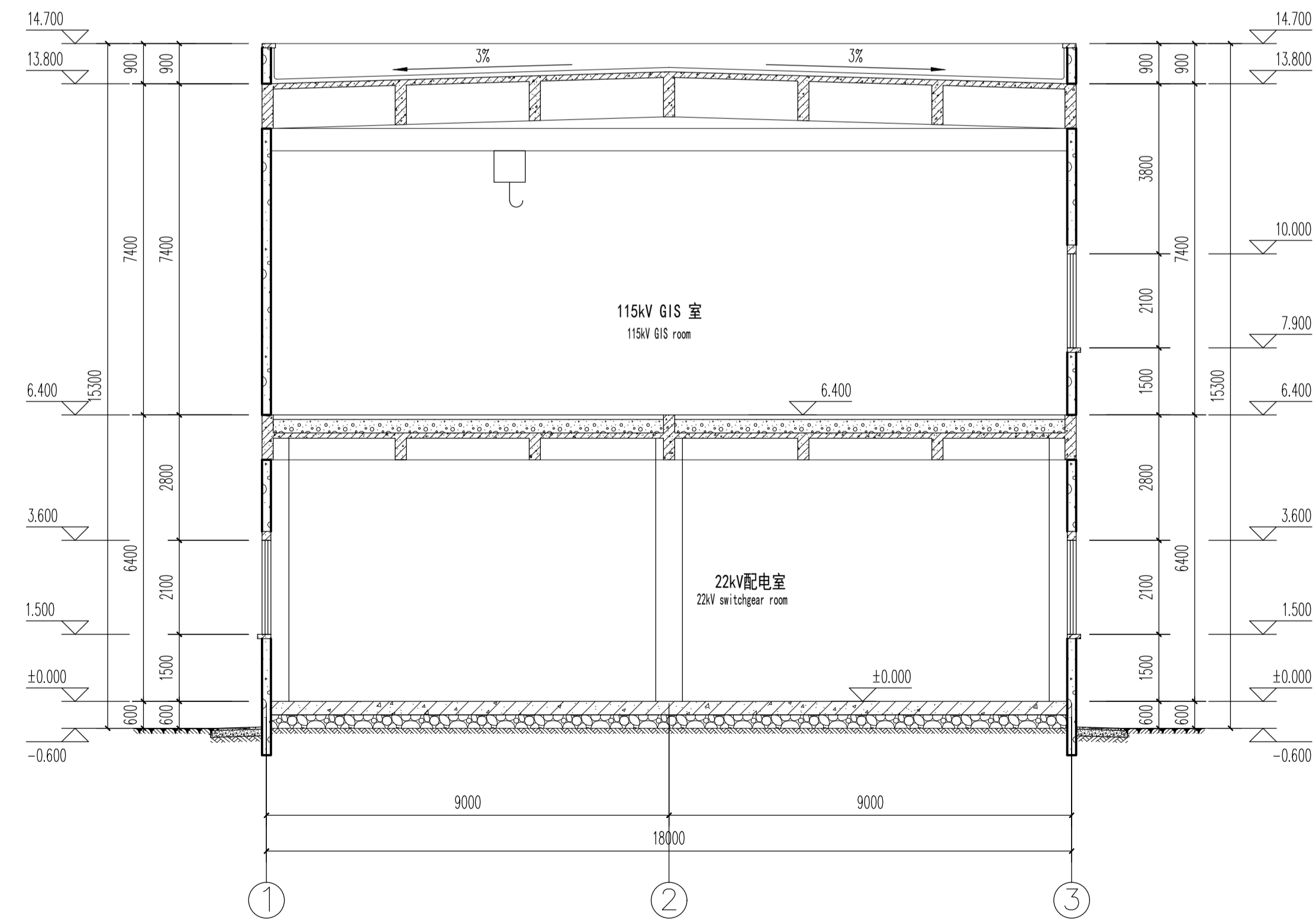
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1-1 剖面图



2-2 剖面图



3-3 剖面图



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设计日期 DATE

设计人 DESIGNER

审核人 CHECKER

批准人 APPROVED

日期 DATE

姓名 NAME

姓名 NAME

姓名 NAME

姓名 NAME

姓名 NAME

姓名 NAME

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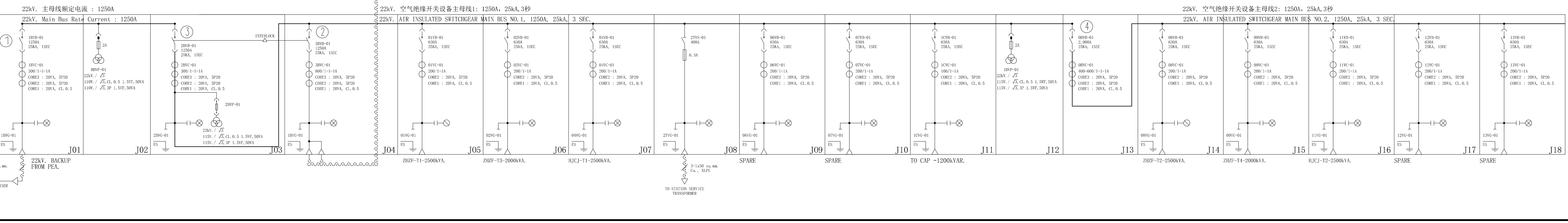
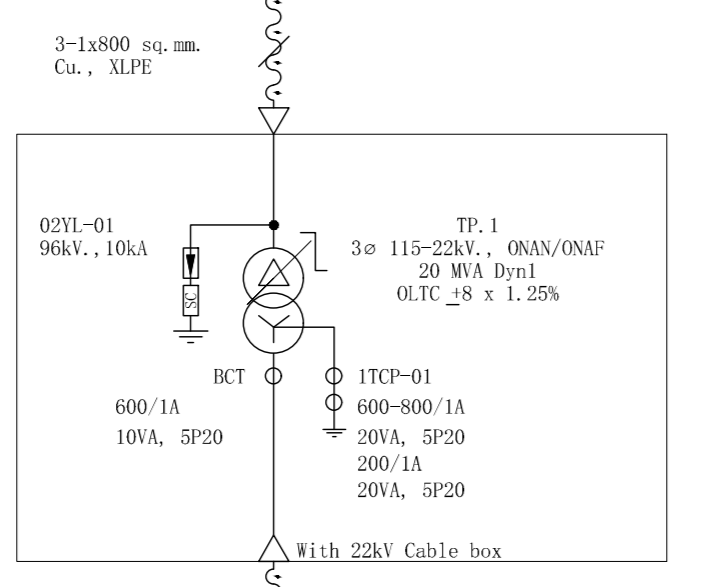
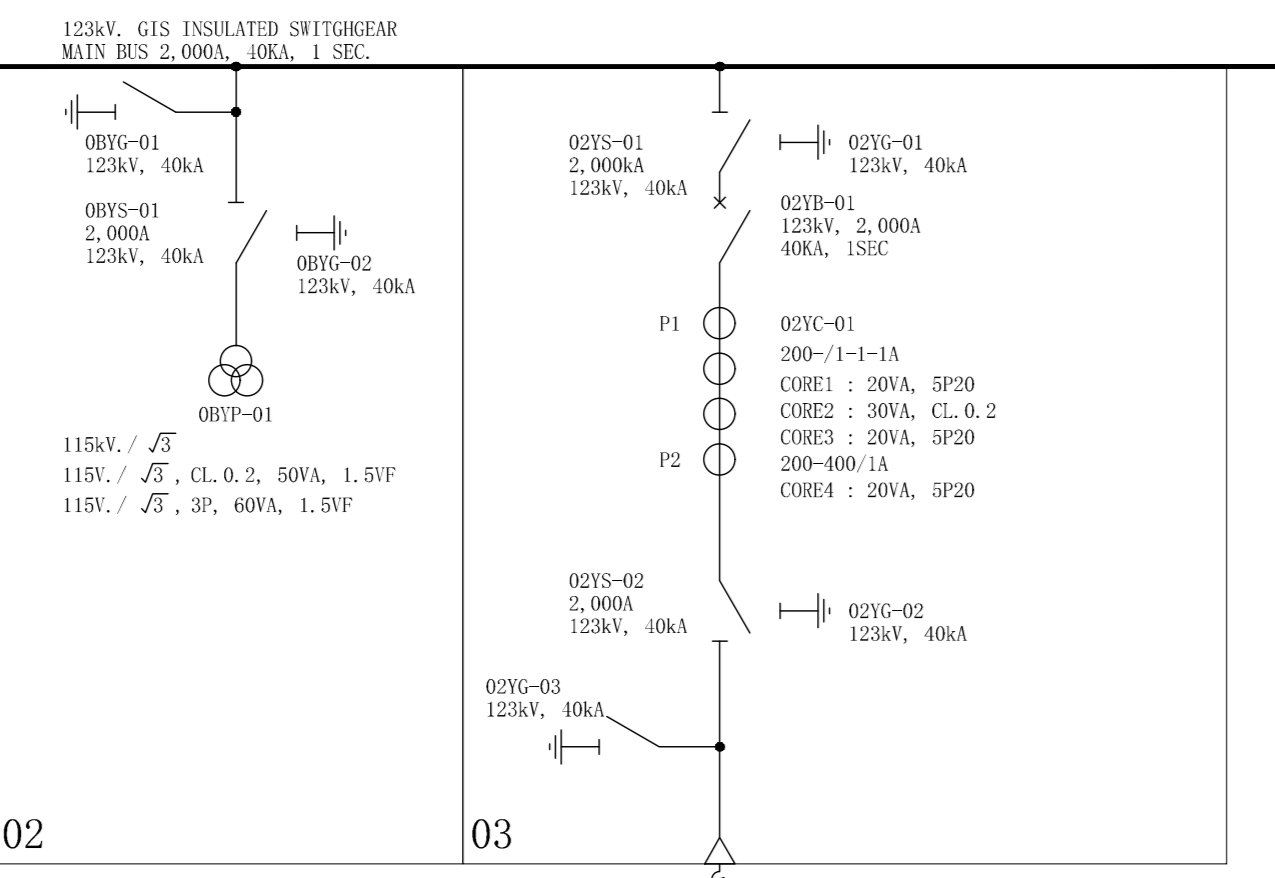
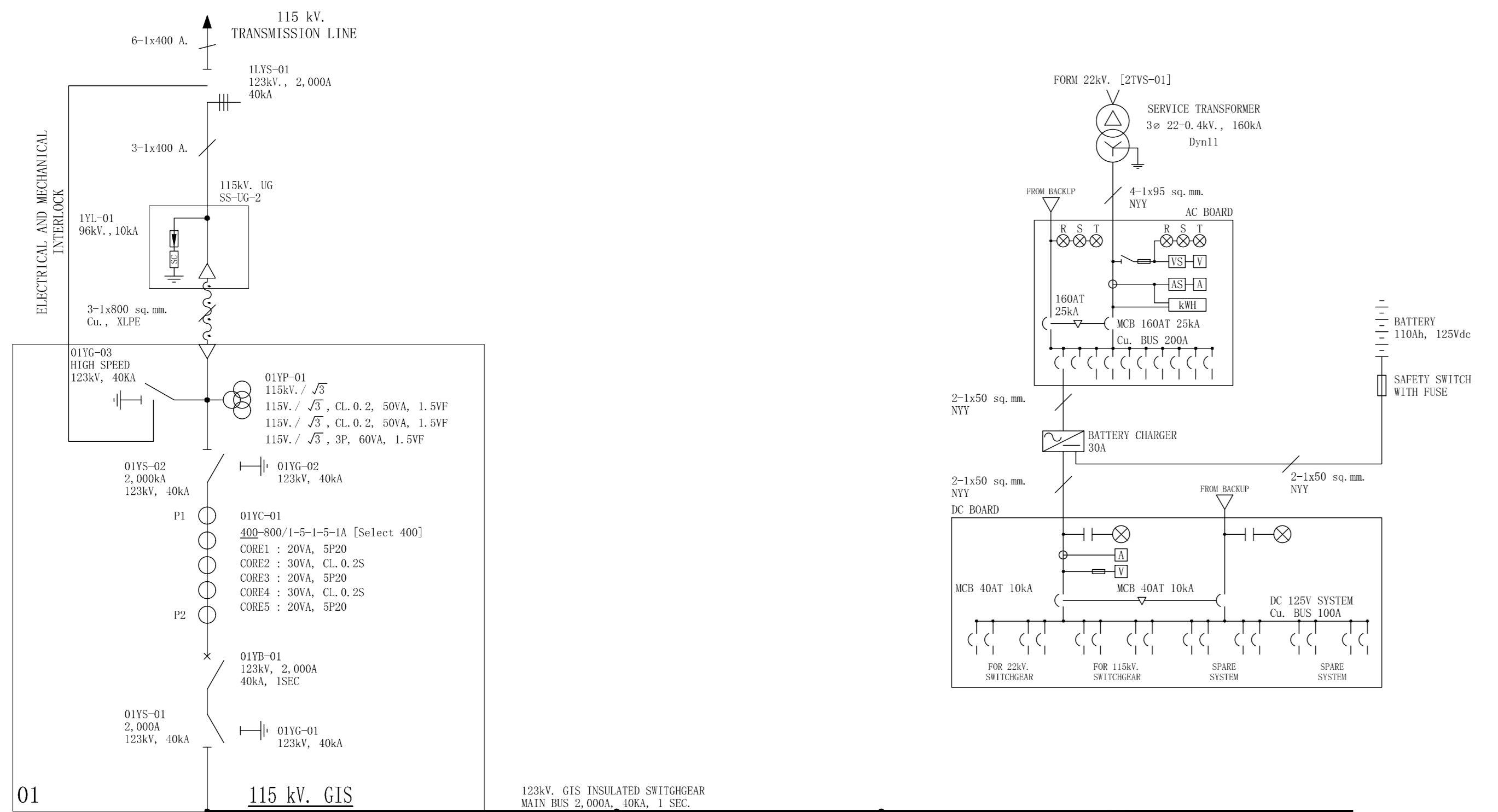
SYMBOL	DESCRIPTION
	115 kV. 空气断路器 115 kV. AIR BREAK SWITCH
	115 kV. 电路断路器 115 kV. CIRCUIT BREAKER
	115 kV. 接地隔离开关 115 kV. DISCONNECTING SWITCH WITH GROUND
	115 kV. 快速接地开关 115 kV. HIGH SPEED EARTH SWITCH
	115/22 kV. 电力变压器 3φ 115-22 kV. POWER TRANSFORMER
	避雷器 4芯中心 LIGHTNING ARRESTER 4 CORE CENTER
	电压互感器 VOLTAGE TRANSFORMER
	电缆终端器 CABLE TERMINATOR
	地下电缆 UNDERGROUND CABLE (11kV)

说明:

- 1、本站一回115kV电源进线取自PEA枢纽变电站, 一回22kV电源进线取自PEA枢纽变电站。
- 2、22kV母排采用单母线分段运行, 两回路进线断路器和两回路母联断路器工作状态如下:  
正常运行情况下, ②④处于合闸状态, ③处于分闸状态。  
115kV进线停电状态, ①③处于合闸状态, ②④处于分闸状态。  
在任何状态下要保证①②③只能有两个处于合闸状态。
- 3、降压站的平面图及系统图均要当地PEA确认实施。

Illustrate:

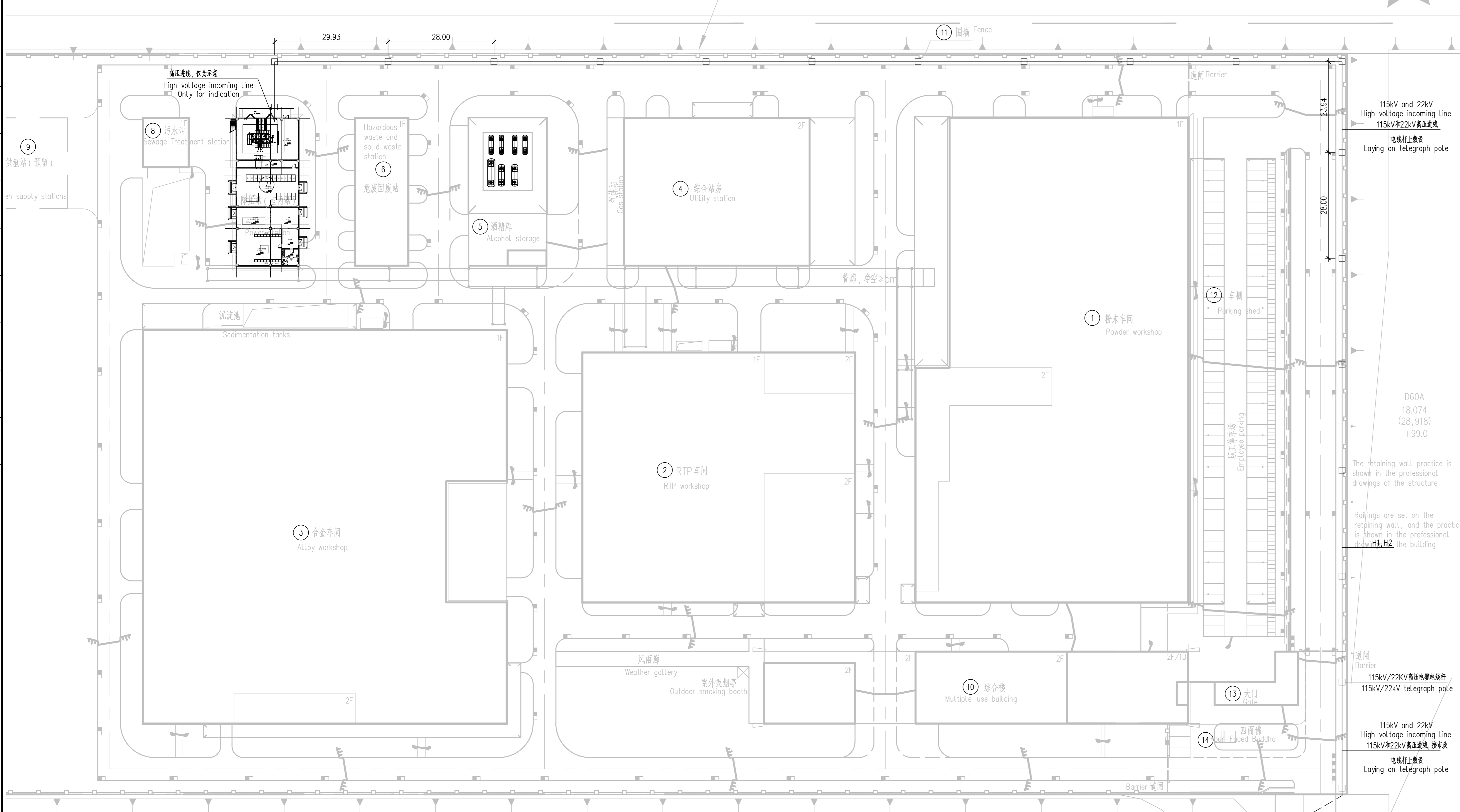
1. The 115kV power supply incoming line of this station is taken from the PEA hub substation, the 22kV power supply incoming line is taken from the PEA hub substation.
2. The 22kV busbar adopts a single busbar segmented operation, and the working status of the two circuit incoming circuit breaker and the two circuit bus tie circuit breaker is as follows:  
under normal operation, ② ④ is in the closed state, and ③ is in the open state.  
In the 115kV incoming power outage state, ① and ③ are in the closed state, and ② and ④ are in the open state.  
In any state, ensure that only two of ①, ②, and ③ are in the closed state.
3. The floor plan and system diagram of the step-down station must be confirmed and implemented by the local PEA.



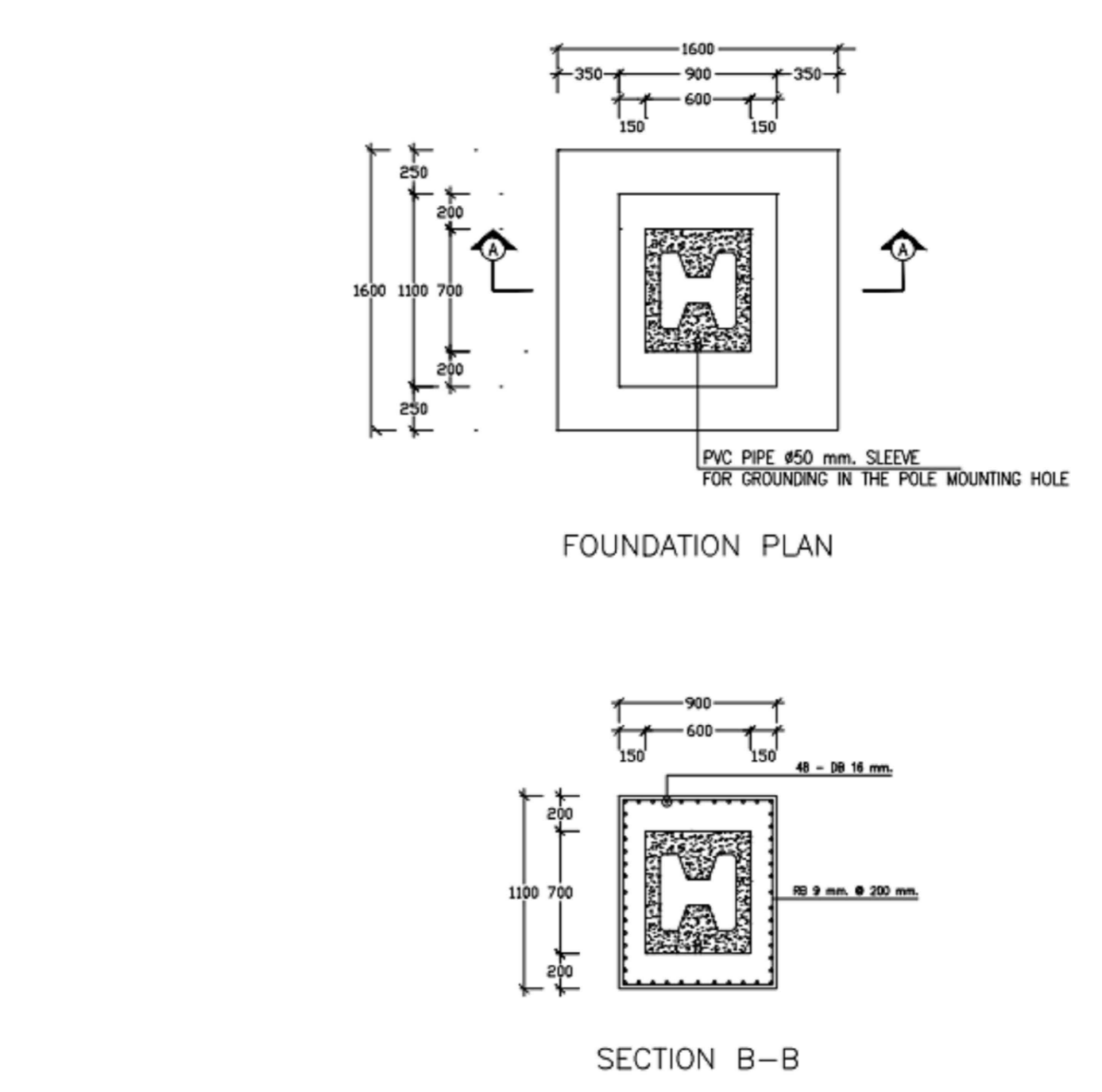
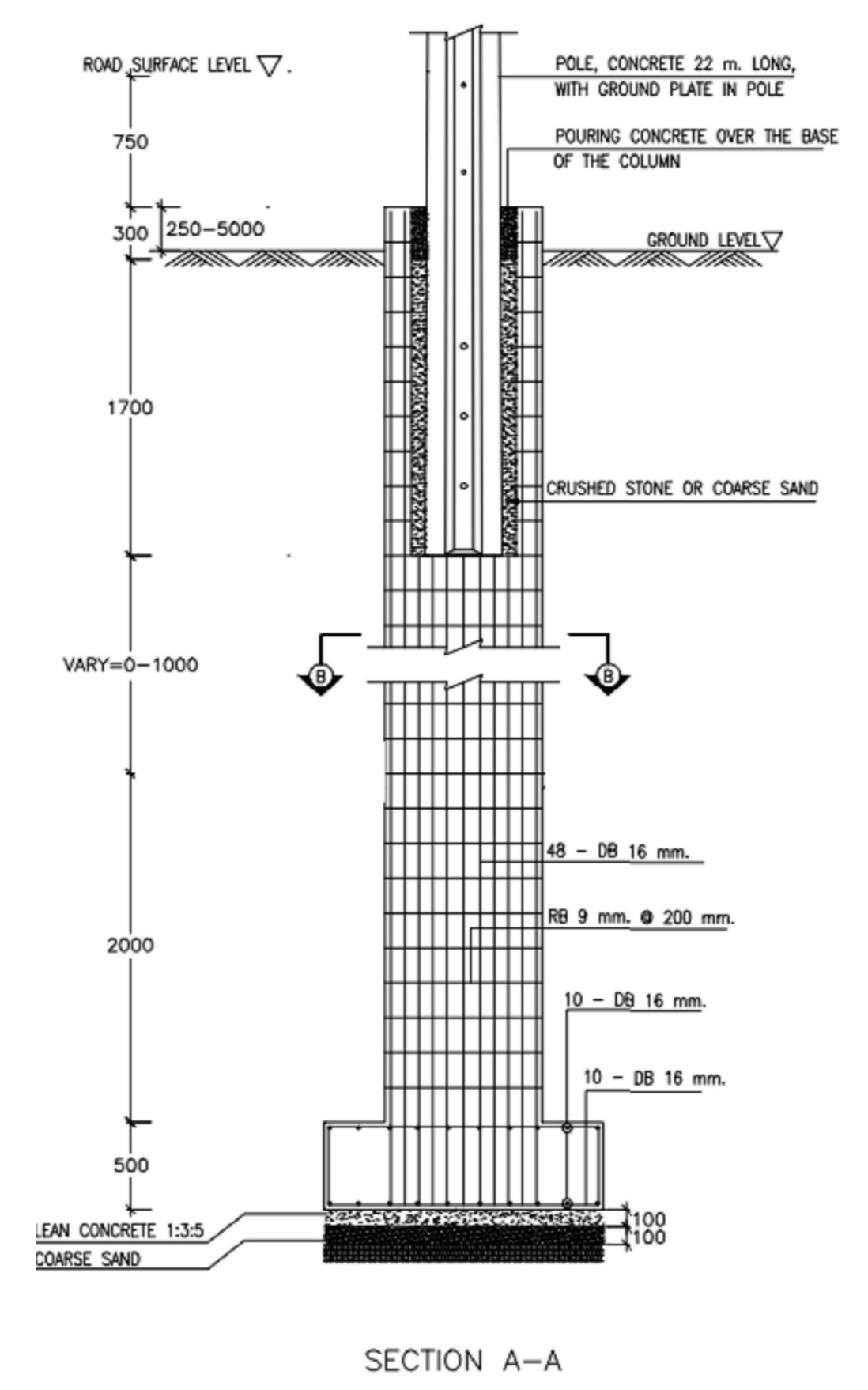
Address: 12/75 Moo 4, Eastern Seaboard Estate Ruyong Road,  
Tambon Phudongthung, Amphur Phudongthung,  
Prachin Buri 31140 E-mail: Sivad@sicvic.com.cn

Address: 182/15 Moo 4, Eastern Seaboard Estate Rongyong Road, Tambon Phukdaeng, Amphur Phukdaeng Rongyong, Postal Code 21140 E-mail: Scvic@scvic.com.cn

4xLVCT-1000x200 4根1000mm(宽)x200mm(高)桥架 4 cable trays 1000mm(wide)x200mm(high)桥架  
 MVCT-800x150 低压(400V)电缆桥架 位于管廊上 Low voltage(400V) cable tray in pipe gallery  
 中压(22kV)电缆桥架 位于管廊上 Medium voltage(22kV) cable tray in pipe gallery  
 厂内115kV/22kV高压电缆电杆 115kV/22kV telegraph pole



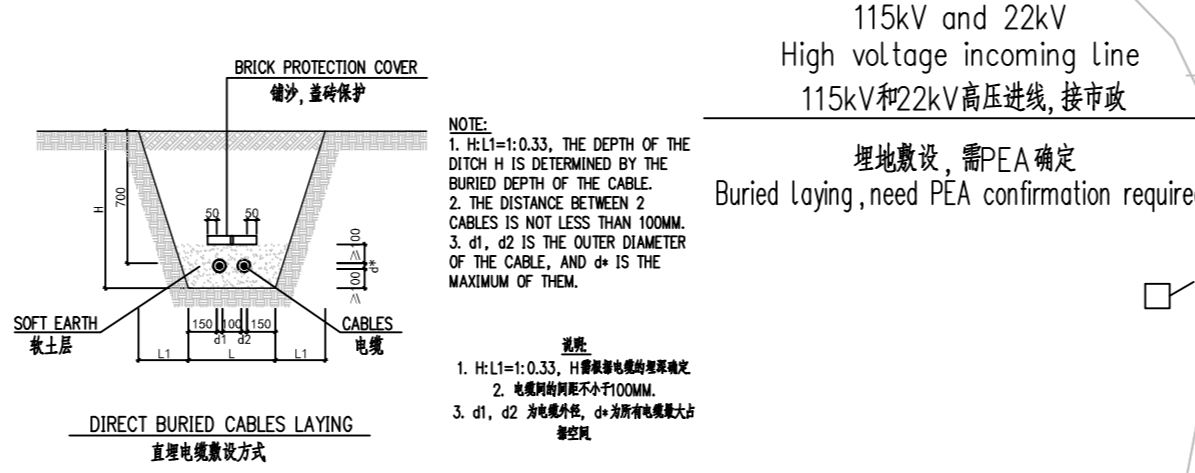
编号 No.	规格 specifications	起点 starting	终点 end	长度 L(m)	备注 remark
H1	高压进线 High voltage incoming line 3根1X240 平方毫米交联聚乙烯绝缘铜线 3 1X240 XLPE, Cu.	省电力局 PROVIDED BY PEA.	⑦ 降压站(室内站) Power station	—	22kV市政进线(规格需电力局确认) 22kV High voltage incoming line (Need PEA confirmation required)
H2	3根1X800 平方毫米交联聚乙烯绝缘铜线 3 1X800 XLPE, Cu.	省电力局 PROVIDED BY PEA.	⑦ 降压站(室内站) Power station	—	115kV市政进线(规格需电力局确认) 115kV High voltage incoming line (Need PEA confirmation required)



**电缆设计说明:**  
 1. 厂区内至车间变压器中压电缆采用YJV-18/30KV型, 厂区内低电压配电主要采用YJV/YJV-0.6/1KV型, 线路在厂区内采用管廊内桥架方式敷设及埋地方式敷设, 在特殊的场合采用穿管敷设, 详见专业图纸。  
 2. 电缆路径直线段每隔50米(该值仅供参考, 需满足泰国当地法规要求), 转弯处或接头部位, 应设置明显的标识。  
 3. 电缆与电视线、电话线、数据线等之间的距离应满足要求, 电缆穿越水沟、道路或与其它管道交叉时均应采用保护措施。  
 4. 图上未注明埋地管径规格时, 低压电缆埋地管径选择如下: 电缆小于50mm²时, 保护管为DN50 HDPE管, 穿地埋时保护管为DN100 HDPE管; 电缆大于或等于50mm²且小于120mm²时, 保护管为DN100 HDPE管, 穿地埋时保护管为DN150 HDPE管; 电缆大于等于120mm²时, 保护管为DN150 HDPE管, 穿地埋时保护管为DN200 HDPE管; 电缆大于等于120mm²时, 保护管为DN150 HDPE管, 穿地埋时保护管为DN200 HDPE管; 电缆大于等于120mm²时, 保护管为DN150 HDPE管, 穿地埋时保护管为DN200 HDPE管。  
 5. 直埋电缆埋地时不小于0.7米, 道路下不小于1.0米。  
 6. 直埋电缆埋地时不小于0.7米, 道路下不小于1.0米。  
 7. 直埋电缆埋地时不小于0.7米, 道路下不小于1.0米。  
 8. 本图尺寸标注单位以mm计, 线路与道路中心及建筑物的间距是沿线路中心距道路中心及建筑物的间距。  
 9. 电缆的敷设要求及与其它设施的间距最小间距如下表。  
 10. 单芯电缆敷设在A、B、C相成三角形排列, 且不得单独敷设在管廊中。

电缆与地下管沟 Cable and underground trench	平行 parallel	交叉 cross
控制电缆之间 Between control cables	—	0.5*
电力电缆之间或与控制电缆之间 Between power cables or between control cables	10kV及以下电力电缆 10kV and below power cable 0.1	0.5*
	10kV以上电力电缆 More than 10kV power cable 0.25**	0.5*
不同部门使用的电缆 Cables used in different departments	0.5**	0.5*
热气管沟 Heat pipe trench	2***	0.5*
油管或(可)燃气管道 Laying or gas (oil) gas pipe line	1	0.5*
其它管道 Other pipe line	0.5	0.5*
直埋电力电缆 Directly buried power cable	3	1.0
直埋电气化铁路轨道 Directly buried electrified railway track	10	1.0
电缆与建筑物基础 Cable and building foundation	0.6***	—
电缆与公路边 Cable and road edge	1.0***	—
电缆与排水沟 Cable and drain	1.0***	—
电缆与树木的主干 Cable and tree trunk	0.7	—
电缆与1kV以下架空线电杆 Cable and 1kV and below overhead power line	1.0***	—
电缆与1kV以上架空线杆塔基础 Cable and overhead power line tower foundation	4.0***	—

**注:**  
 \* 用隔板分隔或电缆穿管时不得小于0.25m;  
 \*\* 用隔板分隔或电缆穿管时不得小于0.1m;  
 \*\*\* 特殊情况时, 减小值不得大于50%。  
 Note:  
 \* When separated by a partition or cable, the pipe shall not be less than 0.25m;  
 \*\* Do not be less than 0.1m when separated by a partition or when the cable is piped;  
 \*\*\* In special cases, the reduction value must not exceed 50%.



Water Treatment Plant (1)  
 59.69  
 (95,504)  
 59-2-75.0

cable well size: 2.0m(L)x2.0m(W)x1.9m(D)  
 电缆井  
 内部主要尺寸: 2.0m(长)x2.0m(宽)x1.9m(深)

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建筑师 ARCHITECTS  
 结构工程师 VERIFIED STRUCTURAL ENGINEERS  
 结构工程师 STRUCTURAL ENGINEERS  
 工程师 ENGINEERS  
 电气工程师 ELECTRICAL ENGINEERS  
 卫生工程师 SANITARY ENGINEERS

图例检查 DRAWING CHECKED  
 检查 CHECKING 签字 SIGNATURE 日期 DATE

建设单位 CLIENT  
 金赞铝镁合金(泰国)有限公司  
 GOLDEN GREY ALUMINUM ALLOY (THAILAND) CO. LTD.  
 项目名称 PROJECT  
 泰国金赞铝镁合金生产基地二期项目  
 Phase II Project of Thailand Golden Grey Alum Production Site  
 子项名称 BUILDING  
 降压站  
 Power station  
 图例名称 DRAWING TITLE  
 厂区配电平面图  
 Power distribution plan

专业 DISCIPLINE 阶段 STAGE  
 比例 SCALE 版本 VERSION  
 图号 DRAWING NO. 7A-07

总第 页

# 建筑设计说明



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建筑师

ARCHITECTS

结构工程师

VERIFIED STRUCTURAL ENGINEERS

结构工程师

STRUCTURAL ENGINEERS

工程师

ENGINEERS

机电工程师

ELECTRICAL ENGINEERS

卫生工程师

SANITARY ENGINEERS

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检查 CHECKING 签名 SIGNATURE 日期 DATE

建筑 ARCHITECTURE

结构 STRUCTURE

图纸 DRAWING

文字 WORDING

建设单位 CLIENT

金鹭硬质合金（泰国）有限公司

GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.

项目名称 PROJECT

泰国金鹭硬质合金生产基地二期项目设计

Phase II Project of Thailand Golden Egret Cement Carbide Production Base

子项名称 BUILDING

降压站

Power station

图样名称 DRAWING TITLE

建筑设计说明（中文）

Architecture Description (Chinese)

审 定

AUTHORIZED

设计总负责人

DESIGN MANAGER

审 核

APPROVAL

校 对

CHECK

设计负责人

DISCIPLINE LEAD

设 计

DESIGNER

日 期

DATE

专业： DISCIPLINE 阶段： STAGE

比 例： 1：100 版 次： A

SCALE REVISION

图 号： 7A-SM01

DRAWING NO.

## 一 设计依据

1. 本公司与金鹭硬质合金（泰国）有限公司签订的合同。
2. 甲方提供的金鹭硬质合金（泰国）有限公司的有关资料。

## 二 项目概况

建设单位：金鹭硬质合金（泰国）有限公司

项目名称：泰国金鹭硬质合金生产基地二期项目设计

建筑名称：降压站

建设地点：泰国

建筑物占地面积：713.45m<sup>2</sup>

建筑物总建筑面积：车间建筑面积：978.08m<sup>2</sup>(不含雨棚)

建筑高度：15.300m（由室外地坪至女儿墙顶高度）

建筑层数：二层

建筑类别：工业建筑

建筑物结构形式：钢筋混凝土框架结构

## 三 设计标高及平面尺寸标注

1. 本工程的室内设计标高0.600相当于绝对标高为104.95m，室内外高差600mm。
2. 图中标注的地面、楼面、平台面等标高均为建筑完成面标高。混凝土屋面为结构板面标高（不包括找坡层、保温层、防水层等）。门窗洞口标高为结构梁底标高。
3. 本工程施工图图纸中尺寸以毫米（mm）计，标高以米（m）计。
4. 本图仅用于招标使用。

## 四 一般工程做法

1. 墙体材料说明：

1.1 本工程车间外墙标高0.540防潮层以下墙体做法详见结构施工图。标高0.540以上外墙体采用200厚实心砖墙。

车间区卫生间墙体采用砼实心砖，专用水泥砂浆砌筑；

墙体具体使用部位详见平面图。

1.2 墙身防潮层：设置于标高0.540m处，做法为20厚1：2水泥砂浆内掺水泥重量5%防水剂，在此标高有钢筋混凝土圈梁者可不设。

1.3 本工程中两种砌筑墙体交接处，应根据饰面材质在做饰面前加金属网或在施工中加贴耐碱玻纤网格布，防止裂缝。

2. 门窗工程

2.1 门窗安装及其所需的预埋件，按有关标准图设置。门窗五金及配件应与门窗统一配套定货。

2.2 门窗玻璃的选用应遵照地方及主管部门的有关规定。

2.3 门窗立樘：门窗有标准图按标准图立樘或按生产厂家图纸立樘。其它除注明外，门居中布置，外窗及百叶定位详见节点详图。

2.4 本工程外窗选用90系列断桥铝合金推拉窗、固定窗或上悬窗，车间玻璃采用6+12+6钢化白玻；外窗在制作及安装上外门窗气密、水密、抗风压性能应满足：

气密性能：在±10Pa检测压力差下，不应低于1.5≥q1>1.0，4.5≥q2>3.0；

水密性能：不应低于500>ΔP≥350Pa；

抗风压性能：不应低于3.0≤P3<3.5。

2.5 所有门、窗玻璃均采用钢化安全玻璃。

钢化玻璃厚度选用：

- a.最大许用面积<4.0m<sup>2</sup>，玻璃采用6mm；
- b.4.0m<sup>2</sup><最大许用面积<6.0m<sup>2</sup>，玻璃采用8mm；
- c.6.0m<sup>2</sup><最大许用面积<8.0m<sup>2</sup>，玻璃采用10mm；

2.6 公共卫生间门、防火门和密闭门均加闭门器。窗上所有开启扇应设置纱窗。

2.7 本工程门、窗所注尺寸为洞口尺寸，门窗框净尺寸与洞口之间的间隙除应满足安装固定的需要外，同时考虑不同饰面层的厚度，由施工和门窗制作单位具体确定。门窗洞口尺寸，在门窗加工制作前应实地复测。

注：本工程窗料的大小及玻璃的厚度由生产制造厂家根据产品性能、当地风压、生产材料性能复核确定，并对门窗的安全，气密，美观及保温性负责外窗在制作及安装上应使其雨水渗透性及空气渗透性达到国家标准的要求。

2.8 门窗的性能及要求

2.8.1 双面钢板平开防火门

成品50厚平口铰链门，不锈钢把手，1.2mm电镀锌门板，3面PVC条，内部充填50厚膨胀珍珠岩板，板纯灰色静电粉末喷涂，门框密封槽内嵌防火胶密封条，自闭闭门器，自动门底封；耐火极限：甲级防火门≥1.5h；乙级防火门≥1.0h；丙级防火门≥0.5h。

2.8.2 电动钢制卷帘：

钢板液压成双层钢板帘片，中间填充阻燃型硬质聚氨酯，≥22mm厚，四边内嵌EPDM密封条。

2.8.3 电动提升门：

双层镀锌钢板，内衬PU发泡填充物（100%不含氟里昂），门板厚度42mm。提升门底部均应有缓冲密封胶条；顶部、侧面设密封胶条；门板之间设板间密封胶条。

气密闭性能达到漏风量小于12m<sup>3</sup>/m<sup>2</sup>·h（50pa压力下）。抗风压能力≥

650N/m<sup>2</sup>。运行状态下提升及下降速度≥0.4米/秒。

2.8.4 断桥铝合金窗

车间采用6+12+6钢化白玻，可开启外窗均做隐藏式纱窗。铝合金门窗型材的壁厚应经过计算或试验确定，除压条、扣板等需要弹性装配的型材外，铝合金门窗型材主要基材截面最小壁厚为外门应≥

2.2mm、内门应≥2.0mm、外窗应≥1.8mm、内窗应≥1.4mm。门窗产品质量应由门窗制造厂直接向建设单位负责。

2.8.5 防雨型单层钢制百叶窗，叶片厚度0.6mm，金属表面采用粉末喷涂，颜色同外墙颜色，竖框均为隐藏型，竖框与边框位于同一平面。选用防飘雨型百叶，有效通风面积不小于50%。由百叶供应商复核所需型材强度和材质厚度，并提供相应合格产品，并须经设计院确认后方可安装制作。百页内侧装防虫不锈钢丝网。

2.9 除注明外，门边距最近柱边或墙边250，或门边紧靠柱边、墙边。

3. 室外工程（散水、坡道、台阶）：

（1）散水：在建筑物四周除门口坡道及雨水沟外做1000宽细石混凝土散水，散水流水坡3%，散水应设置伸缩缝，其延米间距不得大于10m，转角处应做45°缝，缝宽度为15~20mm，缝内填嵌柔性密封材料，散水与外墙间设通缝，缝宽10mm，缝内填沥青胶泥。

（2）坡道：由厂区道路起坡做至建筑物门口，坡道宽为门洞两侧各加500mm。

4. 油漆涂料工程：

4.1 不外露钢质构件均表面刷醇酸底漆二道，漆膜总厚度≥2x30μm。

4.2 室内外露金属构件（除铝合金、不锈钢、铜制品外，室内外露钢结构的钢梁、钢柱及支撑等，室内其他钢构件：钢梯、扶手、栏杆等）油漆做法（涂层干漆膜总厚度>150μm）：

a. 清理基层，除锈等级不低于Sa21/2或St2（结构施工图已注明的除外）；

b. 底漆：醇酸底漆4道，干膜厚≥25μm/道；

c. 腻子：满刮腻子磨平；

d. 面漆：醇酸面漆两道，干膜厚≥25μm/道。（同内墙彩钢颜色）。

4.3 室外外露金属构件（除铝合金、不锈钢、铜制品外）油漆做法（涂层干漆膜总厚度≥160μm）：

a. 清理基层，除锈等级不低于Sa21/2或St2（结构施工图已注明的除外）；

b. 底漆：环氧富锌底漆二道，干膜厚≥25μm/道；

c. 中漆：环氧云铁二道，干膜厚≥20μm/道；

d. 面漆：聚氨酯面漆三道，干膜厚≥23μm/道（同外墙彩钢颜色）。

注：需涂刷防火涂料的钢结构构件，不刷面漆，必须满足耐火极限要求，且要求防火涂料与防腐油漆相容。

4.4 钢柱、钢梁（包括柱间支撑）需刷防火涂料，防火涂料厚度达泰国当地规定，耐火极限达到2h。

4.5 预埋铁件、木砖及与墙体接触的木构件均需相应做防锈、防腐处理。

# Description of Architectural Design



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业主签名 SIGNATURE	日期 DATE

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建筑师 ARCHITECTS	
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结构工程师 VERIFIED STRUCTURAL ENGINEERS	
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结构工程师 STRUCTURAL ENGINEERS	
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工程师 ENGINEERS	
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机电工程师 ELECTRICAL ENGINEERS	
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卫生工程师 SANITARY ENGINEERS	
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建筑 ARCHITECTURE	
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结构 STRUCTURE	
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图纸 DRAWING	
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文字 WORDING	
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建设单位 CLIENT 金鹭硬质合金（泰国）有限公司 GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.
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项目名称 PROJECT 泰国金鹭硬质合金生产基地二期项目设计 Phase II Project of Thailand Golden Egret Cement Carbide Production Base
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子项名称 BUILDING 降压站 Power station
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图样名称 DRAWING TITLE 建筑设计说明（英文） Architecture Description (English)
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审 定 AUTHORIZED 设计总负责人 DESIGN MANAGER	
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审 核 APPROVAL 校 对 CHECK 设计负责人 DISCIPLINE LEAD	
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设 计 DESIGNER	
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日 期 DATE	
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专 业 DISCIPLINE	建 筑 BUILDING	阶 段 STAGE	
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比 例 SCALE	1:100	版 次 REVISION	A
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图 号 DRAWING NO.	7A-SM02
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Wind pressure resistance: should not be less than 3.0<P3<3.5.  
2.5 All doors and Windows are made of tempered safety glass.  
Thickness selection of tempered glass:  
a. The maximum allowable area is < 4.0m<sup>2</sup>, the glass is 6mm;  
b.4.0m<sup>2</sup> < maximum allowable area < 6.0m<sup>2</sup>, glass using 8mm;  
c.6.0m<sup>2</sup> < maximum allowable area < 8.0m<sup>2</sup>, glass 10mm;  
2.6 Door closers shall be added to public bathroom doors, fire doors and airtight doors. All open Windows in the window should be screened.  
2.7 The dimensions of doors and Windows in this project are the dimensions of holes. The gap between the net dimensions of door and window frames and holes shall not only meet the needs of installation and fixing, but also consider the thickness of different finishing layers, which shall be determined by the construction and door and window making units. The dimensions of door and window openings should be retested on the spot before door and window processing.  
Note: The size of the window material and the thickness of the glass in this project are determined by the manufacturer according to the product performance, local wind pressure and the performance of the production material. The manufacturer is responsible for the safety, airtightness, beauty and insulation of the doors and Windows, and the production and installation of the exterior window should make its rainwater permeability and air permeability meet the requirements of the national standard.

2.8 Performance and requirements of doors and Windows  
2.8.1 Double-sided steel plate flat fire door  
Finished 50-thick flat hinged door, stainless steel handle, 1.2mm electro-galvanized door panel, 3 sides PVC, filled with 50 thick expanded perlite board, the board pure gray electrostatic powder spraying, door frame sealing slot inlaid fireproof rubber sealing strip, with its own door closing device, automatic door bottom seal; Fire resistance: Grade A fire door ≥1.5h; Class B fire door ≥1.0h; Class C fire door ≥0.5h.  
2.8.2 Electric steel roller curtain:  
The steel plate is rolled into a double-layer steel curtain, the middle is filled with flame-retardant rigid polyurethane, ≥22mm thick, and the four sides are embedded with EPDM sealing strips.

2.8.3 Electric lift door:  
Double galvanized steel plate, lined with PU foam filler (100% free of freon), door thickness 42mm. The bottom of the lifting door should have a buffer sealing rubber strip; The top and side are provided with sealing rubber strips; Sealing rubber strips are arranged between door panels.  
The air sealing performance is less than 12m<sup>3</sup>/m<sup>2</sup>·h (under 50pa pressure).  
Wind pressure resistance ≥650N/m<sup>2</sup>. Lift and drop speed ≥0.4 m/s in operation.

2.8.4 Aluminum alloy window with broken bridge  
The workshop adopts 6+12+6 tempered white glass. Can be opened outside Windows are hidden screen window. The wall thickness of aluminum alloy door and window profiles should be determined by calculation or test, in addition to the profiles requiring elastic assembly such as strips and gusset plates, the minimum wall thickness of the main substrate section of the main aluminum alloy door and window profiles is the outer door should be ≥2.2mm, the inner door should be ≥2.0mm, the outer window should be ≥1.8mm, the inner window should be ≥1.4mm. The quality of doors and Windows should be directly responsible for the construction unit by the doors and Windows manufacturer.

2.8.5 Rainproof single-layer steel shutters, blade thickness 0.6mm, metal surface is powder sprayed, the color is the same as the color of the outer window, mullions are hidden, mullions and border are located in the same plane. The effective ventilation area is not less than 50%. The louver supplier shall review the required profile strength and material thickness, and provide corresponding qualified products, and shall be confirmed by the design institute before installation and production. The inside of the 100 pages is equipped with insect-proof stainless steel wire mesh.

2.9 Unless indicated, the door should be 250 away from the nearest column or wall, or close to the column or wall.  
3.Outdoor works (water, ramps, steps) :

(1) Water dispersion: In addition to the ramp at the door and the storm drain, a 1000-wide fine stone concrete water dispersion shall be made around the building, and the water flow slope shall be 3%. Expansion joints shall be set up for the water dispersion, and the distance between the length of the meters shall not be greater than 10m. 45° joints shall be made at the corners, and the width of the joints shall be 15 ~ 20mm, and flexible sealing materials shall be inserted in the joints.

(2) Ramp: Ramp from the factory road to the door of the building, the width of the ramp is 500mm on both sides of the door.

4.Paint engineering:  
4.1 Brush two coats of alkyd primer on the surface of the non-exposed steel members, and the total thickness of the paint film shall be ≥2x30μm.  
4.2 Indoor exposed metal components (except aluminum alloy, stainless steel, copper products, indoor exposed steel structure of steel beams, steel columns and supports, other indoor steel components: steel ladder, handrails, railings, etc.) Painting methods (total thickness of dry coating film ≥150μm) :  
a. Clean the base, the rust removal grade is not lower than Sa21/2 or St2 (except as indicated in the structural construction drawings);  
b. Primer: 4 lines of alkyd primer, dry film thickness ≥25μm/ Line;  
c. Putty: full of scraping putty to smooth;  
d. Finish: two alkyd finish coats, dry film thickness ≥25μm/ coat. (with the color of the interior wall color steel plate).

4.3 Pointing method of outdoor exposed metal components (except aluminum alloy, stainless steel, copper products) (total thickness of dry coating film ≥160μm) :  
a. Clean the base, the rust removal grade is not lower than Sa21/2 or St2 (except as indicated in the structural construction drawings);  
b. Primer: epoxy zinc-rich primer, dry film thickness ≥25μm/ strip;  
c. Medium paint: epoxy cloud iron two, dry film thickness ≥20μm/ way;  
d. Top paint: polyurethane top paint three times, dry film thickness ≥23μm/ way (the same color of external wall color steel plate).

Note: The steel structure members that need to be coated with fireproof paint, do not brush with topcoat, must meet the fire resistance limit requirements, and require fireproof paint and anti-corrosion paint compatible.

4.4 Steel columns and beams (including support between columns) shall be painted with fireproof paint, the thickness of the fireproof paint shall meet the local regulations of Thailand, and the fire resistance limit shall reach 2h.

4.5 The embedded iron parts, wood bricks and wood parts in contact with the wall shall be treated accordingly for rust prevention and corrosion prevention.

**I Design basis**  
1. The contract signed by the company with GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.  
2. Relevant information of GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.,Ltd. provided

**II Project overview**  
Construction unit:GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.  
Project Name:Phase II Project of Thailand Golden Egret Cement Carbide Production Base  
Building name:Power station  
Construction site: Thailand  
Floor area of building:713.45m<sup>2</sup>  
Total building area :978.08m<sup>2</sup>(No canopy included)  
Building floors,floor height :Two floors .  
Building height :15.30m (outdoor floor to top of parapet wall)  
Building category: Industrial Building  
Structural form of building: Grid structure

**III Design elevation and plane dimension**  
1.The interior design elevation of the project is 0.600, equivalent to the absolute elevation of 104.95 meters, and the difference between indoor and outdoor elevation is 600mm.  
2. The ground elevation is the building completion surface elevation, the concrete roof elevation is the structural surface elevation, the steel structure roof elevation is the waterproof layer completion surface elevation.  
3. Dimensions indicated in this engineering drawing are in mm and elevation in m.  
3. See the professional drawing of general layout for the general layout.  
4.this drawing is only used for tender.

**IV General engineering practices**  
1.Wall material description:  
1.1 Please refer to the structure construction drawing for details about the method of wall elevation below 0.240 moisture-proof layer of the external wall of the engineering workshop. Elevation 0.240~ elevation 1.500m external wall adopts 200 thick core brick wall, elevation 1.500m above the double pressed steel plate wall (vertical plate).  
The washroom wall in the workshop area is made of concrete solid brick and built with special cement mortar.  
See the plan for the specific parts of the wall.

1.2 Wall moisture-proof course: set at the elevation of 0.240m, the practice is 20 thick 1:2 cement mortar mixed with 5% cement weight waterproof agent, in this elevation with reinforced concrete floor girders do not set.  
1.3 At the junction of two kinds of masonry walls in the project, metal mesh shall be added in front of the decoration according to the finishing material or alkali-resistant glass fiber mesh cloth shall be added during construction to prevent cracks.

2.Door and window engineering  
2.1 The installation of doors and Windows and the embedded parts required shall be set according to the relevant standard drawings. Door and window hardware and accessories should be ordered with doors and Windows.  
2.2 The selection of Windows and doors should comply with the relevant provisions of the local and competent authorities.  
2.3 Doors and Windows: doors and Windows have standard drawings according to the standard drawing or according to the manufacturer's drawings. Unless otherwise indicated, the door is centered, and the location of the outer window and louver is detailed in the node drawing.

2.4 The exterior Windows of this project are made of 90 series broken bridge aluminum alloy sliding Windows, fixed Windows or upper hanging Windows, and the workshop glass is made of 6+12+6 tempered white glass; In the production and installation of the outer window, the airtight, watertight and wind pressure resistance of the outer door and window should meet:  
Airtight performance: under the detection pressure difference of ±10Pa, it should not be less than 1.5≥q1 > 1.0, 4.5≥q2 > 3.0;  
Watertight performance: should not be less than 500 > ΔP≥350Pa;

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# 电气设计说明

# Description of Electrical Design

## 一 设计依据

1. 本公司与金鹭硬质合金(泰国)有限公司签订的合同。
2. 甲方提供的金鹭硬质合金(泰国)有限公司的有关资料。

## 二 项目概况

建设单位: 金鹭硬质合金(泰国)有限公司  
 项目名称: 泰国金鹭硬质合金生产基地二期项目设计  
 建筑名称: 降压站  
 建设地点: 泰国  
 建筑物占地面积: 713.45m<sup>2</sup>  
 建筑物总建筑面积: 车间建筑面积: 978.08m<sup>2</sup>(不含雨棚)  
 建筑高度: 15.300m (由室外地坪至女儿墙顶高度)  
 建筑层数: 二层  
 建筑类别: 工业建筑  
 建筑物结构形式: 钢筋混凝土框架结构

## 三 工程概况

- 本工程为新建一座115kV降压站, 规模及基本配置如下(115kV变压器、115kV及22kV配电装置均为户内布置)
- 1、配置1台SZ20型20MVA油浸式有载调压三相双绕组变压器, 达到GB20052-2020二级能效, 电压等级115/22kV。
  - 2、采用双回路进线, 其中: 一回为115kV进线, 另一回为22kV进线, 二者互为备用; 22kV进线满足主要设备用电; 主接线形式为单母线分段接线, 115kV进线开关采用115kV组合电器气体绝缘GIS, 22kV进线开关采用KYN28型22kV开关柜。22kV侧配置电容无功补偿装置。
  - 3、外部(PEA)计量按当地供电局要求进行配置, 以满足其计量要求; 其余为内部计量, 与变电所统一采用多功能电表。
  - 4、项目配套建设消谐、保护、控制、通信、安防、智能辅助等系统。
  - 5、市政双回路进线至降压站主要为架空线路, 厂区大门口至厂区段约55米为电缆埋地敷设; 电缆埋地敷设工程需与PEA确认。
  - 6、站内自行配置一台站用变(与接地变共用, 达到GB20052-2020二级能效标准), 满足站内低压用电负荷需求(照明、公用配电、站内工作电源等); 对于安防、消防、综合系统后台、中压及高压开关操作电源、照明电源等, 设置双电源供电。
  - 7、满足当地设计及验收标准的配套消防设施, 需施工图设计进行深化。
  - 8、本设计为方案, 一次深化及二次图纸需施工单位进行深化并通过当地ETA等机构的审查。

## I Design basis


- 1.The contract signed by the company with GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.
- 2.Relevant information of GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.,Ltd. provided

## II Project overview

Construction unit:GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.  
 Project Name:Phase II Project of Thailand Golden Egret Cement Carbide Production Base  
 Building name:Power station  
 Construction site: Thailand  
 Floor area of building:713.45m<sup>2</sup>  
 Total building area:978.08m<sup>2</sup>(No canopy included)  
 Building floors,floor height:Two floors .  
 Building height:15.30m (outdoor floor to top of parapet wall)  
 Building category: Industrial Building  
 Structural form of building: Grid structure

## III Project overview

- This project is a new 115kV Power station, the scale and basic configuration are as follows (115kV transformer, 115kV and 22kV distribution devices are indoor layout)
- 1.Equipped with a SZ20 20MVA oil-immersed three-phase double-winding transformer with on-load voltage regulation, to achieve GB20052-2020 two level energy efficiency, voltage class 115/22kV.
  - 2.Adopt double circuit inlet line, one is 115kV inlet line, the other is 22kV inlet line, the two are alternate; 22kV inlet line to meet the main equipment electricity; The main wiring form is single bus section wiring, 115kV wire inlet switch adopts 115kV combination electrical gas insulated GIS, 22kV wire inlet switch adopts KYN28 type 22kV switchgear. A capacitive reactive power compensation device is configured on the 22kV side..
  - 3.External (PEA) metering is configured according to the requirements of the local power supply authority to meet its metering requirements; The rest is internal metering, and the multi-function meter is used in the substation.
  - 4.he project supports the construction of harmonic elimination, protection, control, communication, security, intelligent assistance and other systems.
  - 5.The main route from the municipal double-circuit approach line to the Power station is an overhead line, and about 55 meters from the factory gate to the factory are buried cables. The buried cable laying project shall be confirmed with PEA.
  - 6.The station is equipped with a station transformer (shared with the ground transformer to meet the GB20052-2020 level II energy efficiency standard) to meet the needs of low-voltage power load in the station (lighting, public distribution, station working power supply, etc.); For security, fire, integrated system background, medium voltage and high voltage switch operation power supply, lighting power supply, etc., set double power supply.
  - 7.The supporting fire fighting facilities that meet the local design and acceptance standards need to be deepened in the construction drawing design.
  - 8.This design is a scheme, the first deepening and the second drawing need to be deepened by the construction unit and passed the review of the local IETA and other institutions.

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建设单位 CLIENT 金鹭硬质合金(泰国)有限公司 GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.		
项目名称 PROJECT 泰国金鹭硬质合金生产基地二期项目设计 Phase II Project of Thailand Golden Egret Cement Carbide Production Base		
子项名称 BUILDING 降压站 Power station		
图样名称 DRAWING TITLE 电气设计说明 electrical Description		
审定 AUTHORIZED 设计总负责人 DESIGN MANAGER		
审核 APPROVAL		
校对 CHECK 设计负责人 DISCIPLINE LEAD		
设计 DESIGNER		
日期 DATE		
专业: DISCIPLINE	阶段: STAGE	
比例: SCALE 1:100	版次: REVISION A	
图号: DRAWING NO.	7A-SM03	



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GOLDEN EGRET CEMENT CARBIDE (THAILAND) CO., LTD.

泰国金鹭硬质合金生产基地二期项目  
Phase II Project of Thailand Golden Egret Cement Carbide Production Base

降压站 Power station

## 图 样 目 次

### DRAWING LIST

序号 NO.	图 号 DRAWING NO.	图 样 名 称 DRAWING TITLE	张 数 SHEETS	幅 面 SIZE (IN A1)	起 止 页 次 PAGE FROM TO	备 注 REMARKS
1	7A-TM01	图样目次 DRAWING LIST	1	0.125		
2	7A-SM01	建筑设计说明 (中文) Architecture Description (Chinese)	1	1		
3	7A-SM02	建筑设计说明 (英文) Architecture Description (English)	1	1		
4	7A-SM03	电气设计说明 electrical Description	1	1		
5	7A-01	平面图 Building plans	1	1		
6	7A-02	屋面平面图、立面图 Roof plan and elevation	1	1		
7	7A-03	电气设备平面布置图 Electrical equipment layout	1	1		
8	7A-04	立面图 Elevation	1	1		
9	7A-05	剖面图 Section	1	1		
10	7A-06	进线方案系统图 System diagram of incoming line scheme	1	2		
11	7A-07	厂区配电平面图 Power distribution plan	1	1.5		

审 核 APPROVAL		专 业: DISCIPLINE	阶 段: STAGE
校 对 CHECK		图 号: DRAWING NO.	7A-TM01
设计负责人 DISCIPLINE LEAD			
设计 DESIGNER			

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# **Electrical Installation Technology Requirements**

## **1. General provisions**

1.1 This technical specification outlines the functional design, structure, performance, installation, testing, packaging, and transportation requirements for the system/equipment. This document is to be used in conjunction with the construction design drawings to clarify technical requirements that are not explicitly expressed or cannot be identified in the drawings and to formalize key technical points.

1.2 As the general contractor, quality control and progress management of the project involve two aspects:

- First, reviewing the subcontractor's enterprise quality standards for manufacturing and installation, including process cards and quality inspection work forms, as well as project management system documents.
- Second, conducting random inspections to verify that the quality and progress of materials, semi-finished products, and finished products in the installation process meet contract requirements, including design drawings and the "General Technical Requirements."

1.3 The requirements specified in this document represent the minimum technical requirements for contract equipment and do not cover all technical specifications and applicable standards. The subcontractor must provide high-quality products and corresponding services that comply with this attachment and the listed standards. All national mandatory safety and environmental standards must be met.

1.4 The subcontractor must comply with the standards listed in this attachment. In case of any discrepancies, the higher standard shall prevail. The subcontractor must adhere to the latest applicable versions of all regulations, codes, and standards related to equipment design and manufacturing.

1.5 The subcontractor shall provide high-quality equipment that meets this technical

specification and design requirements. In case of conflicts, the higher standard shall apply. The equipment must be mature, reliable, and technologically advanced, and the manufacturer must have proven experience in producing and operating similar capacity units.

1.6 After signing the contract, the main contractor reserves the right to make additional requests and modifications to this specification, and the subcontractor shall undertake to co-operate with them. If modifications are proposed, the specific items and conditions shall be agreed upon by both parties.

1.7 The Subcontractor is solely responsible for the system equipment/materials it procures to provide, and the manufacturer of the products procured must be approved in advance by the Main Contractor.

1.8 These technical specifications, once confirmed by the contracting parties, shall have the same legal effect as the main text of the contract as technical annexes to this contract.

1.9 It is the responsibility of the Subcontractor to co-operate with the Principal Contractor in the design of the Works, including attending engineering and design liaison meetings at the request of the Principal Contractor.

1.10 Matters not covered in this Technical Specification shall be determined by mutual agreement.

## **2. Project Overview**

### 2.1 Project Name:

Jinlu Cemented Carbide (Thailand) Co., Ltd. Thailand Jinlu Cemented Carbide Production Base Phase II 115KV Substation Supporting Project.

### 2.2 Environmental Conditions

The project is located in Chonburi Province, Thailand. The product must meet the environmental conditions of this region: (The product's operating temperature shall not be lower than 45°C. The manufacturer must ensure that the product can operate reliably in the local environmental conditions over the long term).

Altitude < 1000m

Maximum ambient temperature: +45°C

Minimum ambient temperature: -5°C

Maximum daily average relative humidity: 95%

Maximum monthly average relative humidity: 90%

### **3. Scope of Subcontracting Work**

#### **3.1 Electrical Engineering Scope**

The scope of the power system engineering for this step-down substation includes the procurement, manufacturing, assembly, packaging, transportation, insurance, unloading, on-site installation, maintenance, testing, commissioning, coordination, official power transmission, technical training, trial operation, project acceptance, and warranty period services. The subcontractor is fully responsible for the functionality, usability, and completeness of the contracted scope. This is a turnkey project, including planning, design, implementation, and acceptance.

#### **3.2 Project Interfaces**

The project covers all power-related work from the municipal power towers/poles to the 22kV outgoing switchgear of the substation, including but not limited to:

3.2.1 The conventional power supply system, covering the 115kV incoming line, 22kV switchgear, external power lines, GIS equipment, main transformer, capacitor compensation devices, auxiliary power systems, grounding transformers, arc suppression coils, AC/DC power supply panels, and all related facilities.

3.2.2 The 22kV power system, covering the installation of the 22kV incoming line, 22kV switchgear, external power lines, and all necessary electrical equipment.

3.2.3 Secondary equipment in the substation, including monitoring panels, smart meters, metering and protection devices, fault recording systems, power quality monitoring, AC/DC integrated devices, intelligent mimic panels, operational consoles, and communication systems.

3.2.4 Power monitoring systems, including procurement, integration, and commissioning of monitoring computers, software, network devices, servers, large display screens, and security assessment to ensure compliance with power bureau acceptance requirements.

3.2.5 Dispatch and communication automation, covering data exchange with the local power

grid's dispatching system, procurement and installation of required devices, and ensuring compliance with local grid communication standards. The subcontractor is responsible for communication network access fees.

3.2.6 Intelligent auxiliary control systems, including video surveillance, environmental monitoring, SF6 gas alarm system, access control, and other security systems.

3.2.7 Procurement and installation of all necessary electrical and signal cables, cable trays, conduits, and related supports.

3.2.8 Testing and commissioning of all primary and secondary equipment in the substation to ensure smooth operation.

3.2.9 Configuration and commissioning of the 115kV and 22kV system protection settings.

3.2.10 Handling of all necessary approvals and procedures with the power supply bureau to ensure compliance with regulations and completion of the project.

3.2.11 Design and implementation of grounding, lightning protection, lighting, emergency lighting, sockets, and low-voltage power distribution facilities.

3.2.12 The subcontractor must specify manufacturers for all equipment and materials in the bid stage and ensure accurate estimates of material quantities. Any omissions in the quotation will not be compensated separately.

3.2.13 The subcontractor must procure high-quality equipment and materials from reputable manufacturers. Certain specified equipment must come from suppliers approved by the general contractor. All other equipment must be from well-known domestic brands and require written approval from both the owner and general contractor before procurement.

3.2.14 Upon arrival at the site, the subcontractor is responsible for unloading and inspecting the equipment jointly with designated personnel. The equipment will be recorded and stored after approval.

3.2.15 The subcontractor must provide valid manufacturer certificates, compliance documents, and test reports to verify authenticity. Cables and wires must be accompanied by copper material composition reports.

3.2.16 The subcontractor is responsible for all system tests, anti-corrosion treatments, color coding, and system markings for proper identification and operation.

3.2.17 Electrical instruments must be inspected by a recognized quality inspection agency

before installation. Inspection fees will be borne by the subcontractor.

3.2.18 Any additional work necessary to complete the project is considered included in the contract price.

3.2.19 The subcontractor is regarded as an experienced contractor and is responsible for foreseeing any necessary technical details not explicitly mentioned but essential for a complete system. If any required materials or components are missing from the quotation, the subcontractor must provide them at no additional cost. The subcontractor must also correct any obvious errors in the technical documents upon confirmation by the general contractor. Construction drawings must comply with relevant codes and local regulations.

### 3.2.20 Other Unspecified Work Included in the Project

All costs incurred in this project are already included in the contract price.

The subcontractor is regarded as an experienced contractor and should be able to anticipate requirements and technical details that may not be explicitly described in the technical documents but are inherently necessary for a reliable and complete system.

For components and auxiliary materials essential for the operation of the entire equipment system and construction, even if they are not listed in the quotation or if quantities are insufficient, the subcontractor must provide them at no additional cost when executing the contract.

Additionally, any obvious errors in the technical documents must be identified and pointed out by the subcontractor and corrected upon confirmation by the general contractor's representative.

All construction drawings provided by the subcontractor must comply with the relevant standards and local regulations.

## **4. Technical Requirements**

### 4.1 General Requirements

4.1.1 During design and construction, the following must be observed:

All applicable laws, regulations, rules, decrees, and ordinances of China and the project location.

These include but are not limited to the following aspects:

✧ Electrical design and construction specifications

- ✧ Occupational safety and health
- ✧ Environmental protection
- ✧ Fire prevention

4.1.2 Construction must strictly follow the requirements of the construction drawings.

4.1.3 Construction and inspection must comply with relevant national standards.

#### 4.2 Construction Basis

- ✧ Construction technical requirements
- ✧ Construction drawings
- ✧ Relevant national standards
- ✧ Construction must strictly follow the drawings, design documents, and the following relevant standards and specifications (but not limited to), to ensure engineering quality and be subject to supervision and inspection by the general contractor at any time.

<b>NO.</b>	<b>Standard Name</b>	<b>Standard Code</b>
1	Unified Standard for Construction Quality Acceptance of Building Engineering	GB50300
2	Code for Construction and Acceptance of Electrical Installation Engineering for High-Voltage Electrical Appliances	GB50147
3	Code for Construction and Acceptance of Electrical Installation Engineering for Power Transformers, Oil-Immersed Reactors, and Current Transformers	GB50148
4	Code for Construction and Acceptance of Electrical Installation Engineering for Busbar Installations	GB50149
5	Code for Construction and Acceptance of 110-500kV Overhead Power Line Engineering	GB50233
6	Standard for Electrical Equipment Hand-Over Testing of Electrical Installation Engineering	GB50150
7	Code for Construction and Acceptance of Electrical Installation	GB50168

	Engineering for Cable Lines	
8	Code for Construction and Acceptance of Electrical Installation Engineering for Grounding Devices	GB50169
9	Code for Construction and Acceptance of Electrical Installation Engineering for Rotating Electrical Machines	GB50170
10	Code for Construction and Acceptance of Electrical Installation Engineering for Panels, Cabinets, and Secondary Circuit Wiring	GB50171
11	Code for Construction and Acceptance of Electrical Installation Engineering for Storage Batteries	GB50172
12	On-Site Hand-Over Testing Procedures for Gas-Insulated Metal-Enclosed Switchgear	DL/T 618
13	Code for Construction and Acceptance of Electrical Installation Engineering for Low-Voltage Electrical Equipment	GB50254
14	Code for Construction and Acceptance of Electrical Installation Engineering for Power Conversion Equipment	GB50255
15	Code for Construction and Acceptance of Electrical Installation Engineering for Crane Electrical Installations	GB50256
16	Code for Construction and Acceptance of Electrical Installations in Explosive and Fire Hazardous Environments	GB50257
17	Standard for Supervision of Power Construction Engineering	DL/T 5434
18	Code for Construction Quality Acceptance of Building Electrical Installation Engineering	GB50303
19	General Technical Conditions for Relay Protection Cabinets and Panels in Power Systems	DL/T720
20	Operation and Maintenance Technical Regulations for DC Power Supply Devices Using Storage Batteries in Power Systems	DL/T724
21	Construction Procedures for Power Line Crossing Overhead Lines	DL5106
22	Selection, Installation, Acceptance, and Operation Procedures for Surge Protectors of Electrical Supply Systems in Buildings	CECS 174

23	Design Specification for Power Engineering Cables	GB50217
24	Design Specification for Relay Protection and Automatic Devices of Power Installations	GB/T 50062

**Note:** In case of any discrepancies or errors, the approved design documents and current national standards shall prevail.

#### 4.3 Construction Requirements

4.3.1 Construction must strictly comply with the latest national construction, testing, commissioning, and acceptance specifications.

4.3.2 To ensure engineering quality, upon arrival of major equipment and materials at the construction site, the contractor must immediately notify the owner and the general contractor for on-site inspection and provide factory certification documents and quality assurance certificates.

4.3.3 The original factory shipment list must be attached for verification by the general contractor. Copper cables and wires must be accompanied by a material report.

4.3.4 If the purchased equipment and materials differ from the drawings or technical requirements, the subcontractor must submit a "Technical Deviation Table" and obtain the general contractor's signed approval.

4.3.5 The phase sequence color coding must strictly follow the specified standards.

4.3.6 Electrical equipment color coding must comply with the following table:

Component	Color	Remarks
Busbar	Gray	-
Distribution Cabinets	Light Gray RAL7035	-
Distribution Cabinets (Warning Colors)	Yellow or Red	Background color
Text Color	Black	-
Cable Ladder Rack	Galvanized Material or White Aluminum RAL9006	-
Various Cables	Black RAL9005	-



Cable Conduits	Light Gray	-
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The specific requirements for color-coded rings and types of primer/finish paint must be determined in consultation with the owner on-site.

4.3.7 Flexible metal conduits must be connected to steel pipes, cable trays, or equipment using specialized connectors. Threaded connections must be used for steel conduits connected to cable trays and distribution boxes, with inner and outer locknuts installed.

4.3.8 Strong and weak electrical circuits in the cable tray must be separated by partitions. Wire conduits must have protective sleeves at the exit points.

4.3.9 Electrical insulation failure that may cause a live circuit must be properly grounded. This applies to electrical enclosures, frames of cabinets, consoles, wiring steel pipes, and metal cable trays. Flexible metal conduits and metallic cable sheaths must not be used as grounding conductors.

4.3.10 Cable terminations must be sealed with specialized heat-shrink tubing; dry-wrapped cable heads are not allowed.

4.3.11 All cables must be continuous without intermediate splicing. The cable sheath must have manufacturer name, model, and cable length printed at specified intervals.

4.3.12 Upon completion of cable installation, permanent cable identification tags must be attached to both ends, indicating the model, starting point, and endpoint. The tags must be printed.

4.3.14 During construction, close coordination with civil and other disciplines is required.

4.3.15 After construction is complete, visual labeling must be applied to transformers, GIS equipment, switchgear, distribution boxes, and cabinets. The labeling should include equipment numbers, circuit numbers, and areas controlled by each circuit breaker, along with system diagrams for ease of operation. Measures must also be taken for dust and rodent prevention.

4.3.16 After cable installation, appropriate permanent cable identification tags must be attached to both ends, indicating model, starting point, and endpoint.

#### 4.4 Equipment Technical Specifications

Refer to the attached documents.

These technical specifications serve as the basic functional requirements for the equipment,

systems, and materials provided by the subcontractor. The subcontractor must fully comply with these specifications and procure equipment and main materials with a full understanding of the general contractor's requirements.

Before being put into use, all equipment and materials must be inspected, and the general contractor must be provided with compliance certificates, permits, test reports, and other material certification documents.

End of Document

# 电力安装技术要求

## 1. 总则

1.1 本技术要求提出了该系统/设备的功能设计、结构、性能、安装和试验及包装，运输等方面的技术要求。本文与施工设计图纸一起使用，目的是将图纸不能明确表达或无法识别的技术要求阐述清楚并将技术要点文件化。

1.2 作为总包商，对工程项目的质量控制和进度控制包括两个方面，即：首先审查分包商在制造、安装方面的企业质量标准体系文件（含工艺卡、质量检查的作业表格）和项目管理体系文件；其次抽查工程安装过程中的材料、半成品、成品的质量和进度是否满足合同要求，包括设计图纸及《一般技术要求》的要求。

1.3 本技术要求提出的是对合同设备最低限度的技术要求，并未规定所有的技术要求和适用的标准，分包方提供满足本附件和所列标准要求的高质量产品及其相应服务。对国家有关安全、环保等强制性标准，必须满足其要求。

1.4 分包方须执行本附件所列标准。有矛盾时，按较高标准执行。分包方在设备设计和制造中所涉及的各项规程、规范和标准必须遵循现行最新版本的标准。

1.5 分包方按照本技术要求及设计要求提供高质量的设备，有矛盾时，按较高标准执行。这些设备是成熟可靠、技术先进的产品，且制造厂已有相同容量机组合同设备制造、运行的成功经验。

1.6 在签定合同之后，总包方保留对本规范书提出补充要求和修改的权利，分包方应承诺予以配合。如提出修改，具体项目和条件由双方商定。

1.7 分包方对其采购提供的系统设备/材料负有全责，采购的产品制造商必须事先征得总包方的认可。

1.8 本技术规范经合同双方确认后，作为本合同的技术附件与合同正文具有同等法律效力。

1.9 分包方有责任配合总包方进行工程设计，包括应总包方要求参加工程及设计联络会。

1.10 本技术规范书未尽事宜，双方协商确定。

## 2. 工程概况

### 2.1 工程名称:

金鹭硬质合金(泰国)有限公司泰国金鹭硬质合金生产基地二期项目配套 115KV 降压站工程。

### 2.2 环境条件

本次产品使用在泰国春武里府,产品应满足该区域的环境条件:(其中产品使用环境温度不低于 45℃,生产厂家须能保证其产品能在当地环境条件下长期可靠运行)。

海拔<1000m

最高环境温度: +45℃

最低环境气温: -5℃

最大日平均相对湿度: 95%

最大月平均相对湿度: 90%

## 3. 工程分包内容

### 3.1 电力工程内容

本降压站配套电力系统工程的设备、材料的采购、加工制造、装配、包装、运输、保险、卸货、现场安装、修补维护、检测、调试,所有检测、所有协调工作、正式送电、技术培训、试生产、工程有关验收工作和质保期服务,并对其承包内容的功能性、使用性、完整性负全责验收,为总承包交钥匙工程,包括规划、设计、实施及验收交付的所有内容。

### 3.2 工程界面:

自市政塔架/电杆至本站 22kV 出线柜的所有电力相关内容, 包含市政引入及整个降压站电力系统安装工程, 包括但不限于:

3.2.1 常规电源部分: 从政电力塔架起引下 115kV 线路至 22kV 开关柜出线桩头, 包含外部引入线路及设施、站内 GIS 设备、主变压器、22kV 中置柜、22kV 电容补偿装置、站用电+接地变压器、消弧线圈接地装置、交直流屏等所有电力设施。

3.2.2 22kV 电源部分: 从 22kV 电力塔架/电杆 至 22kV 开关柜出线桩头, 包含外部引入线路及设施、站内 22kV 中置柜设备、主变压器、22kV 中置柜、交直流屏等所有电力设施。

- 3.2.3 降压站二次设备部分：站内测控屏、智能仪表、计量装置、保护装置、故障录波装置、电能质量检测装置、交直流一体化装置、保护盘柜、智能化模拟屏、操作控制台、通信工程设备/盘柜等购置、安装调试。
- 3.2.4 电力监控部分：监控计算机、监控软件、网络设备、服务器（含配套软件）、监控大屏、微机五防系统等购置和集成、调试，包含提供该监控系统的等保测评工程，并提供系统测评报告通过供电局审查验收。
- 3.2.5 调度及通信自动化部分：与当地电网公司调度系统数据通讯的远动、保信及电能计量等BYD用户侧设备购置、安装、调试。包含与当地电网地方调度段自动化工程配合的相关费用。通信设备选型应符合当地供电公司现有通信并网要求，以满足通信网络的互联互通与管理。115千伏用户变接入电网，需要占用当地电网调度通信网络带宽资源，并在上级电站配置光接口板、数据网接口板设备，接口设备费通信网络带宽资源占用收费均由分包方负责。
- 3.2.6 智能辅助控制系统：系统包括站内图像监视及安全警卫子系统、环境监测子系统、SF6气体报警系统、一匙通系统、视频监控系统等。
- 3.2.7 线缆、桥架：设备互联互通所需强弱电线缆、桥架、线缆支吊架、线管的购置和敷设安装。
- 3.2.8 试验及投运：降压站整体一二次设备的交接试验、通电投运。
- 3.2.9 115kV、22kV系统综保整定值及系统调试；
- 3.2.10 供电手续办理：与电网公司供电部门对接，完成降压站施工及投运的全套手续办理及相关费用缴纳。
- 3.2.11 分包方负责本站配套的防雷接地、照明、应急照明、插座、低压配电等设施及线路的设计、实施。
- 3.2.13 分包方在报价阶段，须注明所采用的设备材料具体厂家。并应对本工程的设备材料及工程量有准确预估，报价清单中工程内容如有遗漏或设备材料数量不足的情况，且分包方在报价阶段也未提出异议的，总包方对其不予追加费用。
- 3.2.14 分包方采购的设备材料应为知名厂商的优质产品，为保证工程质量，所采用的部分设备和材料必须采用发包方认可的附件中的供应商。未提及的材料和设备其生产厂家及品牌也应采用国内知名品牌，采购前须征得业主方及发包方的书面同意。

3.2.15 所有设备和材料到现场后，由分包方负责卸货，双方指定人员共同验货，并填写验货记录，双方签字认可后由分包方负责放入仓库，登记保管。

3.2.16 对于本工程的主要设备和材料，为了保证产品不被假冒，请分包方提供相关厂家产品的有效证明、合格证和检验证书，并附原厂有效发货清单，以便发包方复核。电缆、电线应提供铜材材质报告。

3.2.17 附图所有系统的试验、防腐和色标涂刷以及系统检测、验收工作均由分包方负责。

3.2.18 本工程的所有支架均需进行防腐处理；按相序色标标准使用相应颜色的导线；在施工完成后，需在配电箱、柜标注系统图、回路编号、回路去向等电气信息，需做电缆、母线标志牌，注明电缆回路、起点、终点等，变电所做系统标志图。方便人员有针对性的操作。

3.2.19 所有电气仪表由分包方送到需方认可的技术质量检验部门检验并取得合格证后方可安装，检验费用由分包方承担（检测次数根据当地电力部门确定）。

3.2.20 其他包含在本工程中的未尽内容。

**本工程所发生的全部相关费用已含在合同价中。**

分包方被视为有丰富工程经验的承包商，应能够预知需求及技术文件中未有描述，但隐含于一个可靠、完善之系统所必须之技术细节。对于属于整套设备运行和施工所必需的部件及辅材，即使报价清单未列出和 / 或数目不足，分包方仍须在执行合同时补足而不增加费用。并应对技术文件中明显的错误及时指出，得到发包方代表的确认后纠正。分包方提供的施工图均需按照相关规范和当地的规定执行。

## **4. 技术要求**

### 4.1 总体要求

#### 4.1.1 设计和施工时应遵守：

所有适用的中国和项目所在地区的法规、规定、规章、法令和条例。这些包括但不限于下列细目：

- ✧ 电气相关设计，施工规范
- ✧ 职业安全、健康
- ✧ 环境保护
- ✧ 火灾预防

4.1.2 严格按照施工图纸要求施工。

4.1.3 严格按照国家相关标准施工、检验。

#### 4.2 施工依据

◇ 施工技术要求。

◇ 施工图纸。

◇ 相关的国家标准。

◇ 施工应严格按图纸、设计文件及以下相关标准、规范(但不限于)，组织制造、安装，确保工程质量，并随时接受总包方的监督和检查。

1	建筑工程施工质量验收统一标准	GB50300
2	电气装置安装工程高压电器施工及验收规范	GB50147
3	电气装置安装工程 电力变压器、油浸电抗器、互感器施工及验收规范	GB 50148
4	电气装置安装工程 母线装置施工及验收规范	GB 50149
5	110~500KV 架空电力线路施工及验收规范	GB50233
6	电气装置安装工程电气设备交接试验标准	GB50150
7	电气装置安装工程电缆线路施工及验收规范	GB50168
8	电气装置安装工程接地装置施工及验收规范	GB50169
9	电气装置安装工程旋转电机施工及验收规范	GB50170
10	电气装置安装工程盘柜及二次回路结线施工及验收规范	GB50171
11	电气装置安装工程蓄电池施工及验收规范	GB50172
12	气体绝缘金属封闭开关设备现场交接试验规程	DLT 618
13	电气装置安装工程低压电器施工及验收规范	GB50254
14	电气装置安装工程电力变流设备施工及验收规范	GB50255
15	电气装置安装工程起重机电气装置施工及验收规范	GB50256
16	电气装置安装工程爆炸和火灾危险环境电气装置施工及验收规范	GB50257
17	电力建设工程监理规范	DL/T 5434

18	建筑电气安装工程施工质量验收规范	GB50303
19	电力系统继电保护柜、屏通用技术条件	DL/T720
20	电力系统用蓄电池直流电源装置运行与维护技术规程	DL/T724
21	跨越电力线路架线施工规程	DL5106
22	建筑物电压电源电涌保护器选用、安装、验收和运行规程	CECS 174
23	电力工程电缆设计规范	GB50217
24	电力装置的继电保护和自动装置设计规范	GB/T 50062

注：以上如有不足和错误以批准的设计文件和现行国家规范为准。

#### 4.3 施工要求

4.3.1 施工应严格执行国家最新的施工、试验、试运行及验收规范。

4.3.2 为了保证工程质量，该工程的主要设备材料进入施工现场应立即通知业主及发包方到现场验货，并应提供出厂合格证明文件及质保函。

4.3.3 为了保证工程质量，该工程的主要设备材料进入施工现场应立即通知业主及发包方到现场验货，并应提供出厂合格证明文件及质保函。并附原厂有效发货清单，以便发包方复核。电缆、电线应提供铜材的材质报告。

4.3.4 分包商在采购相关设备材料时，如与图纸或本技术要求有出入，需出具《技术偏离表》并征得发包方签字认可。

4.3.5 严格按相序色标标准使用相应颜色的导线。

4.3.6 电气设施的颜色标准按下表要求：

**以下要求均为暂定，需得到业主确认后方可实施。**

	标识物	颜色	备注
●	母线	灰色	
●	各类配电柜	米灰 RAL7035	
●	配电柜		



	标识物	颜色	备注
	警戒色		
	底色	黄色或红色	
	字体色	黑色	
●	电缆梯架	镀锌材料或 白铝色 RAL9006	
●	各类电缆	黑色 RAL9005	
●	电缆管道	浅灰	

色标色环的具体要求和底漆面漆的种类须现场与业主协商后再确定。

4.3.7 金属软管与钢管、桥架或设备连接应用软管专用接头连接；穿线钢管与电缆桥架及配电箱柜的连接采用丝扣连接，需要配置内外锁紧螺母。

4.3.8 强电线路和弱电线路在桥架中应用隔板分开，穿管导线在出口处应装护线套。

4.3.9 电气绝缘损坏而可能带电的电器装置或机械设备均应保护接地，如电器外壳和底座、电气柜、台、箱的框架、穿线钢管、金属桥架等，不得使用金属软管、电缆的金属护层作接地线。

4.3.10 电缆终端需要用专用热缩套管进行封装，不允许做干包电缆头。

4.3.11 所有的电缆为整条过，不允许中间有接头。电缆的外表面在规定长度范围内应印有制造厂商名称、电缆规格型号、电缆长度的标志。

4.3.12 所有电缆敷设完毕后要在电缆的两端挂永久性电缆标识牌，注明其型号、起点及终点，电缆牌需要打印版。

4.3.14 施工过程中应与土建及其它专业密切配合。

4.3.15 施工完成后，需对变压器、GIS 设备、开关柜、配电箱、配电柜、检修箱等进行目视化标注，标注设备、箱、柜的编号及名称，各回路编号及用途（各开关回路控制的区域或设备）等电气信息，同时贴上系统图，以便于操作，另外还必须做好防尘、防鼠的措施。

4.3.16 电缆安装完成后，在电缆的两端挂相应的永久性电缆标识牌，注明其型号、起点、终点。

#### 4.4 设备技术规范

**另见附件。**

以上作为附件内容的技术规范作为总包方对于乙供设备/系统/材料的基本功能性要求，分包方应能完全满足相关技术规范要求，并应在充分理解总包方规范要求意图下进行设备/主材等的采购工作。

设备/材料在进场前必须向总包上报材料的合格证、准用证、试验报告等材质证明资料，否则不得投入使用。

下无正文。

# **technical specification**

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## I. General part

### 1 General

#### 1.1 General provisions

1.1.1 This technical specification applies to the main transformer, planned for centralized procurement, with a specification of 20 MVA and a voltage level of 115/22 kV. The technical specification includes technical requirements for the functional design, structure, performance, installation and testing of the main transformer and the neutral point equipment.

Bidders are required to quote in accordance with each specification of the main transformer, for the bidder has non-common specifications of the above procurement needs, the shortlisted suppliers should be based on the actual needs of the project to provide the bidder with the required specifications of the equipment, and the price shall not be higher than the required specifications on the adjacent specifications of the equipment of the winning bid price.

The specific project information and technical specification details corresponding to each specification of main transformer will be clarified when the contract is signed.

1.1.2 Bidders are required to read carefully all the terms and conditions set out in this Technical Specification (General and Special Part). The transformer body and its accessories supplied by the bidder shall comply with the requirements specified in this technical specification, and the bidder may also recommend similar stereotyped products complying with the requirements of this technical specification, provided that detailed technical deviations are provided.

1.1.3 This technical specification sets out the technical requirements for the technical parameters, performance, structure and testing of the transformer body and its accessories. The requirements for the transformer transport profile limiting dimensions meet the requirements of the specification.

**1.1.4** This technical specification puts forward the minimum technical requirements, and does not stipulate all the technical details, nor does it fully cite the provisions of the relevant standards and norms, and the bidder shall provide brand-new products that comply with the latest version of the standards and technical requirements of the standards cited in this technical specification, and if there is inconsistency between the standards cited or if the standards used in this technical specification are inconsistent with the standards implemented by the bidder. If there is any inconsistency between the standards cited or the standards used in this technical specification are inconsistent with the standards executed by the bidder, the standards shall be executed in accordance with the standards with higher requirements.

**1.1.5** If the bidder does not submit in writing a discrepancy to the provisions of this technical specification, it means that the equipment supplied by the bidder fully complies with the requirements of this technical specification. If there is any inconsistency with the requirements of this specification, it must be listed in the "table of technical differences" item by item.

**1.1.6** These technical specifications shall be attached to the ordering contract and shall have the same legal effect as the contract. Matters not covered in these technical specifications shall be determined by the contracting parties during the contract negotiation.

**1.1.7** Where there is a contradiction between the commercial aspects of these specifications and the commercial part of the technical specifications, the commercial part shall prevail.

**1.1.8** In the event of a conflict between the provisions of the general part of these technical specifications and the special part of the technical specifications, the special part shall prevail.

**1.1.9** Bidders are required to have a track record of similar projects in Thailand and a good understanding of local standards;

**1.1.10** Bidding products need to meet the local power grid and the region's relevant certification, with local or power industry access conditions; and provide supporting materials

1.1.11 This technical condition, only provides general technical requirements, for local special requirements, the bidder should be fully aware of, and indicate in the tender.

1.1.12 The bidder will be required to provide guidance for on-site installation, the cost of which is included in the bid price.

## 1.2 Scope of work

This technical specification applies only to the equipment listed in the scope of supply of the special part of the technical specification. It includes technical requirements on functional design, structure, performance, installation and testing of the transformer body and its accessories, as well as supply and on-site technical services. Provide all the test reports of this product and the supporting products.

## 1.3 Requirements for design drawings, specifications and test reports

### 1.3.1 Drawings required for transformers

(1) Transformer main components and accessories diagram.

(2) External dimensions drawings: the drawings shall indicate all the required number of accessories, catalogue number, ratings and models and other technical data, transport dimensions and quality, total weight of the assembly and the amount of oil, it should also indicate the centre of gravity of the transformer after the transformer is ready for transport, the location of the oil storage cabinets, the dimensions of the electrically charged parts of the air with the air clearances from the neighbouring grounding body.

The drawings shall indicate the dimensions and positions of all parts and accessories, as well as the height of the space required for dismantling the high and medium pressure casing, the lifting height of the upper section of the tank, the



position of the lifting tops and towing lugs, and the dimensions and positions of the flanges of the valves.

Drawings shall indicate transformer base and foundation bolt size and location.

(3) casing and its terminal diagrams: drawings should include casing type, casing structure within the anatomical details, terminal details, fixed flange and umbrella details, casing the top of the safety bearing force, the top of the destructive force and creepage distance and dry arc distance should be given.

(4) Nameplate diagrams: should be in line with relevant national standards.

(5) Schematic diagram of the transformer body: positional arrangement of the windings and their connection to the bushings and the on-load tap-changer, including a description of the lead connection assembly.

(6) Lifting diagram of the upper section tank: indicate the lifting weight, lifting height and arrangement of slings and lifting points.

7) Cross-section drawing of casing raised seat with dimensions noted: flanges, current transformer seats, etc. shall be shown.

(8) Dimensional drawings of all supplied accessories: including bushings, gas relays, pressure relief devices, disc thermometers and winding thermometers, current transformers and raised seats, coolers (radiators) with oil pumps and fan motors.

9) Assembly drawing of the on-load tap-changer and transformer temperature controller.

(10) Assembly drawings of control cabinets used for tap changers, transformer cooling devices and transformer group control.

(11) Expanded diagrams and wiring diagrams: including wiring schematics of AC and DC circuits required for metering, protection, control, alarm, lighting and power.

The schematic wiring diagram of the Cooling System shall include a description of the principle of automatic switching to the standby power supply in the event of failure of one of the power sources.

The schematic wiring diagram shall indicate the terminals of the transformer control cabinet and all transformer accessories, such as current transformers, alarm devices, fan motors, etc., and the markings of the terminal blocks where these devices

are wired to the transformer and where the user's cables are connected.

Devices located inside the control cabinet shall be shown on the connection wiring diagram in a manner close to their actual location. Devices located outside the control cabinet, e.g. current transformers, shall be located on the diagram in such a way that their lead wires to the terminals can be briefly labelled, and at least a certain amount of space shall be left between the terminals on the terminal block for the tenderer's use in adding cable connections to the terminal block.

(12) Other drawings and information required for the installation, operation, maintenance and design of the transformer and related facilities.

(13) Including all technical data such as secondary resistance, magnetic flux density at the inflection point, core cross-section and average core length of the cased current transformer, and excitation curve diagram of the cased current transformer.

(14) Arrangement drawing of core earthing sleeve, detail drawing of neutral earthing sleeve lead support: including pillar insulator, supporting steel structure arrangement, earthing conductor and steel structure detail drawing.

(15) Disassembly diagrams: casing removal method, core lifting ring position, core and winding removal method.

### **1.3.2 Product specifications**

#### **1.3.2.1 Installation instructions.**

#### **1.3.2.2 Product specifications shall also include the following:**

1) An overview and sketch of the structure, connections and core and winding type, etc.

(2) Drawings and installation and maintenance instructions for relevant parts and accessories of the transformer, e.g. bushings, radiators (coolers), bushing type current transformers, regulator switches, and all protective and measuring devices.

3) Maintenance instructions for the on-load tap-changer with detailed drawings.

4) Transformer excitation characteristic curve.

(5) Provide the same type, similar capacity transformer to withstand the short-circuit capacity of the calculations and the factory has done the largest capacity transformer to withstand the short-circuit capacity test report.

(6) List of special tools and instruments for transformers, special instructions, samples and manuals.

7) A statement of special needs.

### **1.3.3 Test reports**

1.3.3.1 All transformer test reports, including routine, type and special test reports.

**1.3.3.2** Routine and type test reports for major components [including bushings, radiators (coolers), on-load tap-changers, cased current transformers, gas relays, pressure releases, various thermometers, etc.].

**1.3.3.3** Inspection reports for major materials such as silicon steel sheets, oil, various types of conductors, insulating cardboard, etc.

**1.3.4** The seller's information shall be submitted in a timely and sufficient manner to meet the requirements of the project progress. After signing the agreement, provide the basic information (including electronic files) within 5 days to meet the requirements of providing engineering design and the basic design of the design institute; the seller shall provide the final design documents of the above documents within 5 working days after receiving the feedback from the design institute. Within 15 days after signing the contract to give all the technical information, provide detailed base drawings and other matching design information and delivery progress list, and confirmed by the buyer.

## **1.4 Standards and norms**

**1.4.1** Contract equipment, including all accessories and equipment purchased by the bidder from other vendors, as specified in the relevant standards, specifications or guidelines, shall conform to the requirements of those standards, specifications or guidelines.

**1.4.2** The provisions of the standards listed in Table 1 become the provisions of these technical specifications by reference to these technical specifications, and all subsequent change orders (excluding errata) or revisions of dated referenced standards

do not apply to these technical specifications. Where a cited document is not dated, the latest version applies to these Technical Specifications.

standard number	Name of standard
GB 1094.1	Power transformers Part 1 General provisions
GB 1094.2	Power transformers Part 2 Temperature rise
GB 1094.3	Power transformers Part 3 Insulation levels, insulation tests and air gaps for external insulation
GB 1094.4	Power transformers Part 4 Guidelines for lightning strike and operational shock testing of power transformers and reactors
GB 1094.5	Power transformers Part 5 Capability to withstand short circuits
GB/T 1094.10	Power transformers Part 10 Determination of sound levels
GB 311.1	Insulation fit of high-voltage transmission and substation equipment
GB 1208	current transformer
GB 2536	transformer oil
GB 5273	Terminals for transformers, high-voltage appliances and bushings
GB 2900.15	Electrical terminology Transformers, transformers, voltage regulators and reactors
GB 10230.1	Tap changers Part 1 Performance requirements and test methods
GB 10230.2	Tap changers Part 2: Application guidelines
GB 16847	Technical requirements for transient characteristics of current transformers for protection purposes
GB 50150	Electrical installation engineering electrical equipment handover test standard
GB/T 4109	Insulation sleeves for AC voltages above 1000V
GB/T 4585	Artificial filth test of high voltage insulators for a.c. systems
GB/T 5582	High-voltage power equipment external insulation filth level
GB/T 7252	Guidelines for Analysis and Judgement of Dissolved Gases in Transformer Oil
GB/T 7295	Transformer oil quality standards in operation
GB/T 7354	Partial Discharge Measurement
GB/T 13499	Power Transformer Application Guidelines
GB 13027	Oil-paper capacitor transformer casing form and size
GB/T 15164	Oil-immersed Power Transformer Load Guidelines
GB/T 6451	Oil-immersed power transformer technical parameters and requirements
GB 16434	Classification of high-voltage overhead lines and power plants and substations with respect to environmental pollution areas and selection criteria for external insulation
GB 16927.1	High Voltage Test Techniques Part I: General Test Requirements
GB 16927.2	High Voltage Testing Techniques Part II: Measurement Systems
GB 13499	Power Transformer Application Guidelines
GB/T 17468	Power Transformer Selection Guidelines
GB 148	Code of practice for the construction and acceptance of power transformers, oil-immersed reactors and transformers for electrical installation works
GB20052	Power transformer energy efficiency limit values and energy efficiency class
DL/T 572	Power Transformer Operation Regulations
DL/T 596	Preventive Test Regulations for Electric Power Equipment

DL 911	Frequency response analysis method for power transformer winding deformation
DL 1093	Judgement Guidelines for Detecting Deformation of Power Transformer Windings by the Capacitance Method
DL 1094	Insulating oil selection guide for power transformers
JB/T 3837	Transformer type product numbering method
Q/GDW 152	Power system contamination area grading and external insulation selection criteria
GB 20052-2020	Power transformer energy efficiency limit values and energy efficiency class
The following are referenced IEC standards, but are not limited to them:	
IEC60815.1-2008	Selection and sizing of high-voltage insulators for use in dirty conditions Part I: Definitions, information and general principles
IEC60815.2-2008	Selection and sizing of high-voltage insulators for use in dirty conditions Part II: Ceramic and glass insulators for a.c. systems

**1.4.3** All bolts, double-ended bolts, threads, pipe threads, bolt heads and nuts shall comply with ISO and SI metric standards.

**1.4.4** When there are differences between standards and norms, the more demanding indicator shall be implemented.

## 1.5 Technical data and information to be provided at the time of bidding

**1.5.1** The bidder shall provide technical data item by item according to the items listed in Tables 1 to 4 (Technical Parameters Response Table) of the special part of the technical specifications, and the technical data provided shall be guaranteed data, which will be used as part of the contract. If there is any discrepancy with the technical data required by the bidders in Tables 1 to 4, it shall also be included in Table 11 (Table of technical deviations) of the special part of the technical specifications.

### **1.5.2** Test reports

Test reports to be provided, as detailed in the table below.

All transformer test reports, including routine, type, special, and factory test reports.

Routine and type test reports for major components (including bushings, heat sinks, on-load tap-changers, cased current transformers, gas relays, pressure reliefs, various thermometers, etc.).

Inspection reports on major materials, such as silicon steel sheets, oil, various types of wires, insulating cardboard, etc.

Content	number of copies	Delivery time	receiving unit
Component testing (1) Transformer oil test report (2) Routine and type test reports for on-load tap-changers (3) Casing routine test, type test report and oil chromatography analysis report (4) All kinds of relay routine test and type test report (5) Thermometer routine test and type test report (6) Pressure relief device routine test and type test report (7) Current transformer routine and type test report (8) Radiator routine test and type test report (9) Silicon steel sheet inspection report (10) Conductor test report (11) Routine and type test reports for other parts and components Transformer routine test report Transformer type test and special test report (including short-circuit withstand capacity test report)		See dedicated section of the technical specification	

## 1.6 Spare parts

**1.6.1** The Bidder shall provide spare parts necessary for the installation, the price of which shall be included in the total bid price.

**1.6.2** The Bidder proposes the spare parts necessary for operation and maintenance, see Table 6 of the Special Part of the Technical Specification.

**1.6.3** Spare parts recommended by the Bidder, see Table 9 of the Specialised Section of the Technical Specification.

**1.6.4** All spare parts shall be brand-new products, interchangeable with the corresponding parts of the installed equipment, with the same technical specifications and the same specifications, materials and manufacturing processes.

**1.6.5** All spare parts shall be protected against dust, moisture, damage and other measures, and shall be shipped together with the main equipment, and labelled "spare parts" to distinguish them from the parts used for the installation of the body.

**1.6.6** The Bidder shall have a lifetime warranty on the product and shall provide parts and materials other than the spare parts listed in Table 6 of the Special Part of the Technical Specification for repair and replacement within 15 days of notification from the Owner, as required.

## 1.7 Specialised tools and instrumentation

**1.7.1** The Bidder shall provide special tools and instrumentation necessary for the installation, the price of which shall be included in the total bid price.

**1.7.2** The Bidder proposes specialised tools and instrumentation necessary for operation and maintenance, listed in Table 2 of the Specialised Section of the Technical Specification.

**1.7.3** The Bidder shall recommend specialised tools and instrumentation that may be used, as listed in Table 3 of the Specialised Section of the Technical Specification.

**1.7.4** All specialised tools and instruments shall be new and state-of-the-art and shall be accompanied by complete and detailed information on their use.

**1.7.5** Special tools and instruments should be packed in special packing boxes, indicating "special tools", "instruments", "instruments", and marked moisture-proof, dust-proof, fragile, up, do not Inverted and other words, with the main equipment shipped together.

## 1.8 Installation, commissioning, test run and acceptance

**1.8.1** Installation and commissioning of the contract equipment will be carried out

by the bidder under the guidance of the bidder's technical staff in accordance with the provisions of the technical documents and installation and use instructions provided by the bidder.

**1.8.2** Upon completion of the installation of the Contract Equipment, the Tenderer and the Bidder shall inspect and confirm the installation work and sign a Certificate of Completion of Installation Work, two copies of which shall be executed by each party.

**1.8.3** Commissioning and acceptance of contract equipment shall be carried out in accordance with the standards, protocols and specifications specified in these technical specifications.

**1.8.4** The acceptance time is 72h after the completion of installation, commissioning and trial operation and stable operation (preferably through the examination of large load operation). During this period, all the contract equipment shall meet the requirements of various operational performance indicators. The buyer and seller can sign the acceptance certificate of the contract equipment. The certificate shall consist of two copies, one for each party.

**1.8.5** If any abnormality occurs in the equipment during the period of installation, commissioning, trial operation and warranty, both the seller and the buyer shall jointly analyse the reasons, separate the responsibilities and implement them in accordance with the relevant provisions of the contract.

## **2 Structural and other requirements**

### **2.1 Layout requirements**

**2.1.1** The arrangement of the transformer body, bushing, oil storage cabinet and cooler (radiator) shall be in accordance with the requirements of the tenderer.

**2.1.2** The high and low voltage side bushings of the transformer should be connected to the terminals of other equipment by soft connections to prevent the generation of excessive stress.



**2.1.3** The earth lead of the core and clamps shall be separately led to the lower ground of the tank.

**2.1.4** Transformers are of the graded insulation type.

## 2.2 Cores and windings

**2.2.1** The core should be made of high-quality, low-loss grain-oriented cold-rolled silicon steel sheets, stacked and fastened using advanced methods to prevent loosening due to transportation and operation vibrations.

**2.2.2** All windings shall be made of copper conductors, with preference given to semi-hard copper conductors. The strands should be reasonably transposed, so that the additional loss is reduced to a minimum, continuous transposition of the conductor should be self-adhesive transposition of the conductor. The winding should have a good shock voltage wave distribution, the transformer should not be used inside the addition of non-linear resistance to limit the overvoltage; permissible field strength should be strictly controlled, heat-resistant, high-density, low ash insulation paper as turn-to-turn insulation, to ensure that the winding does not occur within the partial discharge and insulation breakdown. The leakage flux of the winding should be controlled to avoid local overheating in the winding, leads, tank wall and other metal components.

**2.2.3** The winding, set, and compression should be strictly fastening process measures, and the leads should be sufficiently supported so that the body of the device forms a solid whole with sufficient short-circuit resistance.

**2.2.4** There should be a more uniform distribution of oil flow inside the body, and the core interstage iterative piece should also be left with appropriate cooling oil channels, and make the oil circuit smooth, to avoid local overheating of the windings and the core.

**2.2.5** The transformer shall be free from any loosening, displacement and damage during transport when the impact acceleration is not greater than 3g.

## 2.3 Oil storage cabinets

**2.3.1** The oil in the Oil Storage Tank shall be isolated from the atmosphere and the volume of oil therein may be regulated by the expansion or contraction of a capsule or metal expander. The gas chamber in the Oil Storage Tank is connected to the atmosphere by means of a hygroscope.

**2.3.2** Accumulation of gas in casing elevated seats etc. shall be directed to the gas relay through a sloped gas collection main to the Oil Storage Tank. Butterfly valves shall be added to both sides of the horizontal pipework of the gas relay.

**2.3.3** Oil storage cabinets shall be fitted with an oil level gauge (with sealed contacts for alarms at high and low levels), a bleeder plug, a vent pipe, a drain pipe, an oil inlet pipe, a hoist and a manhole.

## 2.4 Fuel tanks

**2.4.1** The top of the transformer tank should not form water, and there should be no dead space inside the tank.

**2.4.2** The transformer shall be capable of sliding on a flat surface or rolling on a tube in the direction of its main and short axes, and there shall be towing lugs on the tank for bi-directional towing. The method of fixing the transformer base to the foundation shall be approved by the tenderer.

**2.4.3** The sealing surfaces of all flanges should be flat, and the gaskets should be properly limited to prevent excessive pressure on the gaskets, resulting in leakage after cracking and ageing.

**2.4.4** The tank shall be provided with thermometer holders, grounding plates, lifting straps and jack supports.

**2.4.5** The tank shall be fitted with a ladder, the lower part of which shall have a stop that locks the treads, and the ladder shall be positioned so as to facilitate the inspection of the gas relay.

**2.4.6** The tank shall be fitted with the following valves:

1) Oil inlet and drain valves (should be arranged diagonally in the upper and lower parts of the transformer);

2) Oil sample valve (the structure and position of the sampling valve should be easy to seal the sample).

**2.4.7** Transformers shall be fitted with pressure relief devices with alarm or trip contacts, at least 2 per transformer, mounted directly on both ends of the tank.

**2.4.8** The gas relay heavy gas contacts should not be inadvertently activated by the build-up of gas and should have a gas pick-up tube leading to ground level to facilitate the collection of gas samples.

#### **2.4.9** Mechanical strength of transformer tanks

It shall be subjected to mechanical strength test with vacuum residual pressure of 133 Pa and positive pressure of 0.1 MPa without damage and impermissible permanent deformation.

#### **2.4.10** Sealing requirements

The whole transformer (including the cooling device) should be able to withstand the static pressure of 0.03MPa applied on the oil surface of the Oil Storage Tank for 24h, and there should be no leakage and damage.

**2.4.11** According to the requirements of users can provide oil chromatography online monitoring and nitrogen-filled fire extinguishing device pipeline interface. 220kV and above voltage level oil-immersed transformer, should be equipped with multi-component oil dissolved gas online monitoring device, online monitoring device must meet the national standard specification, industry norms and power grid company requirements.

**2.4.12** Transformer gas relays, oil flow relays, thermometers and oil level meters should be fitted with rain covers, and ball valves and elbows should be used for oil drainage devices.

## **2.5** Cooling devices

**2.5.1** The type and manufacturer will normally be provided by the bidder.

2.5.2 The radiator shall be secured to the transformer tank by means of a butterfly valve or by means of independent floor support so that the transformer tank does not have to be drained when the cooler is installed or removed.

2.5.3 The load capacity of the transformer shall meet the requirements of GB/T15164 "Oil-immersed Power Transformer Load Guidelines", and the bidder shall provide the calculation report of the short-term first aid overload capacity, with the control conditions of ambient temperature of 40°C, starting load of 80% of the rated capacity, 150% of the rated capacity running continuously for not less than 30min, and the hot spot temperature of the transformer not exceeding 140°C.

## 2.6 Casing

2.6.1 Capacitor-type casing shall be used and shall have terminals for testing and shall be constructed in such a way as to facilitate test wiring.

2.6.2 Casing shall be leak-tight. Oil-immersed casing shall have an oil level indicator that can be easily checked from the ground.

2.6.3 Each casing shall have a flat terminal block with changeable orientation to facilitate the installation of connection wires to the grid, and the terminal block shall be able to withstand a moment of 400 N-m without deformation.

2.6.4 Umbrella skirts shall be of large and small size, and the protruding length and spacing of the skirts shall be in accordance with the provisions of IEC 60815.

2.6.5 The colour of the ceramic sleeve is based on the requirements of the tenderer.

2.6.6 The test and other performance requirements of casing shall be in accordance with GB/T 4109.

2.6.7 Transformer casing terminals (hoop clamps) should be used T2 pure copper hot extrusion moulding. Prohibit the use of brass material or casting moulding hoop wire clamp.

2.6.8 A separate fastening bolt shall be used for the casing pressure equalising ring, and it is prohibited to share the fastening bolt with the sealing bolt, or to share the sealing bolt with the upper and lower seals.

## 2.7 Casing type current transformers

**2.7.1** The secondary leads of the current transformer shall be led to the transformer terminal box through metal shielding pipes, and the leads shall be oil- and heat-resistant flexible wires with a cross-section of not less than 4 mm<sup>2</sup>. The secondary lead bundle may be protected by a metal slot box.

**2.7.2** Casing type current transformer should be in line with the provisions of GB 1208, GB 16847 current standards.

**2.7.3** Current transformers for analogue temperature measurement of windings shall be installed in the casing on the high voltage side.

## 2.8 Tap changer

### 2.8.1 On-load tap-changer:

**2.8.1.1** The on-load tap-changer shall be of the high-speed change-over resistor type.

**2.8.1.2** The diverter switch unit of the on-load tap-changer shall be installed in a leak-tight oil compartment separate from the transformer tank. The diverter switch insert may be lifted out separately for maintenance.

**2.8.1.3** The diverter switch oil compartment of the on-load tap-changer shall have a separate Oil Storage Tank, a moisture absorber, a pressure relief device and a relay for protection.

**2.8.1.4** The drive motor of the on-load tap-changer and its accessories shall be housed in a weatherproof control box.

**2.8.1.5** The on-load tap-changer shall be capable of being operated remotely or manually in situ at the transformer. It shall have an action recorder for the total number of switching operations and a tap position indicator. The control circuit shall have a computer interface.

The control leads for the on-load tap-changer connected internally to itself are to be provided by the bidder.

**2.8.1.6** The diverter switch oil compartment of the on-load tap-changer shall

be capable of withstanding an oil pressure test at a pressure of 0.05 MPa for 24 h without leakage.

**2.8.1.7** The on-load tap-changer does not need to be inspected until it has been operated for 7 years or after 100,000 operations.

**2.8.1.8** The on-load tap-changer shall be easily accessible for maintenance and service without lifting the tank.

**2.8.1.9** The on-load tap-changer is recommended to be made of Shanghai Huaming products.

## 2.9 Transformer oil

**2.9.1** Transformer oil should be the new oil which conforms to the provisions of GB 2536 with cycloalkyl, low sulphur content and added antioxidant.

**2.9.2** The supply of new oil shall include 10 per cent of spare oil.

## 2.10 Temperature measuring devices

The transformer shall be equipped with a winding analogue temperature measurement device and an oil temperature measurement device. The oil temperature measurement shall have not less than two monitoring points. The above temperature variables are observable on the transformer body and can send out this platinum resistance temperature measurement signal.

## 2.11 Transformer secondary circuit connection

**2.11.1** Transformer secondary terminal box layout and cable laying requirements, grounding terminal position and other special requirements of the layout need to be proposed to the bidder before the design liaison meeting.

**2.11.2** The cable between the terminal box or local instrumentation of the temperature measuring device on the transformer body shall be an oil-resistant, flame-retardant, shielded cable. Gas relay to the terminal box cable should be each

contact lead out separately, shall not be combined with a multi-core cable.

**2.11.3** The terminal box of the transformer and the terminal rows in the cooling device shall be flame retardant and moisture-proof type, and there shall be 15 per cent of spare terminals for use by users.

**2.11.4** Terminal box should be reasonably designed, using stainless steel materials, with reliable moisture-proof, waterproof measures, outdoor placement of its protection level of IP55. for the ground-type arrangement, the installation height of the terminal box should be easy to operate and maintain on the ground in situ.

**2.11.5** The terminal box shall have sufficient terminals for internal lead connections for control, protection, alarm signals and secondary leads of current transformers, etc., and the terminals shall be made of copper. All external terminals, including spare terminals, should be wire clamp type. Control trip between the terminals and other terminals should be left between an empty terminal, or other isolation measures, so as not to cause false tripping due to shorting.

**2.11.6** The terminal junction box shall be provided with openable and closeable lighting and shall have a heater of suitable capacity of 220V, AC to prevent condensation of water vapour from occurring inside the cabinet. Power sockets (single phase, 10A, 220V, AC) shall be provided in the control cabinet and terminal junction box.

**2.11.7** Transformer secondary lead wires should be taken to prevent rust, aging and other appropriate protective measures.

## 2.12 Alarm and trip protection contacts for transformers

The transformer shall have alarm and trip protection contacts as listed in Table 7 of the Special Part of the Technical Specification.

## 2.13 Painting and rust prevention

**2.13.1** The external surfaces of transformer tanks, oil storage cabinets, cooling devices and connecting pipes shall be painted, and their colours shall be in accordance

with the requirements of the tenderer.

**2.13.2** The internal surfaces of the transformer tank, the upper and lower clamping parts of the core, etc. shall be painted with a light-coloured lacquer with good compatibility with the transformer oil, the lacquer to be used to be decided by the bidder. All surfaces to be painted shall be thoroughly surface treated (e.g. by sandblasting or shotblasting) before painting.

**2.13.3** Within 8h after sandblasting (shot blasting) treatment and before rusting, a layer of metal primer shall be applied. The primer should have good anti-corrosion, moisture-proof and adhesion properties, the thickness of the paint layer is not less than 0.04mm, the surface layer of topcoat is compatible with the primer and has good durability.

All external surfaces shall be coated with at least one primer and two topcoats, the thickness of the topcoat shall not be less than 0.085mm, and the surface topcoat shall be sufficiently elastic to withstand temperature changes, resistant to peeling and not fading or chalking.

**2.13.4** When the transformer is shipped from the factory, the external surface shall be freshly painted, and the tenderer shall be supplied with the appropriate quantity of the original paint for on-site touch-up paint during installation.

## 2.14 Transformer life

The transformer shall have an expected life of not less than 30 years when operated under specified operating and loading conditions and installed and maintained in accordance with the operating instructions.

As a responsible product supplier, the seller is responsible for providing the bidder with a detailed maintenance programme, replacement, and charging plan (e.g., regular inspections and return visits) throughout the product's useful life, and this maintenance and replacement service should be provided throughout the product's useful life cycle.



## 2.15 Nameplates

The nameplate shall include the following:

- 1) Transformer type (name, model, product code);
- 2) Standard code;
- 3) The name of the manufacturing plant (including the name of the country);
- 4) Factory serial number;
- 5) Year and month of manufacture;
- 6) Number of phases;
- 7) Rated capacity (MVA) (for double-winding transformers, the rated capacity of each winding shall be given);
- 8) Rated frequency (Hz);
- 9) Rated voltage (kV) and tap range for each winding;
- (10) Linkage grouping labelling (and give a schematic diagram of the winding connection, which should be consistent with the actual arrangement of the position);
- (11) The measured value of short-circuit impedance expressed as a percentage (for double-winding transformers, the measured value of short-circuit impedance equivalent to 100 per cent of rated capacity shall be indicated);
- 12) Insulation level;
- 13) Cooling method;
- 14) Total weight (t);
- (15) Insulating oil weight (t) (specify the brand, factory name, oil base);
- 16) Transport weight (t);
- 17) Body lifting weight (t);
- 19) Upper section tank weight (for bell-type transformers) (t);
- 20) Load loss (measured value) (kW);
- 21) No-load loss (measured value) (kW);
- 22) No-load current (measured value) (%);
- (23) Casing type current transformers (their main technical data are given on a separate label);

- 24) Insulation thermal class (Class A may not be given);
- 25) Temperature rise (when not a standard specified value);
- 26) Temperature versus reservoir oil level curve.

## 2.16 Primary Electrical Connection

### 2.16.1 Casing arrangement

The high-voltage neutral bushing of a double-winding transformer shall be placed on the high-voltage side.

### 2.16.2 Forms of lead wires

Each casing of the transformer shall have a flat terminal block with changeable direction to facilitate wiring installation. Casing terminal board should be able to withstand lead tension and gravity-induced torque without deformation. Transformer high and medium voltage side leads are generally connected by soft wires to prevent excessive stress; there are also directly connected to the GIS equipment with SF6 busbar, indoor stations are also connected by cables. Low-voltage side is generally connected by hard busbar, and there should be expansion and contraction fittings when connecting with the main transformer. The **115kV and 22kV** sides of the main transformer should be equipped with support frames for the convenience of leading out of the main transformer body.

Primary wiring terminal board should meet the circuit short-circuit current and heat requirements. The material of the terminal board is aluminium alloy, the surface is silver-plated and smooth without scratches, and the number of openings is required to ensure reliable connection.

### 2.16.3 Grounding

Transformer core, clamping pieces of the grounding lead should be insulated from the tank, from the casing installed on the tank and lead out of the lower part of the tank and the tank connected to grounding, grounding should be obvious grounding symbols or "grounding" characters.

When the neutral point of the main transformer is directly earthed, two earth lead

wires shall be used to lead to different directions of the main earth network.

#### 2.16.4 Colour of appearance

The colour of the porcelain cover is usually brown.

The external surface colour of the transformer tank, Oil Storage Tank, cooling device and connecting pipe is recommended to be sea grey B05. the charged end of each phase of the casing should be painted with a distinct phase-specific colour code.

The colour of the outer surface of the transformer fire protection unit is red.

### 2.17 Secondary Electrical Connection

#### 2.17.1 On-load tap-changer

The on-load tap-changer of the transformer shall have a stall display and a remote transmission device, and the switching stall signal shall be uploaded using stall one-to-one contact or BCD code. The on-load tap-changer shall have the functions of remote operation, emergency stop and blocking to meet the requirements of local and remote control operation. Configuration of an action recorder for the number of times the tap changer is switched. The main transformer overload blocking on-load voltage regulation function is realised by the main transformer body. 2.17.2 Oil temperature indicating controller

Oil temperature indication controller should meet the requirements of GB/T6451. In the transformer oil tank two oil temperature higher point, respectively installed a Pt100 platinum resistance temperature indication controller. Temperature indication controller should have temperature display and remote transmission function.

#### 2.17.3 Intrinsic protection of transformers

The body protection of the transformer is used for tripping and alarming, and the contents of the body protection are shown in Table 4.

#### 2.17.4 Transformer terminal boxes

##### 2.17.4.1 Terminal box structure

Transformer terminal box design should be reasonable, terminal box should be able to sun, rain, moisture, and have enough space, terminal box protection level

should meet IP55.

#### 2.17.4.2 Wiring inside the terminal box

(1) The terminal box should have enough terminals for the internal wiring of the transformer body and its end connections, and should provide 20% of the spare terminals, all the terminals used for external connection, including the spare terminals are all crimped terminals. All terminals used for external connections including spare terminals are of crimp type. Terminal rows should be identified by terminal row number. It is required that all cables and joints should be protected against water ingress and the cable arrangement should be accessed from bottom to top.

AC and DC terminal rows should be arranged in separate areas, and AC circuit and DC circuit cables should be tied separately. The cable numbers are numbered according to double numbering. AC and DC circuits shall not share a common cable.

(2) A dehumidifier with temperature and humidity controller (AC220V, 50Hz) should be provided for the terminal box.

#### 2.17.4.3 Coupling cables

All cable wiring laid on the transformer body shall be led to the terminal box through a cable protection tube or trough box (stainless steel material). The cable wiring must be flame retardant, oil resistant, temperature resistant shielded cable, and the cable should be long enough in the components and components, components and terminal box and terminal box between the cable is not allowed to have cable joints. The part of the cable by the manufacturer to provide matching, and provide cable inventory. Cable inventory should list all the cables provided, cable inventory should be marked cable number, cable starting point, cable end point, cable type, cable core, cable cross-section, cable spare core and cable length.

## **2.18 civil interface**

### 2.18.1 Fuel tanks

There shall be a lifting climb on the tank, and a jack seat shall be provided on its lower part. The transformer shall be capable of sliding on a flat surface or rolling on a

tube in the direction of its main and short axes, and there shall be towing lugs on the tank for bi-directional towing.

#### 2.18.2 Foundations and embedded elements

The main transformer foundation adopts strip foundation, the number of foundation is uniformly two, the foundation spacing is uniformly 2.04m, the surface of the foundation is pre-embedded steel plate, and the transformer base is suitable to be fixed on the pre-embedded steel plate of the foundation by spot welding.

#### 2.18.3 Oil storage tanks

An oil storage tank is set up around the main transformer foundation, and the length and width dimensions of the oil pit should be 1m larger than the main transformer outer dimensions on each side.

### **3 Tests**

According to this technical specification, the latest version of the national standard (GB) and the IEC standard and its supplementary instructions for transformer test, the test should be issued with a detailed record of the test data of the official test report, and a representative of the bidding party or a third party present to supervise the test or witness, and to provide the transformer and its accessories corresponding type test report and routine test report, the test should be in strict accordance with the requirements of the regulations and specifications.

## II. Earmarked segment

### 1 Main transformer and neutral equipment technical parameters

Bidders should carefully fill in the guaranteed values of the bidders in the Technical Parameters Table (see Tables 1 and 2) one by one, with no spaces or substitutions for the word "response", and no alteration of the values required by the bidders is allowed. If there is any discrepancy, please fill in Table 11.

Note 1: Items with "\*" in this technical specification are important technical terms, if the equipment provided by the successful bidder does not meet the requirements, the bidder has the right to terminate the contract or require the successful bidder to replace the products or components that meet the requirements of this technical specification, and the successful bidder shall bear the relevant losses caused to the bidder.

2. No-load and load losses exceeding 15 per cent of the required value individually or 10 per cent in total will be considered as substantial non-compliance with the requirements of the solicitation documents.

Table 1 115kV main transformer technical parameters and performance requirements response table

serial number	name (of a thing)	Item	Standard parameter values	Bidder's guaranteed value	
1	Rated*	Transformer type or model	SZ20-20000/115	(to be completed by the bidder)	
		a. Rated voltage (kV)	High voltage winding	115	(to be completed by the bidder)
			low voltage winding	22	(to be completed by the bidder)
		b. Rated frequency (Hz)		50	(to be completed by the bidder)
		c. Rated capacity (MVA)	High voltage winding	20	(to be completed by the bidder)
			low voltage winding	20	(to be completed by the bidder)
		d. Number of phases	3	(to be completed by the bidder)	

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serial number	name (of a thing)	Item	Standard parameter values		Bidder's guaranteed value	
		e. Pressure regulation	transformer		(to be completed by the bidder)	
		f. Pressure regulating position	high voltage neutral		(to be completed by the bidder)	
		g. Pressure regulation range	±8 x 1.25 per cent		(to be completed by the bidder)	
		h. Neutral grounding method	Directly grounded or not		(to be completed by the bidder)	
		i. Short-circuit impedance and permissible deviation of the main tap (at full capacity)	Short circuit impedance (per cent)	tolerance (allowed error) (per cent)	Short circuit impedance (per cent)	tolerance (allowed error) (per cent)
		High Pressure - Low Pressure	10.5	±5	(to be completed by the bidder)	(to be completed by the bidder)
		j. Cooling methods	ONAN/ONAF		(to be completed by the bidder)	
		k. Linkage group symbols	Dyn1		(to be completed by the bidder)	
2	Insulation level*	a. Lightning full-wave impulse voltage (kV, peak)	high voltage line end	480	(to be completed by the bidder)	
			low-pressure line end	200	(to be completed by the bidder)	
			neutral point terminal	325	(to be completed by the bidder)	
		b. Lightning cut-off surge voltage (kV, peak)	high voltage line end	530	(to be completed by the bidder)	
			low-pressure line end	220	(to be completed by the bidder)	
		c. Short-time frequency withstand voltage (kV, rms)	high voltage line end	200	(to be completed by the bidder)	
			low-pressure line end	85	(to be completed by the bidder)	
			neutral point terminal	140	(to be completed by the bidder)	
		3	Temperature rise limit (K)	topsoil		55
Windings (average)				65	(to be completed by the bidder)	
Winding (hot spot)				78	(to be completed by the bidder)	
Fuel tanks, cores and metal structural surfaces				75	(to be completed by the bidder)	
Item				Standard parameter values		Bidder's guaranteed value
4	Short-circuit impedance and permissible deviation at ultimate tap (at full capacity)	a. Maximum tap	Short circuit impedance (per cent)	tolerance (allowed error) (per cent)	Short circuit impedance (per cent)	tolerance (allowed error) (per cent)
		High Pressure - Low Pressure	Bidders provide	±10	(to be completed by the bidder)	(to be completed by the bidder)
		b. Minimum tap	Short circuit impedance (per cent)	tolerance (allowed error) (per cent)	Short circuit impedance (per cent)	tolerance (allowed error) (per cent)
		High Pressure - Low Pressure	Bidders provide	±10	(to be completed by the bidder)	(to be completed by the bidder)
5	Winding resistance (□ , 75°C)	a. High voltage windings	primary tap	(provided by the bidder)		(to be completed by the bidder)
			Maximum Tap	(provided by the bidder)		(to be completed by the bidder)
			minimum tap	(provided by the bidder)		(to be completed by the bidder)
		b. Low-voltage windings	(provided by the bidder)		(to be completed by the bidder)	
6	Current density	a. High voltage windings	(provided by the bidder)		(to be completed by the bidder)	

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serial number	name (of a thing)	Item	Standard parameter values	Bidder's guaranteed value	
	(A/mm <sup>2</sup> )	b. Low-voltage windings	(provided by the bidder)	(to be completed by the bidder)	
		c. Regulating windings	(provided by the bidder)	(to be completed by the bidder)	
7	Maximum working field strength between turns (kV/mm)	design value	(provided by the bidder)	(to be completed by the bidder)	
8	Core parameters	Core column flux density (rated voltage, at rated frequency) (T)	(provided by the bidder)	(to be completed by the bidder)	
		Specific loss of silicon steel sheet (W/kg)	(provided by the bidder)	(to be completed by the bidder)	
		Calculated total mass of iron core (t)	(provided by the bidder)	(to be completed by the bidder)	
9	No-load loss (kW)	No-load loss at rated frequency and rated voltage	≤55	(to be completed by the bidder)	
		Rated frequency 1.1 times rated voltage time-vacuum loss	(provided by the bidder)	(to be completed by the bidder)	
10	No-load current (%)	a. At 100 per cent of rated voltage	≤0.3	(to be completed by the bidder)	
		b. At 110 per cent of rated voltage	(provided by the bidder)	(to be completed by the bidder)	
11	Load loss (kW, 75°C)	High Pressure - Low Pressure	primary tap	(provided by the bidder)	(to be completed by the bidder)
			of which stray losses	(provided by the bidder)	(to be completed by the bidder)
			Maximum Tap	(provided by the bidder)	(to be completed by the bidder)
			of which stray losses	(provided by the bidder)	(to be completed by the bidder)
			minimum tap	(provided by the bidder)	(to be completed by the bidder)
			of which stray losses	(provided by the bidder)	(to be completed by the bidder)
12	Noise level dB(A)	idle	≤60	(to be completed by the bidder)	
		100 per cent load condition	≤60	(to be completed by the bidder)	
13	Withstand 2s outlet symmetrical short-circuit current value (kA) (ignoring system impedance)	High voltage winding	(provided by the bidder)	(to be completed by the bidder)	
		low voltage winding	(provided by the bidder)	(to be completed by the bidder)	
		Calculated average winding temperature after 2s short circuit (°C)	<250	(to be completed by the bidder)	
14	Partial discharge level (pC) at 1.5 x $U_m/\sqrt{3}$ kV	High voltage winding	≤300	(to be completed by the bidder)	
		low voltage winding	(provided by the bidder)	(to be completed by the bidder)	
15	Winding with casing tan δ (%)	High voltage winding	≤0.5	(to be completed by the bidder)	
		low voltage winding	≤0.5	(to be completed by the bidder)	
16	Mass and dimensions (required for bidders if limited values)	a. Installation dimensions (L x W x H) (m)	(provided by the bidder)	(to be completed by the bidder)	
		b. Transport dimensions (L x W x H) (m)	(to be provided by the bidder and to meet transport requirements)	(to be completed by the bidder)	
		c. Height of centre of gravity (m)	(provided by the bidder)	(to be completed by the bidder)	
		d. Installation quality (t)	Body mass (t)	(provided by the bidder)	(to be completed by the bidder)
			Mass of upper section tank (t)	(provided by the bidder)	(to be completed by the bidder)
			Oil mass (t) (without back-up)	(provided by the bidder)	(to be completed by the bidder)
Total mass (t)	(provided by the bidder)		(to be completed by the bidder)		



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serial number	name (of a thing)	Item	Standard parameter values			Bidder's guaranteed value			
		e. Transport quality (t)	(provided by the bidder)			(to be completed by the bidder)			
		f. Transformer transport permitted Maximum tilt	15°			(to be completed by the bidder)			
17	Chip Radiator	model number	(provided by the bidder)			(to be completed by the bidder)			
		No. of groups	(provided by the bidder)			(to be completed by the bidder)			
		Mass per group (t)	(provided by the bidder)			(to be completed by the bidder)			
18	bushing	Model Specification	a. High-pressure casing	Fibreglass reinforced plastic (FRP) dry type			(to be completed by the bidder)		
			b. Low-voltage casing	Fibreglass reinforced plastic (FRP) dry type			(to be completed by the bidder)		
			c. Neutral point casing	Fibreglass reinforced plastic (FRP) dry type			(to be completed by the bidder)		
		Rated current (A)	a. High-pressure casing	≥1.2 times the rated current at the line end of the corresponding winding			(to be completed by the bidder)		
			b. Low-voltage casing	≥1.2 times the rated current at the line end of the corresponding winding			(to be completed by the bidder)		
			c. Neutral point casing	≥Rated current of the corresponding winding			(to be completed by the bidder)		
		Insulation level (LI/AC) (kV)	a. High-pressure casing*	550/230			(to be completed by the bidder)		
			b. Low-voltage casing*	200/95			(to be completed by the bidder)		
			c. Neutral point casing	325/147			(to be completed by the bidder)		
		Partial discharge level (pC) at 1.5 × U <sub>m</sub> /√3 kV for 66 kV and above bushings	a. High-pressure casing	≤10			(to be completed by the bidder)		
			b. Neutral point casing	≤10			(to be completed by the bidder)		
		Capacitive sleeve tan□□ (%) and capacity (pF)		tan□	electric capacity		tan□	electric capacity	
		a. High-pressure casing		≤0.4	(provided by the bidder)		(to be completed by the bidder)	(to be completed by the bidder)	
		b. Neutral point casing		≤0.4	(provided by the bidder)		(to be completed by the bidder)	(to be completed by the bidder)	
18	bushing	Bending load resistance of casing (kN)	level (of achievement etc)	perpendicular	perpendicular	level (of achievement etc)	perpendicular	perpendicular	
		a. High-pressure casing	3	1.25	1.5	(to be completed by the bidder)	(to be completed by the bidder)	(to be completed by the bidder)	
		b. Low-voltage casing	3	1.5	2	(to be completed by the bidder)	(to be completed by the bidder)	(to be completed by the bidder)	
		c. Neutral point casing	2	1	1	(to be completed by the bidder)	(to be completed by the bidder)	(to be completed by the bidder)	
		Casing creepage distance (equal to the effective creepage)	a. High-pressure casing	≥3150K <sub>d</sub>			(to be completed by the bidder)		
b. Low-voltage casing	≥1256K <sub>d</sub>			(to be completed by the bidder)					

serial number	name (of a thing)	Item	Standard parameter values	Bidder's guaranteed value							
		distance multiplied by the diameter factor $K_d$ (mm)	c. Neutral point casing	$\geq 1812K_d$	(to be completed by the bidder)						
		Dry arc distance of casing (shall be multiplied by an elevation correction factor $K_H$ ) (mm)	a. High-pressure casing	(provided by the bidder)	(to be completed by the bidder)						
			b. Low-voltage casing	(provided by the bidder)	(to be completed by the bidder)						
			c. Neutral point casing	(provided by the bidder)	(to be completed by the bidder)						
		Casing creepage/dry arc distance		$\leq 4$	(to be completed by the bidder)						
		Average casing diameter (mm)	a. High-pressure casing	(provided by the bidder)	(to be completed by the bidder)						
			b. Low-voltage casing	(provided by the bidder)	(to be completed by the bidder)						
			c. Neutral point casing	(provided by the bidder)	(to be completed by the bidder)						
		19	Casing type current transformer	Installation on the high-voltage side	Number of windings	To be determined at the time of contract award			To be determined at the time of contract award		
					accuracy level	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award
current ratio	To be determined at the time of contract award				To be determined at the time of contract award						
Secondary capacity (VA)	To be determined at the time of contract award				To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award				
<i>FS</i> or <i>ALF</i>	To be determined at the time of contract award				To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award		
Installation on the neutral side	Number of windings			To be determined at the time of contract award			To be determined at the time of contract award				
	accuracy level			To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award				
	current ratio			To be determined at the time of contract award			To be determined at the time of contract award				
	Secondary capacity (VA)			To be determined at the time of contract award			To be determined at the time of contract award	To be determined at the time of contract award			
	<i>FS</i> or <i>ALF</i>			To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award	To be determined at the time of contract award			
20	on-load tap-changer	model number	(provided by the bidder)			(to be completed by the bidder)					
		Rated current (A)	$\geq 1.2$ times the rated current of the corresponding winding			(to be completed by the bidder)					
		Level voltage (kV)	(provided by the bidder)			(to be completed by the bidder)					
		Electrical life of on-load tap-changer (times)	$\geq 200,000$			(to be completed by the bidder)					
		Mechanical life of on-load tap-changer (times)	$\geq 800,000$			(to be completed by the bidder)					
		Insulation level ( <i>LI/AC</i> ) (kV)	(provided by the bidder)			(to be completed by the bidder)					

serial number	name (of a thing)	Item	Standard parameter values	Bidder's guaranteed value		
		Item	Standard parameter values	Bidder's guaranteed value		
20	on-load tap-changer	of the on-load tap-changer drive motor	Power (kW)	(provided by the bidder)	(to be completed by the bidder)	
			phase (math.)	(provided by the bidder)	(to be completed by the bidder)	
			Voltage (V)	(provided by the bidder)	(to be completed by the bidder)	
21	pressure release fixtures	model number	(provided by the bidder)	(to be completed by the bidder)		
		item on program (TV, computer etc)	1 to 2	(to be completed by the bidder)		
		Release pressure (MPa)	0.055	(to be completed by the bidder)		
22	Multiplier and duration of increase in industrial frequency voltage	Frequency voltage increase multiplier	No-load duration times	Full load continuous times	No-load duration times	Full load continuous times
		1.05	progression	progression	(to be completed by the bidder)	(to be completed by the bidder)
		1.1	progression	20min	(to be completed by the bidder)	(to be completed by the bidder)
		1.3	1min		(to be completed by the bidder)	(to be completed by the bidder)
23	transformer oil	New oil provided (including the required spare oil)	Oil breakdown voltage (kV) should be achieved after filtration	≥45	(to be completed by the bidder)	
			tan $\delta$ (90°C) (%)	≤0.5	(to be completed by the bidder)	
			Water content (mg/L)	≤20	(to be completed by the bidder)	

Table 2 Response table of technical parameters and performance requirements of 115kV main transformer neutral point equipment sets

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
"one" radical in Chinese characters (Kangxi radical 1)	common parameter			
1	Neutral point set of equipment model specification			(to be completed by the bidder)
2	Transformer voltage class	kV	115	(to be completed by the bidder)
3	Transformer neutral withstand voltage			
	8/ 20 $\mu$ S Lightning Surge (peak)	kV	325	(to be completed by the bidder)
1min industrial frequency	140		(to be completed by the bidder)	
4	weights	Kg	(provided by the bidder)	(to be completed by the bidder)
5	Dry Arc Distance	mm	(provided by the bidder)	(to be completed by the bidder)
6	Creepage distance/dry arc distance (dry arc distance should take into account the altitude correction factor KH)		≤4	(to be completed by the bidder)
7	Maximum radio interference voltage	$\mu$ V	500	(to be completed by the bidder)
8	Life expectancy (years)	surname Nian	30	(to be completed by the bidder)

Technical Specification for Main Transformer and Neutral Point Equipment

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value	
stupid (Beijing dialect)	Disconnect Switch Parameters				
1	Disconnect switch type		(provided by the bidder)	(to be completed by the bidder)	
2	Type or model of actuator		(provided by the bidder)	(to be completed by the bidder)	
	Electric or manual		Motorised and manually operated	(to be completed by the bidder)	
	Motor Voltage		AC380	(to be completed by the bidder)	
	Control Voltage		AC220	(to be completed by the bidder)	
3	rated voltage	kV	72.5	(to be completed by the bidder)	
4	rated frequency	Hz	50	(to be completed by the bidder)	
5	rated current	A	630	(to be completed by the bidder)	
6	Main circuit resistance	$\mu\Omega$	(provided by the bidder)	(to be completed by the bidder)	
7	Temperature rise test current	A	1.1Ir	(to be completed by the bidder)	
8	Rated frequency 1min withstand voltage	break	kV	200	(to be completed by the bidder)
		targeted (e.g. attacks)		160	(to be completed by the bidder)
9	Rated peak lightning impulse withstand voltage (1.2/50 $\square$ s)	break	kV	410	(to be completed by the bidder)
		targeted (e.g. attacks)		350	(to be completed by the bidder)
10	Rated short-time withstand current and duration	kA/s	To be determined at the time of contract award	To be determined at the time of contract award	
11	Rated peak withstand current	kA	To be determined at the time of contract award	To be determined at the time of contract award	
12	Time to open the gate	s	(provided by the bidder)	(to be completed by the bidder)	
	Closing time	s	(provided by the bidder)	(to be completed by the bidder)	
	Average speed of tripping	m/s	(provided by the bidder)	(to be completed by the bidder)	
	Average closing speed	m/s	(provided by the bidder)	(to be completed by the bidder)	
13	Short-time frequency withstand voltage for auxiliary and control circuits	kV	2	(to be completed by the bidder)	
14	mechanical stability	vice-	$\geq 3000$	(to be completed by the bidder)	
15	Terminal block static State mechanical load	Horizontal Vertical	N	(provided by the bidder)	(to be completed by the bidder)
		horizontal horizontal		(provided by the bidder)	(to be completed by the bidder)
		perpendicular		(provided by the bidder)	(to be completed by the bidder)
		safety factor		(provided by the bidder)	(to be completed by the bidder)
3	current transformer				
1	Current transformer type		(provided by the bidder)	(to be completed by the bidder)	
2	rated voltage	kV		(to be completed by the bidder)	
3	Maximum equipment voltage Um	kV		(to be completed by the bidder)	
4	rated frequency	Hz	50	(to be completed by the bidder)	
5	Rated primary current I1n	A	To be determined at the time of contract award	To be determined at the time of contract award	
6	Rated secondary current I2n	A	To be determined at the time of contract	To be determined at the time of	

Technical Specification for Main Transformer and Neutral Point Equipment

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
			award	contract award
7	Rated capacity	VA	To be determined at the time of contract award	To be determined at the time of contract award
8	Level combination (Level P with accuracy limit factor ALF)		To be determined at the time of contract award	To be determined at the time of contract award
9	core number (of iron cores)	classifier for individual things or people, general, catch-all classifier	1	(to be completed by the bidder)
10	Rated Thermal Stability Current	kA	To be determined at the time of contract award	To be determined at the time of contract award
11	thermal stability duration		To be determined at the time of contract award	To be determined at the time of contract award
12	Casing dry arc distance (mm)		(provided by the bidder)	(to be completed by the bidder)
13	Creepage distance/dry arc distance		≤4.0	(to be completed by the bidder)
14	polarities		depolarisation	(to be completed by the bidder)
15	Casing material		Silicone rubber/porcelain	(to be completed by the bidder)
16	Umbrella skirt structure		umbrellas	(to be completed by the bidder)
17	Average casing diameter	mm	(provided by the bidder)	(to be completed by the bidder)
4	cable connector			
1	Model Specification		YH1.5W-72/186	(to be completed by the bidder)
2	rated voltage	kV	72	(to be completed by the bidder)
3	Continuous operation voltage	kV	58	(to be completed by the bidder)
4	Nominal discharge current	kA	1.5	(to be completed by the bidder)
5	DC 1mA reference voltage (not less than)	kV	103	(to be completed by the bidder)
6	Leakage current at 0.75 times DC 1mA reference voltage	μA	≤50	(to be completed by the bidder)
7	Maximum residual voltage at 500 A operating inrush current (peak, not greater)	kV	174	(to be completed by the bidder)
8	Maximum residual voltage at 1.5 kA lightning surge current (peak value, not greater)	kV	186	(to be completed by the bidder)
9	rated frequency	Hz	50	(to be completed by the bidder)
5	Discharge Gap			
1	Gap form		Balls/bats	(to be completed by the bidder)
2	Protection gap distance		90-160 (adjustable within this range)	(to be completed by the bidder)
3	Gap material		Copper/Steel	(to be completed by the bidder)
6	brackets			
1	makings		Galvanised steel/stainless steel	(to be completed by the bidder)
2	high degree		Confirmation after providing drawings	(to be completed by the bidder)

## 2 Project requirements

### 2.1 Basic project overview

The bidding project location Thailand Golden Heron Cemented Carbide Production Base Phase II Project, Block D61, WHA Weihua East Coast Industrial Zone, Chonburi, Thailand.

### 2.2 Conditions of use

Determine the environmental conditions and system conditions for the specific project at the time of signing the contract.

### 2.3 Scope of supply

Package 1

Equipment name	name (of a thing)	Specification	note
115kV main transformer 1	Main transformer 1	Three-phase double-winding power transformer SZ20-20000/115	
	Neutral point kit		

Main transformers are quoted according to different capacities and different elevations. Specific quantities and other details are given in the commercial tender documents.

The scope of supply for each main transformer includes, but is not limited to, the following components:

Table 5 List of Goods Required and Scope of Supply

serial number	Name	unit (of measure)	Project unit requirements		Bidder Response	
			Type and specification	quantities	Type and specification	quantities
1	Transformer body	classifier for heavy objects, such as machines, TVs, computers; theater performances				
2	High Pressure Casing	Pieces/Unit	Fibreglass reinforced plastic (FRP) dry type	3		
3	Low Pressure Casing	Pieces/Unit	Fibreglass reinforced plastic (FRP) dry type	3		
4	Neutral point casing	Pieces/Unit	Fibreglass reinforced plastic (FRP) dry type	1		
5	High voltage side cased current transformer	Groups/units		3		
6	Neutral point bushing type current transformer			1		
7	Main tank Oil Storage Tank (including oil level gauge, moisture absorber and other oil protection devices) and gas relay	Sets/units		1		
8	On-load tap-changers (including Oil Storage Tanks, moisture absorbers, oil level gauges, gas relays, etc.) and their actuating mechanisms	Sets/units	Combination Vacuum Switches	1		
9	Components of the joint management	Sets/units		1		
10	pressure relief device	Sets/units		2		
11	Winding Temperature Controller	Sets/units		1		
12	Oil Temperature Controller	Sets/units		2		
13	car radiator	Groups/units		1		
14	Transformer terminal box	Sets/units	Stainless steel housing	1		
15	Various valves	Sets/units		1		
16	Cores, Clamps Grounding Leads and Sleeves	Sets/units		1		
17	gaskets	Sets/units		1		
18	transformer oil	t/unit	45#/25#	full amount		
19	Nameplates, signage and warning signs	Sets/units		1		
20	All necessary cables for the connection of the above groups of components to the control cabinet and the terminal boxes.	Sets/units		full amount		
21	Other components not included					
serial number	Name	unit (of measure)	Project unit requirements		Bidder Response	
			Type and specification	quantities	Type and specification	quantities
1	Neutral point kit	interleave		1		

Table 6 Necessary spare parts, special tools and instrumentation supply list

serial number	Name	unit (of measure)	Project unit requirements		Bidder Response		Remarks
			Models and specifications	quantities	Models and specifications	quantities	
1	reserve oil	Volume/unit	Same as body oil	10%			By total oil volume
2		Various specifications	interleave	1			
3							
4							

When each bidder creates the bidding documents, common parts of the equipment may be placed together, and different parts must be listed by bid package.

The transformer and neutral point complete sets of equipment supplied by the bidder shall meet the requirements of the corresponding national norms, this specification and the power grid (including but not limited to the "State Grid Co., Ltd. on the issuance of eighteen major anti-accident measures for the power grid (revised version) of the notice"), and when the requirements of the above normative documents are different, they shall be implemented in accordance with the higher standard thereof.

Transformers are to meet the requirements in the "Transformer Energy Efficiency Limit Values and Energy Efficiency Ratings".

At the time of the specific project, the voltage and short circuit impedance of the high voltage side of the main transformer must meet the requirements of the national standard and the power company at the project site. Clear impedance values will be provided for specific projects.

At the time of the specific project, the method of connecting the high voltage side of the main transformer to the distribution unit will be determined by the bidder based on the project and the bidder will be required to meet any method of connection.

The correction of coefficients involved in altitude shall be made by the bidder in accordance with the specification, which can be referred to the Technical Provisions on Design of Conductor and Electrical Appliance Selection (DL/T5222-2005) and other specifications and standards. 3000 metres or more shall be corrected in accordance with the maximum of 4000 metres.

### **3 Table of alarm and trip contacts**

The project unit should fill in the alarm and trip contacts in Table 7 according to the actual engineering needs, and the bidder should fill in "response" or not.



Table 7 Alarm and trip contacts

serial number	Contact Name	Alarm or trip	To be completed by the project unit			Bidder Response
			Supply Voltage (V, DC)	Contact capacity (VA)	exports 4-20mA	
1	Main tank gas relay	Light Fault Alarm Heavy fault tripping	220	110	--	(to be completed by the bidder)
2	Main Fuel Tank Level Gauge	give a warning	220	110	--	(to be completed by the bidder)
3	Main tank pressure relief device	Alarm or trip	220	110	--	(to be completed by the bidder)
4	Oil level thermostat	give a warning	220	110	PT100	(to be completed by the bidder)
5	Winding Thermostat	give a warning	220	110	PT100	(to be completed by the bidder)
6	On-load tap-changer pressure surge relay (or gas relay)	of a circuit breaker or switch) trip	220	110	--	(to be completed by the bidder)
7	Pressure relief device for the diverter switch oil compartment of the on-load tap-changer	give a warning	220	110	--	(to be completed by the bidder)
8	Oil level gauge for on-load tap-changer	give a warning	220	110	--	(to be completed by the bidder)
9	On-load tap-changer reject indication (controlled by drive mechanism)	give a warning	220	110	--	(to be completed by the bidder)

## 4 Information provided by bidders

Table 8 Sales run performance table

serial number	Model Specification	quantities	user unit	User Contacts	User contact phone number	commissioning time	note
1							
2							
3							
4							
5							
6							
7							

Table 9 Recommended delivery schedule for spare parts, special tools and instruments

(to be completed by the bidder)

serial number	Name	Models and specifications	unit (of measure)	quantities
1				
2				
3				

4				
5				
6				

Table 10 Material list of main components

serial number	Name	Model, specification, manufacturer, origin		Remarks
		Bidder requirements	Bidder Response	
1	silicon steel sheet	Selection of advanced technology, stable performance, mature operation, reliable quality suitable thickness, good flatness, high quality and low consumption of silicon steel sheet, should be able to meet the requirements of the bidding documents on the transformer loss and noise and other performance parameters; thickness of not more than 0.3mm. selection of high quality silicon steel sheet in the P1.7 when the unit loss $\leq 100$ Recommended Wuhan Iron and Steel, Nippon Steel		
2	transposition lead	Recommended Shanghai Yanghang, Shenyang Hongyuan, Tianwei wire, Jurong United, Hunan Xiangneng, Wuxi Tongli, Sichuan Jinrui, Asta, Esaix, Changzhou Zhenghe, Jiangyin Huadian, Wuxi Xizhou, Jiangsu Zhongrong or equivalent.		
	Flat copper wire			
3	Insulated cardboard	Bidders provide		
	Insulation mouldings	Mature design, advanced technology, reliable quality		
4	transformer oil	Karamay #45 oil/#25 oil or equivalent		
5	seals	Bidders provide		
6	steels	Bidders provide		
7	On-load or off-excitation tap-changer	Recommended Combination Vacuum Switches		
8	High Pressure Casing	Fibreglass reinforced plastic (FRP) dry type		
9	Low Pressure Casing	Fibreglass reinforced plastic (FRP) dry type		
10	High Voltage Neutral Sleeve	Fibreglass reinforced plastic (FRP) dry type		
11	Casing type current transformer	Bidders provide		
12	car radiator	chip		
13	fan (loanword)	-		
14	Oil pump (if any)	-		
15	Oil flow relay (if any)	-		
16	Butterfly and ball valves	Bidders provide		
17	Oil Storage Tank	Corrugated metal external oil type		
18	Gas Relay	Bidders provide		
19	Oil level gauge (body and switching oil chamber)	Bidders provide		
20	Moisture absorber (body/switching oil compartment)	Bidders provide		
21	Top oil thermometer	Bidders provide		
22	Winding Thermometer	Bidders provide		

serial number	Name	Model, specification, manufacturer, origin		Remarks
		Bidder requirements	Bidder Response	
23	Pressure relief valve (body/switching oil chamber)	Bidders provide		
24	Pressure Burst Relay (if available)	Bidders provide		
25	control cabinets	-		
26	Other materials and annexes requiring clarification	-		

## 5 Table of technical deviations

The technical specifications of the products provided by the bidders shall fully satisfy the provisions in this technical specification. If there is any deviation, the bidder shall truthfully and carefully fill in the deviation value in the technical deviation table (Table 11), otherwise it is regarded as the same as the requirements stipulated in this technical specification. If there is no technical deviation, "no deviation" shall be entered in the technical deviation table.

Table 11 Table of technical deviations of bidders

serial number	Item	Corresponding article number	Technical bidding document requirements	Difference	Remarks
1					
2					
3					

## 6 Other information to be provided by bidders

6.1 Proof of user operation.

6.2 Identification certificate of similar products and type test report of the identified products.

Table 12 List of accreditation certificates provided by bidders

serial number	Identification of product model name	Organisation identification unit	Based on criteria	Date of appraisal

Table 13 Table of test and inspection reports provided by bidders

serial number	Model Name	Type and content of test reports	Based on criteria	Test time	test unit

6.3 A pre-determined programme for the products of this tender and a description thereof.

(1) The structure of the core, windings and case of the main transformer, including the location and type of winding arrangement;

(2) The bidder shall provide measures and calculation reports to improve the short-circuit resistance, and provide sudden short-circuit type test reports of similar products;

(3) Provide a discussion of equipment regarding seismic measures;

(4) Technical measures to reduce stray losses and prevent local overheating;

(5) Technical measures to prevent leakage;

(6) A description of the structure of the winding leads connected to the casing;

(7) Description of the oil and gas isolation system of the oil storage cabinet;

(8) Other information and explanations required.

# 技术规范书

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## 一 通用部分

### 1 总则

#### 1.1 一般规定

1.1.1 本技术规范书适用于主变压器，拟集中采购的主变压器规格为20MVA，电压等级为115/22kV。技术规范书包括主变压器及中性点设备的功能设计、结构、性能、安装和试验等方面的技术要求。

投标人需按照每种规格的主变压器进行报价，对于招标人有非以上常用规格采购需求的，入围供应商应依据项目实际需求提供招标人所需规格的设备，且价格不得高于所需规格之上临近规格设备的中标价格。

每种规格主变压器对应的具体项目信息及技术规范细节待合同签订时予以明确。

1.1.2 投标人须仔细阅读本技术规范（通用和专用部分）阐述的全部条款。投标人提供的变压器本体及其附件应符合本技术规范所规定的要求，投标人亦可以推荐符合本技术规范要求的类似定型产品，但必须提供详细的技术偏差。

1.1.3 本技术规范提出了对变压器本体及其附件的技术参数、性能、结构、试验等方面的技术要求。变压器运输外形限制尺寸的要求满足规范要求。

1.1.4 本技术规范提出的是最低限度的技术要求，并未对一切技术细节做出规定，也未充分引述有关标准和规范的条文，投标人应提供符合本技术规范引用标准的最新版本标准和技术要求的全新产品，如果所引用的标准之间不一致或本技术规范所使用的标准如与投标人所执行的标准不一致时，按要求较高的标准执行。

1.1.5 如果投标人没有以书面形式对本技术规范的条文提出差异，则意味着投标人提供的设备完全符合本技术规范的要求。如有与本本技术规范要求不一致的地方，必须逐项在“技术差异表”中列出。

1.1.6 本技术规范将作为订货合同的附件，与合同具有同等的法律效力。本技术规范未尽事宜，由合同签约双方在合同谈判时协商确定。



**1.1.7** 本技术规范中涉及有关商务方面的内容，如与技术规范的商务部分有矛盾时，以商务部分为准。

**1.1.8** 本技术规范中通用部分各条款如与技术规范专用部分有冲突，以专用部分为准。

**1.1.9** 投标人需有泰国类似项目的业绩，并对当地标准有充分了解；

**1.1.10** 投标产品需满足当地电网及地区的相关认证，具备当地或电力行业的准入条件；并提供证明材料

**1.1.11** 本技术条件，仅规定了一般技术要求，对于当地的特殊要求，投标人应有充分了解，并在投标书中注明。

**1.1.12** 投标人需对现场安装进行指导，此项费用包含在投标价格之中。

## 1.2 工作范围

本技术规范仅适用于技术规范专用部分供货范围中所列的设备。其中，包括变压器本体及其附件的功能设计、结构、性能、安装和试验等方面的技术要求，以及供货和现场技术服务。提供本产品及配套产品的全部试验报告。

## 1.3 对设计图纸、说明书和试验报告的要求

### 1.3.1 变压器所需图纸

1) 变压器主要器件及配件图。

2) 外形尺寸图：图纸应标明全部所需要的附件数量、目录号、额定值和型号等技术数据，运输尺寸和质量、装配总重量和油量，它还应标示出变压器在运输准备就绪后的变压器重心，储油柜的位置、尺寸、带电部位与邻近接地体的空气净距。

图纸应标明所有部件和附件的尺寸、位置，以及拆卸高压和中压套管时所需要的空间高度，上节油箱起吊高度，起顶、拖耳位置，各阀门法兰尺寸及位置。

图纸应标明变压器底座和基础螺栓尺寸、位置。

3) 套管及其接线端子图：图纸应包括套管型号、套管内结构解剖详图、接线端子详图、固定法兰及伞型详图，套管顶部安全承力、顶部破坏作用力及爬电

距离和干弧距离均应给出。

4) 铭牌图: 应符合国家相关标准。

5) 变压器器身示意图: 绕组位置排列及其与套管、分接开关的连接, 包括引线连接装配的说明。

6) 上节油箱起吊图: 标明起吊重量、起吊高度和吊索、吊点布置方式。

7) 注有尺寸的套管升高座的横断面图: 应显示出法兰、电流互感器座等。

8) 所有供应的附件外形尺寸图: 包括套管、气体继电器、压力释放装置、盘式温度计和绕组温度计、电流互感器及升高座、带有油泵及风扇电机的冷却器(散热器)等。

9) 分接开关和变压器温度控制器的装配图。

10) 分接开关、变压器冷却装置和变压器组成组控制等使用的控制柜装配图。

11) 展开图及接线图: 包括计量、保护、控制、报警、照明及动力等所需的交流和直流回路的线路原理图。

冷却装置的原理接线图, 应包括当一个电源发生故障时, 能自动向备用电源切换的原理说明。

原理接线图应标示变压器控制柜和所有变压器附件的端子, 如电流互感器、报警装置、风扇电机等, 以及这些设备在变压器上的布线和用户电缆连接的接线板的标志。

位于控制柜内的设备, 应以接近其实际位置的方式表示在连接线路图上。位于控制柜外面的器件, 例如电流互感器, 其在图上的位置, 应能简明标示其向接线端子上的引出连线, 接线板上的端子间至少应留出一定的空隙, 以备招标方在向接线板上增加电缆连接时用。

12) 变压器安装、运行、维修和有关设施设计所需的其他图纸和资料。

13) 包括套管式电流互感器的二次电阻、拐点处的磁通密度、铁心截面和铁心平均长度等技术数据, 套管式电流互感器的励磁曲线图等。

14) 铁心接地套管布置图、中性点接地套管引线支撑详图: 包括支柱绝缘子、支持钢结构排列、接地导体及钢结构详图。

15) 拆卸图: 套管的拆卸方法, 铁心吊环位置、铁心和绕组拆卸方法。

### 1.3.2 产品说明书

**1.3.2.1** 安装使用说明书。

**1.3.2.2** 产品说明书还应包括下列各项：

- 1) 关于结构、连接及铁心、绕组型式等的概述和简图。
- 2) 变压器有关部件及附件的图纸和安装维护说明，例如：套管、散热器（冷却器）、套管式电流互感器、调压开关，以及所有保护装置和测量装置等。
- 3) 具有详细图纸的有载分接开关维护说明。
- 4) 变压器励磁特性曲线。
- 5) 提供相同类型、相近容量变压器承受短路能力的计算书和本厂做过的最大容量变压器承受短路能力试验报告。
- 6) 变压器用的特殊工具和仪器的清单、专用说明书、样本和手册等。
- 7) 特殊需要的说明。

**1.3.3** 试验报告

**1.3.3.1** 变压器全部试验报告，包括例行、型式和特殊试验报告。

**1.3.3.2** 主要部件〔包括套管、散热器（冷却器）、分接开关、套管式电流互感器、气体继电器、压力释放器、各种温度计等〕例行和型式试验报告。

**1.3.3.3** 主要材料，如硅钢片、油、各类导线、绝缘纸板等的检验报告。

**1.3.4** 卖方资料的提交及时充分，满足工程进度要求。在签订协议后，5天内提供满足提供工程设计的基础资料（含电子文件），满足设计院的基础设计；卖方在收到设计院反馈意见后5个工作日内应提供以上文件的最终设计文件。在签订合同后15天内给出全部技术资料、提供详细基础图及其它配合设计资料和交付进度清单，并经买方确认。

## 1.4 标准和规范

**1.4.1** 按有关标准、规范或准则规定的合同设备，包括投标人向其他厂商购买的所有附件和设备，都应符合这些标准、规范或准则的要求。

**1.4.2** 表1所列标准中的条款通过本技术规范的引用而成为本技术规范的条款，凡是注明日期的引用标准其随后所有的修改单（不包括勘误的内容）或修订版均不适用本技术规范。凡是不注明日期的引用文件，其最新版本适用本技术规范。

标准号	标准名称
GB 1094.1	电力变压器 第1部分 总则
GB 1094.2	电力变压器 第2部分 温升
GB 1094.3	电力变压器 第3部分 绝缘水平、绝缘试验和外绝缘空气间隙
GB 1094.4	电力变压器 第4部分 电力变压器和电抗器雷电冲击和操作冲击试验导则
GB 1094.5	电力变压器 第5部分 承受短路的能力
GB/T 1094.10	电力变压器 第10部分 声级测定
GB 311.1	高压输变电设备的绝缘配合
GB 1208	电流互感器
GB 2536	变压器油
GB 5273	变压器、高压电器和套管的接线端子
GB 2900.15	电工术语 变压器、互感器、调压器和电抗器
GB 10230.1	分接开关 第1部分 性能要求和试验方法
GB 10230.2	分接开关 第2部分：应用导则
GB 16847	保护用电流互感器暂态特性技术要求
GB 50150	电气装置安装工程电气设备交接试验标准
GB/T 4109	交流电压高于1000V的绝缘套管
GB/T 4585	交流系统用高压绝缘子的人工污秽试验
GB/T 5582	高压电力设备外绝缘污秽等级
GB/T 7252	变压器油中溶解气体分析与判断导则
GB/T 7295	运行中变压器油质量标准
GB/T 7354	局部放电测量
GB/T 13499	电力变压器应用导则
GB 13027	油纸电容式变压器套管形式和尺寸
GB/T 15164	油浸式电力变压器负载导则
GB/T 6451	油浸式电力变压器技术参数和要求
GB 16434	高压架空线路和发电厂、变电所环境污区分级及外绝缘选择标准
GB 16927.1	高压试验技术 第一部分：一般试验要求
GB 16927.2	高压试验技术 第二部分：测量系统
GB 13499	电力变压器应用导则
GB/T 17468	电力变压器选用导则
GB 148	电气装置安装工程电力变压器、油浸电抗器、互感器施工及验收规范
GB20052	电力变压器能效限定值及能效等级
DL/T 572	电力变压器运行规程
DL/T 596	电力设备预防性试验规程
DL 911	电力变压器绕组变形的频率响应分析法
DL 1093	电力变压器绕组变形的电抗法检测判断导则
DL 1094	电力变压器用绝缘油选用指南

JB/T 3837	变压器类产品型号编制方法
Q/GDW 152	电力系统污区分级与外绝缘选择标准
GB 20052-2020	电力变压器能效限定值及能效等级
下列为所参照的 IEC 标准，但不限于此：	
IEC60815.1—2008	污秽条件下用高压绝缘子的选择和尺寸 第一部分：定义、信息和通用原理
IEC60815.2—2008	污秽条件下用高压绝缘子的选择和尺寸 第二部分：交流系统用陶瓷和玻璃绝缘子

**1.4.3** 所有螺栓、双头螺栓、螺纹、管螺纹、螺栓头和螺帽均应遵照 ISO 及 SI 公制标准。

**1.4.4** 当标准、规范之间存在差异时，应按要求高的指标执行。

## 1.5 投标时必须提供的技术数据和信息

**1.5.1** 投标人应按技术规范专用部分表 1~表 4（技术参数响应表）列举的项目逐项提供技术数据，所提供的技术数据应为保证数据，这些数据将作为合同的一部分。如与投标人在表 1~表 4 中所要求的技术数据有差异，还应写入技术规范专用部分表 11（技术偏差表）中。

### 1.5.2 试验报告

应提供的试验报告，详见下表。

变压器全部试验报告，包括例行、型式和特殊试验报告。

主要部件（包括套管、散热器、分接开关、套管式电流互感器、气体继电器、压力释放器、各种温度计等）例行和型式试验报告。

主要材料，如硅钢片、油、各类导线、绝缘纸板等的检验报告。

内 容	份数	交付时间	接图单位
零部件试验 1) 变压器油试验报告 2) 有载分接开关例行和型式试验报告 3) 套管例行试验、型式试验报告和油色谱分析报告 4) 各种继电器例行试验和型式试验报告 5) 温度计例行试验和型式试验报告 6) 压力释放装置例行试验和型式试验报告 7) 电流互感器例行和型式试验报告			见技术规范专用部分

8) 散热器例行试验和型式试验报告	
9) 硅钢片检验报告	
10) 导线试验报告	
11) 其他零部件的例行和型式试验报告	
变压器例行试验报告	
变压器型式试验和特殊试验报告 (含短路承受能力试验报告)	

## 1.6 备品备件

**1.6.1** 投标人应提供安装时必需的备品备件，价款应包括在投标总价中。

**1.6.2** 投标人提出运行维修时必需的备品备件，见技术规范专用部分表 6。

**1.6.3** 投标人推荐的备品备件，见技术规范专用部分表 9。

**1.6.4** 所有备品备件应为全新产品，与已经安装设备的相应部件能够互换，具有相同的技术规范和相同的规格、材质、制造工艺。

**1.6.5** 所有备品备件应采取防尘、防潮、防止损坏等措施，并应与主设备一并发运，同时标注“备品备件”，以区别于本体安装用零部件。

**1.6.6** 投标人应对产品实行终生保修，根据需要在得到业主通知 15 日内提供技术规范专用部分表 6 所列备品备件以外的部件和材料，以便维修更换。

## 1.7 专用工具和仪器仪表

**1.7.1** 投标人应提供安装时必需的专用工具和仪器仪表，价款应包括在投标总价中。

**1.7.2** 投标人提出运行维修时必需的专用工具和仪器仪表，列在技术规范专用部分表 2 中。

**1.7.3** 投标人应推荐可能使用的专用工具和仪器仪表，列在技术规范专用部分表 3 中。

**1.7.4** 所有专用工具和仪器仪表应是全新的、先进的，且须附完整、详细的使用说明资料。

**1.7.5** 专用工具和仪器仪表应装于专用的包装箱内，注明“专用工具”“仪器”“仪表”，并标明防潮、防尘、易碎、向上、勿倒置等字样，同主设备一并

发运。

## 1.8 安装、调试、试运行和验收

**1.8.1** 合同设备的安装、调试，将由招标方根据投标人提供的技术文件和安装使用说明书的规定，在投标人技术人员指导下进行。

**1.8.2** 完成合同设备安装后，招标方和投标人应检查和确认安装工作，并签署安装工作完成证明书，共两份，双方各执一份。

**1.8.3** 合同设备试运行和验收，根据本技术规范规定的标准、规程、规范进行。

**1.8.4** 验收时间为安装、调试和试运行完成后并稳定运行 72h（最好能通过大负荷运行考核）。在此期间，所有的合同设备都应达到各项运行性能指标要求。买卖双方可签署合同设备的验收证明书。该证明书共两份，双方各执一份。

**1.8.5** 如果在安装、调试、试运行及质保期内，设备发生异常，买卖双方应共同分析原因、分清责任，并按合同相关规定执行。

## 2 结构和其他要求

### 2.1 布置要求

**2.1.1** 变压器本体、套管、储油柜和冷却器（散热器）等布置应符合招标方的要求。

**2.1.2** 变压器高、低压侧套管与其他设备端子相连均应采用软连接，以防止过高应力的产生。

**2.1.3** 铁心、夹件的接地引下线应分别引出至油箱下部接地。

**2.1.4** 变压器为分级绝缘型。

### 2.2 铁心和绕组

**2.2.1** 铁心应采用优质、低耗的晶粒取向冷轧硅钢片，用先进方法叠装和紧固，使变压器铁心不致因运输和运行中的振动而松动。

**2.2.2** 全部绕组均应采用铜导线，优先采用半硬铜导线。股线间应有合理的换位，使附加损耗降至最低，连续换位导线应采用自粘性换位导线。绕组应有良好的冲击电压波分布，变压器内部不宜采用加装非线性电阻方式限制过电压；许用场强应严格控制，采用耐热、高密度、灰分低的绝缘纸作为匝间绝缘，确保绕组内不发生局部放电和绝缘击穿。应对绕组漏磁通进行控制，避免在绕组、引线、油箱壁和其他金属构件中产生局部过热。

**2.2.3** 绕组绕制、套装、压紧应有严格的紧固工艺措施，引线应有足够的支撑，使器身形成坚固的整体，具有足够的抗短路能力。

**2.2.4** 器身内部应有较均匀的油流分布，铁心级间迭片也应留有适当的冷却油道，并使油路通畅，避免绕组和铁心产生局部过热。

**2.2.5** 变压器运输中当冲撞加速度不大于 3g 时，应无任何松动、位移和损坏。

## 2.3 储油柜

**2.3.1** 储油柜中的油应与大气隔离，其中的油量可由胶囊或金属膨胀器的膨胀或收缩来调节。储油柜中的气室通过吸湿器与大气相通。

**2.3.2** 套管升高座等处积集气体应通过带坡度的集气总管引向气体继电器，再引至储油柜。在气体继电器水平管路的两侧加蝶阀。

**2.3.3** 储油柜应装有油位计（带高、低油位时供报警的密封接点）、放气塞、排气管、排污管、进油管、吊攀和人孔。

## 2.4 油箱

**2.4.1** 变压器油箱的顶部不应形成积水，油箱内部不应有窝气死角。

**2.4.2** 变压器应能在其主轴线和短轴线方向在平面上滑动或在管子上滚动，油箱上应有用于双向拖动的拖耳。变压器底座与基础的固定方法，应经招标方认可。

**2.4.3** 所有法兰的密封面应平整，密封垫应有合适的限位，防止密封垫过度承压、以致龟裂老化后造成渗漏。

**2.4.4** 油箱上应设有温度计座、接地板、吊攀和千斤顶支撑座等。



**2.4.5** 油箱上应装有梯子，梯子下部有一个可以锁住踏板的挡板，梯子位置应便于对气体继电器的检查。

**2.4.6** 油箱应装有下列阀门：

- 1) 进油阀和排油阀（在变压器上部和下部应成对角线布置）；
- 2) 油样阀（取样阀的结构和位置应便于密封取样）。

**2.4.7** 变压器应装带报警或跳闸触点的压力释放装置，每台变压器至少 2 个，直接安装在油箱两端。

**2.4.8** 气体继电器重瓦斯触点不应因为气体的积累而误动，并应具有引至地面的取气管，便于采集气样。

**2.4.9** 变压器油箱的机械强度

应承受真空残压 133Pa 和正压 0.1MPa 的机械强度试验，不得有损伤和不允许的永久变形。

**2.4.10** 密封要求

整台变压器（包括冷却装置）应能承受在储油柜的油面上施加的 0.03MPa 静压力，持续 24h，应无渗漏及损伤。

**2.4.11** 根据用户要求可提供油色谱在线监测和充氮灭火装置的管道接口。220kV 及以上电压等级油浸式变压器，应配置多组分油中溶解气体在线监测装置，在线监测装置必须满足国标规范、行业规范及电网公司的要求。

**2.4.12** 变压器的气体继电器、油流速动继电器、温度计、油位表应加装防雨罩，排油装置使用球阀和弯头。

## 2.5 冷却装置

**2.5.1** 型式和生产厂家一般由投标人提供。

**2.5.2** 散热器应经蝶阀固定在变压器油箱上或采用独立落地支撑，以便在安装或拆掉冷却器时变压器油箱不必放油。

**2.5.3** 变压器的负载能力应符合 GB/T15164《油浸式电力变压器负载导则》的要求，投标人应提供短时急救过负载能力的计算报告，控制条件为环境温度 40℃，起始负载为 80%额定容量，150%额定容量连续运行不低于 30min，变压器的热点温度不超过 140℃。

## 2.6 套管

2.6.1 应采用电容型套管，并应有试验用端子，其结构应便于试验接线。

2.6.2 套管应不渗漏。油浸式套管应有易于从地面检查油位的油位指示器。

2.6.3 每个套管应有一个可变化方向的平板式接线端子，以便于安装与电网的连接线，端子板应能承受  $400\text{N}\cdot\text{m}$  的力矩而不发生变形。

2.6.4 伞裙应采用大小伞，伞裙的伸出长度、伞间距等应符合 IEC 60815 之规定。

2.6.5 瓷套颜色依据招标方要求。

2.6.6 套管的试验和其他的性能要求应符合 GB/T 4109 规定。

2.6.7 变压器套管接线端子（抱箍线夹）应采用 T2 纯铜材质热挤压成型。禁止采用黄铜材质或铸造成型的抱箍线夹。

2.6.8 套管均压环应采用单独的紧固螺栓，禁止紧固螺栓与密封螺栓共用，禁止密封螺栓上、下两道密封共用。

## 2.7 套管式电流互感器

2.7.1 电流互感器的二次引线应经金属屏蔽管道引到变压器端子箱上，引线应采用截面不小于  $4\text{mm}^2$  的耐油、耐热的软线。二次引线束可采用金属槽盒防护。

2.7.2 套管式电流互感器应符合 GB 1208、GB 16847 现行标准的规定。

2.7.3 绕组模拟温度测量用电流互感器应设于高压侧套管。

## 2.8 分接开关

2.8.1 有载分接开关：

2.8.1.1 有载分接开关应是高速转换电阻式。

2.8.1.2 有载分接开关的切换装置应装于与变压器主油箱分隔且不渗漏的油室里。其中的切换开关芯子可单独吊出检修。

2.8.1.3 有载分接开关切换油室应有单独的储油柜、吸湿器、压力释放装置和保护用继电器等。

2.8.1.4 有载分接开关的驱动电机及其附件应装于耐候性好的控制箱内。

2.8.1.5 有载分接开关应能远距离操作，也可在变压器旁就地手动操作。应

具备累计切换次数的动作记录器和分接位置指示器。控制电路应有计算机接口。本身内部连接的有载分接开关的控制线由投标人提供。

**2.8.1.6** 有载分接开关切换开关油室应能经受 0.05MPa 压力的油压试验，历时 24h 无渗漏。

**2.8.1.7** 有载分接开关运行 7 年或操作 10 万次后才需要检查。

**2.8.1.8** 有载分接开关应能在不吊油箱的情况下方便地进行维护和检修。

**2.8.1.9** 有载分接开关推荐采用上海华明产品。

## 2.9 变压器油

**2.9.1** 变压器油应是符合 GB 2536 规定的环烷基、低含硫量、添加抗氧化剂的新油。

**2.9.2** 提供的新油，应包括 10% 的备用油。

## 2.10 温度测量装置

变压器应配备绕组模拟温度测量装置和油温测量装置。油温测量应不少于两个监测点。上述温度变量在变压器本体上可观测，并能将该铂电阻测温信号送出。

## 2.11 变压器二次回路连接

**2.11.1** 变压器二次接线端子箱布置及电缆敷设要求、接地端子位置及其他布置的特殊要求需在设计联络会前向招标方提出。

**2.11.2** 变压器本体上的测温装置的端子箱或就地仪表间的电缆应采用耐油、阻燃、屏蔽电缆。气体继电器至端子箱电缆应将每个触点的引线单独引出，不得合用一根多芯电缆。

**2.11.3** 变压器的端子箱和冷却装置内的端子排应为阻燃、防潮型，并应有 15% 的备用端子，供用户使用。

**2.11.4** 端子接线箱应设计合理，采用不锈钢材料，有可靠的防潮、防水措施，室外放置其防护等级为 IP55。为地面式布置，端子接线箱的安装高度应便于在地面上进行就地操作和维护。

**2.11.5** 端子箱应有足够的接线端子以便连接控制、保护、报警信号和电流互感器二次引线等的内部引线连接，接线端子采用铜质端子。所有外部接线端子包括备用端子均应为线夹式。控制跳闸的接线端子之间及与其他端子间均应留有一个空端子，或采用其他隔离措施，以免因短接而引起误跳闸。

**2.11.6** 端子接线箱内应有可开闭的照明设施，并应有适当容量的交流 220V 的加热器，以防止柜内发生水汽凝结。控制柜和端子接线箱内设电源插座(单相，10A，220V，AC)。

**2.11.7** 变压器二次引出线应采取防锈、防老化等相应保护措施。

## 2.12 变压器的报警和跳闸保护触点

变压器应有技术规范专用部分表 7 所列报警和跳闸保护触点。

## 2.13 油漆和防锈

**2.13.1** 变压器油箱、储油柜、冷却装置及连管等的外表面均应涂漆，其颜色应依照招标方的要求。

**2.13.2** 变压器油箱内表面、铁心上下夹件等均应涂以浅色漆，并与变压器油有良好的相容性，用漆由投标人决定。所有需要涂漆的表面在涂漆前应进行彻底的表面处理（如采用喷砂处理或喷丸处理）。

**2.13.3** 喷砂（喷丸）处理后 8h 内，且未生锈之前，应涂一层金属底漆。底漆应具有良好的防腐、防潮和附着性能，漆层厚度不小于 0.04mm，表层面漆与底漆相容，具有良好的耐久性能。

所有外表面至少要涂一道底漆和二道面漆，面漆厚度不小于 0.085mm，表层面漆应有足够弹性以耐受温度变化，耐剥落且不褪色、粉化。

**2.13.4** 变压器出厂时，外表面应油漆一新，并供给招标方适当数量的原用漆，用于安装时现场补漆。

## 2.14 变压器的寿命

变压器在规定的工作条件和负载条件下运行，并按使用说明书进行安装和维

护，预期寿命应不少于 30 年。

作为负责任的产品供应商，卖方有责任在产品的整个使用寿命期内向招标方提供详细的维护方案、更换、收费计划（例如定期的巡检和回访），该维护、更换服务应贯穿产品的整个使用寿命周期。

## 2.15 铭牌

铭牌应包括以下内容：

- 1) 变压器种类（名称、型号、产品代号）；
- 2) 标准代号；
- 3) 制造厂名（包括国名）；
- 4) 出厂序号；
- 5) 制造年月；
- 6) 相数；
- 7) 额定容量（MVA）（对双绕组变压器，应给出每个绕组的额定容量）；
- 8) 额定频率（Hz）；
- 9) 各绕组额定电压（kV）和分接范围；
- 10) 联结组别标号（并给出绕组连接示意图，应与实际排列位置相符）；
- 11) 以百分数表示的短路阻抗实测值（对双绕组变压器应标明相当于 100% 额定容量时的短路阻抗实测值）；
- 12) 绝缘水平；
- 13) 冷却方式；
- 14) 总重（t）；
- 15) 绝缘油重（t）（注明牌号、厂名、油基）；
- 16) 运输重（t）；
- 17) 器身吊重（t）；
- 19) 上节油箱重（对钟罩式变压器）（t）；
- 20) 负载损耗（实测值）（kW）；
- 21) 空载损耗（实测值）（kW）；
- 22) 空载电流（实测值）（%）；

- 23) 套管式电流互感器（用单独标牌给出其主要技术数据）；
- 24) 绝缘耐热等级（A 级可不给出）；
- 25) 温升（当不是标准规定值时）；
- 26) 温度与储油柜油位关系曲线。

## 2.16 电气一次接口

### 2.16.1 套管布置

双绕组变压器高压中性点套管应放在高压侧。

### 2.16.2 引接线形式

变压器每个套管应有一个可变化方向的平板式接线端子，以便于接线安装。套管端子板应有能承受引线张力和重力引起的力矩而不发生变形。变压器高中压侧引线一般采用软导线连接，以防止过高应力的产生；也有直接与 GIS 设备用 SF6 母管连接，户内站也有用电缆连接。低压侧一般采用硬母线连接，与主变连接时应有伸缩金具。主变 115kV、22kV 侧为方便引出主变本体应带出线支撑架。

一次接线端子板应满足回路短路电流及发热要求。端子板材质为铝合金，表面镀银且平滑无划痕，开孔数量需要保证连接可靠。

### 2.16.3 接地

变压器铁心、夹件的接地引下线应与油箱绝缘，从装在油箱上的套管引出后一并在油箱下部与油箱连接接地，接地处应有明显的接地符号或“接地”字样。

主变中性点直接接地时，应采用两根接地引下线引至主地网的不同方向。

### 2.16.4 外观颜色

瓷套颜色一般采用棕色。

变压器油箱、储油柜、冷却装置及连管等的外表面颜色建议为海灰 B05。各相套管带电端部应涂明显相别色标。

变压器消防装置外表面颜色采用红色。

## 2.17 电气二次接口

### 2.17.1 有载分接开关

变压器的有载分接开关应有档位显示器及远传装置，开关档位信号采用档位

一对一接点或 BCD 码上传。有载分接开关具有远方操作、急停和闭锁等功能，满足就地及远方控制操作要求。配置分接头切换次数的动作记录器。主变过负荷闭锁有载调压功能由主变本体实现。

### 2.17.2 油温指示控制器

油温指示控制器应满足 GB/T6451 的要求。在变压器油箱两个油温较高点上，分别安装一个 Pt100 铂电阻温度指示控制器。温度指示控制器应具备温度就地显示和远传功能。

### 2.17.3 变压器的本体保护

变压器的本体保护用于跳闸和报警，本体保护内容见表 4。

### 2.17.4 变压器端子箱

#### 2.17.4.1 端子箱结构

变压器端子箱设计应合理，端子箱应能防晒、防雨、防潮，并有足够的空间，端子箱防护等级应满足 IP55。

#### 2.17.4.2 端子箱内部布线

(1)端子箱应有足够的端子用于变压器本体内部布线及其端头连接，并提供 20%的备用端子，所有用于外部连接的端子，包括备用端子在内全部采用压接型端子。端子排组应有端子排编号予以标识。要求所有的电缆及接头应有防进水措施，电缆布置应由下往上接入。

交、直流端子排应分区布置，交流回路、直流回路电缆应分开绑扎。电缆号头按双重编号。交、直流回路不得共用一根电缆。

(2) 端子箱宜提供带温湿度控制器(AC220V、50Hz)的除湿装置。

#### 2.17.4.3 联结电缆

在变压器器身上敷设的所有电缆布线，均应通过电缆保护管或槽盒（不锈钢材料）引接到端子箱。该电缆线必须选用阻燃、耐油、耐温的屏蔽电缆，且该电缆应足够长，在元件与元件，元件与端子箱及端子箱之间的电缆不允许有电缆接头。该部分电缆由制造厂配套提供,并提供电缆清册。电缆清册应开列所提供的全部电缆，电缆清册中应标明电缆编号、电缆起点、电缆终点、电缆型号、电缆芯数、电缆截面、电缆备用芯数及电缆长度。

## 2.18 土建接口

### 2.18.1 油箱

油箱上应有吊攀，其下部应设置千斤顶座。变压器应能在其主轴线和短轴线方向在平面上滑动或在管子上滚动，油箱上应有用于双向拖动的拖耳。

### 2.18.2 基础及埋件

主变基础采用条形基础，基础数量统一为二条，基础间距统一为 2.04m，基础表面预埋钢板，变压器底座宜采用点焊方式固定在基础的预埋钢板上。

### 2.18.3 储油池

主变基础周围设置储油池，油坑长、宽尺寸应比主变外廓尺寸每边大 1m。

## 3 试验

根据本技术规范、最新版的国标（GB）和 IEC 有关标准及其补充说明进行变压器试验，试验应出具详细记载测试数据的正式试验报告，并有招标方代表或第三方人员在场监试或见证，并提供变压器及其附件相应的型式试验报告和例行试验报告，试验应严格按照规程规范要求。



## 二 专用部分

### 1 主变及中性点设备技术参数

投标人应认真逐项填写技术参数表（见表 1、表 2）中投标人保证值，不能空格，也不能以“响应”两字代替，不允许改动招标人要求值。如有差异，请填写表 11。

注 1. 本技术规范中带“\*”的项目为重要技术条款，若中标人所提供的设备存在不满足要求的情况，招标人有权终止合同或要求中标人予以更换为符合本技术规范要求的产品或部件，并由中标人承担对招标人造成的相关损失。

2. 空载和负载损耗单项超过要求值 15%或总损耗超过 10%，将被视为实质性不符合招标文件要求。

表 1 115kV 主变压器技术参数和性能要求响应表

序号	名称	项 目	标准参数值		投标人保证值			
1	额定值*	变压器型式或型号		SZ20-20000/115		(投标人填写)		
		a. 额定电压 (kV)	高压绕组	115		(投标人填写)		
			低压绕组	22		(投标人填写)		
		b. 额定频率 (Hz)		50		投标人填写		
		c. 额定容量 (MVA)	高压绕组	20		(投标人填写)		
			低压绕组	20		(投标人填写)		
		d. 相数		3		(投标人填写)		
		e. 调压方式		有载		(投标人填写)		
		f. 调压位置		高压中性点		(投标人填写)		
		g. 调压范围		±8×1.25%		(投标人填写)		
		h. 中性点接地方式		直接接地或不直接接地		(投标人填写)		
		i. 主分接的短路阻抗和允许偏差 (全容量下)		短路阻抗 (%)	允许偏差 (%)	短路阻抗 (%)	允许偏差 (%)	
		高压—低压		10.5	±5	(投标人填写)	(投标人填写)	
		j. 冷却方式		ONAN/ONAF		(投标人填写)		
k. 联结组标号		Dyn1		(投标人填写)				
2	绝缘水平*	a. 雷电全波冲击	高压线端	480		(投标人填写)		

序号	名称	项 目	标准参数值		投标人保证值		
		电压 (kV, 峰值)	低压线端	200	(投标人填写)		
			中性点端子	325	(投标人填写)		
		b. 雷电截波冲击电压 (kV, 峰值)	高压线端	530	(投标人填写)		
			低压线端	220	(投标人填写)		
		c. 短时工频耐受电压 (kV, 方均根值)	高压线端	200	(投标人填写)		
			中性点端子	140	(投标人填写)		
3	温升限值 (K)	顶层油		55	(投标人填写)		
		绕组 (平均)		65	(投标人填写)		
		绕组 (热点)		78	(投标人填写)		
		油箱、铁心及金属结构件表面		75	(投标人填写)		
		项 目		标准参数值		投标人保证值	
4	极限分接下短路阻抗和允许偏差 (全容量下)	a. 最大分接		短路阻抗 (%)	允许偏差 (%)	短路阻抗 (%)	允许偏差 (%)
		高压—低压		投标人提供	±10	(投标人填写)	(投标人填写)
		b. 最小分接		短路阻抗 (%)	允许偏差 (%)	短路阻抗 (%)	允许偏差 (%)
		高压—低压		投标人提供	±10	(投标人填写)	(投标人填写)
5	绕组电阻 ( $\Omega$ , 75°C)	a. 高压绕组	主分接	(投标人提供)		(投标人填写)	
			最大分接	(投标人提供)		(投标人填写)	
			最小分接	(投标人提供)		(投标人填写)	
		b. 低压绕组		(投标人提供)		(投标人填写)	
6	电流密度 (A/mm <sup>2</sup> )	a. 高压绕组		(投标人提供)		(投标人填写)	
		b. 低压绕组		(投标人提供)		(投标人填写)	
		c. 调压绕组		(投标人提供)		(投标人填写)	
7	匝间最大工作场强 (kV/mm)	设计值		(投标人提供)		(投标人填写)	
8	铁心参数	铁心柱磁通密度 (额定电压、额定频率时) (T)		(投标人提供)		(投标人填写)	
		硅钢片比损耗 (W/kg)		(投标人提供)		(投标人填写)	
		铁心计算总质量 (t)		(投标人提供)		(投标人填写)	
9	空载损耗 (kW)	额定频率额定电压时空载损耗		≤55		(投标人填写)	
		额定频率 1.1 倍额定电压时空载损耗		(投标人提供)		(投标人填写)	
10	空载电流 (%)	a. 100%额定电压时		≤0.3		(投标人填写)	

序号	名称	项 目	标准参数值	投标人保证值	
		b. 110%额定电压时	(投标人提供)	(投标人填写)	
11	负载损耗(kW、75°C)	高压—低压	主分接	(投标人提供)	(投标人填写)
			其中杂散损耗	(投标人提供)	(投标人填写)
			最大分接	(投标人提供)	(投标人填写)
			其中杂散损耗	(投标人提供)	(投标人填写)
			最小分接	(投标人提供)	(投标人填写)
			其中杂散损耗	(投标人提供)	(投标人填写)
12	噪声水平 dB (A)	空载状态下	≤60	(投标人填写)	
		100%负荷状态下	≤60	(投标人填写)	
13	可承受的2s出口对称短路电流值(kA)(忽略系统阻抗)	高压绕组	(投标人提供)	(投标人填写)	
		低压绕组	(投标人提供)	(投标人填写)	
		短路2s后绕组平均温度计算值(°C)	<250	(投标人填写)	
14	在 $1.5 \times U_m / \sqrt{3}$ kV下局部放电水平(pC)	高压绕组	≤300	(投标人填写)	
		低压绕组	(投标人提供)	(投标人填写)	
15	绕组连同套管的 $\tan\delta$ (%)	高压绕组	≤0.5	(投标人填写)	
		低压绕组	≤0.5	(投标人填写)	
16	质量和尺寸(如有限值招标人需填写)	a. 安装尺寸(长×宽×高)(m)	(投标人提供)	(投标人填写)	
		b. 运输尺寸(长×宽×高)(m)	(投标人提供, 并满足运输要求)	(投标人填写)	
		c. 重心高度(m)	(投标人提供)	(投标人填写)	
		d. 安装质量(t)	器身质量(t)	(投标人提供)	(投标人填写)
			上节油箱质量(t)	(投标人提供)	(投标人填写)
			油质量(t)(不含备用)	(投标人提供)	(投标人填写)
			总质量(t)	(投标人提供)	(投标人填写)
		e. 运输质量(t)	(投标人提供)	(投标人填写)	
f. 变压器运输时允许的最大倾斜度	15°	(投标人填写)			
17	片式散热器	型号	(投标人提供)	(投标人填写)	
		组数	(投标人提供)	(投标人填写)	
		每组质量(t)	(投标人提供)	(投标人填写)	
18	套管	型号规格	a. 高压套管	玻璃钢干式	(投标人填写)
			b. 低压套管	玻璃钢干式	(投标人填写)
			c. 中性点套管	玻璃钢干式	(投标人填写)
		额定电流(A)	a. 高压套管	≥1.2倍相应绕组线端额定电流	(投标人填写)
			b. 低压套管	≥1.2倍相应绕组线端额定电流	(投标人填写)

序号	名称	项 目	标准参数值			投标人保证值			
		c. 中性点套管	$\geq$ 相应绕组额定电流			(投标人填写)			
		绝缘水平 (LI/AC) (kV)	a. 高压套管*	550/230			(投标人填写)		
			b. 低压套管*	200/95			(投标人填写)		
			c. 中性点套管	325/147			(投标人填写)		
		66kV 及以上 套管在 $1.5 \times U_m / \sqrt{3}$ kV 下局部放 电水平 (pC)	a. 高压套管	$\leq 10$			(投标人填写)		
			b. 中性点套管	$\leq 10$			(投标人填写)		
		电容式套管 $\tan \delta$ (%)及电容量(pF)		$\tan \delta$	电容量		$\tan \delta$	电容量	
		a. 高压套管		$\leq 0.4$	(投标人提供)		(投标人填写)	(投标人填写)	
		b. 中性点套管		$\leq 0.4$	(投标人提供)		(投标人填写)	(投标人填写)	
		18	套管	套管的弯曲耐受负荷 (kN)	水平	横向	垂直	水平	横向
a. 高压套管	3			1.25	1.5	(投标人填写)	(投标人填写)	(投标人填写)	
b. 低压套管	3			1.5	2	(投标人填写)	(投标人填写)	(投标人填写)	
c. 中性点套管	2			1	1	(投标人填写)	(投标人填写)	(投标人填写)	
套管的爬距 (等于有效爬 距乘以直径系 数 $K_d$ ) (mm)	a. 高压套管			$\geq 3150K_d$			(投标人填写)		
	b. 低压套管			$\geq 1256K_d$			(投标人填写)		
	c. 中性点套管			$\geq 1812K_d$			(投标人填写)		
套管的干弧距 离(应乘以海 拔修正系数 $K_H$ ) (mm)	a. 高压套管			(投标人提供)			(投标人填写)		
	b. 低压套管			(投标人提供)			(投标人填写)		
	c. 中性点套管			(投标人提供)			(投标人填写)		
套管的爬距/干弧距离				$\leq 4$			(投标人填写)		
套管平均直径 (mm)	a. 高压套管			(投标人提供)			(投标人填写)		
	b. 低压套管			(投标人提供)			(投标人填写)		
	c. 中性点套管	(投标人提供)			(投标人填写)				
19	套管式电流互 感器	装设在高压侧	绕组数	待合同签订时确定			待合同签订时确定		
			准确级	待合同签订 时确定	待合同签订 时确定	待合同签订时 确定	待合同 签订时 确定	待合同 签订时 确定	待合同 签订时 确定
			电流比	待合同签订时确定			待合同签订时确定		

序号	名称	项 目		标准参数值			投标人保证值		
			二次容量 (VA)	待合同签订时确定			待合同 签订时 确定	待合同 签订时 确定	待合同 签订时 确定
			FS 或 ALF	待合同 签订时 确定	待合同 签订时 确定	待合同 签订时 确定	待合同 签订时 确定	待合同 签订时 确定	待合同 签订时 确定
		装设在中性点侧	绕组数	待合同签订时确定			待合同签订时确定		
			准确级	待合同 签订时 确定	待合同签订时确定		待合同 签订时 确定	待合同 签订时 确定	
			电流比	待合同签订时确定			待合同签订时确定		
			二次容量 (VA)	待合同签订时确定			待合同 签订时 确定	待合同 签订时 确定	
FS 或 ALF	待合同 签订时 确定	待合同签订时确定		待合同 签订时 确定	待合同 签订时 确定				
20	分接开关	型号		(投标人提供)			(投标人填写)		
		额定电流 (A)		$\geq 1.2$ 倍相应绕组额定电流			(投标人填写)		
		级电压 (kV)		(投标人提供)			(投标人填写)		
		有载分接开关电气寿命 (次)		$\geq 20$ 万			(投标人填写)		
		有载分接开关机械寿命 (次)		$\geq 80$ 万			(投标人填写)		
		绝缘水平 (LI/AC) (kV)		(投标人提供)			(投标人填写)		
		项 目		标准参数值			投标人保证值		
20	分接开关	有载分接开关的 驱动电机	功率 (kW)	(投标人提供)			(投标人填写)		
			相数	(投标人提供)			(投标人填写)		
			电压 (V)	(投标人提供)			(投标人填写)		
21	压力释放 装置	型号		(投标人提供)			(投标人填写)		
		台数		1~2			(投标人填写)		
		释放压力 (MPa)		0.055			(投标人填写)		
22	工频电压升高 倍数和持续时间	工频电压升高倍数		空载持续 时间	满载持续 时间	空载持续 时间	满载持续 时间		
		1.05		连续	连续	(投标人 填写)	(投标人 填写)		
		1.1		连续	20min	(投标人 填写)	(投标人 填写)		
		1.3		1min		(投标人 填写)	(投标人 填写)		
23	变压器油	提供的新油	过滤后应达到油的 击穿电压 (kV)	$\geq 45$			(投标人填写)		

序号	名称	项 目	标准参数值	投标人保证值	
		(包括所需的备用油)	$\tan\delta(90^\circ\text{C})(\%)$	$\leq 0.5$	(投标人填写)
			含水量 (mg/L)	$\leq 20$	(投标人填写)

表2 115kV 主变中性点成套设备技术参数和性能要求响应表

序号	项 目	单位	标准参数值	投标人保证值
一	共用参数			
1	中性点成套装置型号规格			(投标人填写)
2	变压器电压等级	kV	115	(投标人填写)
	变压器中性点耐受电压			
3	8/ 20 $\mu$ S 雷电冲击 (峰值)	kV	325	(投标人填写)
	1min 工频		140	(投标人填写)
4	重量	Kg	(投标人提供)	(投标人填写)
5	干弧距离	mm	(投标人提供)	(投标人填写)
6	爬电距离/干弧距离 (干弧距离应计及海拔修正系数 KH)		$\leq 4$	(投标人填写)
7	最大无线电干扰电压	$\mu$ V	500	(投标人填写)
8	预期寿命 (年)	年	30	(投标人填写)
二	隔离开关参数			
1	隔离开关型号		(投标人提供)	(投标人填写)
	操动机构型式或型号		(投标人提供)	(投标人填写)
2	电动或手动		电动并可手动	(投标人填写)
	电动机电压		AC380	(投标人填写)
	控制电压		AC220	(投标人填写)
3	额定电压	kV	72.5	(投标人填写)
4	额定频率	Hz	50	(投标人填写)

序号	项 目		单位	标准参数值	投标人保证值
5	额定电流		A	630	(投标人填写)
6	主回路电阻		$\mu\Omega$	(投标人提供)	(投标人填写)
7	温升试验电流		A	1.1I <sub>r</sub>	(投标人填写)
8	额定工频 1min 耐受电压	断口	kV	200	(投标人填写)
		对地		160	(投标人填写)
9	额定雷电冲击耐受电压峰值 (1.2/50 $\mu$ s)	断口	kV	410	(投标人填写)
		对地		350	(投标人填写)
10	额定短时耐受电流及持续时间		kA/s	待合同签订时确定	待合同签订时确定
11	额定峰值耐受电流		kA	待合同签订时确定	待合同签订时确定
12	分闸时间		s	(投标人提供)	(投标人填写)
	合闸时间		s	(投标人提供)	(投标人填写)
	分闸平均速度		m/s	(投标人提供)	(投标人填写)
	合闸平均速度		m/s	(投标人提供)	(投标人填写)
13	辅助和控制回路短时工频耐受电压		kV	2	(投标人填写)
14	机械稳定性		次	$\geq 3000$	(投标人填写)
15	接线端子静态机械负荷	水平纵向	N	(投标人提供)	(投标人填写)
		水平横向		(投标人提供)	(投标人填写)
		垂直		(投标人提供)	(投标人填写)
		安全系数		(投标人提供)	(投标人填写)
三	电流互感器				
1	电流互感器型号			(投标人提供)	(投标人填写)
2	额定电压		kV		(投标人填写)
3	设备最高电压 U <sub>m</sub>		kV		(投标人填写)

序号	项 目	单位	标准参数值	投标人保证值
4	额定频率	Hz	50	(投标人填写)
5	额定一次电流 I <sub>1n</sub>	A	待合同签订时确定	待合同签订时确定
6	额定二次电流 I <sub>2n</sub>	A	待合同签订时确定	待合同签订时确定
7	额定容量	VA	待合同签订时确定	待合同签订时确定
8	级次组合 (P 级含准确限值系数 ALF)		待合同签订时确定	待合同签订时确定
9	铁心数	个	1	(投标人填写)
10	额定热稳定电流	kA	待合同签订时确定	待合同签订时确定
11	热稳定持续时间		待合同签订时确定	待合同签订时确定
12	套管干弧距离 (mm)		(投标人提供)	(投标人填写)
13	爬电距离/干弧距离		≤4.0	(投标人填写)
14	极性		减极性	(投标人填写)
15	套管材质		硅橡胶/瓷	(投标人填写)
16	伞裙结构		大小伞	(投标人填写)
17	套管平均直径	mm	(投标人提供)	(投标人填写)
四	避雷器			
1	型号规格		YH1.5W-72/186	(投标人填写)
2	额定电压	kV	72	(投标人填写)
3	持续运行电压	kV	58	(投标人填写)
4	标称放电电流	kA	1.5	(投标人填写)
5	直流 1mA 参考电压 (不小于)	kV	103	(投标人填写)
6	0.75 倍直流 1mA 参考电压下漏电流	μA	≤50	(投标人填写)
7	500A 操作冲击电流下的最大残压(峰值, 不大于)	kV	174	(投标人填写)



序号	项 目	单位	标准参数值	投标人保证值
8	1.5kA 雷电冲击电流下的最大残压（峰值，不大于）	kV	186	（投标人填写）
9	额定频率	Hz	50	（投标人填写）
五	放电间隙			
1	间隙形式		球/棒	（投标人填写）
2	保护间隙距离		90-160（在此范围内可调）	（投标人填写）
3	间隙材质		铜/钢	（投标人填写）
六	支架			
1	材料		镀锌钢/不锈钢	（投标人填写）
2	高度		提供图纸后确认	（投标人填写）

## 2 项目需求

### 2.1 项目基本情况

本次招标项目地点泰国春武里 WHA 伟华东海岸工业区 D61 区块泰国金鹭硬质合金生产基地二期项目。

### 2.2 使用条件

在签订合同时确定具体项目的环境条件及系统条件。

### 2.3 供货范围

标包 1

设备名称	名称	规格型号	备注
115kV 主变压器 1	主变压器 1	三相双绕组电力变压器 SZ20-20000/115	
	中性点成套装置		

主变压器根据不同容量和不同海拔进行报价。具体数量等细节详见商务招标文件。

每台主变的供货范围包括但不限于以下部分：

表 5 货物需求及供货范围一览表

序号	名称	单位	项目单位要求		投标人响应	
			型式、规格	数量	型式、规格	数量
1	变压器本体	台				
2	高压套管	支/台	玻璃钢干式	3		
3	低压套管	支/台	玻璃钢干式	3		
4	中性点套管	支/台	玻璃钢干式	1		
5	高压侧套管式电流互感器	组/台		3		
6	中性点套管式电流互感器			1		
7	主油箱储油柜（包括油位计、吸湿器等油保护装置）及气体继电器	套/台		1		
8	有载分接开关（包括储油柜、吸湿器、油位计、气体继电器等）及其操动机构	套/台	组合式真空开关	1		

序号	名称	单位	项目单位要求		投标人响应	
			型式、规格	数量	型式、规格	数量
9	各部分联管	套/台		1		
10	压力释放装置	套/台		2		
11	绕组温度控制器	套/台		1		
12	油温度控制器	套/台		2		
13	散热器	组/台		1		
14	变压器端子接线箱	套/台	不锈钢外壳	1		
15	各种阀门	套/台		1		
16	铁心、夹件接地引下线及套管	套/台		1		
17	密封垫	套/台		1		
18	变压器油	t/台	45#/25#	足量		
19	铭牌、标识牌和警示牌	套/台		1		
20	用于上述组部件与控制柜和端子接线箱的全部应有的连接电缆	套/台		足量		
21	其他未列入的组部件					
序号	名称	单位	项目单位要求		投标人响应	
			型式、规格	数量	型式、规格	数量
1	中性点成套装置	套		1		

表6 必备的备品备件、专用工具和仪器仪表供货表

序号	名称	单位	项目单位要求		投标人响应		备注
			型号和规格	数量	型号和规格	数量	
1	备用油	量/台	同本体油	10%			按总油量
2	密封垫	各种规格	套	1			
3							
4							

各投标方在制作投标文件时，设备共性部分可放在一起，不同部分必须按标包列出。

投标方所供变压器及中性点成套设备，须满足相应国家规范、本规范书及电网相关(包含不限于《国家电网有限公司关于印发十八项电网重大反事故措施(修订版)的通知》)要求，当以上规范性文件要求不一时，按其中较高标准执行。

变压器要满足《变压器能效限定值及能效等级》中的要求。

具体项目时，主变压器高压侧电压及短路阻抗必须满足国标及项目地电力公

司要求。待具体项目时会提供明确的阻抗值。

具体项目时，主变压器高压侧与配电装置的连接方式由招标方根据项目情况确定，投标方需满足任何方式的连接。

海拔高度涉及的系数修正，由投标方按规范进行修正，可参照《导体和电器选择设计技术规定》（DL/T5222-2005）及其他规范和标准。3000米以上按照最高4000米修正。

### 3 报警和跳闸触点表

项目单位应根据实际工程需要，在表7中填写报警和跳闸触点，投标人填写“响应”与否。

表7 报警和跳闸触点

序号	触点名称	报警或跳闸	由项目单位填写			投标人响应
			电源电压 (V, DC)	触点容量 (VA)	输出 4~20mA	
1	主油箱气体继电器	轻故障报警 重故障跳闸	220	110	—	(投标人填写)
2	主油箱油位计	报警	220	110	—	(投标人填写)
3	主油箱压力释放装置	报警或跳闸	220	110	—	(投标人填写)
4	油面温控器	报警	220	110	PT100	(投标人填写)
5	绕组温控器	报警	220	110	PT100	(投标人填写)
6	有载分接开关压力突变继电器（或气体继电器）	跳闸	220	110	—	(投标人填写)
7	有载分接开关切换油室的压力释放装置	报警	220	110	—	(投标人填写)
8	有载分接开关的油位计	报警	220	110	—	(投标人填写)
9	有载分接开关拒动指示（由驱动机构控制）	报警	220	110	—	(投标人填写)

### 4 投标人提供信息

表8 销售运行业绩表

序号	型号规格	数量	用户单位	用户联系人	用户联系人电话	投运时间	备注
1							

2							
3							
4							
5							
6							
7							

表9 推荐的备品备件、专用工具和仪器仪表供货表（投标人填写）

序号	名称	型号和规格	单位	数量
1				
2				
3				
4				
5				
6				

表10 主要部件材料表

序号	名称	型号、规格、厂家、原产地		备注
		招标人要求	投标人响应	
1	硅钢片	选用工艺先进、性能稳定、运行成熟、质量可靠、厚度适合、平整度好、优质低耗的硅钢片，应能满足招标文件对变压器损耗和噪声等性能参数的要求；厚度不大于0.3mm。选用在P1.7时单位损耗≤100的优质硅钢片 推荐武钢、新日铁		
2	换位导线	推荐上海杨行、沈阳宏远、天威线材、句容联合、湖南湘能、无锡统力、四川金瑞、阿斯塔、埃赛克斯、常州正和、江阴华电、无锡锡洲、江苏中容或等同		
	扁铜线			
3	绝缘纸板	投标人提供		
	绝缘成型件	设计成熟、工艺先进、质量可靠		
4	变压器油	克拉玛依#45油/#25油或等同		
5	密封件	投标人提供		
6	钢材	投标人提供		
7	有载或无励磁分接开关	推荐组合式真空开关		
8	高压套管	玻璃钢干式		
9	低压套管	玻璃钢干式		

序号	名 称	型号、规格、厂家、原产地		备 注
		招标人要求	投标人响应	
10	高压中性点套管	玻璃钢干式		
11	套管式电流互感器	投标人提供		
12	散热器	片式		
13	风扇	—		
14	油泵（如果有）	—		
15	油流继电器（如果有）	—		
16	蝶阀和球阀	投标人提供		
17	储油柜	金属波纹外油式		
18	气体继电器	投标人提供		
19	油位计（本体和切换油室）	投标人提供		
20	吸湿器（本体/切换油室）	投标人提供		
21	顶层油温度计	投标人提供		
22	绕组温度计	投标人提供		
23	压力释放阀（本体/切换油室）	投标人提供		
24	压力突发继电器（如果有）	投标人提供		
25	控制柜	—		
26	其他需要说明的材料和附件	—		

## 5 技术偏差表

投标人提供的产品技术规范应完全满足本技术规范中规定。若有偏差投标人应如实、认真地在技术偏差表（表 11）中填写偏差值，否则视为与本技术规范中规定的要求一致。若无技术偏差则应在技术偏差表中填写“无偏差”。

表 11 投标人技术偏差表

序号	项 目	对应条款编号	技术招标文件要求	差 异	备 注
1					
2					
3					

## 6 投标人应提供的其他资料

6.1 用户运行证明。

6.2 同类产品鉴定证书及鉴定产品的型式试验报告。

表 12 投标人提供的鉴定证书表

序号	鉴定产品型号名称	组织鉴定单位	依据标准	鉴定时间

表 13 投标人提供的试验检测报告表

序号	产品型号名称	试验报告类别和内容	依据标准	试验时间	试验单位

6.3 本投标产品预设方案和有关说明。

- (1) 主变压器铁心、绕组和箱体的结构，包括绕组的排列位置和型式；
- (2) 投标人应提供提高抗短路能力的措施和计算报告，并提供同类产品的突发短路型式试验报告；
- (3) 提供设备有关抗地震措施的论述；
- (4) 降低杂散损耗，防止局部过热的技术措施；
- (5) 预防渗漏的技术措施；
- (6) 绕组引线及套管连接结构的说明；
- (7) 储油柜的油气隔离系统说明；
- (8) 其他需要提供的资料和说明。

# **Common Technical Specification for 145kV Gas-Insulated Metal-Enclosed Switchgear**

**June 2024**



## Catalogue order

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# 145kV Gas Insulated Metal Enclosed Switchgear Procurement Standards common technical specification

## 1 Scope

This section specifies the general provisions, technical parameters, performance requirements, testing, packaging, transportation, delivery, as well as the general requirements for factory inspection and supervision during manufacturing of 145kV gas-insulated metal-enclosed switchgear (hereinafter referred to as GIS).

This section applies to the 145kV GIS.

This part applies to the 145kV GIS.

## 2 Normative references

The following documents are essential for the implementation of this document. For dated references, only the specified version applies. For undated references, the latest version (including all amendments) applies.

GB 1208 Instrument current transformer

GB 1984 High-voltage AC circuit breaker

GB 1985 High-voltage AC disconnectors and earthing switches

GB 7674 Gas-insulated metal-enclosed switchgear for rated voltages of 72.5kV and above

GB/T 8287.1 Pillar insulators for indoor and outdoor systems with a nominal voltage above 1000V  
Part 1: Porcelain or glass insulators for systems with nominal voltage above 1000V

### Testing

GB/T 11022 Common technical requirements for high-voltage switchgear and controlgear standards

GB 11032 Metal Oxide Surge Arrester (AC) without gap

GB/T 12022 Industrial sulphur hexafluoride

GB/T 25096 Definition, test methods and acceptance criteria of composite insulators for station columns for substations with AC voltage higher than 1000V.

GB 50150 Electrical installation works Electrical equipment handover test standard

DL/T 402 Technical conditions for ordering high-voltage AC circuit breakers

DL/T 486 High-voltage AC disconnecting and earthing switches

DL/T 593 Common technical requirements for high-voltage switchgear and controlgear standards

DL/T 617 Technical conditions for gas-insulated metal-enclosed switchgear

DL/T 726 Technical conditions for ordering voltage transformers for electric power

Q/GDW 13001.1 Technical Specification for High Altitude External Insulation Configuration

Q/GDW 11716 Technical specification for expansion joints for gas-insulated metal-enclosed switchgear

## 3 Terms and definitions

The following terms and definitions apply to this document.

### 3.1

#### Bidder

A legal person or other organisation that proposes a project for which a tender is to be issued.

3.2

tenderer

A legal person or other organisation that responds to a tender or competes in a tender.

3.3

**Seller (supplier)**

Legal persons or other organisations, including their legal successors, that provide goods and technical services under this part.

3.4

**buyer (purchaser)**

Legal persons or other organisations, including their legal successors and licensed assigns, who purchase goods and technical services under this part.

**4 general provisions**

4.1 general provisions

4.1.1 Bidders shall have the qualifications required by the solicitation notice, which are set out in the commercial section of the solicitation documents.

4.1.2 Bidders are required to read carefully all the provisions of this part (including the general and relevant specialised technical specifications of this part).

4.1.3 This part puts forward the minimum technical requirements, and does not stipulate all the technical details, and does not fully cite the provisions of the relevant standards, the bidder should provide brand new products that comply with the latest version of the standards cited in this part and the technical requirements of this bidding document, if there is any inconsistency between the standards cited or the standards used in this part are inconsistent with the standards implemented by the bidder, the higher requirement will be applied. standards.

4.1.4 If the bidder does not object in writing to the provisions of this part, it means that the equipment supplied by the bidder fully complies with the requirements of this part. If there is any inconsistency with the requirements of this part, it should be listed in the "Table of Technical Differences" item by item.

4.1.5 This part will be annexed to the order contract and has the same legal effect as the contract. Matters not covered in this part shall be determined by agreement between the contracting parties at the time of contract negotiation.

4.1.6 If there is a conflict between the commercial aspects of this part and the commercial part of the solicitation documents, the commercial part shall prevail.

4.1.7 In the event of a conflict between the provisions of the General Part and the Special Part of this Part, the Special Part shall prevail.

4.1.8 Bidders are required to have a track record of similar projects in Thailand and a good understanding of local standards;

4.1.9 Bidding products need to meet the local power grid and the region's relevant certification, with local or power industry access conditions; and provide supporting materials

4.1.10 These technical conditions, only provide for general technical requirements, for local special requirements, the bidder should be fully aware of, and indicate in the proposal.

4.1.11 The bidder will be required to provide guidance for on-site installation, the cost of which is included in the bid price.

4.2 Qualification documents to be provided by bidders

Bidders should provide the following qualification documents:

Sales records of the products tendered by the bidder or manufacturer and proof of use by the corresponding end-users.

The bidder or manufacturer shall provide ISO 9000 series certification or equivalent quality assurance system certification issued by authoritative institutions.

The bidder or manufacturer shall provide documentation of the technical and major equipment and other production capabilities required to fulfil the contract.

The bidder or manufacturer shall provide documentation of the fulfilment of contractual equipment maintenance, repair and other service obligations.

The bidder or manufacturer shall provide all valid type test reports of the bidding equipment products.

The bidder or manufacturer shall provide a detailed list of suppliers of important outsourced or ancillary components in the bidding product and inspection reports.

The bidder or manufacturer shall provide a letter of commitment to supply the supplier of imported key components in the bidding product.

The bidder or manufacturer shall provide the supplier and place of origin of the component parts of the product under bid.

#### 4.3 Scope of application

4.3.1 The scope of application of this part is limited to the design, installation, testing, commissioning and on-site service and technical service of the products being tendered.

4.3.2 The successful bidder shall, not later than 4 weeks after signing, submit to the Purchaser a detailed production schedule (see Table 1), including details of equipment design, material procurement, equipment manufacture, in-plant testing, and transport to define each part of the work and its progress.

Table 1 Production Progress Schedule

Contract number\_\_\_\_\_ ; Project Name\_\_\_\_\_ ; Equipment Name\_\_\_\_\_ ;  
 Model specification\_\_\_\_\_ ; Working \_\_\_\_\_ ; Manufacturer's name and address\_ ;  
 Technical specification number\_ ;Job number\_\_\_\_;FOB Date \_\_\_\_\_;Date of arrival on shore\_ .  
 Date of arrival at place of delivery\_\_\_\_\_ .

Time (day, month and year)					
Item					
	engineering graphics				
	Drawings sent				
	Drawing approval time				
Design Liaison	number one				
	number two				
	Procurement of materials and ancillary parts				
	Material and ancillary parts into the factory				
GIS component production and testing	interrupter				
	disconnect switch				
	earth switch				
	current transformer				
	voltage transformer				
	cable connector				
	bushing				
	Pot Insulators				
	Support insulators				
	Transmission Line				
	housings				
	expansion joint				
	control mechanism				
	Other components				
	Factory assembly				
	Factory test				

4.3.3 In the event of any delay in the progress of the work, the seller shall promptly explain to the buyer the reasons, consequences and remedial measures taken.

4.4 Requirements for design drawings, specifications and test reports

4.4.1 Procedures for endorsement of drawings and plans

4.4.1.1 The Seller must submit all drawings and explanatory documents to the Buyer for validation and approval within 4 weeks after the contract entry into force. These shall include the outline drawing of the GIS, the distribution of compartments, the layout, the assembly, the foundation, the electrical schematic, the transport dimensions, the transport mass, the centre of gravity, the total mass and the layout of the secondary lines.

4.4.1.2 The buyer shall be entitled to propose amendments during validation. Four weeks after receipt of the drawings to be approved, the buyer shall return to the seller a set of confirmed drawings or drawings bearing the buyer's calibration mark (signed by the buyer's responsible person). Any modifications deemed

necessary by the Buyer and approved by the Seller shall be at no additional cost to the Buyer. Any loss of material purchased or processed without final approval of the drawings by the Buyer shall be the sole responsibility of the Seller.

4.4.1.3 The Seller shall, within 2 weeks after receipt of the Buyer's confirmation drawings (including amendments by the Approved Party), provide the Buyer with the final version of the official drawings and a set of base drawings for reproduction and the official CD-ROM, with the official drawings stamped or signed by the factory.

4.4.1.4 The finished product shall correspond to the final confirmed drawings. The Buyer's approval of the drawings does not relieve the Seller of his responsibility for the correctness of his drawings. If the drawings are further modified by the Seller's technical personnel during the installation of the equipment on site, the Seller shall re-collect the drawings in a new booklet and officially submit it to the Buyer, and shall guarantee that the installed equipment is in full conformity with the drawings.

4.4.1.5 Format of drawings: All drawings shall have title columns, corresponding numbers, all symbols and part marks, and the text shall be in Chinese and English, and the SI international unit system shall be used. For the imported equipment should be equipped with Chinese and English instructions and signs, when the buyer has doubts about the English part, the seller should make a written explanation.

4.4.1.6 The Seller shall provide the Buyer free of charge with all finalised drawings, data and instructions. The drawings shall include the drawings referred to in 4.4.1.1 and the seller's own cable inventory, and shall ensure that the buyer can maintain the equipment supplied in accordance with the final version of the drawings and replace parts and components during operation.

4.4.1.7 GIS required drawings:

- a) Overall assembly drawing: It shall indicate the total assembly of the equipment, showing the front, side and top views of the equipment after assembly and at the same time labelling the components after installation, including external dimensions, location of the centre of gravity of the equipment and the total mass, wind area, transport dimensions and mass, volume and total volume, location of the control cabinets, location of the cable entrances, intrinsic frequency, size and material of the terminals and other accessories.
- b) The interconnection diagram between the control cabinet and the equipment: it should include all the terminals in the control cabinet and indicate the identification number of the cable and the approximate location of the equipment in the cabinet.
- c) Electrical schematic diagram: it should include the internal wiring of the equipment control cabinet and actuator and the AC and DC circuits of control, signalling and lighting for remote operation. If more than one electrical schematic diagram is available, the relevant wiring and contacts between the diagrams should also be labelled and numbered in correspondence with each other. Where necessary, outline operating instructions for all special devices or procedures shall be provided.
- d) Foundation plan: dynamic loads for equipment operation, static loads and their locations, inlet and outlet line dimensions, location and dimensions of foundation bolts, dimensions of equipment and its control cabinets, channel drains, etc., should be marked, and requirements for the strength and level of the foundation should be indicated.
- e) SF6 System Diagram: The layout of the SF6 compartments in each unit, the instrumentation, and the connections between the compartments shall be labelled.
- f) SF6 gas and oil pipework for the equipment: this should include the size, arrangement and pressure of the pipework.
- g) A nameplate showing a graph of SF6 gas pressure versus temperature shall be attached to each SF6 circuit breaker control cabinet.
- h) Casing diagram: including terminal details, the diagram should be marked casing external dimensions, terminal allowable tension, destruction of tension, creepage distance, and so on.
- i) Manipulator system diagram: the hydraulic actuator should be labelled with detailed drawings of

pipe sizes, arrangements, pressures, etc.

- j) System connection diagrams: Controls, relays and interlocks between multiple devices in the electrical primary and secondary circuits should be labelled.
- k) Nameplate drawing: It should comply with the provisions of GB 7674.

#### 4.4.2 Requirements for instructions

4.4.2.1 A complete description and technical data of the GIS structure, installation, adjustment, operation, maintenance, overhaul and all accessories. The following shall be included:

- a) The installation instructions include at least:
  - 1) Unpacking and lifting. Quality of transport units, precautions for lifting and unpacking, special lifting gear, etc.
  - 2) Assembly. GIS that are not transported as a unit shall be clearly labelled and coded as such and shall be provided with a schematic diagram of the assembly with the transport unit number.
  - 3) Installation Preparation. Information on requirements for foundation construction, dimensions of external terminals, location of cable entry points, grounding, and connection methods, dimensions, and arrangement of various pipes.
  - 4) Final installation acceptance. Test items and test methods required by the contract to be carried out on site.
- b) Maintenance: This includes, as a minimum, the provision of maintenance instructions for major components, as well as the classification, procedures and scope of GIS maintenance work, as specified in the relevant standards.
- c) Operation and maintenance: Provide matters that should be noted in operation and control indicators, the maintenance cycle of major components and maintenance programmes.

4.4.2.2 Technical data for each element of the GIS and all accessories.

4.4.2.3 Structural drawings showing the GIS and manoeuvring mechanisms and a description of the technical requirements for the foundations.

4.4.2.4 A more detailed description of the structural features, equipment and its components.

4.4.2.5 Description of operating mechanism characteristics.

4.4.2.6 Instructions for the use of spare parts, special tools and special instrumentation.

4.4.2.7 The instructions are in English and Chinese.

#### 4.4.3 Test report

The seller shall provide the following test reports:

- a) Type test and factory test reports for GIS.
- b) Type test and factory test reports for all GIS components.
- c) If the product has been locally improved or changed the corresponding validation test report should be provided additionally.

#### 4.4.4 Delivery time and quantity of drawings, specifications, test reports and other information

4.4.4.1 The information, drawings, and test reports to be furnished by the Seller to the Buyer shall be as shown in, but not limited, Table 2.

4.4.4.2 The seller shall provide a detailed packing list.



Table 2 Information drawings and test reports provided by the seller to the buyer

serial number	content	serial number	content
1	Drawings	3	Test report
1)	GIS civil, foundation provisions	1)	GIS full set of type test reports
2)	GIS installation, maintenance and operation regulations	2)	GIS Full set of factory test reports
3)	GIS Ventilation Provisions	3)	Other test reports required by the contract
4)	GIS single line map	4)	Test reports on key components (basin insulators, insulated tie bushings, etc.)
5)	Main scheme diagram for secondary control, measurement, monitoring, signaling circuits and auxiliary equipment circuits	4	Other information
6)	GIS layout (plan, section)	1)	GIS Main Component Standards
7)	Installation drawings of main components with external dimensions, transport dimensions, quality	2)	High Pressure Vessel Standards
8)	GIS Foundation Maps	3)	GIS Welding Standards
9)	Distribution of SF6 gas compartments	4)	SF6 Gas Standards
10)	Dimensional drawings for installation and maintenance	5)	Material standards for GIS
11)	SF6 Gas Monitoring System Diagram	6)	GIS inspection, commissioning regulations
2	Installation instructions	7)	GIS Packaging, Shipment, Storage Regulations
1)	Installation guide for major GIS components (circuit breakers, disconnectors, earthing switches, current transformers, etc.)	8)	On-site high-voltage test regulations and standards
2)	Installation guidelines for ancillary equipment (SF6 gas systems, oil systems, local control cabinets, etc.)	9)	Maintenance Guide
3)	Introduction to special tools and instruments	10)	SF6 Gas Quality Certification
4)	Description of specialised equipment required for transport and installation	11)	Hydraulic oil quality certificate
5)	Guidelines for field tests and other tests	12)	Filter material (adsorbent) certification
6)	Full set of installation drawings	13)	GIS Enclosure Security Certification
7)	Complete grounding system drawings	14)	GIS High Pressure Gas Release Device Certification
8)	Full set of foundation drawings	15)	Packing List
9)	Low-voltage cable layout drawings	16)	Packaging instructions
10)	Component installation drawings (in situ control cabinets, operator boxes) (including terminal block lists, layouts, etc.)	17)	Steady state voltage distribution relative to ground
11)	SF6/Oil Casing Interface Dimension Drawing	18)	List of lubricants, greases and hydraulic fluids used in equipment
12)	Transformer interface dimensions	19)	Specification, type, and manufacturer of the energised display device (if used)
13)	Cable interface dimensions	20)	Expansion Joint Configuration Programme

4.4.4.3 Bidders shall provide GIS outline dimensions and compartment distribution diagrams in the bidding documents for reference during bid evaluation.

#### 4.5 Criteria

4.5.1 All equipment and spare parts under the contract, including all accessories and equipment obtained by the Seller from third parties, shall comply with the latest version of the national standards (GB), the power industry standards (DL) and the IEC standards and the international system of units (SI), which are the minimum requirements for the equipment, with the exception of the technical parameters and requirements stipulated in this part. If the Seller adopts its own standards or specifications, it shall provide the Buyer with copies in Chinese and English and obtain the Buyer's consent before adopting them, but they cannot be lower than the relevant provisions of GB, DL and IEC.

4.5.2 All bolts, threads, pipe threads, clamps and nuts shall comply with International Organisation for Standardisation (ISO) and System of International Units (SI) standards.

4.6 Technical data and information to be submitted by the seller

4.6.1 Tables of technical parameter characteristics, tables of technical deviations and related technical information.

4.6.2 Characteristic parameters and features of the tendered product.

4.6.3 Relevant technical documentation and information required for co-operation with other equipment.

4.7 spare partss

4.7.1 The bidder shall provide the necessary and recommended spare partss and list their unit prices separately (fill in the commercial part).

4.7.2 All spare partss shall be new and interchangeable with corresponding parts of the same type of equipment already installed.

4.7.3 All spare partss shall be separately boxed, packed in such a way as to protect against dust, moisture, damage, etc., and shipped together with the main equipment, and labelled "spare partss" to distinguish them from the main body.

4.8 Specialised tools and instrumentation

4.8.1 The bidder shall provide the necessary and recommended specialised tools and instrumentation.

serial number	name (of a thing)	Specifications and Models	unit (of measure)	quantities	the source (of a product)	manufacturer (of a product)	prices	note
1	SF6 gas recovery and purification device		classifier for heavy objects, such as machines, TVs, computers; theater performances	1				Oil-free compressors
2	SF6 micro water density on-line monitoring		interleave	1				Each individual air chamber
3	Localised online monitoring		interleave	1				external
4	Environmental online monitoring		interleave	1				infrared principle

4.8.2 All specialised tools and instruments shall be new and accompanied by detailed instructions for use.

4.8.3 Special tools and instruments should be packed in separate boxes, indicating "special tools" and "instruments", and labelled as moisture-proof, dust-proof, fragile, upward, do not invert, etc., and shipped together with the main equipment.

4.9 Transport, storage, installation, commissioning, performance testing, commissioning and acceptance

4.9.1 Installation and commissioning of the contract equipment will be carried out by the buyer under the direction of the seller's technical personnel in accordance with the technical documents and instructions provided by the seller.

4.9.2 Performance tests, commissioning and acceptance of contract equipment are carried out in accordance with the standards, protocols and specifications specified in this part.

4.9.3 Upon completion of the installation of the contract equipment, the Buyer and the Seller shall inspect and confirm the installation work and shall sign a certificate of installation work in two copies, one for each party.

4.9.4 The equipment can be put into trial operation only after the installation, commissioning and performance test are passed. After the trial operation, the seller and the buyer shall sign the acceptance certificate of the contract equipment (the time of trial operation shall be agreed in the contract negotiation). The certificate shall consist of two copies, one for each party.

4.9.5 If one or more of the technical indicators fail to meet the requirements of the technical part of the contract during the period of installation, commissioning, performance test, trial operation and warranty, the seller and the buyer shall jointly analyse the reasons and assign responsibilities. If the reason is manufacturing or involves claims, it shall be carried out according to the relevant provisions of the commercial part of the contract.

4.9.6 Outgoing packages for transport shall, as far as possible, be in complete functional units as the basic unit of transport and shall be transported under sealed and filled with a slight positive pressure (0.02 to 0.5 mm). Packaging, transport and storage in dry gas (0.05 MPa). Three-dimensional impact recorders shall be added to the transport units of circuit breakers, disconnectors, voltage transformers, surge arresters and bushings (only vibration indicators may be added for in-plant transport), and vibration indicators shall be added to the other transport units. If the shock acceleration is greater than 3g or does not meet the requirements of the product technical documents during transport, the corresponding compartment should be opened after the product is transported to the site to check whether the components are intact, and if necessary, the test items can be increased or returned to the factory for processing.

#### 4.10 Criteria to be met

The equipment shall meet the requirements of GB 1208, GB 1984, GB 1985, GB 7674, GB/T 11022, GB 11032, GB/T 12022, GB 50150, DL/T 402, DL/T 486, DL/T 593, DL/T 617, DL/T 726, Q/GDW 13001.1, Q/GDW 11716 latest version of the requirements, but not limited to the above norms and standards.

#### 4.11 Required Documents

The technical standards of such equipment shall meet the requirements of relevant clauses in the standardisation results of State Grid Corporation of China. The corresponding provisions of the following documents are applicable to this document, and their latest versions (including all amendment sheets) are applicable to this document. Included:

- a) Eighteen Major Anti-Accident Measures for the Grid of the State Grid Corporation Limited (2018 Revision);
- b) The State Grid Corporation Limited Transmission and Substation Engineering General Equipment 35 to 750kV Substation Booklet (2018 Edition);
- c) Generic Design for Transmission and Substation Projects, National Grid Ltd.

## 5 Technical parameters and performance requirements

### 5.1 GIS technical parameters

5.1.1 **GIS** The technical parameters are given in the table of technical parameters and characteristics of this and the corresponding specialised sections.

#### 5.1.2 General requirements

The following should be included:

- a) The product must be designed to safely perform the following functions: normal operation, inspection, maintenance, insulation testing of lead-in cables or other equipment, elimination of hazardous electrostatic charges, phase sequence verification after installation or expansion, operational interlocking, and voltage withstand testing.
- b) The product shall be designed so that the permitted base error and the thermal effects of thermal expansion and contraction do not affect the guaranteed performance of the equipment and meet the requirements for connection to other equipment.
- c) Replaceable components shall be interchangeable when all ratings and construction of the product are the same.

- d) The maintenance manual of the product provided by the manufacturer shall specify the overhaul and maintenance cycle and content. The product and its components should be guaranteed to operate reliably during the service and maintenance intervals.
- e) The components shall comply with their respective relevant standards.
- f) Important group components such as actuators, basin insulators, support insulators, insulating tie rods, expansion joints, etc. have unique numbers and can be traced back to the production process.
- g) The manufacturer shall carry out quality testing of metal materials and component materials, and carry out metal composition testing on samples of key metal components such as tanks, transmission rods, crutch arms, bearings (pins) and sampling of metallurgical tests according to the project, as well as providing test reports.
- h) GIS on-site installation shall be carried out in a temporary clean room. Temporary clean room should be based on the product's structural type, the main equipment, the main bus and branch bus for the overall arrangement of the design of the temporary clean room. Temporary clean room should be easy to disassemble on site, mobile and flexible, windproof, rainproof, dustproof. The length, width and height of the temporary clean room should meet the requirements of equipment installation and commissioning work, and the construction unit should be informed of the requirements of the site and foundation in advance.
- i) Equipment used in cold regions should consider measures to prevent liquefaction of SF6.
- j) The circuit breaker and disconnecting switch actuator box should be set up for easy operation and maintenance, and the perishable parts of the mechanism should be easy to maintain and replace. The distance between the control cabinet and the GIS body should ensure that the cabinet door can be opened normally, so as to facilitate the secondary wiring.
- k) Functional modules within a single interval shall be capable of being easily serviced and replaced without affecting the busbar and adjacent intervals.

### 5.1.3 Specific requirements

The following should be included:

- a) Interlocking:
  - 1) The product shall be provided with mechanical or electrical interlocking devices to prevent pulling and closing of disconnecting switches under load and misclosing of earthing switches under power. The following equipment shall have interlocks and shall meet the following requirements for main circuits:
    - 2) During maintenance, the high-voltage disconnect switches (circuit breakers) on the main circuit used to secure the isolation gap shall ensure that they do not self-close.
    - 3) The earth switch should be closed to ensure that it does not self-split.
    - 4) The disconnecting switch shall be electrically interlocked with the relevant circuit breaker; there shall be a reliable electrical interlock between the disconnecting switch and the earthing switch. The setting of the interlocking logic shall be designed according to the main electrical wiring and shall be clearly indicated in diagrams and agreed by the purchaser.
    - 5) Electrical interlocks shall be provided with separate power circuits and shall be independent of other circuits. Expansion junctions shall not be used for all interlock circuit junctions.
- b) Grounding:
  - 1) The shell of each gas compartment shall be interconnected and reliably earthed, and the earthing circuit shall meet the dynamic and thermal stability requirements for rated short-circuit current.
  - 2) Grounding shall prevent dangerous induced voltages in the enclosure, and the induced

voltages in the enclosure and bracket shall not be greater than 24V under normal operating conditions and 100V under fault conditions.

- 3) The contact surface of the earthing point and the cross-sectional area of the earthing conductor shall be such as to ensure safe passage of the fault earthing current.
- 4) Each phase of the circuit breaker shall have an unpainted, tin-plated grounding point on the base of the circuit breaker with a grounding symbol. The diameter of the tightening earth bolt shall not be less than 12 mm for copper earthing materials, and the diameter of the tightening earth bolt shall not be less than 1.5 mm for steel earthing materials.  
16mm.
- 5) The enclosure shall be capable of being earthed. All metal parts intended to be earthed that are not part of the main or auxiliary circuit shall be earthed.
- 6) The mutual electrical connection of the shell, frame and other components shall be fastened (bolted or welded) and the electrical connection shall be ensured by means of jumper. If straddle pieces are used, there should be special straddle parts on the outdoor GIS tank, and it is prohibited to connect directly through flange bolts.
- 7) The main circuit should be able to be earthed for safe maintenance work. In addition it shall be possible to connect the main circuit to the earth electrode during servicing after the enclosure has been opened.
- 8) Voltage transformers, surge arresters, and quick-earthing switches shall each be provided with a separate lead for earthing. The earth terminal of the earthing switch should be led to the external earth of the GIS through an insulating sleeve and a removable earth connection plate should be provided. For areas with large temperature differences, a soft copper laminated conductive tape should be used to connect the grounding lead to the grounding conductor.

c) Shell:

- 1) For ease of installation and safe operation, housing expansion joints should be fitted.
- 2) The metal enclosure shall be capable of withstanding normal and transient stresses occurring during operation.
- 3) It should meet the requirements of 5.13.1 for the shell, and the manufacturer should carry out non-destructive testing of the welds of GIS and tank circuit breaker tanks to ensure that the welds of the tanks are 100% qualified, and design and manufacture according to the requirements of the conditions that the equipment can not be re-examined after it is put into operation to ensure the safety and reliability of the materials, structure, welding process and inspection.
- 4) The level of insulation of the equipment is ensured when the closed enclosure is filled with a gas of minimum functional pressure. The effects of vibration and temperature variations as well as the influence of climatic conditions shall also be taken into account.
- 5) The shell should be able to meet the design pressure and have the ability not to produce arc external effect and not burn through in the specified time, and should meet the requirements of DL/T 617 standard.
- 6) Whether the shell is welded or cast, the thickness and structure of the calculation method should be selected with reference to similar pressure vessel standards.
- 7) The design temperature of the enclosure is normally the upper limit of the ambient air temperature plus the temperature rise of the enclosure when the main circuit conductors flow the rated current, and should take into account the effects of sunlight.
- 8) The design pressure of the enclosure shall be at least the upper limit of the pressure that can be achieved in the enclosure at the design temperature. In determining the design pressure of the enclosure, the temperature of the gas shall be taken as the average of the

upper limit of the temperature of the enclosure and the upper limit of the temperature of the conductor of the main circuit when passing the rated current, except in those cases where the design pressure can be determined from existing temperature rise test records.

- 9) The following factors shall be taken into account in the design of the enclosure: the vacuum that may occur before the enclosure is inflated; the total pressure difference that the enclosure or insulating partition may withstand; the pressure increase caused by accidental leakage of gas from the compartment in the case of neighbouring compartments with different operating pressures; the possibility of internal malfunctions, etc. If the enclosure is provided with an observation window, the mechanical strength of the transparent panels of the observation window shall be equivalent to that of the enclosure to ensure that there is no leakage of gas and that UV protection is complete.
  - (10) The material properties of the enclosure structure shall have known and characterised minimum physical properties which are the basis for calculations and/or verification tests. The manufacturer shall be responsible for the selection of the material and for maintaining the minimum properties of the material based on the certificate of conformity and incoming test results.
  - (11) The material of the protective cover of the inflatable port should be the same as that of the inflatable port to prevent galvanic corrosion.
  - (12) Outdoor GIS flange butt surface should adopt double sealing, and in the flange joints, mounting screw holes, across the contact surface of the periphery of the piece, flange butt surface injection holes, pot insulator casting holes and other parts of the waterproof glue.
- d) Insulated dividers:
- 1) The product shall be divided into compartments so as to fulfil the requirements for normal conditions of use and for limiting the effects of arcing within the compartment. The insulating partitions shall therefore ensure that there is no change in the gas pressure in this compartment in the event of a leakage of gas in an adjacent compartment or maintenance work which reduces the pressure up to the negative pressure specified by the manufacturer.
  - 2) Insulated partitions are normally made of insulating material. Earthing and other measures shall be provided for personal safety; mechanical safety data shall be shown for the insulated partitions to verify the ability to withstand the normal air pressure still present in the neighbouring compartments.
  - 3) Insulated bulkheads shall be subjected to pressure test, frequency withstand voltage test, partial discharge test and X-ray flaw detection test one by one in accordance with the manufacturer's technical conditions for quality assurance.
  - 4) All SF<sub>6</sub> gas pressure alarms and blocking of all circuit breaker compartments shall have signal outputs, and SF<sub>6</sub> gas pressure reduction in other compartments shall have alarm signal outputs and be indicated on the control cabinet.
  - 5) For GIS with double busbar structure, the disconnecting switches of different busbars in the same interval shall be set up in separate compartments, 252kV and above.  
The GIS busbar disconnectors should not be designed with a common compartment with the busbar. 252kV and 363kV GIS busbar disconnectors with two sets of busbar disconnectors with a common end can be provided with an independent air chamber if required.
  - 6) The long bus shall be divided into appropriate gas chambers, and the gas processing time of the largest gas chamber shall not exceed 8 h. The length of a single gas chamber for equipment of 252 kV and below shall not exceed 15 m, and the corresponding interval of gas chambers for a single main bus shall not exceed 3.
  - 7) First filling with SF<sub>6</sub> gas or operating fluid. SF<sub>6</sub> gas for the first filling and any specified operating fluid shall be supplied with the circuit breaker. SF<sub>6</sub> gas for first filling shall comply with GB/T

12022. Before the gas is delivered, the certificate of the gas passing the toxicity test shall be submitted to the buyer, and the gas used shall be re-inspected and qualified by the buyer before it can be used. The operating fluid shall meet the requirements of the corresponding standards.

- 8) Adsorbent for each compartment. The bidder shall submit an explanation document at the bidding stage, including the location, type and quality of the adsorbent; stainless steel or other high-strength materials shall be used for fixing the adsorbent, and the structure shall be reasonably designed. The diameter of the adsorbent cover opening should be smaller than the diameter of the adsorbent particles; the edges of the adsorbent cover should not have sharp corners and burrs; the gap distance between the installed adsorbent cover and the inner surface of the GIS end cap should be smaller than the diameter of the adsorbent particles. The adsorbent should be made of materials that are not easy to be pulverised and packed in a special bag and tied firmly.
  - 9) Basin insulators should be arranged horizontally as far as possible.
- e) Limit and avoid internal fault arcing:
- 1) Measures to limit and avoid internal fault arcing shall be used, such as interlocking of switchgear, gas leakage limitation and control of insulation coordination, high-speed protection, quick devices for shorting arcs, remote operation (remote control) internal or external pressure relief, and inspection of the quality of work at the site of installation; and the product shall be structurally arranged so as to minimise the effect of internal fault arcing on its ability to continue working. The effects of the arc shall be confined to the compartment in which the arc originated or to some other compartment in the faulty section (if pressure relief facilities are available between compartments in that section). After isolation of the faulty compartment or faulty section, the remaining equipment shall be capable of continuing normal operation.
  - 2) In the interest of personal safety, appropriate protective measures shall be taken to limit the external effects of the arc; only perforations or cracks in the enclosure shall be permitted in the event of external effects of the arc, and no uncontrolled spattering of any solid material shall occur.
  - 3) If pressure relief devices are fitted, they shall be installed in such a way that the escape of gas does not endanger the safety of personnel performing normal operational tasks on site.
  - 4) The seller provides complete information on the use of the protection system and on the external effects of arcing which do not occur for a certain duration when the short-circuit current does not exceed a certain value, and recommends suitable measures or suggestions for fault localisation. The seller shall provide test data and test reports on internal arcing of faults and provide suitable measures and methods for localisation of internal arcing faults.
- f) Each independent gas compartment shall be equipped with a separate gas density relay and pressure gauge, and each circuit breaker of the split-box structure shall be designed as an independent gas compartment and installed with an independent density relay. Each independent bus gas compartment should be equipped with an independent density relay, do not allow multiple bus gas compartments or different phases of the bus gas compartment through the pipeline connected to share a density relay density relay and GIS body connection should meet the requirements of non-disassembly calibration. Density relays installed outdoors shall be provided with rainproof measures. The density relay should be installed in the same operating temperature as the monitored gas chamber. For equipment in cold regions, the density relay shall meet the requirement that the accuracy shall not be less than level 2.5 when the ambient temperature is  $-40\text{ }^{\circ}\text{C}\sim-25\text{ }^{\circ}\text{C}$ . The density relay meter shall be orientated towards the gas chamber to be monitored, and the density relay shall meet the requirement of non-detachable calibration. The density relay meter should be orientated towards the inspection channel.

- g) There should be buffer measures to compensate for expansion and contraction due to foundation settlement and temperature change, mainly used for assembly adjustment, absorption of relative displacement between foundations and thermal expansion and contraction of expansion and contraction. When using pressure balanced expansion joints, the length of busbar between every two expansion joints should not exceed 40 m. The manufacturer shall provide expansion joints configuration plan, and be reviewed by the owner's organisation. Expansion joint configuration plan includes the allowable change of expansion joint and installation operation guide, expansion joint configuration calculation (X, Y, Z three directions of expansion, configuration quantity) expansion joint configuration diagram, expansion joint type (common installation type, pressure balanced type and transverse compensation type) expansion joint (state) expansion – ambient temperature corresponds to the detailed table and other related materials. Configuration of expansion joints should meet the requirements across uneven settlement parts (outdoor different foundations, indoor expansion joints, etc.). Expansion joints used for axial compensation shall be equipped with expansion measurement ruler, and the expansion amount, bolt tightness and other adjustment requirements shall be marked on site. The technical specification of expansion joints shall be carried out in accordance with Q/GDW 11716-2017 Technical Specification for Expansion Joints for Gas-Insulated Metal-Enclosed Switchgear.
- h) Connection and insulation test of cables (works using cable connections)
- 1) The fit of the cable termination box to the cable termination shall be in accordance with the requirements of the corresponding standards.
  - 2) If the incoming cable side is equipped with a live display device, it shall be installed in A, B and C phases separately.
  - 3) The charged display device should be reasonable in structural design, easy to install and maintain, reliable in performance, with self-test function; and it should have the functions of displaying the charged state (light) and mandatory blocking. The charged display device should have interlocking and signal output contacts, and use a separate amplifier for each phase.
  - 4) Removable connecting conductors shall be provided to isolate the cable from the GIS when the cable is subjected to an insulation test, and interface equipment and test sleeves for insulation testing of the cable and the GIS are available on request.
  - 5) The structure and height of the GIS cable bins shall be designed to meet the requirements for ease of installation and removal in the field.
- i) Disconnecting and earthing switches:
- 1) The disconnecting and earthing switches shall have a reliable indication of the opening and closing positions. Observation windows for easy inspection of the contact position may be provided if required. The earth contact of the earthing switch shall be insulated from the body shell. For three-phase mechanically actuated disconnectors with phase-to-phase connecting rods designed for rotary actuation, a switching indicator shall be installed in the phase away from the output axis of the mechanism.
  - 2) The disconnecting and earthing switches shall not be incorrectly separated or incorrectly closed by external forces (including forces caused by short circuits) which may occur during operation.
  - 3) The fast earthing switch shall have the ability to switch on and off inductive currents and the disconnecting switch shall have the ability to switch on and off busbar charging currents as well as small capacitive and inductive currents. The fast transient overvoltage (VFTO) generated when the disconnecting switch opens and closes busbar charging currents shall not damage the equipment, and the resulting transient voltage rise in the enclosure shall not endanger personal safety.



- j) In double busbar, single busbar or bridge connection, GIS busbar arrester and voltage transformer should be provided with independent disconnecting switch. 3/2 circuit breaker connection, GIS busbar arrester and voltage transformer should not be equipped with disconnecting switch, it is desirable to set up removable conductor as the isolation device. The detachable conductor shall be installed in an independent air chamber. The lightning arrester and line voltage transformer of the GIS line interval of the overhead feeder are suitable to adopt external structure.
- k) Each circuit breaker interval shall be equipped with a convergence control cabinet, which shall have analogue wiring diagrams of primary equipment and position indications of circuit breakers, disconnecting switches and earthing switches, as well as humidity-repelling and heating devices to maintain the insulation level inside the cabinet, and a top heat insulation layer in the outdoor forex control cabinet, and the heating device should be temperature- and humidity-controlled, to avoid the use of the long-throw method and prevent the equipment from being over-tempered. Including merger unit, intelligent terminal circuit breaker sink control cabinet should be equipped with air conditioning or other cooling equipment. Small circuit breakers, sockets, lighting and other auxiliary equipment should also be equipped. The household foreign exchange control cabinet and agency box are made of materials with rust-proof performance not lower than low carbon 304 stainless steel, with thickness not less than 2 mm, and internal heat insulation and heat preservation measures should be taken, and the protection level should not be lower than IP45 W. In addition to realising on-site control, measurement and signal display, the cabinet should have enough auxiliary contacts and test terminals for users to use in remote measurement, control and signaling. Each control cabinet should be equipped with "local/remote" control selector switch; for circuit breakers, disconnecting switches and electrically operated earthing switches, switching between local and remote control mode should be realised. When selecting "remote" control, the local control is invalid; when selecting "local" control, the remote control (including protection device information) is invalid. The position of the selector switch should be able to be sent to the remote control centre through the auxiliary contact. The internal lighting device of the control cabinet and terminal box should adopt LED lamps and be equipped with protective cover.
- l) Auxiliary cables:
- 1) The auxiliary cables from the control cabinet to the actuator box TA, TV junction box, as well as from the actuator box and the junction box to the equipment are supplied with the GIS and installed and connected by the manufacturer. The cross-sectional area is in accordance with the following provisions:  
 TA, TV circuit: greater than or equal to  $4\text{mm}^2$   
 Control circuit: greater than or equal to  $2.5\text{mm}^2$ .  
 Signal circuit: greater than or equal to  $1.5\text{mm}^2$ .
  - 2) The cables shall be shielded cables with electrolytic copper conductors, PVC insulated, armoured and flame retardant. The cable shall be marked at both ends with a plate indicating the cable number and the name of the unit connected at the opposite end.
  - 3) The secondary cables laid along the body are laid in metal groove boxes, and the outdoor groove boxes are made of low carbon 304 stainless steel with antirust property not lower than that of low carbon 304 stainless steel. Vertically installed secondary cable box should be supported and fixed separately from the bottom, and well ventilated, horizontally installed secondary cable box should have low drainage measures. GIS, HGIS to the equipment components junction box cable with non-rubber material serpentine tube to transition, the length of serpentine tube should not be more than 1 m. The transition joints of the cable box should be well sealed to avoid water and moisture.

- 4) The AC and DC circuits from the control cabinet to the mechanism box cannot share the same cable, the two sets of trip circuits cannot share the same cable, and the control and power circuits cannot share the same cable.
- m) Terminal blocks and circuits: Terminal blocks shall be marked with a number that corresponds to the circuit diagram provided by the manufacturer. Only one wire can be crimped on each terminal. The terminal block of TA circuit on the control cabinet, using test terminals, should be able to meet the requirements of non-opening the current circuit under the operating condition for stringing or removing the test instrument. General terminals should be able to reliably access 1.5mm<sup>2</sup>~4mm<sup>2</sup> section wires; special needs for access to large cross-section cable terminals, agreed separately.
- n) Requirements for secondary ancillary components in auxiliary and control circuits: The seller shall clearly indicate the models and manufacturers of ancillary components used in auxiliary and control circuits, such as valves, auxiliary and control switches, pressure gauges, density relays, protective relays, terminal blocks, motors, fuses, contactors, low-voltage switches, monitoring and measuring instruments, secondary cables, etc. or procure them in accordance with the buyer's requirements in terms of manufacturers and model numbers to be purchased. The factory test of circuit breakers shall be carried out to verify the operating characteristics of intermediate relays, time relays and voltage relays. The secondary cables and components shall be made of flame-retardant materials, the flame-retardant level of secondary cables shall reach Class C flame-retardant, and the flame-retardant level of secondary components shall reach Class V0.
- o) The enclosures of actuators such as circuit breakers, disconnecting switches, earthing switches, etc., as well as the control cabinets, etc., shall meet the protection level of IP45W and the requirements of IP45W.  
IK10 protection level against mechanical impact, IP55 for wet and rainy areas The box should be equipped with labyrinth vents for air circulation inside the box and be insulated, corrosion-proof, rain-proof, moisture-proof, dust-proof and resistant to the entry of small animals.
- p) GIS installed in humid and rainy, low-temperature areas, the agency box, the convergence control cabinet should be used in a low-power constant pitch heater and manual pitch heater combination of the configuration of the programme, according to the cabinet volume reasonably set up the ventilation holes, the heater power supply and the operation of the power supply should be set up separately and independently, in order to ensure that cut off the operation of the power supply after the heater is still able to work.
- q) Outlet connection. The outgoing connection may be an overhead line connection, a cable connection or a direct connection to the transformer, for the different types of outgoing connection to be decided by the buyer and the technical requirements to be agreed with the seller. When direct connection to the transformer is used, the GIS manufacturer is responsible for coordinating with the transformer manufacturer.
- r) The charged display device should be reasonable in structural design, easy to install and maintain, reliable in performance, and have the functions of displaying the charged status (light) and mandatory blocking.
- s) Rust prevention. Effective anticorrosion and antirust measures should be taken for the shells of equipment for outdoor use, convergence control cabinets, institutional boxes, etc., to ensure that there is no peeling of coatings or surface corrosion during their service life; anticorrosion measures should be taken for terminal boards, bolts, nuts and washers in the outdoor area, especially to prevent galvanic corrosion between different metals, and to prevent moisture from getting into the threads.
- t) The GIS should have the necessary access routes and fixed platforms for operators to inspect and operate the equipment.
- u) Nameplate:
- 1) The GIS and its major components such as auxiliary and control equipment, actuators, etc.

should have durable and clearly legible nameplates;

- 2) For nameplates on outdoor equipment, they shall be weatherproof and corrosion resistant.
- 3) The nameplate shall include the following:
  - ◆ Manufacturer's name or trade mark, year of manufacture, factory number.
  - ◆ Product Model.
  - ◆ Criteria adopted.
  - ◆ Give the following data: rated voltage, rated current of busbar and branch line, rated frequency, rated short-circuit breaking current, rated short-time withstand current and duration, rated **dynamic stabilising current**, rated peak withstand current, rated filling pressure (density) and its alarm pressure (density) used as an insulating medium, rated filling pressure used as an operating medium, and its minimum operating pressure (density) rated **pressure or density (20°C) of the gas operation, minimum operating pressure or density of the gas (20°C)** enclosure design pressure, etc. **or density (20 °C), minimum operating pressure or density of gases (20 °C)**, enclosure design pressure, etc. The nameplate of the individual components can be simplified if the common data are described on the overall nameplate.
  - ◆ The nameplates of the components in the GIS refer to the appropriate standards.
- v) All secondary components in the mechanism box shall be located for ease of disassembly, wiring, observation and operation, and shall be permanently marked to indicate their purpose.
- w) Equipment at reserved intervals shall be fitted with density relays with gas pressure alarm and lockout signal output contacts.
- x) Thermostats (heaters), relays and other secondary components should obtain 3C certification (or 3C certification equivalent performance test), the shell insulation material flame retardant level should meet the V0 level, and provide third-party test reports.
- y) The minimum centre distance of equipment between 110kV GIS intervals is not less than 1500mm (outdoor) and 1000mm (indoor).
- z) Before assembling, check and confirm whether the explosion-proof membrane is damaged by external force. When assembling, ensure that the pressure relief direction of the explosion-proof membrane is correct and accurately positioned, and that the structure and direction of the explosion-proof membrane pressure relief baffle should be avoided from accumulating water, icing, and accidental touching during operation. The nozzle of the explosion-proof film should not be directed towards the inspection channel.

## 5.2 Circuit breakers

5.2.1 The technical parameters of the circuit breaker are given in the characteristic table of technical parameters of the corresponding special-purpose part.

### 5.2.2 Manoeuvring mechanisms

5.2.2.1 Circuit breakers shall be capable of remote and local operation, between which they shall be convertible. 252kV and above circuit breakers shall be provided with two identical and independent breaking circuits, and the mechanical characteristics of the equipment shall be ensured when each breaking disconnecting device is operated, or when both of them are operated at the same time. The actuator itself shall have the performance of preventing jumping, preventing non-full-phase closing and ensuring the closing and splitting time. Hydraulic actuator should be equipped with low-pressure locking and high-pressure protection devices. Hydraulic mechanism should have to prevent the loss of pressure after the slow closing device.

5.2.2.2 The design of circuit breaker actuating mechanism shall meet the requirement of completing the operation sequence of "minute-0.3s-combination minute-3min-combination minute" after one energy storage.

5.2.2.3 Requirements for spring-operated actuators (if used) The closing spring shall be energised 20 s

after the opening operation is completed. The spring-operated mechanism shall be capable of reliably preventing the occurrence of an open-close operation and shall be provided with an easily observable energy storage indicator.

### 5.2.3 Control and operational requirements

5.2.3.1 The Seller shall provide all necessary intermediate relays, latching relays, and control valves for hydraulic fluid for the opening and closing of circuit breakers.

5.2.3.2 Anti-tripping devices, anti-slow-split devices and anti-non-full-phase closing devices. The operating mechanism shall be equipped with anti-tripping device to prevent circuit breaker from repeatedly breaking and closing; the hydraulic mechanism shall be equipped with electrical and mechanical anti-slow-splitting device to ensure that no slow-splitting occurs when the mechanism is re-pressurised after pressure relief; in case of non-full-phase closing of the circuit breaker, it shall be possible to achieve self-splitting of the closed phase. The anti-tripping relay and non-full-phase relay of the newly cast split-phase spring mechanism circuit breaker shall not be installed in the mechanism box, but shall be installed in an independent convergence control box.

5.2.3.3 The control voltage is DC 220V or DC 110V. The closing coil shall operate reliably at 85% ~ 110% of the rated voltage, and the breaking coil shall operate reliably at 65% ~ 110% of the rated voltage; the breaking and closing coils shall not operate at 30% or less of the rated operating voltage.

5.2.3.4 Three-phase mechanical linkage equipment shall be used for newly commissioned 252kV busbar (sectional) main transformer, and high-voltage reactor circuit breakers.

### 5.2.4 Annexes

#### 5.2.4.1 Required and recommended annexes.

It is desirable that each circuit breaker be equipped with the recommended accessories, except for those considered by the seller to be necessary for reliable and safe operation.

#### 5.2.4.2 Position indicators:

- a) Each phase of a split-phase operated circuit breaker shall be fitted with a mechanical switching position indicator, and each phase of a three-phase mechanically linked circuit breaker may be fitted with a mechanical switching position indicator, or with only one position indicator.
- b) Mechanical switching position indicator should be accurate and reliable, the installation position should be clear and conspicuous, and easy for the operator to observe.
- c) The textual markings and colours of the indicators shall be as follows:

text	indicate	Colour
Open position	Minute (OPEN)	GREEN
Closed Position	Close (CLOSE)	Red

5.2.4.3 Counters. Split-phase-operated circuit breakers shall be equipped with a non-reversible action counter for each phase, which shall be located so as to be easily read.

### 5.3 Disconnect switches

5.3.1 For technical parameters, see the table of characteristics of the technical parameters of the corresponding special-purpose section.

#### 5.3.2 Manoeuvring mechanisms

5.3.2.1 Isolating switches equipped with manual actuators shall have a total handle length (including the length of the cross handle) of not more than 400 mm, shall be easy to operate, shall have sufficiently strong locating and limiting devices at the end position of the mechanism and shall be able to reliably block the motorised circuits when manually opening and closing the circuit.

5.3.2.2 Disconnectors and earthing switches with electric actuators shall be capable of being operated both remotely and locally and shall be equipped with manual breaking and closing devices for local operation.

5.3.2.3 It shall be possible to remove or open the door of the actuator box when the electric actuator is in any operating position in order to inspect or repair auxiliary switches and terminals.

5.3.2.4 The centralised control cabinet shall be equipped with electrically operated miniature circuit breakers for the control of the opening and closing operating circuits. The motor power supply of multiple disconnectors in the same interval shall be provided with separate independent switching equipment in the terminal (converging cabinet) box.

5.3.2.5 Motors and instruments used in electric actuators shall comply with the appropriate standards.

5.3.2.6 The actuator shall have indicators reflecting the opening and closing positions of the disconnecting switch and shall be easily observable by the operator. The indicators shall be marked with the words "OPEN" and "CLOSE".

5.3.2.7 The rotating and driving parts of the disconnecting switch shall be lubricated and sealed, and in cold areas anti-freeze lubricants shall be used.

5.3.2.8 The control cabinet shall be equipped with sufficient terminal blocks for wiring within the equipment and for connection of external cable ends. Terminal rows and terminal boards and clamps are installed on the upper part of the cable inlet, each terminal row should have 10% ~ 15% spare terminals, and the terminal rows should have protective measures.

5.3.2.9 All auxiliary contacts shall be numbered on the electrical wiring diagram and wired to the terminal block, and the electrical wiring of each auxiliary switch and all auxiliary contacts shall be numbered.

5.3.2.10 Opening and closing operations: The power actuator shall ensure reliable opening and closing of the disconnecting switch when its voltage is within the following limits. The following conditions shall be included:

- a) When the voltage at the motor terminals of the electric actuator is within 85% ~ 110% of its rated value.
- b) Secondary control coils, electromagnetic interlocking devices, when the voltage at their coil terminals is within 85% ~ 110% of their rated value (coil temperature not to exceed 80°C).

5.3.2.11 The terminals in the operating mechanism shall be of copper.

#### 5.4 Quick-earthing switches

5.4.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.4.2 Operating mechanism: It should be able to operate electrically and manually; it should be able to operate locally and remotely, and an interlocking device should be installed between the local operation and the remote operation.

5.4.3 Each group of quick-earthing switches shall be equipped with a mechanical position indicator for opening/closing, easily observed by the operator, and, if required, with an observation window to enable the operator to check the opening and closing status of the contacts.

5.4.4 The earth terminal of the earthing switch shall be insulated from the body shell.

#### 5.5 Inspection of earthing switches

5.5.1 Technical parameters are listed in the table of characteristics of technical parameters of the corresponding specialised technical specifications.

5.5.2 Actuating mechanism: Manual and motorised operation is possible. Each group of earth switches shall be fitted with a mechanical position indicator for opening/closing, which is easily observable by the operator; an observation window may be fitted on request to enable the operator to check the opening and closing status of the contacts.

5.5.3 The earth terminal of the earthing switch shall be insulated from the body shell.

#### 5.6 Current transformers (TA)

5.6.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.6.2 All leads from the current transformer for each tap lead to the control cabinet terminal block, lead cross section is greater than or equal to

4mm<sup>2</sup> flexible wire. Each terminal shall be clearly labelled and have a wiring diagram showing its

connection, polarity and ratio.

5.6.3 The following data shall be provided for current transformers: excitation characteristic curve, inflection point voltage, transient characteristics, maximum secondary resistance at 75°C, etc.

5.6.4 Requirements for TPY type current transformers:

- a) Type PY bushing current transformers shall be designed and constructed so that the residual magnetism does not exceed 10% of the magnetic density corresponding to the inflection voltage.
- b) The  $K_{SSC}$  transient error should not exceed 10 per cent at the standard primary system time constant and 100 per cent DC component offset.

5.6.5 Shielded metal armoured cables shall be used for all current transformer secondary load wiring and signal lines.

5.6.6 TA Secondary circuit 1min frequency withstand voltage 3000V.

5.6.7 The phase sequence of each group of current transformers shall be arranged in such a way as to ensure consistency, and the primary design phase of the current transformer shall be consistent with the secondary terminal marking.

5.6.8 External current transformer secondary coil guard, secondary terminal box should take effective measures against rain.

5.7 Voltage transformers (TV)

5.7.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.7.2 The phase sequence of each group of voltage transformers shall be arranged in such a way as to ensure consistency, and the designed phase of the primary voltage transformer shall be in accordance with the labelling of the secondary terminals. The primary coil grounding terminal of the voltage transformer shall be separated from the secondary.

5.8 Surge arresters

5.8.1 The technical data are given in the table of characteristics of the technical data of the respective special-purpose section.

5.9 Casing

5.9.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.9.2 The umbrella skirt of the casing shall be an unequal size umbrella, and the design of the umbrella shall comply with the standard requirements, with the difference between the two skirts extending  $(P1 - P2) \geq 15\text{mm}$ .

5.9.3 The ratio of the distance between adjacent skirts of the casing (S) to the length of skirt projection (P) shall not be less than 0.9.

5.9.4 The effective creepage distance of the casing shall take into account the effect of the diameter of the skirt. The creepage distance is increased by 10 % for average diameters greater than 300 mm and by 20 % for average diameters greater than 500 mm.

5.9.5 A waterproof sealant of good performance shall be applied to the glued parts of the insulator metal flange and the porcelain parts.

5.9.6 Pillar porcelain insulators shall meet the requirements of GB/T 8287.1 and pillar composite insulators shall meet the requirements of GB/T 25096 .

5.10 Insulators

5.10.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.10.2 The insulating parts within the GIS shall be subjected to flaw test, frequency voltage test and partial discharge test one by one, and the amount of partial discharge shall not be more than 3pC.

5.10.3 The thermal performance test shall be verified on not less than 5 insulators per batch with 10 thermal cycles each.

## 5.11 Busbars

5.11.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.11.2 GIS busbars should be arranged in a low level and not in a high level.

## 5.12 Casing

5.12.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.12.2 Shell pressure: The shell shall be capable of withstanding normal and internal failure pressures during operation. The following cases shall be included:

- a) For cast aluminium and aluminium alloy housings, the type test pressure is 5 times the design pressure.
- b) For welded aluminium and welded steel housings, the type test pressure is 3 times the design pressure.
- c) The type test pressure of the bulkhead shall be greater than 3 times the design pressure.

## 5.13 SF<sub>6</sub> gas

5.13.1 The technical parameters are given in the table of characteristics of the technical parameters of the corresponding special-purpose section.

5.13.2 Biotoxicity test: non-toxic.

5.13.3 Other items shall comply with the provisions of GB/T 12022 standard.

5.13.4 A certificate of conformity and an analysis report from the SF<sub>6</sub> gas producer shall be submitted.

5.13.5 110 per cent SF<sub>6</sub> gas shall be provided.

## 6 Tests

### 6.1

The components used in GIS shall be type tested, factory tested and field handover tested according to the respective product standards, and the type test and factory test report of each component in the scope of supply shall be provided.

### 6.2 Type test

The purpose of the type test is to verify that the various performances of the GIS device, control loop, control equipment and auxiliary equipment comply with the design requirements.

6.2.1 Each functional element shall be subjected to a complete single-phase or three-phase test at representative arrangement intervals in accordance with the respective standards. Three-phase common box models shall be subjected to a three-phase test in accordance with the requirements of the respective standards.

6.2.2 Due to conditions, and subject to agreement between the seller and the buyer, it is permissible for the type test to be carried out on a representative assembly or sub-assembly of the equipment.

6.2.3 Due to the diversity of types, parameters and possible combinations, it is impractical to type test all arrangements. The performance test data for any particular arrangement can be confirmed by test data for comparable arrangements.

6.2.4 Type testing and verification includes:

- a) Tests to verify the insulation level of equipment and insulation tests of auxiliary circuits.
- b) Tests to verify radio interference voltage (RIV) levels (if applicable).
- c) Tests to verify the temperature rise of all components of the equipment and main circuit resistance measurements.
- d) This test verifies the ability of the main circuit and earthing circuit to carry rated peak withstand current and rated short-time withstand current.
- e) A test to verify the opening and closing capability of the included switchgear.
- f) Verify the mechanical operation and travel  time characteristic measurements of the included

switching devices.

- g) A test to verify the strength of the enclosure.
- h) Verification of the enclosure protection class.
- i) Gas tightness test and gas condition measurement.
- j) Electromagnetic compatibility test (EMC).
- k) Additional tests for auxiliary and control circuits.
- l) Tests of bulkheads.
- m) Tests to verify mechanical operation at extreme temperatures.
- n) Tests to verify performance under thermal cycling and gas-tightness tests of insulators.
- o) Corrosion test of earthing connections
- p) Tests to assess the effects of internal fault arcing
- q) Noise test.
- r) Seismic test: the seller can provide the calculation of the seismic performance of the product, which should be completed by a nationally recognised institution.

6.2.5 The following components are provided with test reports according to their respective standards:

- a) Insulating parts (insulating spacers and supporting insulators).
- b) Shunt capacitors.
- c) Closing resistance.
- d) Transformers.
- e) Insulated parts.
- f) Casing.
- g) Lightning arrester.
- h) Stretch joints.
- i) Connection to transformer (if required).

6.3 Factory test

6.3.1 The GIS shall be assembled in its entirety at the manufacturing facility and all components shall be factory tested. Certain tests may be performed at the component shipping unit or at the complete facility.

6.3.2 The factory test shall ensure that the performance of the product corresponds to that of the type-tested equipment. Critical connections and components shall be marked before disassembly.

6.3.3 Factory test items include:

- a) Main circuit insulation test: It shall be carried out on the complete assembly interval or as complete an interval as possible, and the voltage level of 145kV and above shall be subjected to industrial frequency withstand voltage test; the voltage level of 252kV and above shall also be subjected to positive and negative lightning impulse withstand voltage test three times each.
- b) Auxiliary and control circuit insulation test.
- c) Main circuit resistance measurement.
- d) Partial discharge test.
- e) Gas tightness test.
- f) Mechanical test. Circuit breakers, disconnecting switches and earthing switches shall be subjected to not less than 200 times of mechanical operation tests (the last 20 times of every 100 operation tests of circuit breakers shall be reclosing operation tests) in order to ensure that the contacts are sufficiently worn out, and the inside of the casing shall be thoroughly cleansed after completion of the 200 times of operation, and then other tests shall be carried out at the factory. The test items of mechanical characteristics of circuit breaker shall include time, speed, closing-opening time, speed-travelling curve, auxiliary switch switching and main contact action time coordination.
- g) Electrical and other auxiliary device tests.
- h) Wiring check.



- i) SF6 gas humidity measurement.
- j) Pressure test of shell and insulating partition. Test requirements for insulators and porcelain insulators: frequency withstand voltage and partial discharge test shall be carried out one by one before assembly of insulating tie rods for GIS of 145kV and above, frequency withstand voltage and partial discharge test shall be carried out one by one for insulators for GIS of 145kV and above, and X-ray inspection shall be carried out one by one for GIS of 145kV and above; ultrasonic longitudinal wave inspection shall be carried out one by one for porcelain hollow insulators of 252kV and above. Ultrasonic longitudinal wave flaw detection shall be carried out for porcelain hollow insulators of 252kV and above. The above tests shall be completed by the GIS manufacturer, and the test results shall be submitted to the user with the factory test report.

#### 6.4 Field handover tests

After the GIS is installed, a field handover test shall be performed, which shall include:

- a) For the main circuit insulation test, the AC withstand voltage value of the 145kV GIS shall be 100% of the factory value. Partial discharge test shall be carried out during the frequency withstand voltage, and shock withstand voltage test may be carried out if required.
- b) Auxiliary circuit insulation test.
- c) Main circuit resistance measurement.
- d) Gas tightness test.
- e) For the field mechanical characteristic test, the seller shall provide the speed definition and reference mechanical travel characteristic curve of the circuit breaker, as well as the sensors and mounting accessories for the test.
- f) SF6 gas acceptance (performed before charging electrical equipment).
- g) Measurement of the humidity and purity of SF6 gas (after charging the electrical equipment).
- h) Exterior inspection and verification.
- i) Partial discharge test.
- j) Field testing of components.
- k) Calibration of gas density relays and pressure gauges, safety valves.
- l) Field open and close no-load transformer test (if required).
- m) Field open and close shunt reactor test (if required).
- n) Field open and close no-load line charging current test (if required).
- o) Field open and close no-load cable charging current test (if required).

### 7 technical services, design liaison, factory inspection and supervision of manufacture

#### 7.1 Technical services

##### 7.1.1 Overview:

- a) The seller shall appoint a site representative to co-operate with the buyer and the installation contractor. The Seller shall assign experienced installation instructors and test engineers to provide technical guidance for the installation, commissioning and site testing of the contract equipment. The Seller's instructor shall be responsible for the correctness of all installation work unless the Installation Contractor's work is not carried out in accordance with the Seller's instructor's advice, but the Seller's instructor shall have immediately notified the Buyer in writing of this fact.
- b) The contract equipment is to be installed over a period of 2 weeks, whereby the seller and buyer will mutually agree on a detailed installation process and schedule to be used as a basis for the seller's direction of the installation, as well as a list of the types and quantities of personnel and tools to be supplied by the installing contractor.
- c) The seller and the buyer shall decide by agreement on the specialisation of the seller's technicians, the number of personnel, the duration of their services, and the dates of their arrival and departure from the site, in the light of the actual progress of the work on the construction.

### 7.1.2 Tasks and responsibilities:

- a) The site representative appointed by the Seller shall, within the scope of the contract, fully co-operate and consult with the Buyer's site representative in order to solve relevant technical and working problems. The site representatives of both parties shall not have the right to change or amend the contract without the authorisation of both parties.
- b) The seller's technical personnel shall complete the technical service of the equipment concerned, guide and supervise the installation, commissioning and acceptance test of the equipment in accordance with the contract.
- c) The seller's technical personnel shall explain in detail to the buyer's personnel the technical documents, drawings, operation and maintenance manuals, characteristics of the equipment, analysing methods and relevant precautions, etc., as well as answering and solving technical questions raised by the buyer within the scope of the contract.
- d) The seller's technicians are obliged to provide the necessary training to the buyer's operation and maintenance personnel.
- e) The technical instructions of the seller's technicians shall be correct and the seller shall be responsible for repairing, replacing and/or replenishing the equipment and materials at the seller's expense in the event of damage caused by incorrect instructions, which shall also include service charges incurred during the period when the repairs are carried out. The buyer's technicians concerned shall respect the technical instructions of the seller's technicians.
- f) The seller's representative shall fully understand the buyer's technical and quality comments and suggestions on the installation and commissioning work, so that the installation and commissioning of the equipment shall be of a quality satisfactory to both parties. If the installation or test work is delayed due to the Seller's reasons, the Buyer has the right to request the Seller's installation supervisors or test engineers to continue to stay at the site for service at the Seller's own expense. If the installation or test is delayed due to the buyer's reasons, the buyer shall have the right to request the seller's installation supervisors or test engineers to continue to stay at the site at the seller's expense.

### 7.2 Design liaison meetings

7.2.1 In order to coordinate design and other interfaces, the buyer and the seller shall hold design liaison meetings as necessary. The Seller shall draw up a detailed programme for the design liaison meetings. Within 30 days after signing the contract, the seller shall propose to the buyer a programme of design liaison meetings at which the buyer shall have the right to suggest improvements to the contract equipment, and the seller shall make improvements in accordance with such suggestions.

#### 7.2.2 Main elements of the liaison meeting:

- a) Determine the final layout dimensions, including the shape, casing lead direction, and the arrangement of other ancillary equipment; determine the wiring logic of control circuits in the control cabinet, the selection of secondary components and internal layout, and so on.
- b) Review and confirm the main performance and parameters of the bidding products.
- c) Check the overall progress, quality assurance procedures and quality control measures.
- d) Determine civil requirements/transport dimensions and quality, as well as information requirements for the various interfaces of the engineering design.
- e) Discussion of delivery procedures.
- f) Addressing legacy issues.
- g) Discusses supervised manufacturing, factory testing and inspection issues.
- h) Discuss transport, installation, commissioning and acceptance tests.

7.2.3 Other elements to be discussed, such as location, dates, number of persons, etc., are agreed upon during contract negotiations.

7.2.4 In addition to the above liaison meetings, if there are important matters that need to be studied and discussed by both parties, a separate liaison meeting may be convened with the consent of both parties.

7.2.5 Minutes shall be signed for each meeting and shall form an integral part of the contract.

### 7.3 Factory inspection and supervision

7.3.1 The Buyer shall have the right to send its inspectors to the shop premises of the Seller and its subcontractors to inspect and supervise the manufacture of the contract equipment. The Buyer shall notify the Seller in writing of the names of the representatives to be sent for this purpose.

7.3.2 The Seller shall actively co-operate with the Buyer's supervision and construction work, and designate a representative to be responsible for the supervision and construction contact work, and provide the supervision and construction personnel with relevant information (including but not limited to this) in time:

- a) Physical and chemical properties and types of important raw materials and necessary factory inspection reports.
- b) Acceptance test reports of important outsourced parts and accessories and all factory routine test reports of important parts and accessories.
- c) Equipment factory test programme, test report, semi-finished product test report.
- d) Type test report.
- e) Technical reports on product improvements and refinements.
- f) Copies of technical agreements and subcontracts with subcontractors.
- g) Production schedule for equipment.
- h) Memorandum on quality problems in equipment manufacturing.
- i) Documentation of equipment quality and schedule changes that occur during the manufacturing process of the equipment.

7.3.3 The scope, mode and content of supervision of the equipment shall be determined by the buyer and the supervisors dispatched by the buyer in accordance with the Outline of Equipment Supervision issued by the State Grid Corporation of China.

7.3.4 The supervisor has the right to visit the workshops and departments producing the contract equipment to obtain production information and to raise problems, if any identified during the supervision.

7.3.5 The Seller shall notify the Buyer and the Contracting Authority of its test programme (including schedule) 2 weeks prior to the commencement of factory tests. On the basis of this test programme, the Buyer shall be entitled to determine which test items and phases of the contract equipment are to be witnessed and will notify the Seller within 1 week of receipt of the Seller's notification of the schedule of installation, tests and inspections. The Buyer will then send technicians to the Seller's and/or its manufacturer's production site in order to observe and understand the condition of the factory tests of the contract equipment and its transport packaging. If the quality of any of the goods is found to be not up to the standard specified in the contract, or if the packaging is not satisfactory, the buyer's representative shall have the right to express an opinion, which the seller shall take into serious consideration and take the necessary measures to ensure the quality of the contractual equipment to be shipped, the procedure for witnessing the tests to be decided upon by the representatives of the two parties by mutual agreement.

7.3.6 If the Buyer does not send a representative to participate in the above tests, the Seller shall organise its own tests after notification by the Buyer of the non-attendance of its personnel at the Seller's and/or its subcontractors' factories or if the Buyer fails to send its personnel on time.

7.3.7 Supervisors will not sign any quality documents, and the participation of buyer's personnel in the factory inspection neither relieves the seller of its contractual responsibilities nor replaces the buyer's inspection upon arrival.

7.3.8 The buyer's right to inspect, test and reject (if necessary) the contract goods after they have arrived at the buyer's place of destination shall not be restricted by the seller on the ground that the goods have been supervised and inspected by or on behalf of the buyer and passed prior to shipment at the place of origin.

7.3.9 The attendance of the buyer's personnel at the factory tests, including countersigning of any test results,

shall neither relieve the seller of its contractual responsibilities nor replace the buyer's inspection of the contract equipment upon arrival at the destination.

7.3.10 If any of the contract equipment fails to meet the requirements of the technical specifications after inspection and testing, the buyer may refuse to accept it, and the seller shall replace the rejected goods or make the necessary modifications to bring them into conformity with the technical specifications without the buyer being liable for the cost of doing so.

**7.3.11 The bidder implements a free warranty during the product warranty period (not less than 2 years) and carries out lifelong maintenance of the product.**

## 8 Primary, Secondary and Civil Interface Requirements

### 8.1 145kV GIS equipment

#### 8.1.1 Electrical primary interface

The electrical interfaces of 145kV combined electrical appliances are classified and unified in terms of structural type, spacing centre distance, distance between casing phases, etc., and five types of electrical interfaces are formed according to the different wiring forms of combined electrical appliances and application occasions. Among them, interface 1 corresponds to the outdoor GIS (single/double busbar connection) layout scheme, interface 2 corresponds to the indoor GIS (double busbar connection) layout scheme, interface 3 corresponds to the indoor GIS (single busbar connection, internal bridge connection) layout scheme, interface 4 corresponds to the indoor GIS (line-variable transformer group connection) layout scheme, and interface 5 corresponds to the indoor GIS (ring-in-ring-out branch transformer group connection) layout scheme.

##### 8.1.1.1 Outline dimensions of spacers

For the conventional altitude outdoor GIS layout plan, the distance between the inlet (outlet) casing is 1500mm, the width of the equipment spacing base is 1200mm, and the length of the equipment base shall not be greater than 6800mm (including the control cabinet). The specific dimensions are shown in Fig. 1 and Fig. 2.

For the indoor GIS layout, the distance between the inlet (outlet) casing is 1500mm, the width of the equipment spacing base is 1200mm, and the length of the equipment base shall not be greater than 6800mm (double busbar wiring)/6000mm (the rest of the wiring form). Indoor high-voltage power cable holes in accordance with 800mm (length) × 800mm (width) reserved holes to adapt to different manufacturers of cable terminals, cable installation and then the excess part of the hole for fire sealing. Specific dimensions are shown in Figure 3.

145kV GIS Outdoor Scheme High Altitude Correction as detailed in Table 3.

Table 3 **145kV GIS** Outdoor Scheme Outlet Interval Casing High Altitude Correction Table (Altitude > **1000m**)

notation	Altitude (m)	2000	3000	4000	5000
Distance between phases of outlet casing (mm)		2200	2750	2750	3000

The colour of the GIS casing is brown (porcelain); the outer surfaces of the casing, brackets, etc. shall be painted in the recommended colour of sea grey B05.

##### 8.1.1.2 Forms of deployment

The following should be included:

###### a) Outdoor GIS

In the regular altitude area, the centre distance between 145kV outdoor GIS outlet intervals is considered as 7500m (two times with one span), and the rest of the intervals determine their own interval spacing according to the project layout.

A schematic layout of the equipment is shown in Figure 3.

The 145kV GIS outdoor layout scheme with high altitude correction is detailed in Table 4.

Table 4 **145kV GIS Outdoor Scheme Outlet Interval Centre Distance High Altitude Correction Table**  
(Altitude > **1000m**)

Altitude (m)	2000	3000	4000	5000
notation				
Distance between centres (mm)	7500	9500	9500	10 500

b) Indoor GIS

145kV indoor GIS outlet interval centre distance should be selected 1000mm, part of the interval can be combined with the project building beams and columns, cable shaft location and other adjustments to the width of the interval.

The height of the plant is considered according to the lifting element, the net height of the room is not less than 6500mm, and the maximum lifting weight is not more than 3t. The net width of the longitudinal width of the distribution room is not less than 9000mm. according to the longitudinal dimensions of the 145kV GIS room, the reserved inspection channel should not be less than 1000mm, and the width of the main channel is suitable to be 2000mm~ 3500mm.

The schematic layout of the equipment is shown in detail in Figures 1 to 4.

8.1.1.3 Grounding requirements

The following should be included:

- a) The grounding programme can be used to directly lead the equipment to ground or pre-buried grounding parts. Grounding parts are pre-buried by the civil construction unit, and grounding transition blocks, grounding rows and installation accessories above the grounding parts are provided by the manufacturer.
- b) The shell of each gas compartment shall be interconnected and reliably earthed, and the earthing circuit shall meet the requirements for dynamic and thermal stability against short-circuit currents. The enclosure shall be earthed. All metal parts intended to be earthed that are not part of the main or auxiliary circuit shall be earthed. Mutual electrical connections of the enclosure frame etc. should be fastened to ensure electrical continuity, and the earthing point should be marked with an earth symbol.
- c) The contact surface of the earthing point and the cross-sectional area of the earthing link shall be such that the fault earthing current can be safely passed.
- d) Tighten the grounding screw no less than 4 M12 bolts or 2 M16 bolts. The earth point should be marked with the earth symbol.
- e) GIS grounding shall prevent dangerous induced voltages in the enclosure, and shall prevent local overheating due to enclosure circulating currents.

### 8.1.1.4 Installation bases

GIS base is recommended to be fixed by welding on the foundation of horizontal pre-embedded steel plate, or it can be fixed by foot bolt or chemical anchor bolt. GIS expansion joints should be able to adapt to the assembly adjustment, absorb the relative displacement between the foundations and the expansion and contraction of the thermal expansion and contraction, and the GIS base must be able to adapt to the following civil engineering construction errors:

- The difference between the highest and lowest level of the foundation pre-installation at each interval shall not exceed 2mm;
- Allowable tolerance for all dimensions between intervals is not more than 3mm;
- The permissible deviation of the dimensions of the area where all the intervals are located is not more than 3mm;
- For GIS outlet casing supports, the height should be such that the lowest part of the outer insulator is not less than 2500mm from the ground.

### 8.1.1.5 Installation Schematics

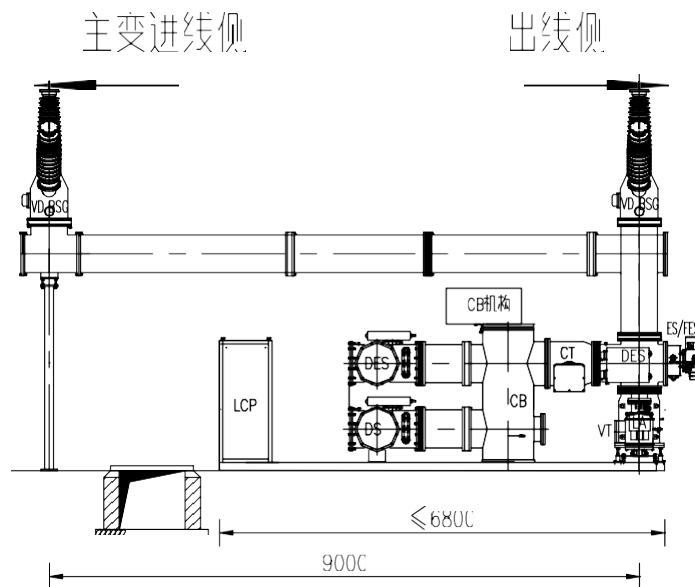
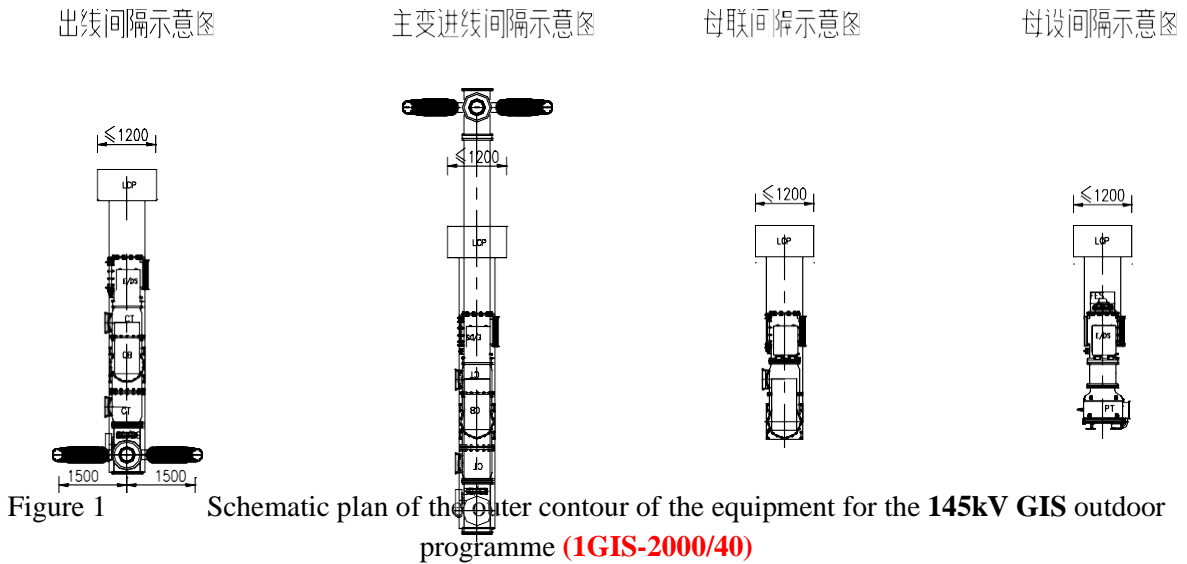


Figure 2 Schematic section of the outer profile of the equipment for the 145kV GIS outdoor programme (1GIS-2000/40)

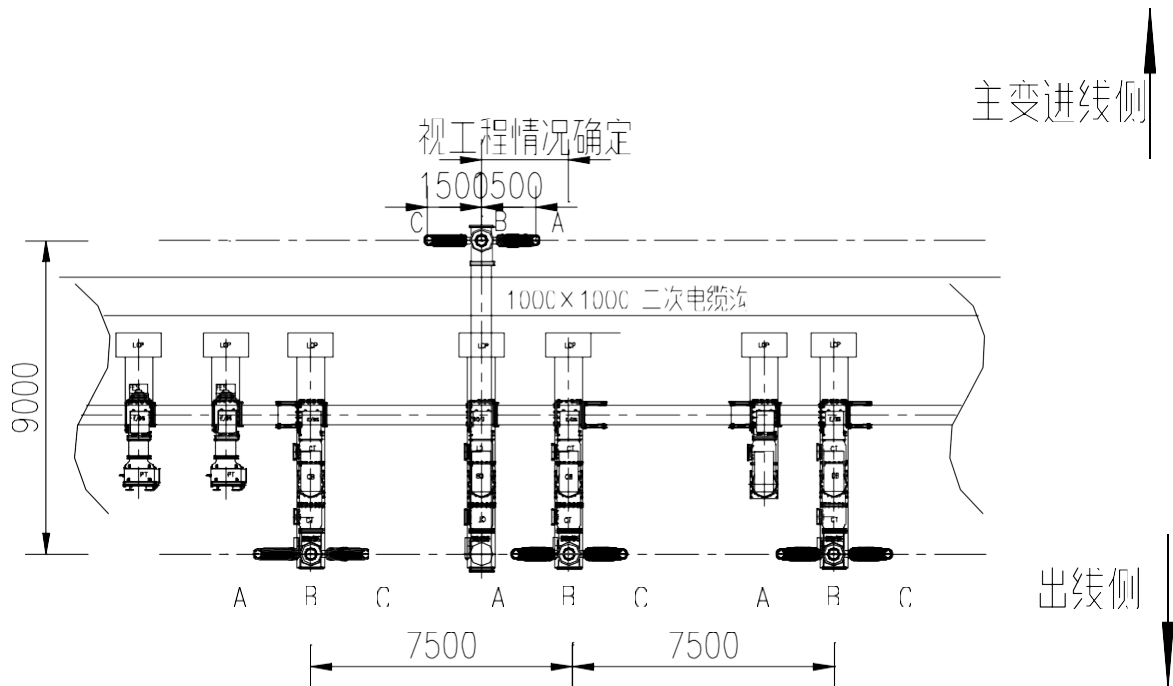


Figure 3 Schematic layout of **145kV** outdoor **GIS** scheme (for double busbar connection, single busbar connection) (**1GIS-2000/40**)

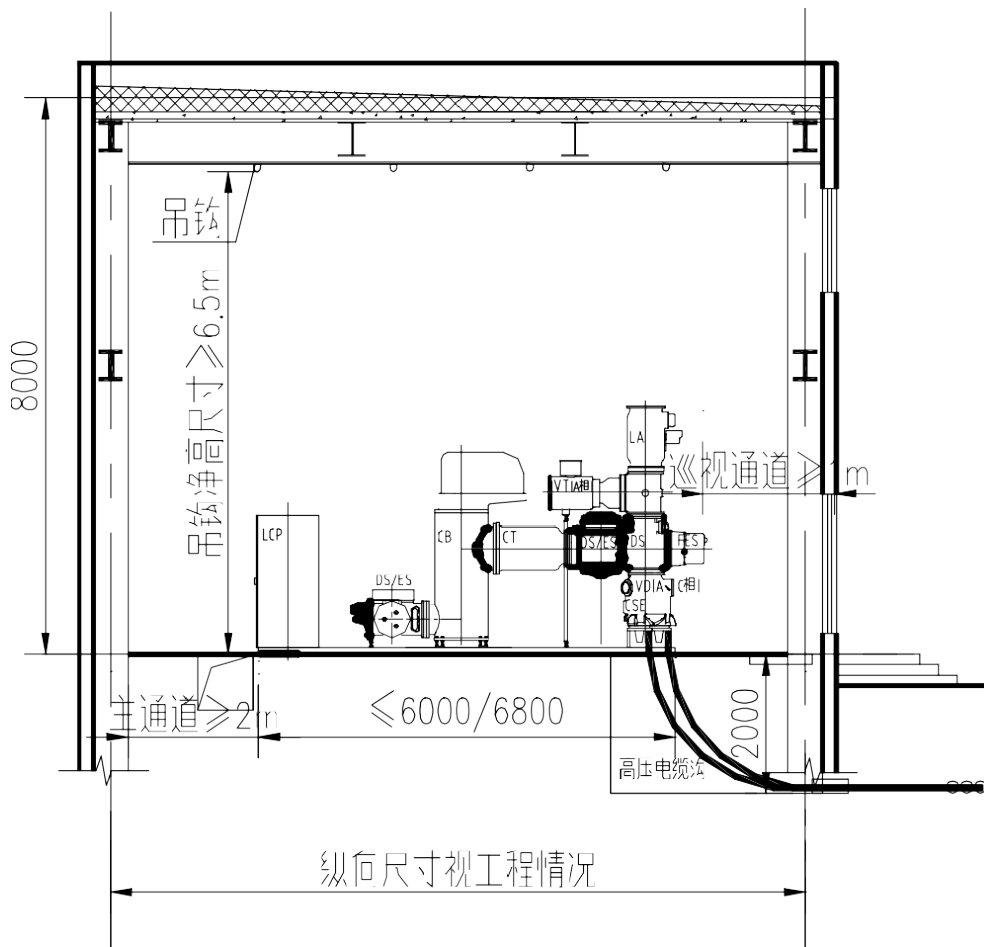


Figure 4 Schematic section of the outer profile of the equipment for the **145kV** GIS indoor programme (**1GIS-2000/40**)

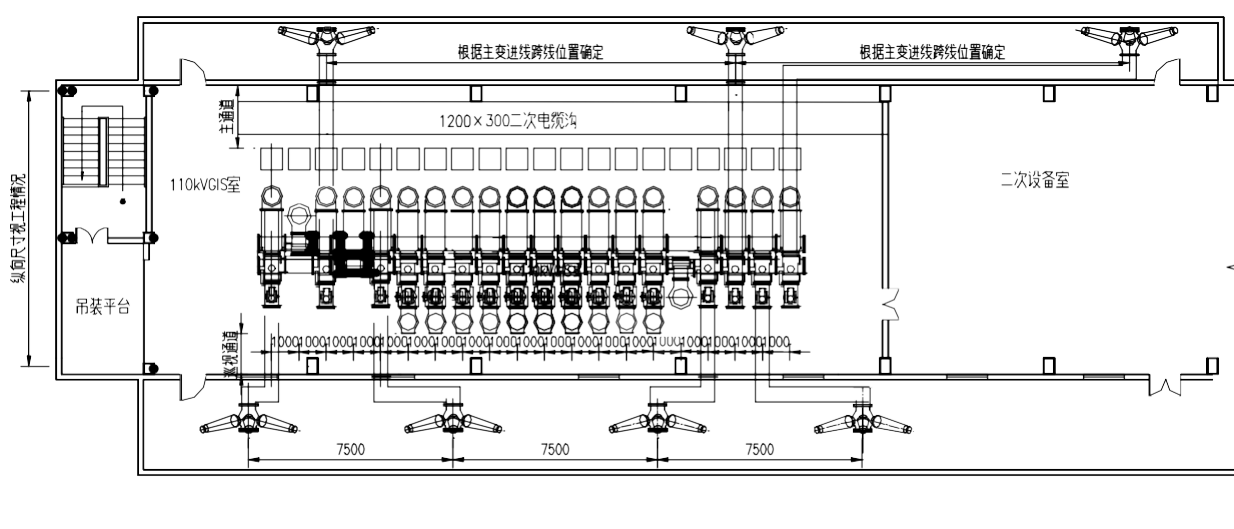


Figure 5 Schematic layout of 145kV indoor GIS scheme (for double busbar connection)  
**(1GIS-2000/40)**

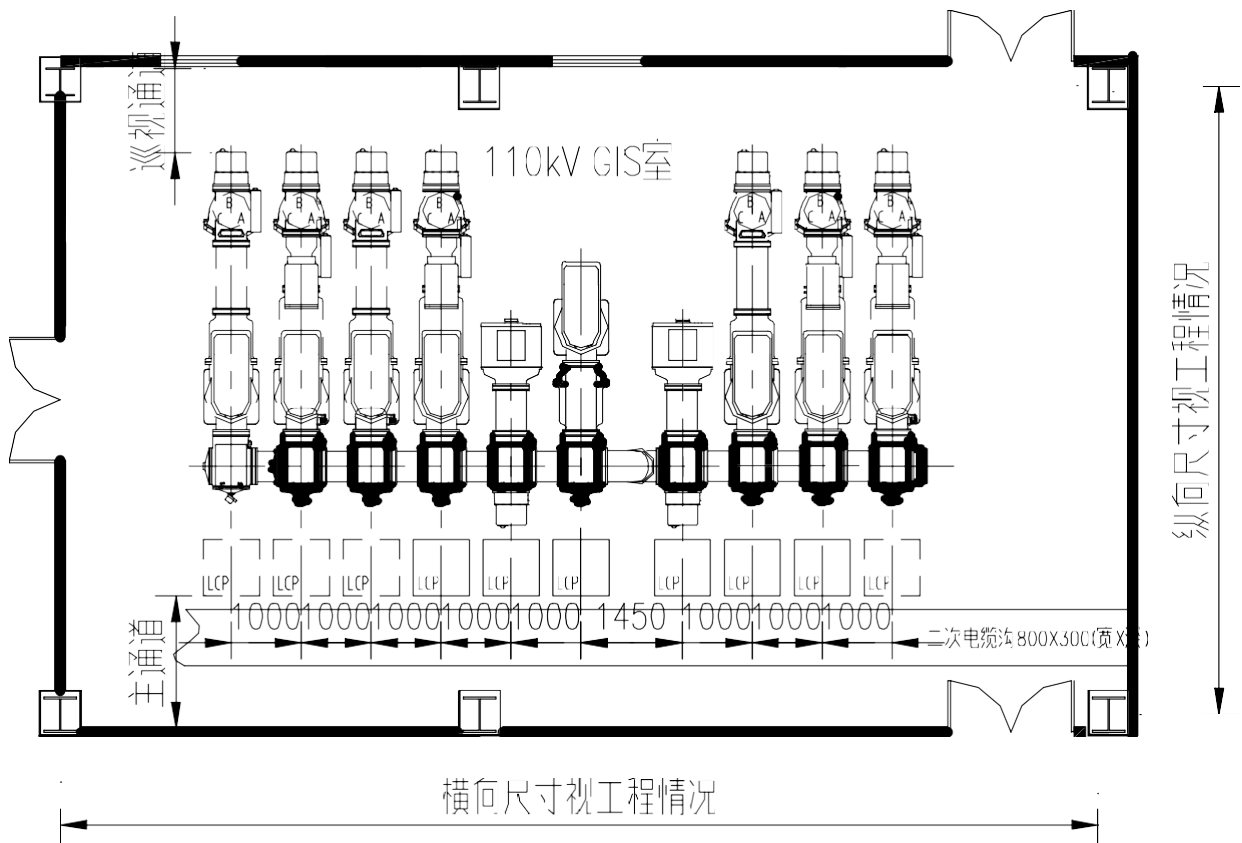




Figure 6 Schematic layout of 145kV indoor GIS scheme (for single busbar connection, internal bridge connection) (1GIS-2000/40)

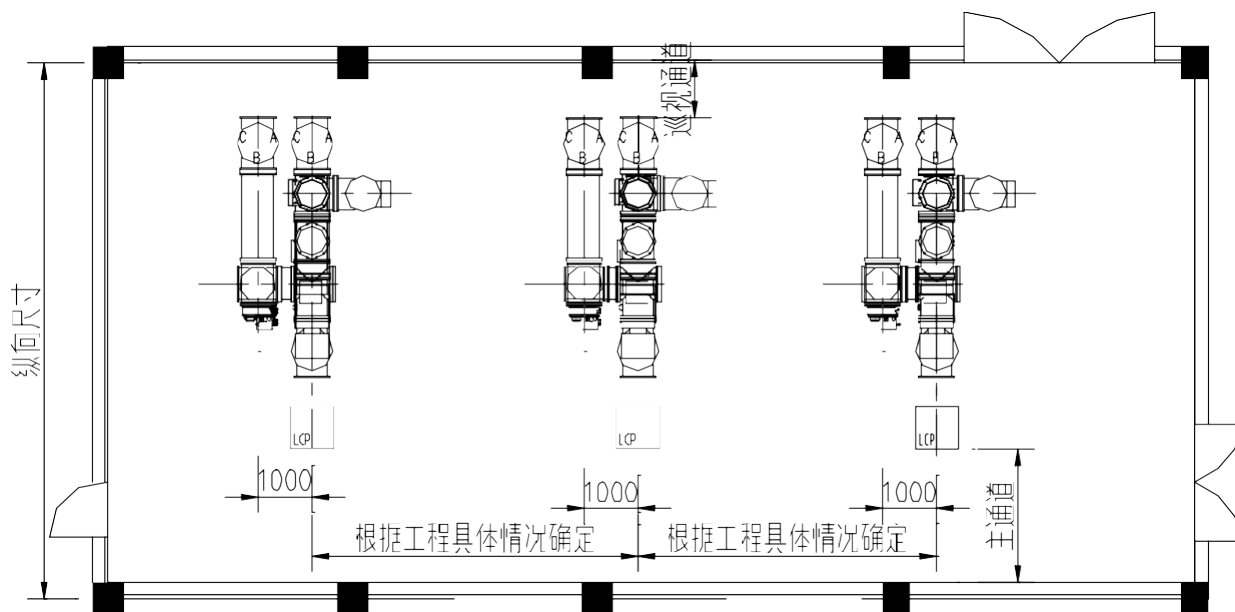


Figure 7 Schematic layout of 145kV indoor GIS scheme (for line-variable group connection) (1GIS-2000/40)

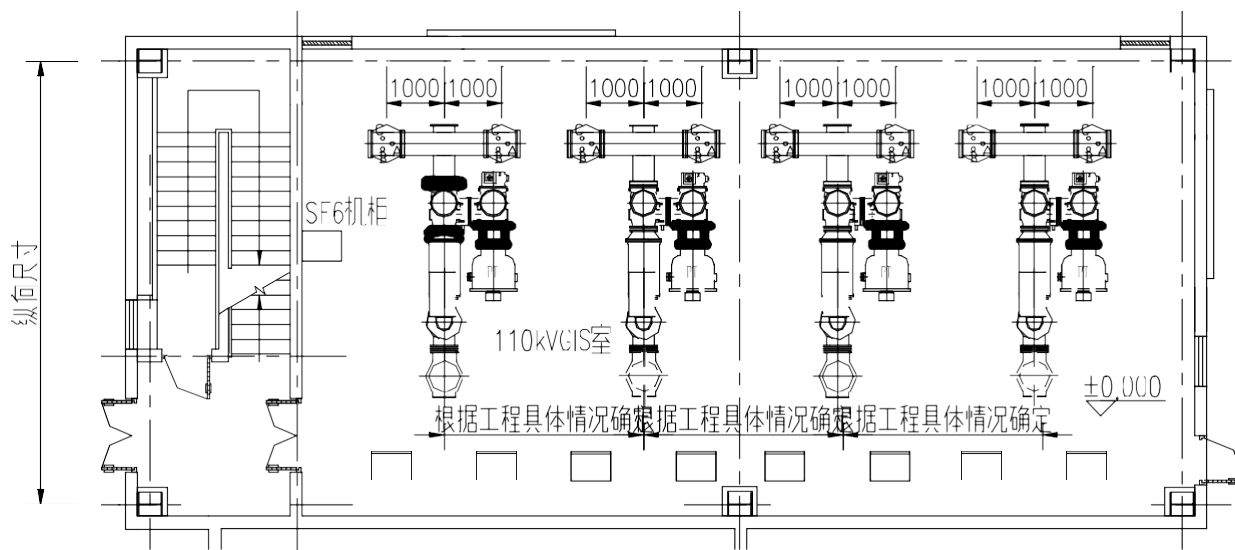


Figure 8 Schematic layout of 145kV indoor GIS scheme (for ring-in-ring-out branch connection transformer bank connection) (1GIS-2000/40)

### 8.1.2 Secondary interfaces

According to the layout scheme of the primary equipment, the electrical secondary interface is unified in six aspects, including the size of the intelligent control cabinet and equipment layout, technical requirements of the secondary circuit, technical requirements of the electrical secondary installation interface, interface of the external terminal row, interface of the optical circuit and the dummy terminal, and a total of one interface is formed.

#### 8.1.2.1 Intelligent control cabinets

The following should be included:

a) Technical parameters and technical conditions

For details of technical parameters and technical conditions of intelligent control cabinet, please refer to Q/GDW 1430-2015 Technical Specification for Intelligent Control Cabinet.

b) Principles of equipment layout in the cabinet

Intelligent control cabinet is suitable for in-situ arrangement, and the order of components in the cabinet is shown in Table 5.

Table 5 Priority order of components on the front of the screen (cabinet) from top to bottom

order from top to bottom	Component Name
1	smart terminal
2	optical distribution frame

Note: 1. The specific cabinet shall be arranged according to the type of device to be arranged in the specific screen (cabinet) and in accordance with the priority order of this table from top to bottom.

2. The centre line of the highest equipment installed on the screen (cabinet) shall be 200 mm from the top of the screen (cabinet); the centre line of the lowest equipment shall be not less than 350 mm from the bottom of the cabinet.

For details of the general technical conditions of merging unit, intelligent terminal and merging unit intelligent terminal integration device, please refer to Parts 16 to 18 of General Equipment (Secondary Equipment) for Intelligent Substation of Transmission and Substation Engineering of State Grid Corporation.

c) Cabinet Size Requirements

The size of indoor intelligent control cabinet is 800mm (width) x 800mm (depth) x 2200mm (height); the size of outdoor intelligent control cabinet is 1000mm (width) x 900mm (depth) x 2000mm (height) or 1200mm (width) x 900mm (depth) x 2000mm (height).

For details of the cabinet layout of the intelligent control cabinet, please refer to Fig. 99~ Fig106. When analogue sampling is adopted for 110kV, refer to Fig. 99~ Fig104 for the cabinet layout of the intelligent control cabinet of the 110kV line, busbar and main transformer intervals.

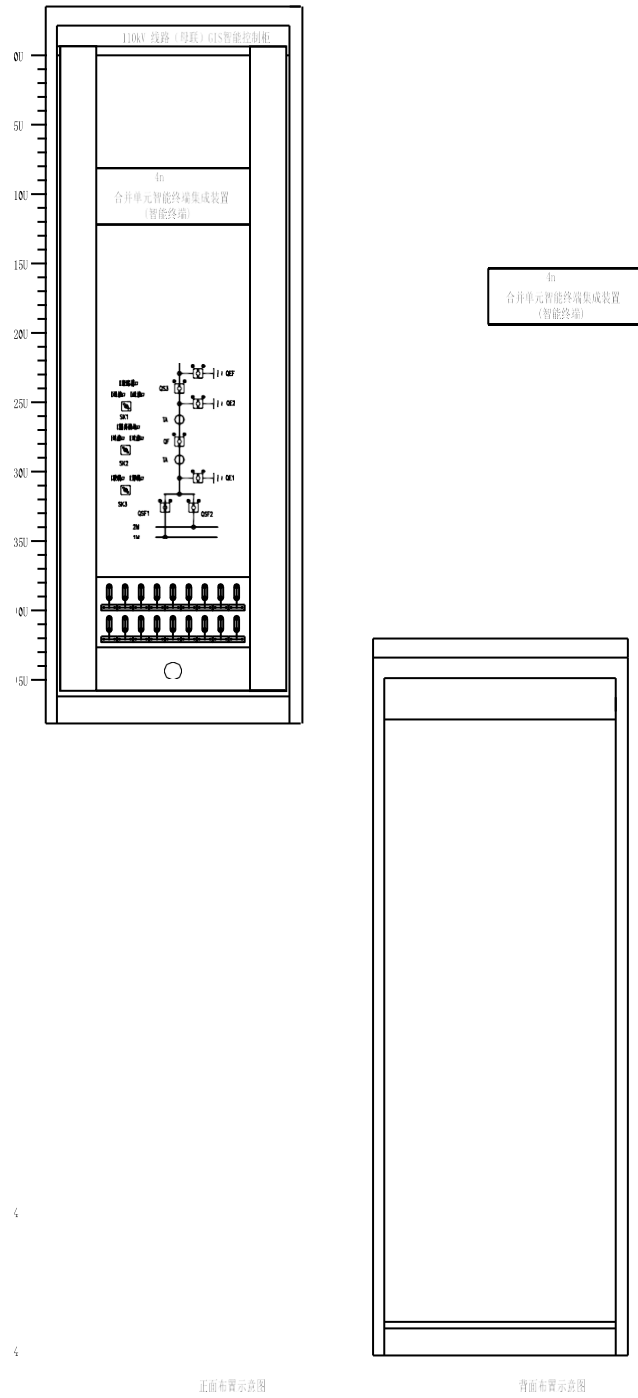


Figure 9 Typical layout of an intelligent control cabinet **1** (line, busbar spacing, outdoor, digital sampling)  
(generic equipment number **IGIS-2000/40**)



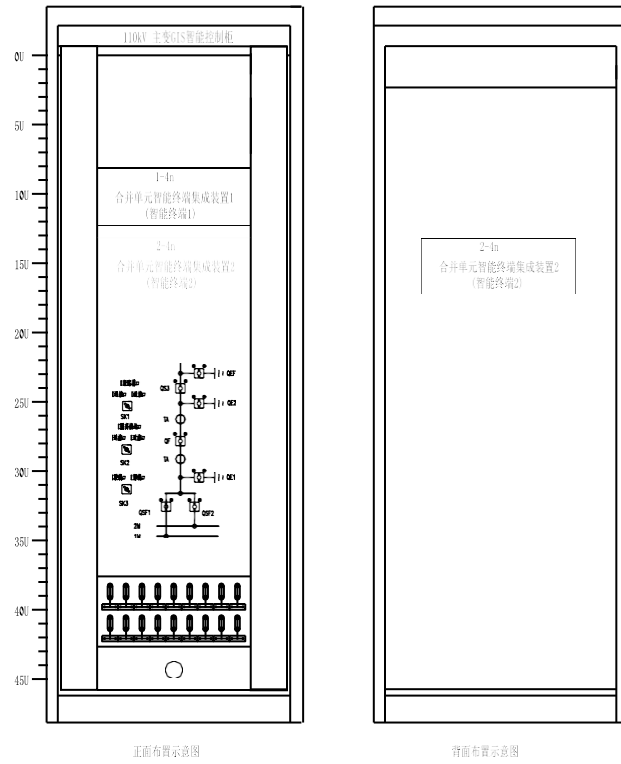


Figure 10 Typical arrangement of intelligent control cabinet 2 (main transformer interval, outdoor, digital sampling)  
(generic equipment number 1GIS-2000/40)

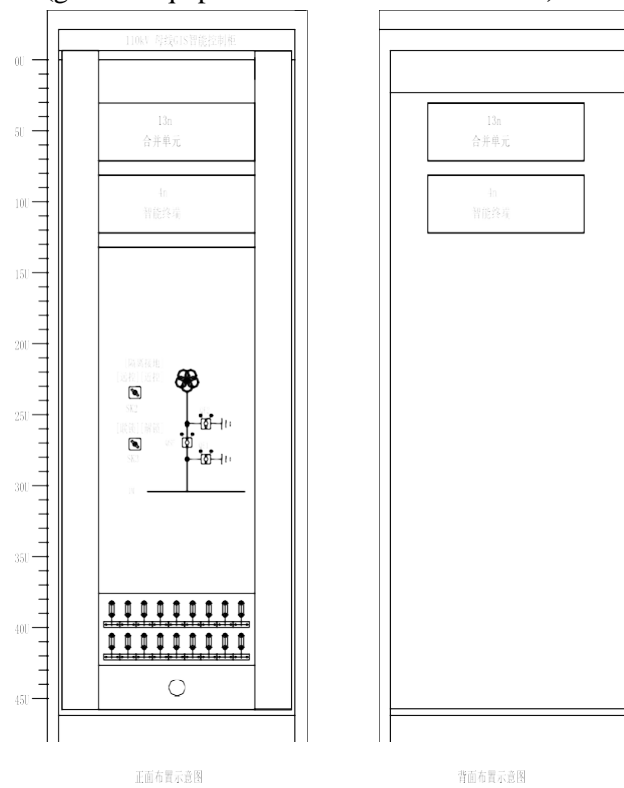


Figure 11 Typical layout of an intelligent control cabinet 3 (busbar spacing, outdoor, digital sampling)  
(generic equipment number 1GIS-2000/40)

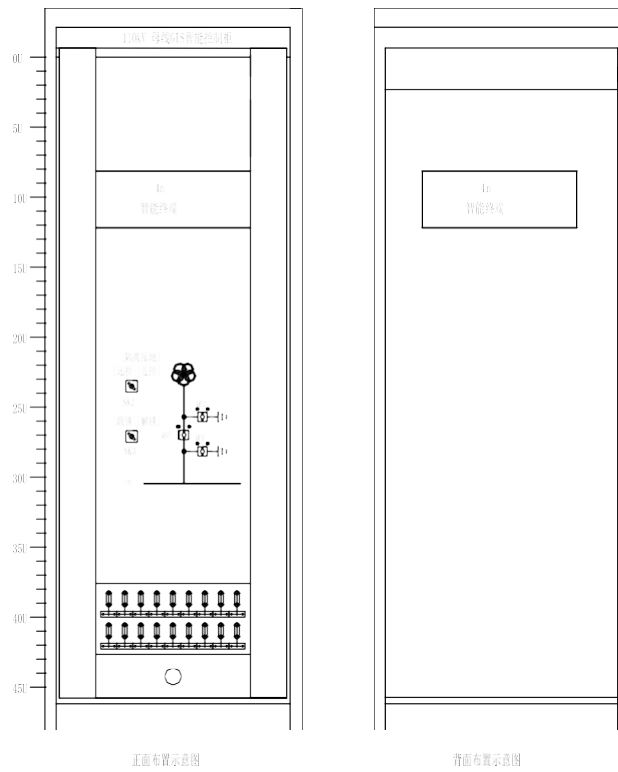


Figure 12 Typical arrangement of an intelligent control cabinet 4 (busbar spacing, outdoor, analogue sampling)

(generic equipment number 1GIS-2000/40)

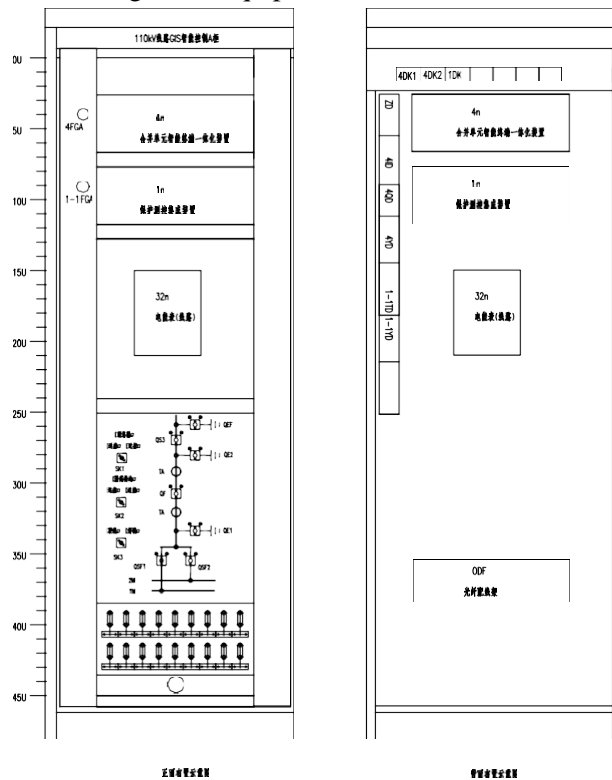


Figure 13 Typical arrangement of an intelligent control cabinet 5 (line, busbar spacing, indoor, digital sampling)

(generic equipment number 1GIS-2000/40)

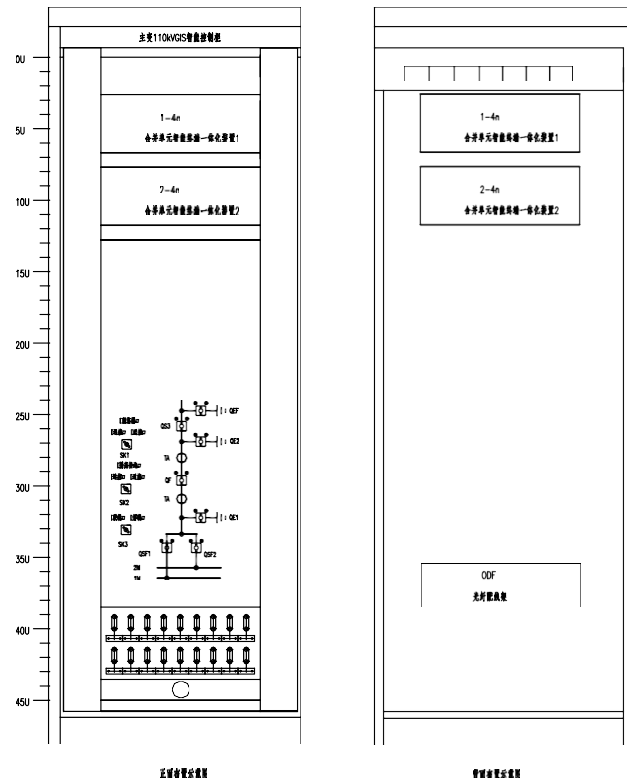


Figure 104 Typical arrangement of an intelligent control cabinet 6 (main substation interval, indoor, digital sampling)  
(generic equipment number 1GIS-2000/40)

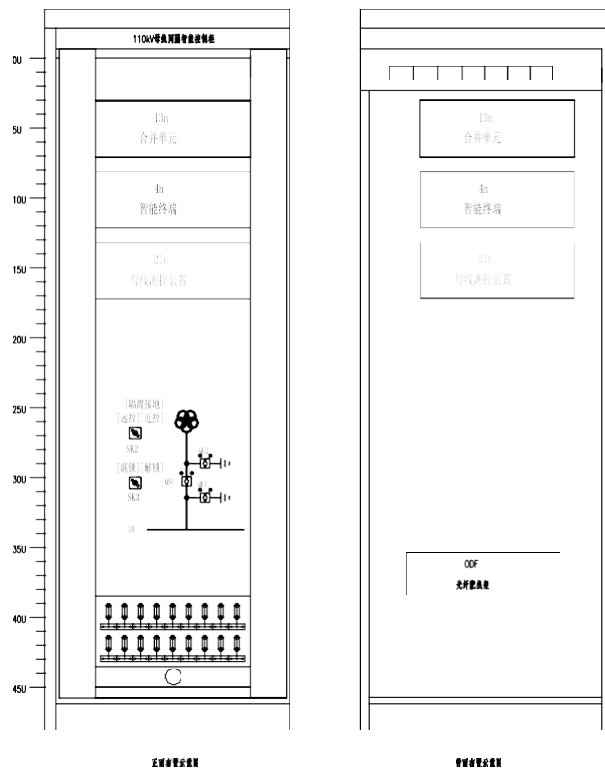


Figure 15 Typical arrangement of an intelligent control cabinet 7 (busbar spacing, indoor, digital sampling)  
(generic equipment number 1GIS-2000/40)

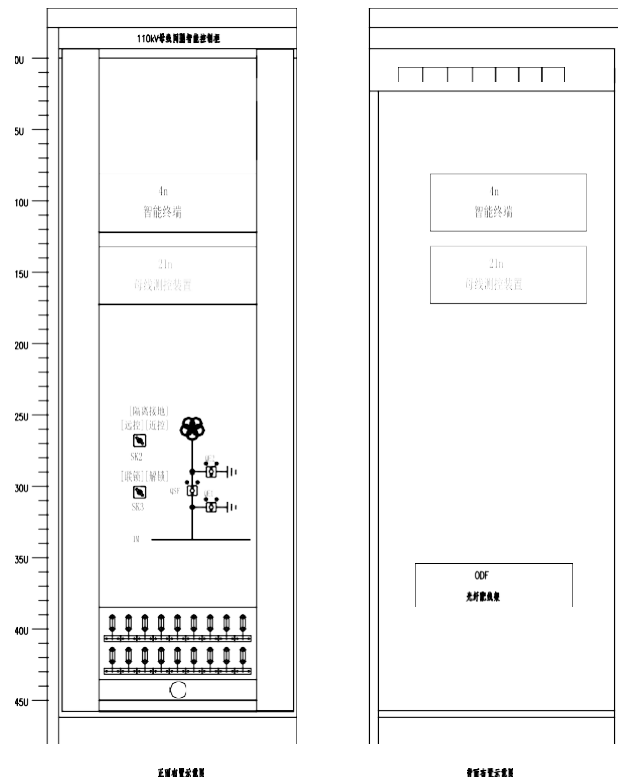


Figure 16 Typical arrangement of an intelligent control cabinet 8 (busbar spacing, indoor, analogue sampling)  
(generic equipment number 1GIS-2000/40)

d) terminal block

According to the principle of universal interchangeability, the terminal row of the control cabinet is divided according to different functions, and the arrangement of the terminal row should take into account the position of each plug-in to avoid wiring cross each other. Terminal arrangement should be in line with the standard, there should be a spacing between positive and negative poles, circuit breaker tripping and closing circuit, DC (+) power supply and tripping circuit can not be connected to the adjacent terminals, terminal row should be numbered.

The terminal rows in the intelligent control cabinet are set up according to the principle of "function segmentation": AC circuit, DC circuit, TA circuit, TV circuit, circuit breaker control and telecommunication circuit, isolation and grounding switch control and telecommunication circuit, auxiliary contact and alarm circuit.

This section unifies the external wiring terminal block interface of the GIS intelligent control cabinet, as detailed in Figure 17~ Figure22.

1) Current transformer section terminal block

Figure 17 shows the 145kV GIS current transformer terminal row under the analogue sampling method, in which the current transformer terminal row diagram 1 applies to the 110kV side interval of the main transformer of the 330kV substation, and the current transformer terminal row diagram 2 applies to the 110kV line and busbar (sectional) interval of the 330kV substation.

Figure 108 shows the 145kV GIS current transformer terminal block under the digital sampling method, which is applicable to the external interface of the control cabinet when the combined unit is installed indoors in a cabinet in extremely cold areas, etc. The current transformer terminal block schematic diagram 3 is applicable to the 110kV side of the main substation for voltage levels of 220kV and below, and the current transformer terminal block schematic diagram 4 is applicable to the 110kV line, busbar (subsection) and intermediate intervals. The current transformer terminal block is applicable to 110kV line, mother link (subsection) intervals.

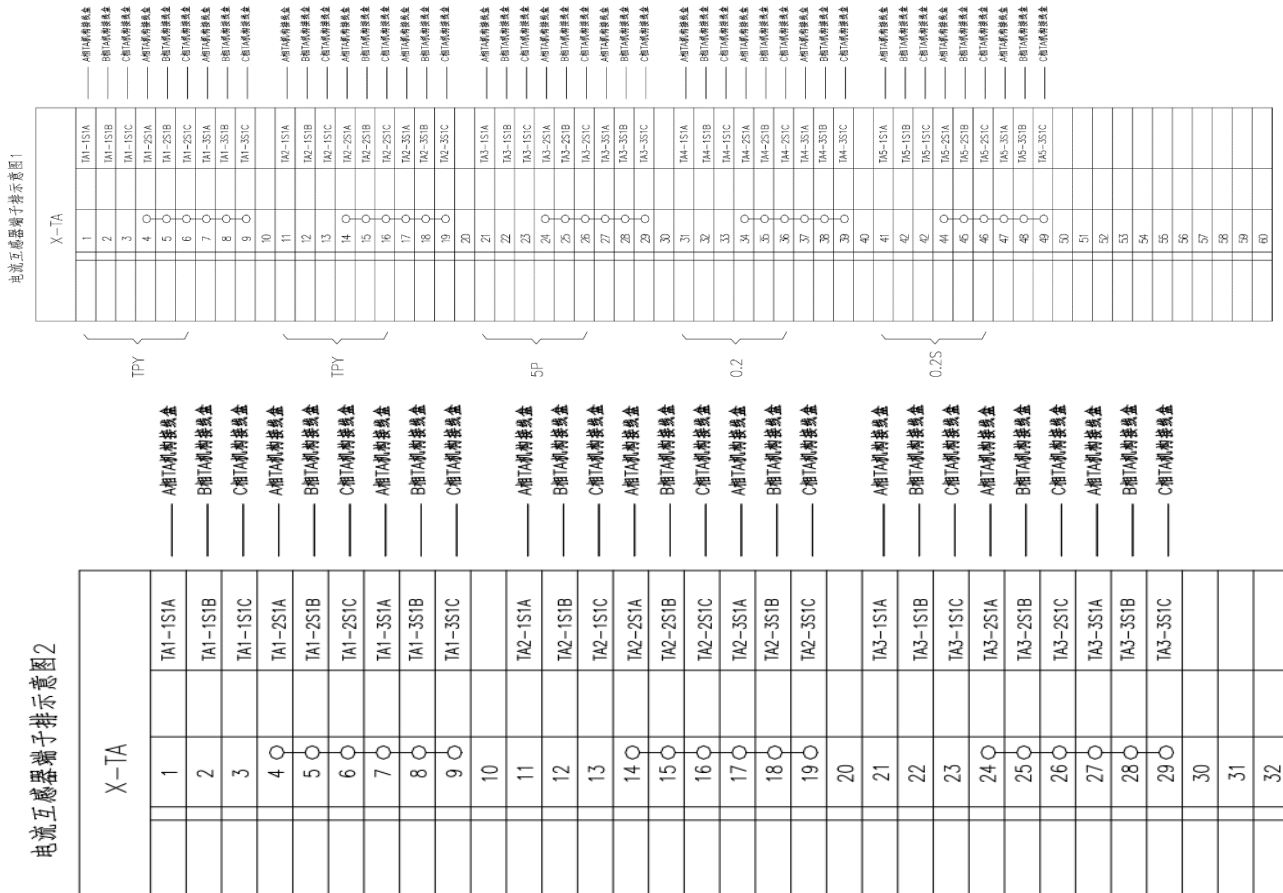
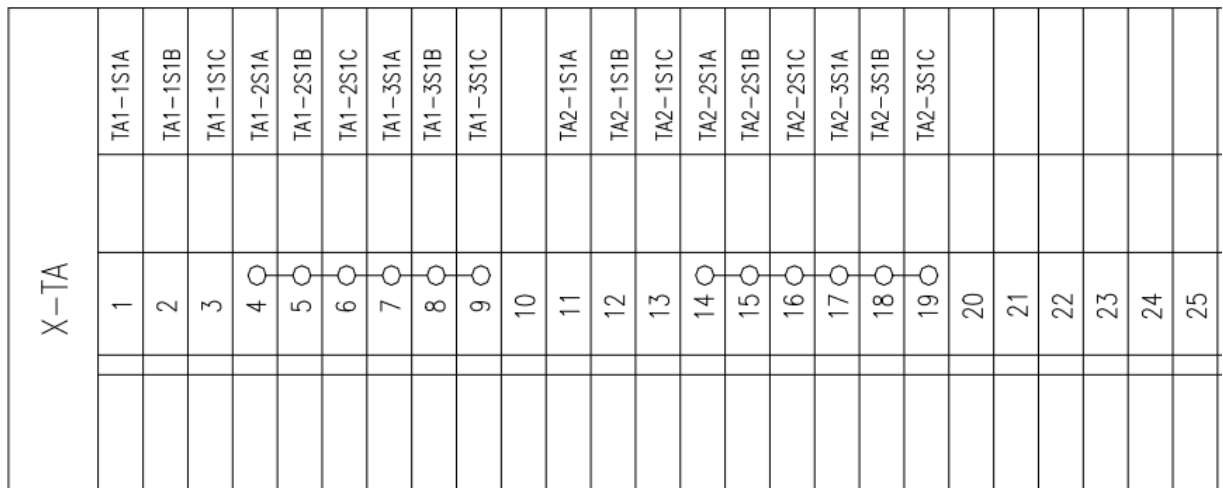


Figure 17 Current transformer TA loop terminal interface for analogue sampling mode (generic equipment number 1GIS-2000/40)



电流互感器端子排示意图4



电流互感器端子排示意图3

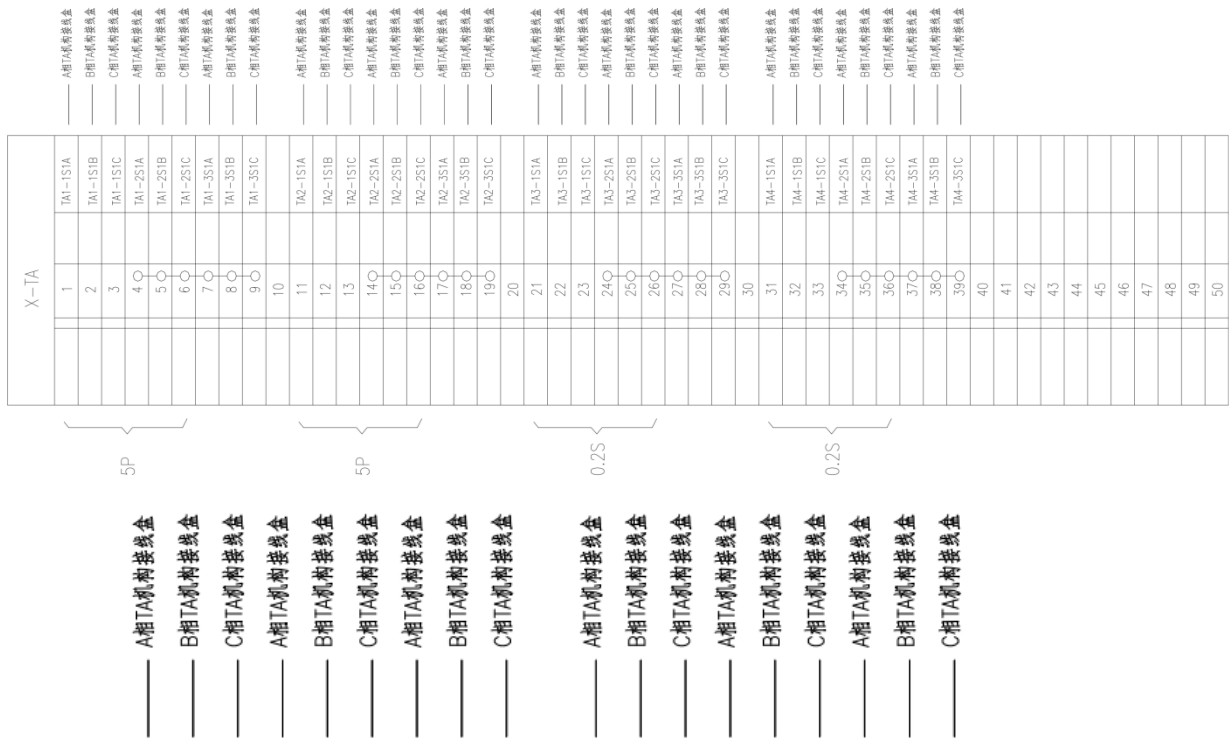


Figure 18 Current transformer TA loop terminal interface for digital sampling mode (generic equipment number 1GIS-2000/40)

2) Voltage transformer section terminal block

The terminal block interface diagram shown in Figure 109 applies to GIS busbar and line interval voltage transformers when the combined unit is installed indoors using analogue sampling and in extremely cold regions.

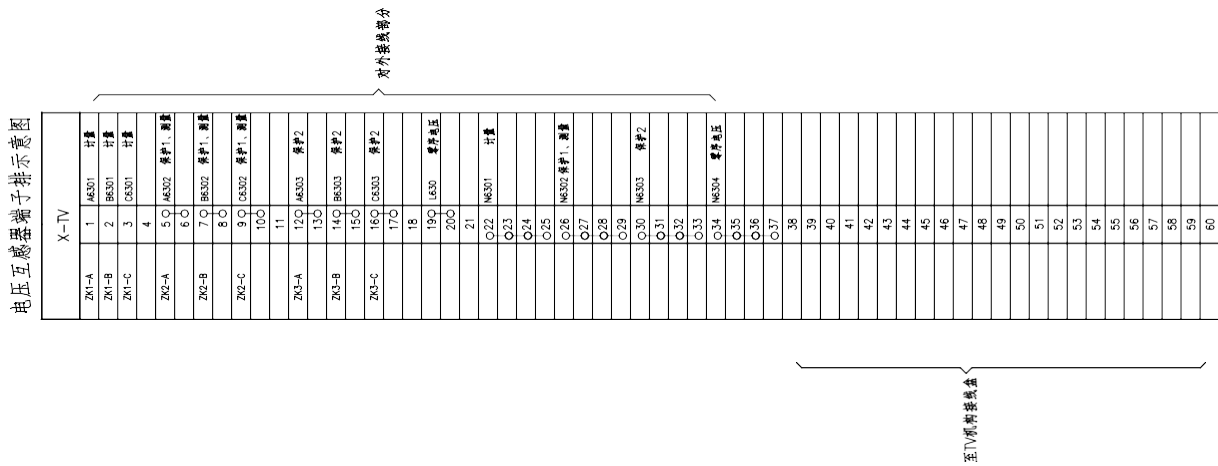


Figure 19 Voltage transformer TV-circuit terminal connection diagram (Generic No. 1GIS-2000/40)

3) AC and DC power supply terminal block

The terminal block interface diagram shown in Fig. 20 applies to the circuit breaker intervals, the main transformer intervals are set up according to two total AC inputs and two total DC inputs, and other intervals are set up according to two total AC inputs and one total DC input.

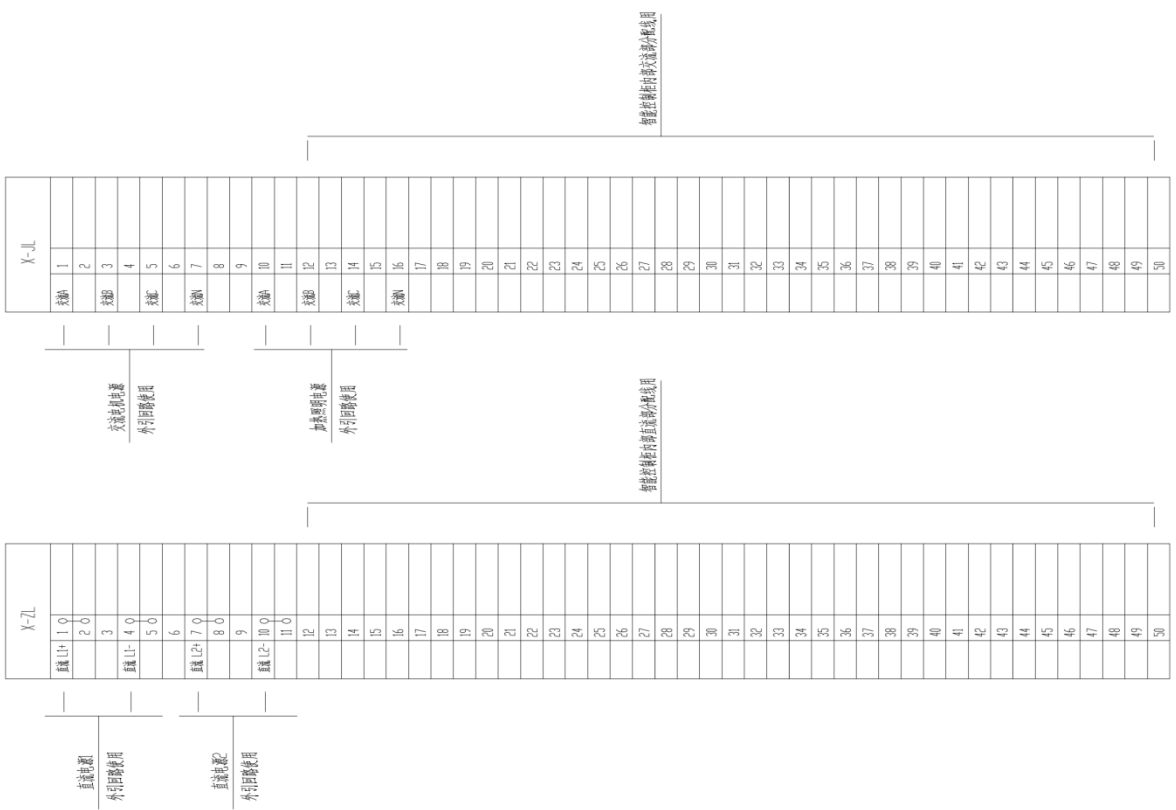


Figure 20 AC and DC power supply terminal interface diagram (generic equipment number 1GIS-2000/40)

4) Circuit breaker, disconnecting switch, grounding switch control and signal terminal block

The terminal block interface diagrams shown in Figures 21 and 22 are applicable to the external interface of the control cabinet when the intelligent terminal block is installed indoors, such as in extremely cold regions.

e) Optical Circuit Standard Interface

Two sets of protection such as SV sampling and GOOSE trip control loops that require enhanced reliability shall use their own independent fibre optic cables and fibre optic plug-in boxes.

145kV GIS circuit breaker intervals (except main transformer intervals) are equipped with a single set of fusion-free fibre optic splice boxes, and the number of interfaces per set should not be less than 24; main transformer intervals are equipped with a double set of fusion-free fibre optic splice boxes, and the number of interfaces per set should not be less than 24; and the 145kV GIS busbar intervals are equipped with a single set of fusion-free fibre optic splice boxes, and the number of interfaces should not be less than 72.

f) imaginary terminal

See Secondary Specialist Technical Specification for details of combined unit dummy terminal drawings.

For details of the virtual terminal diagram of the intelligent terminal, please refer to the secondary professional technical specification.

For details of the dummy terminal diagram of the integrated device of the intelligent terminal of the combined unit, see the technical specification of the secondary speciality.

告警回路

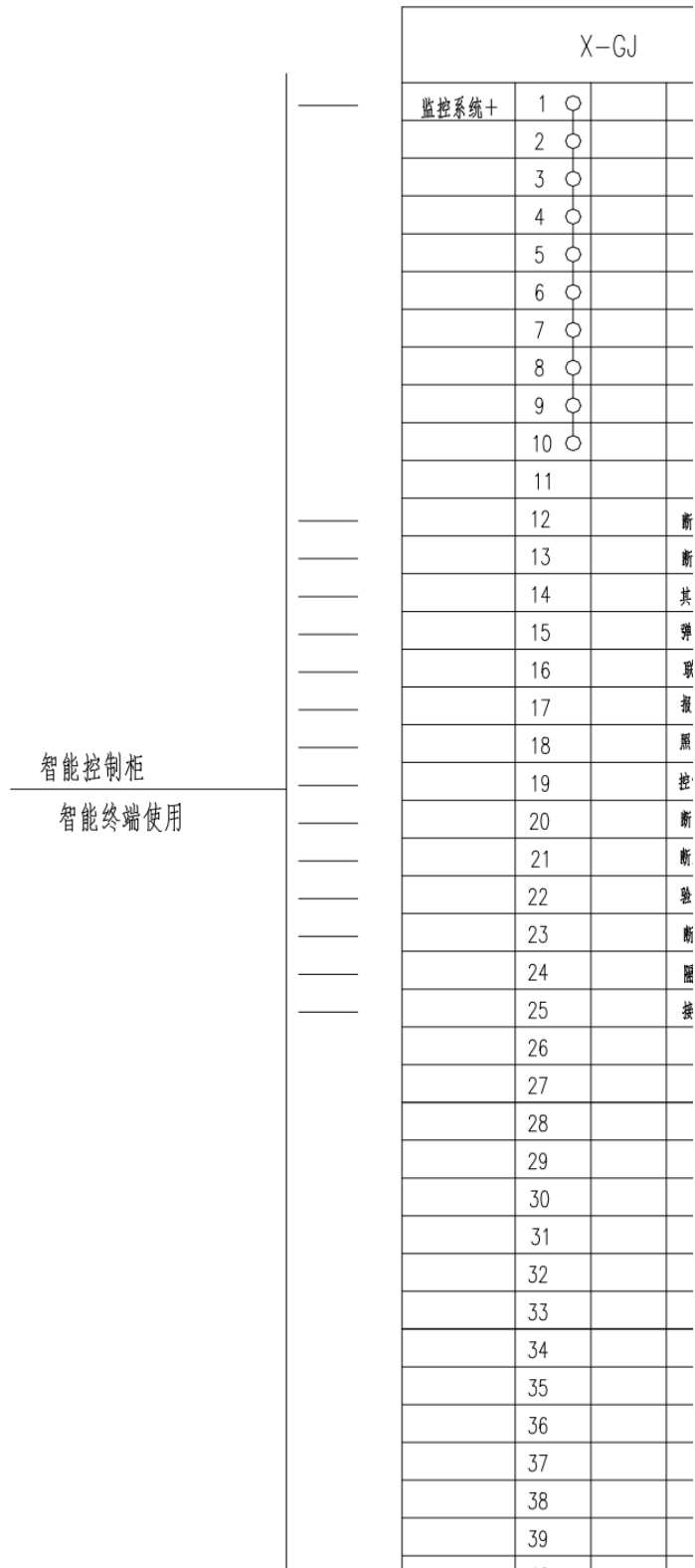


Figure 21 Alarm Circuit Terminal Block Interface Diagram (Generic No. 1GIS-2000/40)

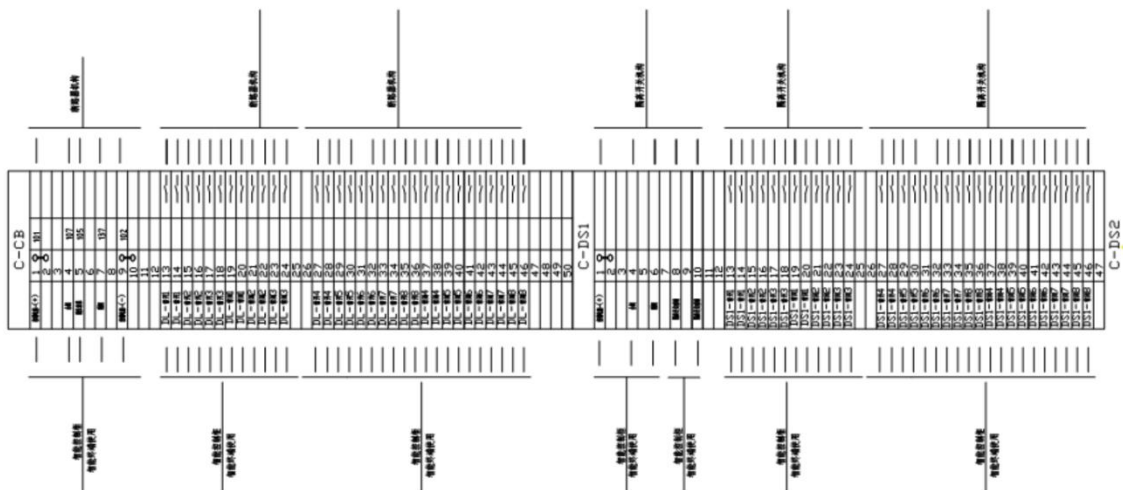


Figure 22 Circuit breaker, disconnecting switch secondary circuit terminal block interface diagram (generic equipment numbers 1GIS-2000/40, 1HGIS-2000/40)

#### 8.1.2.2 Technical requirements for the secondary circuit section

The following should be included:

- a) The circuit breaker shall be capable of three-phase electrical linkage operation.
- b) Circuit breakers, disconnecting switches and earthing switches shall be capable of remote and local operation, and of switching between remote and local. The remote/earth diverter switch of the circuit breaker shall be separately configured. The remote/earth diverter switch shall be equipped with auxiliary contacts, two normally open and two normally closed, and lead to the terminal block.
- c) The circuit breaker actuator shall be equipped with an internal electrical anti-trip circuit. The anti-tripping function shall be realised through the internal anti-tripping circuit of the circuit breaker in the case of close control and remote control.
- d) The circuit breaker shall be able to realise SF6 low pressure alarm and blocking function. The alarm and blocking function shall provide two groups of completely independent contacts, of which each group shall provide a pair of contacts for the user to use in case of low pressure blocking.
- e) Hydraulic mechanism should be able to achieve abnormal pressure alarm and locking function, should be able to provide two groups of completely independent pressure low locking contacts, and each group should provide at least one pair of contacts for the user. The spring mechanism shall be able to realise the function of unstored energy blocking and closing, and shall also provide at least two pairs of contacts for the user to use.
- f) The circuit breaker shall provide an external interface for monitoring the integrity of the opening and closing circuits.
- g) It should have perfect "five-proof" operation interlocking function, and meet the requirements of relevant national regulations and standards. The locking circuit should have an interface to facilitate the introduction of external locking contacts.
- h) The AC power supply is used for the motor power supply of the operating mechanism of the circuit breaker, disconnecting switch and earthing switch as well as for the control power supply of the disconnecting switch and earthing switch. The heating and lighting power supplies are evenly distributed on each phase of the AC power supply. Heating, lighting, operation and energy storage power switches shall be independently set up.

- i) The circuit breaker control and local signalling power supply of the GIS are all DC powered.
- j) Except for auxiliary contacts required for control and other auxiliary functions, each circuit breaker, disconnecting switch, and earthing switch shall be provided with sufficient auxiliary contacts for the user's use, all of which shall be electrically independent and shall be routed to a terminal strip.
- k) The motor power supply of multiple disconnecting and earthing switches in the same interval must be provided with separate independent switching equipment in the convergence control cabinet.
- l) AC and DC circuits should not share the same cable, two sets of trip circuits should not share the same cable; control and power circuits should not share the same cable.
- m) Time relays should not be selected as air bag type time relays.
- n) Circuit breaker breaking circuits should not be designed for RC acceleration.
- o) The control circuit of the disconnecting switch (earth switch) should not be self-holding in the event of a loss of power to the motor circuit.

#### 8.1.2.3 Electrical secondary installation interface technical requirements

The following should be included:

- a) Intelligent control cabinets for GIS should be configured by breaker interval, with one intelligent control cabinet breaker interval.
- b) The intelligent control cabinet is front and rear opening. The intelligent control cabinet shall be provided with horizontal and vertical conductor slots, and all equipment shall be installed in a location that facilitates the entry of external cables from the bottom of the intelligent control cabinet.
- c) The secondary cables from the GIS body to the intelligent control cabinet and between the intelligent control cabinets shall be shielded cables. This part of the cable is provided by the manufacturer, and the manufacturer should also provide a detailed list of cables and their laying requirements.
- d) Metal wiring ducts shall be provided to facilitate the fixing of cables and secondary cables on the GIS body shall be laid in the wiring ducts.
- e) One side of the intelligent control cabinet terminal block is for the wiring from the gas-insulated metal-enclosed switchgear mechanism to the GIS terminal block, and the other side is for the GIS terminal block to Smart Terminal/Consolidation Unit backplane wiring.
- f) The terminals are of crimp type, rated at 1000V, 10A, and withstand frequency voltage of 2000V. TA secondary circuits shall be provided with standard test terminals to facilitate disconnection or shorting of input and output circuits of the devices; test parts or connecting tabs for separate operation of the circuits shall be provided for the tripping exit circuits of all the devices, so that they can be disengaged from their exit circuits if necessary. Only one wire shall be permitted to be connected to a terminal. There should be sufficient insulation between the terminal blocks, which should be arranged in sections according to function, and there should be at least 10 per cent spare terminals, which can be increased if necessary.
- g) The trip circuit on the intelligent control cabinet should use terminals capable of connecting a 4mm<sup>2</sup> section cable core, and the trip and close terminals should be separated by terminals. The power supply circuit on the intelligent control cabinet should use terminals capable of connecting 6mm<sup>2</sup> section cable cores, and the positive and negative terminals should be separated by terminals. TA and TV circuits should use terminals capable of crimping 6mm<sup>2</sup> section cable cores.
- h) Intelligent control cabinet should be set up in the lower part of the body of the secondary grounding of special copper row, cross-section of not less than 100mm<sup>2</sup>, grounding terminals for crimping type.

It is appropriate to use standard prefabricated cable to connect between GIS electrical equipment body and intelligent control cabinet, and the prefabricated cable can be single-ended or double-ended prefabricated type.

- i) Intelligent control cabinet to the protection room, intelligent control cabinet is suitable for standard prefabricated optical cable connection, prefabricated optical cable option is suitable for double-ended prefabricated type.

### 8.1.3 Civil interfaces

The civil interfaces of 145kV GIS and HGIS are classified and unified in terms of the range of rebars reserved for the foundation of the equipment piers and platforms, the spacing of the foundation of outdoor inlet/outlet spacer casing, and the embedded parts in the structural layer of the indoor equipment slabs, etc., and a total of 6 types of electrical interfaces are formed according to the different forms of the electrical layouts. Among them, interface 1 corresponds to outdoor GIS scheme and interface 2 corresponds to indoor GIS layout scheme.

Outdoor equipment civil construction interface unified equipment pier foundation reserved rebar range and outdoor into (out of) the line interval casing foundation spacing. The spacing between the centre line of the equipment pier foundation and the centre line of the inlet/outlet casing foundation is determined according to the electrical arrangement scheme. Large plate foundation according to different design conditions to determine the outline of the large plate in the figure is only schematic.

The civil engineering interface of indoor equipment is unified with a buried piece on the floor structure layer, and the channel or I-beam will be welded on the buried piece according to the equipment data after confirmation of the equipment data. Indoor high-voltage power cable hole size is 800mm (length) × 800mm (width).

The size of indoor intelligent control cabinet is 800mm (width) x 800mm (depth) x 2200mm (height); the size of outdoor intelligent control cabinet is 1000mm (width) x 900mm (depth) x 2000mm (height) or 1200mm (width) x 900mm (depth) x 2000mm (height).

High altitude corrections for the outdoor programme are detailed in Section 8.4 High Altitude Corrections.

#### 8.1.3.1 Outdoor equipment

The following should be included:

- a) OutdoorGIS Basics

When the GIS is laid out, the reasonable combination of the entire GIS spacing should be planned according to the requirements of external conditions, and the construction drawing design should be carried out in conjunction with the general design scheme. The outdoor layout includes buildings and structures on the site, hole-retaining slots, grounding devices and main cable trenches.

The location of the outdoor GIS spacing should be determined according to the location of the access line and the overall arrangement of the concept, the civil engineering set up the whole slab foundation, the slab foundation is located below the ground, the slab foundation is reserved for rebar (or planting) The equipment foundation is to be made according to the equipment information after the equipment information is confirmed, and the concrete of the upper foundation is poured for the second time. The size of each foundation surface reserved rebar area is 1500mm×7000mm. see schematic diagram 23.

#### 8.1.3.2 Indoor equipment

When the GIS is laid out, the reasonable combination of GIS intervals should be planned according to the requirements of external conditions, and the construction drawing design should be carried out in conjunction with the general design scheme and the overall requirements of the complex building where the GIS is located. The indoor layout includes the basic structure of the buildings and structures, and the layout of the special reserved holes and slots for the indoor GIS.

The location of the indoor GIS interval should be determined according to the location of the access line and the overall arrangement. Civil engineering in the floor of the structural layer to set up the primary

buried parts (length 7m), to be confirmed by the equipment data according to the equipment data in the primary buried parts welded calibrated channel steel or I-beam, welded after the completion of the secondary lightweight concrete floor poured on the floor. During installation, the GIS equipment with steel foundation base is placed onto the levelled channel or I-beam and welded to the reserved embedded parts. The size of the indoor high-voltage power cable opening is 800mm (length) x 800mm (width).

See Figures 24 and 25 for the sequence of construction pours and the flat sections of the embedded elements.

8.1.3.3 Basis for intelligent control cabinets (sink cabinets)

The size of indoor intelligent control cabinet is 800mm (width) x 800mm (depth) x 2200mm (height); the size of outdoor intelligent control cabinet is 1000mm (width) x 900mm (depth) x 2000mm (height) or 1200mm (width) x 900mm (depth) x 2000mm (height). When the intelligent control cabinet (remittance control cabinet) is not on the GIS body, the lower part of the use of GIS overall raft foundation, in the overall raft foundation reserved rebar, intelligent control cabinet (remittance control cabinet) foundation second pouring. The flatness error of the foundation surface should be no more than 2mm, and the cable trench between the intelligent control cabinet (control cabinet) and the cable trench is set up with a cable branch trench or buried pipe.

See Figure 26 for a schematic diagram of the base of the intelligent control cabinet (sink cabinet).

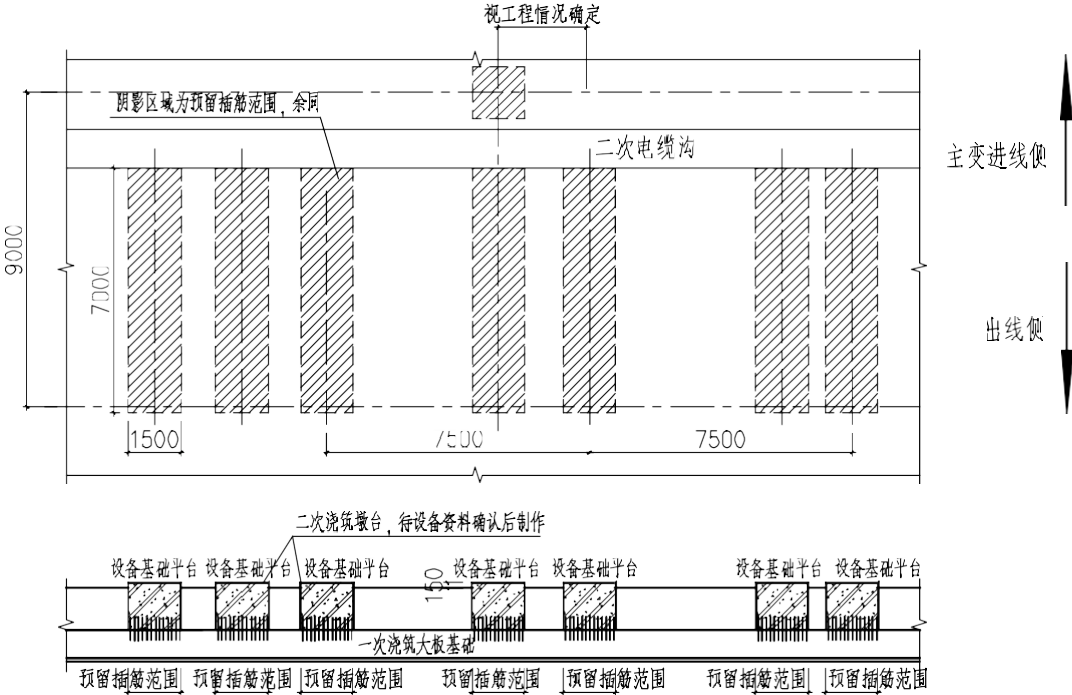


Figure 23 145kV outdoor GIS scheme (for double busbar connection, single busbar connection) foundation plan and section diagram (generic equipment number 1GIS-2000/40)



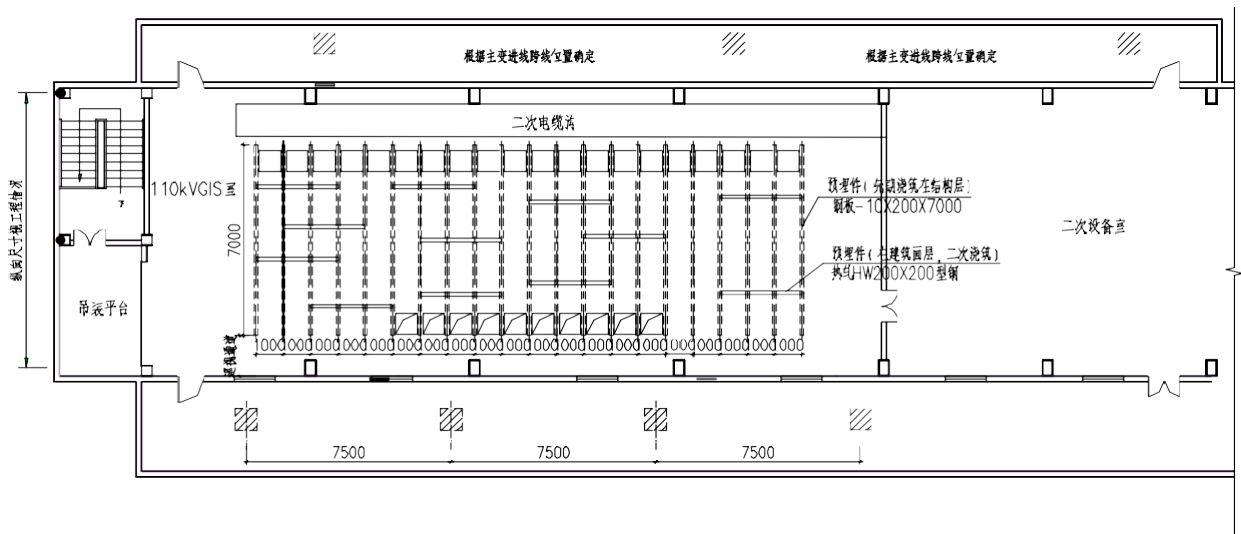
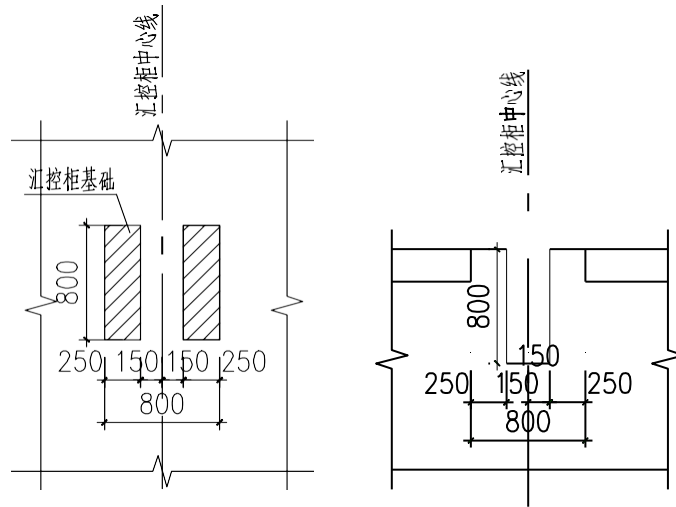


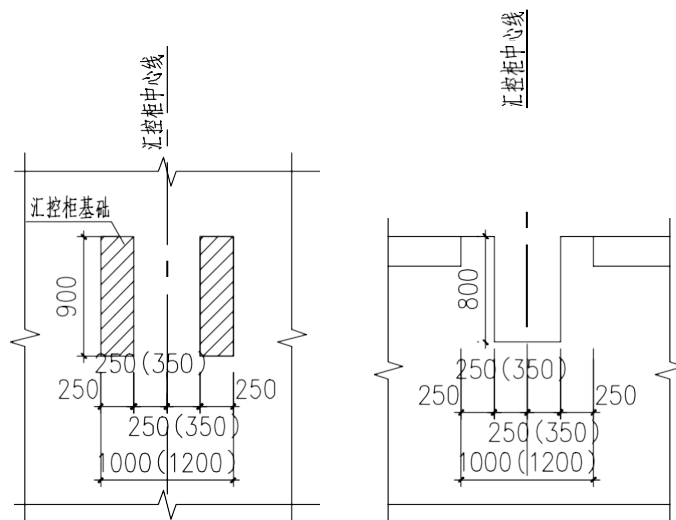
Figure 24 Schematic layout of the foundation for the **145kV** indoor **GIS** scheme (generic equipment number **1GIS-2000/40**)



Figure 25 Schematic of indoor **GIS** foundation section (generic equipment number **1GIS-2000/40**)



(indoor equipment)



(Outdoor equipment)

Figure 26 Schematic diagram of the basis for an intelligent control cabinet (sink cabinet) (generic equipment number **1GIS-2000/40**)

# 145kV气体绝缘金属封闭开关设备

## 通用技术规范

2024年6月

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# 145kV 气体绝缘金属封闭开关设备采购标准

## 通用技术规范

### 1 范围

本部分规定了 145kV 气体绝缘金属封闭开关设备（以下简称 GIS）招标的总则、技术参数和性能要求、试验、包装、运输、交货及工厂检验和监造的一般要求。

本部分适用于 145kV GIS。

### 2 规范性引用文件

下列文件对于本文件的应用是必不可少的。凡是注日期的引用文件，仅注日期的版本适用于本文件。凡是不注日期的引用文件，其最新版本（包括所有的修改单）适用于本文件。

GB 1208 电流互感器

GB 1984 高压交流断路器

GB 1985 高压交流隔离开关和接地开关

GB 7674 额定电压 72.5kV 及以上气体绝缘金属封闭开关设备

GB/T 8287.1 标称电压高于 1000V 系统用户内和户外支柱绝缘子第 1 部分：瓷或玻璃绝缘子的

试验

GB/T 11022 高压开关设备和控制设备标准的共用技术要求

GB 11032 交流无间隙金属氧化物避雷器

GB/T 12022 工业六氟化硫

GB/T 25096 交流电压高于 1000V 变电站用电站支柱复合绝缘子定义、试验方法及接收准则

GB 50150 电气装置安装工程 电气设备交接试验标准

DL/T 402 高压交流断路器订货技术条件

DL/T 486 高压交流隔离开关和接地开关

DL/T 593 高压开关设备和控制设备标准的共用技术要求

DL/T 617 气体绝缘金属封闭开关设备技术条件

DL/T 726 电力用电压互感器订货技术条件

Q/GDW 13001.1 高海拔外绝缘配置技术规范

Q/GDW 11716 气体绝缘金属封闭开关设备用伸缩节技术规范

### 3 术语和定义

下列术语和定义适用于本文件。

#### 3.1

**招标人 bidder**

提出招标项目，进行招标的法人或其他组织。

#### 3.2

**投标人 tenderer**

响应招标、参加投标竞争的法人或者其他组织。

### 3.3

#### 卖方（供方） seller（supplier）

提供本部分货物和技术服务的法人或其他组织，包括其法定的承继者。

### 3.4

#### 买方（需方） buyer（purchaser）

购买本部分货物和技术服务的法人或其他组织，包括其法定的承继者和经许可的受让人。

## 4 总则

### 4.1 一般规定

4.1.1 投标人应具备招标公告所要求的资质，具体资质要求详见招标文件的商务部分。

4.1.2 投标人须仔细阅读本部分（包括本部分通用和相关专用技术规范）的全部条款。

4.1.3 本部分提出的是最低限度的技术要求，并未对一切技术细节作出规定，也未充分引述有关标准的条文，投标人应提供符合本部分引用标准的最新版本部分和本招标文件技术要求的全新产品，如果所引用的标准之间不一致或本部分所使用的标准与投标人所执行的标准不一致，按要求较高的标准执行。

4.1.4 如果投标人没有以书面形式对本部分的条文提出异议，则意味着投标人提供的设备完全符合本部分的要求。如有与本部分要求不一致的地方，应逐项在“技术差异表”中列出。

4.1.5 本部分将作为订货合同的附件，与合同具有同等的法律效力。本部分未尽事宜，由合同签约双方在合同谈判时协商确定。

4.1.6 本部分中涉及有关商务方面的内容，如与招标文件的商务部分有矛盾，以商务部分为准。

4.1.7 本部分中通用部分各条款如与专用部分有冲突，以专用部分为准。

4.1.8 投标人需有泰国类似项目的业绩，并对当地标准有充分了解；

4.1.9 投标产品需满足当地电网及地区的相关认证，具备当地或电力行业的准入条件；并提供证明材料

4.1.10 本技术条件，仅规定了一般技术要求，对于当地的特殊要求，投标人应有充分了解，并在投标书中注明。

4.1.11 投标人需对现场安装进行指导，此项费用包含在投标价格之中。

### 4.2 投标人应提供的资格文件

投标人应提供下列资格文件：

- a) 投标人或制造商投标产品的销售记录及相应的最终用户的使用情况证明。
- b) 投标人或制造商应提供权威机构颁发的 ISO 9000 系列认证证书或等同的质量保证体系认证证书。
- c) 投标人或制造商应提供履行合同所需的技术和主要设备等生产能力的文件资料。
- d) 投标人或制造商应提供履行合同设备维护保养、修理及其他服务义务的文件。
- e) 投标人或制造商应提供投标设备产品全部有效的型式试验报告。
- f) 投标人或制造商应提供一份详细的投标产品中重要外购或配套部件供应商清单及检验报告。
- g) 投标人或制造商应提供投标产品中进口关键元件供应商的供货承诺函。
- h) 投标人或制造商应提供投标产品中组部件的供应商及原产地。

### 4.3 适用范围

4.3.1 本部分的适用范围仅限于招标产品的设计、安装、试验、调试及现场服务和技术服务。

4.3.2 中标人不应晚于签约后 4 周内，向买方提出一份详尽的生产进度计划表（见表 1），包括设备设计、材料采购、设备制造、厂内测试以及运输等项的详情，以确定每部分工作及其进度。



表1 生产进度计划表

合同号：\_\_\_\_\_；项目名称：\_\_\_\_\_；设备名称：\_\_\_\_\_；  
 型号规格：\_\_\_\_\_；工作日期\_\_\_\_\_至\_\_\_\_\_；制造商名称及地址：\_\_\_\_\_；  
 技术规范号：\_\_\_\_\_；工作号：\_\_\_\_\_；离岸日期：\_\_\_\_\_；到岸日期：\_ \_\_\_\_\_；  
 \_\_\_\_\_； 到达交货地点日期：\_\_\_\_\_。  
 \_\_\_\_\_。

项目		时间（年月日）			
工程制图					
图纸寄出					
图纸认可时间					
设计联络会	第一次				
	第二次				
材料及配套件采购					
材料及配套件进厂					
GIS 部件生产及试验	断路器				
	隔离开关				
	接地开关				
	电流互感器				
	电压互感器				
	避雷器				
	套管				
	盆式绝缘子				
	支撑绝缘子				
	母线				
	外壳				
	伸缩节				
	操动机构				
	其他部件				
工厂组装					
工厂试验					

4.3.3 工作进度如有延误，卖方应及时向买方说明原因、后果及采取的补救措施等。

4.4 设计图纸、说明书和试验报告要求

4.4.1 图纸及图纸的认可程序

4.4.1.1 所有需经买方确认的图纸和说明文件，均应由卖方在合同生效后的 4 周内提交给买方进行审定认可。这些资料包括 GIS 的外形图、隔室分布图、布置图、组装图、基础图、电气原理图、运输尺寸、运输质量、重心、总质量及二次线布置图等。

4.4.1.2 买方审定时有权提出修改意见。买方在收到需认可图纸 4 周后，将一套确认的或签有买方校定标记的图纸（买方负责人签字）返还给卖方。凡买方认为需要修改且经卖方认可的，不得对买方增加费用。在未经买方对图纸做最后认可前，任何采购或加工的材料损失应由卖方单独承担。

4.4.1.3 卖方在收到买方确认图纸（包括认可方修正意见）后，应于 2 周内向买方提供最终版的正式图纸和一套供复制用的底图及正式的光盘，正式图纸应加盖工厂公章或签字。

4.4.1.4 完工后的产品应与最后确认的图纸一致。买方对图纸的认可并不减轻卖方关于其图纸的正确性的责任。设备在现场安装时，如卖方技术人员进一步修改图纸，卖方应对图纸重新收编成册，正式递交买方，并保证安装后的设备与图纸完全相符。

4.4.1.5 图纸的格式：所有图纸均应有标题栏、相应编号、全部符号和部件标志，文字均用中英文，并使用 SI 国际单位制。对于进口设备应配中英文说明和标识，当买方对英文局部有疑问时，卖方应进行书面解释。

4.4.1.6 卖方免费提供给买方全部最终版的图纸、资料及说明书。其中图纸应包括 4.4.1.1 所涉及的图纸和卖方自带的电缆清册，并且应保证买方可按最终版的图纸资料对所供设备进行维护，并在运行中进行更换零部件等工作。

4.4.1.7 GIS所需图纸：

- a) 总体装配图：应表示设备总的装配情况，表明设备组装后的正视图、侧视图和俯视图并同时标出安装完后的组件，包括外形尺寸、设备重心位置与总质量、受风面积、运输尺寸和质量、体积和总装体积、控制柜位置、电缆入口位置、固有频率、端子尺寸和材料及其他附件。
- b) 控制柜与设备间的相互连接图：应包括控制柜内全部端子情况，并标明电缆的识别编号及柜内设备的大致位置。
- c) 电气原理图：应包括设备控制柜及操动机构的内部接线和远方操作的控制、信号、照明等交流和直流回路。如有多张电气原理图，还应标明各图之间的有关线路与接点相互对应编号。必要时，应提供所有特殊装置或程序的概要操作说明。
- d) 基础图：应标注设备操作的动态负荷、静态负荷及其位置、进出线尺寸，基础螺栓的位置和尺寸，设备及其控制柜的尺寸，渠道排水沟等，应注明对基础的强度和水平度的要求。
- e) SF6 系统图：应标注每个单元中 SF6 隔室的布置、仪表装设以及各隔室间的连接关系。
- f) 设备的 SF6 气体及油管路图：应包括管路的尺寸、布置和压力等。
- g) 每台 SF6 断路器控制柜上应附有 SF6 气体压力与温度的关系曲线图的铭牌。
- h) 套管图：包括端子详图，图上应标出套管外形尺寸，端子的允许拉力、破坏拉力，爬电距离等。
- i) 操动机构系统图：对液压操动机构应标注管路尺寸、布置、压力等的详图。
- j) 系统连接图：应标注电气一、二次回路多个设备间的控制、继电器和联锁等。
- k) 铭牌图：应符合 GB 7674 的规定。

#### 4.4.2 说明书的要求

4.4.2.1 GIS 结构、安装、调整、运行、维护、检修和全部附件的完整说明和技术数据。应包括以下内容：

- a) 安装说明书上至少包括：
  - 1) 开箱和起吊。运输单元的质量、起吊和开箱的注意事项及专用的起吊用具等。
  - 2) 组装。不是整体运输的 GIS，其运输单元应有清楚的标志和代号，并提供有运输单元号的组装示意图。
  - 3) 安装准备。基础施工的要求、外部接线端子的尺寸、电缆进入地点位置、接地以及各种管道的连接方式、尺寸和布置等资料。
  - 4) 最后的安装验收。合同要求的在现场进行的试验项目及试验方法。
- b) 维护：至少包括按相关标准的规定，提供主要元件的维护说明以及 GIS 维修工作的分类、程序和范围。
- c) 运行检修：提供运行中应注意的事项及控制指标，主要元件的检修周期和检修方案。

- 4.4.2.2 GIS 各个元件和所有附件的技术数据。
- 4.4.2.3 表示 GIS 和操动机构的结构图及对基础的技术要求的说明。
- 4.4.2.4 结构特征、设备及其元件的更详细的说明。
- 4.4.2.5 操动机构特征的说明。
- 4.4.2.6 备品备件、专用工具和专用仪器仪表的使用说明。
- 4.4.2.7 说明书使用中英文。

#### 4.4.3 试验报告

卖方应提供下列试验报告：

- a) GIS的型式试验和出厂试验报告。
- b) GIS所有元件的型式试验和出厂试验报告。
- c) 如果产品进行了局部改进或改变应补充提供相应的验证性试验报告。

#### 4.4.4 图纸、说明书、试验报告等资料的交付时间、数量

4.4.4.1 卖方应向买方提供的资料、图纸、试验报告见表 2，但不限于表 2 的内容。

4.4.4.2 卖方应提供详细的装箱清单。

表 2 卖方向买方提供的资料图纸和试验报告

序号	内 容	序号	内 容
1	图纸类	3	试验报告
1)	GIS 土建、地基规定	1)	GIS 全套型式试验报告
2)	GIS 安装、维护、运行规定	2)	GIS 全套出厂试验报告
3)	GIS 通风规定	3)	合同要求的其他试验报告
4)	GIS 单线图	4)	关键零部件试验报告（盆式绝缘子、绝缘拉杆套管等）
5)	二次控制、测量、监控、信号回路、辅助设备回路主方案图	4	其他资料
6)	GIS 布置图（平面、断面）	1)	GIS 主要元件标准
7)	主要部件安装图，带外观尺寸、运输尺寸、质量	2)	高压容器标准
8)	GIS 地基图	3)	GIS 焊接标准
9)	SF6 气体隔室分布图	4)	SF6 气体标准
10)	安装、维修尺寸图	5)	GIS 所用材料标准
11)	SF6 气体监视系统图	6)	GIS 检查、调试规定
2	安装使用说明书	7)	GIS 包装、装船、储存规定
1)	GIS 主要部件安装指南（断路器、隔离开关、接地开关、电流互感器等）	8)	现场高压试验规定和标准
2)	辅助设备安装指南（SF6 气体系统、油系统、就地控制柜等）	9)	维修指南
3)	特殊工具、仪表介绍	10)	SF6 气体质量证明
4)	运输和安装所需要专用设备的说明	11)	液压油质量证明
5)	现场试验和其他试验指南	12)	过滤器材料（吸附剂）证明
6)	全套安装图纸	13)	GIS 外壳安全性证明
7)	全套接地系统图纸	14)	GIS 高压气体释放装置证明
8)	全套地基图纸	15)	装箱清单

9)	低压电缆布置图纸	16)	包装说明
10)	元件安装图纸（就地控制柜、操作箱）（包括接线板清单、布置等）	17)	相对地稳态电压分布图
11)	SF6/油套管交界面尺寸图	18)	设备中使用的润滑剂、油脂和液压油的清单
12)	变压器交界面尺寸图	19)	带电显示装置的规格、型式、厂家（如果采用
13)	电缆交界面尺寸图	20)	伸缩节配置方案

4.4.4.3 投标人在投标文件中应提供 GIS 外形尺寸及隔室分布图，供评标时参考。

#### 4.5 标准

4.5.1 合同中所有设备、备品备件，包括卖方从第三方获得的所有附件和设备，除本部分中规定的技术参数和要求外，其余均应遵照最新版本的国家标准（GB）、电力行业标准（DL）和 IEC 标准及国际单位制（SI），这是对设备的最低要求。卖方如果采用自己的标准或规范，应向买方提供中文和英文复印件并经买方同意后方可采用，但不能低于 GB、DL 和 IEC 的有关规定。

4.5.2 所有螺栓、螺纹、管螺纹、螺栓夹及螺母均应遵守国际标准化组织（ISO）和国际单位制（SI）标准的规定。

#### 4.6 卖方应提交的技术数据和信息

4.6.1 技术参数特性表、技术偏差表及相关技术资料。

4.6.2 投标产品的特性参数和特点。

4.6.3 与其他设备配合所需的相关技术文件和信息。

#### 4.7 备品备件

4.7.1 投标人应提供必备和推荐的备品备件，并分别列出其单价（商务部分填写）。

4.7.2 所有备品备件应为全新产品，与已经安装同型号设备的相应部件能够互换。

4.7.3 所有备品备件应单独装箱，包装应能防尘、防潮、防止损坏等，与主设备一并发运，并标注“备品备件”以区别本体。

#### 4.8 专用工具和仪器仪表

##### 4.8.1 投标人应提供必备和推荐的专用工具和仪器仪表。

序号	名称	规格和型号	单位	数量	产地	生产厂家	价格	备注
1	SF6气体回收净化装置		台	1				无油压缩机
2	SF6微水密度在线监测		套	1				每个单独气室
3	局放在线监测		套	1				外置式
4	环境在线监测		套	1				红外原理

4.8.2 所有专用工具与仪器仪表应是全新的，且须附详细使用说明资料。

4.8.3 专用工具与仪器仪表应单独装箱，注明“专用工具”、“仪器仪表”，并标明防潮、防尘、易碎、向上、勿倒置等字样，同主设备一并发运。

#### 4.9 运输、储存、安装、调试、性能试验、试运行和验收

4.9.1 合同设备的安装、调试，将由买方根据卖方提供的技术文件和说明书的规定，在卖方技术人员指导下进行。

4.9.2 合同设备的性能试验、试运行和验收，根据本部分规定的标准、规程规范进行。

4.9.3 完成合同设备安装后，买方和卖方应检查和确认安装工作，并签署安装工作证明书，共两份，双方各执一份。

4.9.4 设备安装、调试和性能试验合格后方可投入试运行。试运行后买卖双方应签署合同设备的验收证明书（试运行时间在合同谈判中商定）。该证明书共两份，双方各执一份。

4.9.5 如果在安装、调试、性能试验、试运行及质保期内，技术指标一项或多项不能满足合同技术部分要求，买卖双方应共同分析原因、分清责任。如属制造方面的原因，或涉及索赔部分，按商务部分有关条款执行。

4.9.6 出厂包装运输应尽可能以完整的功能单元为基本运输单位，应在密封和充微正压（0.02～0.05MPa）干燥气体的情况下包装、运输和储存。应在断路器、隔离开关、电压互感器、避雷器和套管运输单元上加装三维冲击记录仪（厂内运输时可仅加装震动指示器），其他运输单元加装震动指示器。运输中如出现冲击加速度大于 3g 或不满足产品技术文件要求的情况，产品运至现场后应打开相应隔室检查各部件是否完好，必要时可增加试验项目或返厂处理。

#### 4.10 应满足的标准

设备应满足 GB 1208、GB 1984、GB 1985、GB 7674、GB/T 11022、GB 11032、GB/T 12022、GB 50150、DL/T 402、DL/T 486、DL/T 593、DL/T 617、DL/T 726、Q/GDW 13001.1、Q/GDW 11716 最新版本的要求，但不限于上述规范和标准。

#### 4.11 应满足的文件

该类设备技术标准应满足国家电网有限公司标准化成果中相关条款要求。下列文件中相应的条款规定均适用于本文件，其最新版本（包括所有的修改单）适用于本文件。包括：

- a) 《国家电网有限公司十八项电网重大反事故措施（2018 修订版）》；
- b) 《国家电网有限公司输变电工程通用设备 35～750kV 变电站分册（2018 年版）》；
- c) 《国家电网有限公司输变电工程通用设计》。

## 5 技术参数和性能要求

### 5.1 GIS 技术参数

#### 5.1.1 GIS 技术参数见本部分和相应专用部分的技术参数特性表

#### 5.1.2 通用要求

应包括以下内容：

- a) 产品设计应能使设备安全地进行下述各项工作：正常运行、检查和维护性操作、引出电缆或其他设备的绝缘试验、消除危险的静电电荷、安装和（或）扩建后的相序校核、操作联锁和耐压试验等。
- b) 产品的设计应能在允许的基础误差和热胀冷缩的热效应下不致影响设备所保证的性能，并满足与其他设备连接的要求。
- c) 产品所有额定值和结构相同时，可更换的元件应具有互换性。
- d) 制造厂提供的产品维护手册中，应明确检修维护周期和内容。产品及其元部件应保证在检修维护周期内可靠运行。
- e) 各元件应符合各自的有关标准。
- f) 操动机构、盆式绝缘子、支撑绝缘子、绝缘拉杆、伸缩节等重要组部件具有唯一编号，并可追溯生产流程。
- g) 制造厂应对金属材料 and 部件材质进行质量检测，对罐体、传动杆、拐臂、轴承（销）等关键金属部件的材质按工程抽样进行金属成分检测、按批次进行金相试验抽检，并提供检测报告。
- h) GIS 现场安装应在临时洁净间内进行。临时洁净间应根据产品的结构型式、主设备、主母线和分支母线的总体布置方式进行临时洁净间的设计。临时洁净间应便于现场拆装，移动

灵活，防风、防雨、防尘。临时洁净间的长、宽、高应满足设备安装和调试工作的需求，对场地和基础的要求应提前告知施工单位。

- i) 用于严寒地区的设备应考虑 SF6 防液化的措施。
- j) 断路器、隔离开关操动机构箱设置应便于运维检修，机构易损件应便于维护更换。汇控柜与GIS 本体间距应保证柜门正常开启，方便二次接线。
- k) 单间隔内各功能模块应能便于检修更换，不影响母线和相邻间隔。

### 5.1.3 具体要求

应包括以下内容：

#### a) 联锁：

- 1) 产品应设有机电或电气联锁装置，以防止带负荷拉、合隔离开关和带电误合接地开关。下列设备应有联锁，对于主回路应满足以下要求：
- 2) 在维修时，用来保证隔离间隙的主回路上的高压隔离开关（断路器）应确保不自合。
- 3) 接地开关合闸后应确保不自分。
- 4) 隔离开关要与相关的断路器实现电气联锁；隔离开关与接地开关之间应有可靠的电气联锁。其联锁逻辑的设置应根据电气主接线进行设计，应用图表表示清楚，并取得买方同意。
- 5) 电气联锁应单独设置电源回路，且与其他回路独立。所有联锁回路的结点不得采用拓展结点。

#### b) 接地：

- 1) 每个气体隔室的壳体应互连并可靠接地，接地回路应满足额定短路电流的动、热稳定要求。
- 2) 接地应防止外壳产生危险感应电压，外壳和支架上的感应电压，正常运行条件下不应大于 24V，故障条件下不应大于 100V。
- 3) 接地点的接触面和接地连线的截面积应能保证安全地通过故障接地电流。
- 4) 每相断路器的基座上应有一个不油漆的、表面镀锡的接地处，并有接地标志。铜接地材料时紧固接地螺栓的直径不得小于 12mm。钢接地材料时紧固接地螺栓的直径不得小于 16mm。
- 5) 外壳应能接地。凡不属主回路或辅助回路的预定要接地的所有金属部分都应接地。
- 6) 外壳、框架等部件的相互电气连接，应采用紧固连接（螺栓连接或焊接），并以跨接方式保证电气连通。如采用跨接片，户外 GIS 罐体上应有专用跨接部位，禁止通过法兰螺栓直连。
- 7) 主回路应能接地，以保证维修工作的安全。另外在外壳打开后的维修期间，应能将主回路连接到接地极。
- 8) 电压互感器、避雷器、快速接地开关应各自独立设置引线接地。接地开关的接地端应通过绝缘套筒引至 GIS 外部接地，且应设置可拆卸接地连板。对温差较大地区接地引出端与接地引线线间应使用软铜叠片式导电带连接。

#### c) 外壳：

- 1) 为便于安装和安全运行，应装设外壳伸缩节。
- 2) 金属外壳应能承受在运行中出现的正常的和暂态的压力。
- 3) 应符合 5.13.1 对壳体的要求，生产厂家应对 GIS 及罐式断路器罐体焊缝进行无损探伤检测，保证罐体焊缝 100%合格，并按设备投产后不能复查的条件要求进行设计、

制造，以确保材料、结构、焊接工艺、检验等的安全可靠性。

- 4) 封闭外壳充以最低功能压力的气体时，能保证设备的绝缘水平。还应考虑振动和温度变化的作用以及气候条件的影响。
- 5) 外壳应能满足设计压力，并具备在规定时间内不产生电弧外部效应和不烧穿的能力，应符合 DL/T 617 标准的要求。
- 6) 不论焊接或铸造的外壳，其厚度和结构的计算方法应参照类似压力容器标准来选择。
- 7) 外壳的设计温度，通常是周围空气温度的上限加主回路导体流过额定电流时外壳的温升，并应考虑日照影响。
- 8) 外壳的设计压力，至少是在设计温度时外壳内能达到的压力上限。在确定外壳设计压力时，气体的温度应取通过额定电流时外壳温度上限和主回路导体温度上限平均值，对设计压力能从已有温升试验记录中确定的情况除外。
- 9) 外壳设计时应考虑如下因素：外壳充气前可能出现的真空度；外壳或绝缘隔板可能承受的全部压力差；相邻隔室具有不同运行压力的情况下，因隔室意外漏气造成的压力升高；发生内部故障的可能性等。若外壳有设置观察窗，观察窗的透明板的机械强度应与外壳相当，确保气体不泄漏，且防紫外线措施完备。
- 10) 外壳结构的材料性能，应具有已知的和经过鉴定的最低限度物理性能，这些性能是计算和/或验证试验的基础。制造商应对材料的选用负责，并根据材料合格证和进厂检验结果，对保持材料的最低性能负责。
- 11) 充气口保护封盖的材质应与充气口材质相同，以防发生电化学腐蚀。
- 12) 户外 GIS 法兰对接面宜采用双密封，并在法兰接缝、安装螺孔、跨接片接触面周边、法兰对接面注胶孔、盆式绝缘子浇注孔等部位涂防水胶。

d) 绝缘隔板：

- 1) 产品应划分为若干隔室，以达到满足正常使用条件和限制隔室内部电弧影响的要求。因此绝缘隔板应能确保当相邻隔室内漏气或维修工作而使压力下降直至制造厂规定的负压时，本隔室的气体压力不发生任何变化。
- 2) 绝缘隔板通常由绝缘材料制成。为保证人身安全，应有接地及其他措施；应明示绝缘隔板机械安全性能数据，以验证可承受相邻隔室中仍然存在的正常气压能力。
- 3) 绝缘隔板应按制造商技术条件逐只进行压力试验、工频耐压试验、局部放电试验和 X 射线探伤试验，以保证质量。
- 4) 所有断路器隔室的 SF<sub>6</sub> 气体压力报警、闭锁均应有信号输出，其他隔室的 SF<sub>6</sub> 气体压力降低，应有报警信号输出，并在控制柜上指示。
- 5) 对双母线结构的 GIS，同一间隔的不同母线隔离开关应各自设置独立隔室，252kV 及以上 GIS 母线隔离开关不应采用与母线共隔室的设计结构，252kV 及 363kV GIS 两组母线隔离开关公共端有需要时可设置独立气室。
- 6) 长母线应有适当的气室分割，最大气室的气体处理时间不超过 8h。252kV 及以下设备单个气室长度不超过 15m，且单个主母线气室对应间隔不超过 3 个。
- 7) SF<sub>6</sub> 气体或操动液第一次灌注。应随断路器供给第一次灌注用的 SF<sub>6</sub> 气体和任何所规定的操动液。供第一次充气用的 SF<sub>6</sub> 气体应符合 GB/T 12022 的规定。在气体交货之前，应向买方提交气体通过毒性试验的合格证书，所用气体应经买方复检合格后方可使用。操动液应符合相应标准的要求。
- 8) 各隔室的吸附剂。投标人在投标阶段提交一份解释文件，包括吸附剂的位置、种类和质量，固定吸附剂的应选用不锈钢或其他高强度材料，结构应设计合理。吸附剂罩开孔直径应小于吸附剂颗粒直径；吸附剂罩边沿不应有尖角、毛刺；安装后的吸附剂罩与 GIS

端盖内表面之间的间隙距离应小于吸附剂颗粒直径。吸附剂应选用不易粉化的材料并装于专用袋中，绑扎牢固。

9) 盆式绝缘子应尽量避免水平布置。

e) 限制并避免内部故障电弧：

1) 应采用限制和避免内部故障电弧的措施，如开关设备的联锁、气体泄漏限制及控制绝缘配合、高速保护、短接电弧的快速装置、远距离操作（遥控）、内部或外部压力释放、安装现场的工作质量检查等；产品在结构布置上，应使内部故障电弧对其继续工作能力的影响降至最小。电弧影响应限制在起弧的隔室内或故障段的另一些隔室（若该段的隔室之间有压力释放设施时）之内。将故障隔室或故障段隔离以后，余下的设备应具有继续 ze 常 ze 工作的能力。

2) 为了人身安全，应采取适当保护措施限制电弧的外部效应；发生电弧的外部效应时仅允许外壳出现穿孔或裂缝，不应发生任何固体材料不受控制地溅出。

3) 如装有压力释放装置，安装位置应保证气体逸出时不危及在现场执行正常运行任务人员的安全。

4) 卖方提供关于保护系统使用的完整资料及当短路电流不超过某一值时，在某一持续时间内不会发生电弧的外部效应的资料，并推荐故障定位的合适措施或建议。卖方应提供内部故障电弧试验数据和试验报告，并提供对内部电弧故障进行定位的适当措施和方法。

f) 每一个独立气体隔室应装有单独的气体密度继电器、压力表，分箱结构的断路器每相应设计成独立气室并安装独立的密度继电器。每一个独立的母线气室均应装设独立的密度继电器，不允许多个母线气室或不同相母线气室通过管路连通共用一个密度继电器。密度继电器与 GIS 本体间的连接方式应满足不拆卸校验要求。户外安装的密度继电器应设置防雨措施。密度继电器应装设在与被监测气室处于同一运行环境温度的位置。对于严寒地区的设备，其密度继电器应满足环境温度在  $-40^{\circ}\text{C} \sim -25^{\circ}\text{C}$  时准确度不低于 2.5 级的要求。密度继电器表计应朝向巡视通道。

g) 应有补偿因基础沉降及温度变化产生的膨胀和收缩的缓冲措施，主要用于装配调整、吸收基础间的相对位移和热胀冷缩的伸缩量等。采用压力平衡型伸缩节时，每两个伸缩节间的母线筒长度不宜超过 40m。制造厂应提供伸缩节配置方案，并经业主单位组织审核。伸缩节配置方案包括伸缩节的允许变化量和安装作业指导书、伸缩节配置计算书（X、Y、Z 三个方向的伸缩量、配置数量）、伸缩节配置图、伸缩节类型（普通安装型、压力平衡型和横向补偿型）、伸缩节（状态）伸缩量-环境温度对应明细表等相关材料。伸缩节配置应满足跨不均匀沉降部位（室外不同基础、室内伸缩缝等）的要求。用于轴向补偿的伸缩节应配备伸缩量计量尺，并在现场标明伸缩量、螺栓松紧情况等调整要求。伸缩节技术规范按照 Q/GDW 11716—2017《气体绝缘金属封闭开关设备用伸缩节技术规范》执行。

h) 电缆的连接和绝缘试验（采用电缆连接的工程）：

1) 电缆终端箱与电缆终端的配合应符合相应标准的要求。

2) 进线电缆侧如装有带电显示装置，应在 A、B、C 三相分别装设。

3) 带电显示装置应结构设计合理，安装维护方便，性能可靠，具有自检功能；且应具有显示带电状态（灯光）和强制性闭锁的功能。带电显示装置应有联锁及信号输出接点，每相使用单独的放大器。

4) 应设置可取下的连接导体，以便电缆进行绝缘试验时使电缆和 GIS 隔离，并可根 ze 要求提供对电缆和 GIS 进行绝缘试验的接口设备和试验套管。

5) GIS 电缆仓的结构和高度应设计成便于现场安装和拆卸的要求。

i) 隔离开关和接地开关：



- 1) 隔离开关和接地开关应有可靠的分、合闸位置指示装置。如需要可配制便于视察触头位置的观察窗。接地开关的接地触头应与本体外壳绝缘。对相间连杆采用转动传动方式设计的三相机械联动隔离开关，应在远离机构输出轴相安装分合闸指示器。
  - 2) 隔离开关和接地开关不得因运行中可能出现的外力（包括短路而引起的力）而误分或误合。
  - 3) 快速接地开关应具有开合感应电流的能力，隔离开关应具备开合母线充电电流以及小电容电流和小电感电流的能力。隔离开关开合母线充电电流时产生的特快瞬态过电压（VFTO）不得损坏设备，由此引起的外壳瞬态电压升高不应危及人身安全。
- j) 双母线、单母线或桥形接线中，GIS 母线避雷器和电压互感器应设置独立的隔离开关。3/2 断路器接线中，GIS 母线避雷器和电压互感器不应装设隔离开关，宜设置可拆卸导体作为隔离装置。可拆卸导体应设置于独立的气室内。架空进线的 GIS 线路间隔的避雷器和线路电压互感器宜采用外置结构。
- k) 每个断路器间隔应装设汇控柜，汇控柜上应有一次设备的模拟接线图及断路器、隔离开关和接地开关的位置指示，并应有驱湿、加热装置，维持柜内的绝缘水平，户外汇控柜还应有顶部隔热层，加热装置宜采用温湿度控制，避免采用长投方式，防止造成设备温度过高。包含合并单元、智能终端的断路器汇控柜内应装设空调或其他降温设备。另外还要配置小型断路器、插座、照明等辅助设备。户外汇控柜、机构箱采用防锈性能不低于低碳 304 不锈钢的材料，厚度不小于 2 毫米，内部应有隔热和保温措施，防护等级不低于 IP45W。该柜除实现就地控制、测量和信号显示外，还应有足够的辅助触点和试验端子，供用户远方测量、控制和信号使用。每面控制柜需设置“就地/远方”控制选择开关；对断路器、隔离开关和电动操作的接地开关，应实现就地和远方控制方式的切换。在选择“远方”控制时，就地控制无效；选“就地”控制时，远方控制（包括保护装置信息）无效。选择开关位置应能通过辅助触点送往远方控制中心。汇控柜、端子箱等的内部照明装置应采用 LED 灯，并装设防护罩。
- l) 辅助电缆：
- 1) 由汇控柜至操动机构箱 TA、TV 接线盒，以及机构箱和接线盒至各设备之间的辅助电缆均与 GIS 成套，由制造商供应并负责安装和连接。其截面积符合下列规定：  
 TA、TV 回路：大于或等于  $4\text{mm}^2$   
 。控制回路：大于或等于  $2.5\text{mm}^2$ 。  
 信号回路：大于或等于  $1.5\text{mm}^2$ 。
  - 2) 电缆应采用电解铜导体、PVC 绝缘、铠装、阻燃的屏蔽电缆。电缆两端有标示牌，标明电缆编号及对端连接单元名称。
  - 3) 沿本体敷设的二次电缆采用金属槽盒敷设，户外槽盒采用防锈性能不低于低碳 304 不锈钢的材料。垂直安装的二次电缆槽盒应从底部单独支撑固定，且通风良好，水平安装的二次电缆槽盒应有低位排水措施。GIS、HGIS 至各设备元件接线盒的电缆用非橡胶材质蛇形管加以过渡，蛇形管长度不宜超过 1m。电缆槽盒过渡接头应密封良好，避免进水受潮。
  - 4) 汇控柜至机构箱的交、直流回路不能共用同一根电缆，两套跳闸回路不能共用同一根电缆，控制和动力回路不能共用同一根电缆。
- m) 端子排及回路：端子排上应有标明与制造商提供的回路图上一致的编号。每个端子上只能压接一根导线。汇控柜上 TA 回路的端子排，采用试验端子，应能满足运行状态下不断开电流回路串入或拆除测试仪表的要求。一般端子应能可靠地接入  $1.5\text{mm}^2\sim 4\text{mm}^2$  截面的导线；特殊需要的接入大截面电缆的端子，另行商定。

- n) 对辅助和控制回路中二次配套元件的要求：卖方应明确标示辅助和控制回路中所采用的配套元件，如阀门、辅助和控制开关、压力表、密度继电器、保护继电器、接线端子、电动机、熔断器、接触器、低压开关、监视和测量仪表、二次电缆等元件的型号和制造商，或者按照买方要求的制造商和型号进行采购。断路器出厂试验应进行中间继电器、时间继电器、电压继电器动作特性校验。二次电缆及元件应采用阻燃材料，二次电缆阻燃等级应达到 C 级阻燃，二次元件阻燃等级应达到 V0 等级。
- o) 断路器、隔离开关、接地开关等操动机构的外壳及汇控柜等，均应满足 IP45W 的防护等级和 IK10 的防护机械撞击水平的要求，潮湿多雨地区防护等级为 IP55。箱体应设置可使箱内空气流通的迷宫式通风口，并具有隔热、防腐、防雨、防潮、防尘和防小动物进入的性能。
- p) 安装在潮湿多雨、低温地区的 GIS，其机构箱、汇控柜应采用低功率常投加热器与手动投切加热器组合配置的方案，根据柜体容积合理设置通风孔，加热器电源和操作电源应分别独立设置，以保证切断操作电源后加热器仍能工作。
- q) 出线连接。出线连接可以是架空线连接、电缆连接或和变压器直接连接，对于不同的出线连接方式由买方决定，技术要求与卖方商定。当采用和变压器直接连接方式时，由 GIS 制造商负责与变压器制造商协调。
- r) 带电显示装置应结构设计合理，安装维护方便，性能可靠，具有显示带电状态（灯光）和强制性闭锁的功能。
- s) 防锈。对户外使用设备的外壳、汇控柜、机构箱等，应采取有效的防腐、防锈措施，确保在使用寿命内不出现涂层剥落、表面锈蚀的现象；在户外的端子板、螺栓、螺母和垫圈应采取防腐措施，尤其应防止不同金属之间的电腐蚀，而且应防止水分进到螺纹中。
- t) GIS 应具备必要的方便运行人员对设备进行巡视和操作的通道及固定平台。
- u) 铭牌：
  - 1) GIS 及其辅助和控制设备、操动机构等主要元件均应有耐久和清晰易读的铭牌；
  - 2) 对于户外设备的铭牌，应是不受气候影响和防腐的。
  - 3) 铭牌应包括如下内容：
    - ◆ 制造商名称或商标、制造年月、出厂编号。
    - ◆ 产品型号。
    - ◆ 采用的标准。
    - ◆ 给出下列数据：额定电压、母线和支线的额定电流、额定频率、额定短路开断电流、额定短时耐受电流及持续时间、**额定动稳定电流**、额定峰值耐受电流、用作绝缘介质的额定充入压力（密度）及其报警压力（密度）、用作操作介质的额定充入压力及其最低动作压力（密度）、**气体运行额定压力或密度（20℃）、气体最小运行压力或密度（20℃）、**外壳设计压力等。如果共用数据已在整体铭牌上做了说明，则各元件的铭牌可以简化。
    - ◆ GIS 中各元件的铭牌参照相应标准。
- v) 机构箱内的所有二次元件的位置应便于拆装、接线、观察及操作，并有表明其用途的永久性标识。
- w) 预留间隔的设备应装设密度继电器，并有气体压力报警和闭锁信号输出接点。
- x) 温控器（加热器）、继电器等二次元件应取得 3C 认证（或 3C 认证同等性能试验），外壳绝缘材料阻燃等级应满足 V0 等级，并提供第三方检测报告。
- y) 110 千伏 GIS 间隔间设备最小中心距不小于 1500mm（户外）、1000mm（户内）。
- z) 装配前应检查并确认防爆膜是否受外力损伤，装配时应保证防爆膜泄压方向正确、定位准确，防爆膜泄压挡板的结构和方向应避免在运行中积水、结冰、误碰。防爆膜喷口不应

朝向巡视通道。

## 5.2 断路器

### 5.2.1 断路器技术参数见相应专用部分技术参数特性表

### 5.2.2 操动机构

5.2.2.1 断路器应能远方和就地操作，其间应可以转换。252kV 及以上断路器应设有两个相同而又各自独立的分闸回路，每个分闸脱扣装置动作时或两个同时动作时，均应保证设备的机械特性。操动机构自身应具备防止跳跃、防止非全相合闸和保证合分时间的性能。液压操动机构应具备低压闭锁和高压保护装置。液压机构应具有防止失压后慢分慢合的装置。

5.2.2.2 断路器操动机构的设计应满足一次储能后完成“分—0.3s—合分—3min—合分”操作顺序的要求。

5.2.2.3 对弹簧操动机构的要求（如果采用）。当分闸操作完成后，合闸弹簧应在 20s 内完成储能。弹簧操动机构应能可靠防止发生空合操作，应设有方便观察的储能指示器。

### 5.2.3 控制和操作要求

5.2.3.1 卖方应提供用于断路器分闸和合闸所有必需的中间继电器、闭锁继电器，以及液压油的控制阀。

5.2.3.2 防跳装置、防慢分装置、防非全相合闸装置。操动机构应装设防跳装置，防止断路器反复分闸和合闸；液压机构应配有电气和机械的防慢分装置，保证机构泄压后重新打压时不发生慢分；断路器发生非全相合闸时，应可实现已合闸相自分闸。新投的分相弹簧机构断路器的防跳继电器、非全相继电器不应安装在机构箱内，应装在独立的汇控箱内。

5.2.3.3 控制电压为 DC 220V 或 DC 110V。合闸线圈在额定电压 85%~110%时应可靠动作，分闸线圈在额定电压 65%~110%时应可靠动作；分、合闸线圈在额定操作电压的 30%及以下时均不应发生分、合闸动作。

5.2.3.4 新投的 252kV 母联（分段）、主变压器、高压电抗器断路器应选用三相机械联动设备。

### 5.2.4 附件

5.2.4.1 必备的及推荐的附件。

除卖方认为是对于可靠和安全运行所必备的附件之外，每台断路器宜配备推荐附件。

5.2.4.2 位置指示器：

- a) 分相操作的断路器每相均应装设一个机械式的分合闸位置指示器，三相机械联动的断路器可每相装设一个机械式的分合闸位置指示器，也可只装设一个位置指示器。
- b) 机械式的分合闸位置指示器应动作准确、可靠，装设位置应清晰醒目，并便于运行人员观察。
- c) 指示器的文字标示及颜色应如下：

文字	标示	颜色
开断位置	分（OPEN）	绿色
闭合位置	合（CLOSE）	红色

5.2.4.3 计数器。分相操作的断路器每相均应装设不可复归的动作计数器，其位置应便于读数。

## 5.3 隔离开关

### 5.3.1 技术参数见相应专用部分技术参数特性表

### 5.3.2 操动机构

5.3.2.1 配用手动操动机构的隔离开关，手柄总长度（包括横柄长度在内）不应大于 400mm，操作轻便，其机构的终点位置应有足够强度的定位和限位装置，且在手动分、合闸时能可靠闭锁电动回路。

5.3.2.2 对于采配用电动操动机构的隔离开关和接地开关应能远方及就地操作，并应装设供就地操作作用的手动分、合闸装置。

5.3.2.3 电动操动机构处于任何动作位置时均应能取下或打开操动机构的箱门，以便检查或修理辅助开关和接线端子。

5.3.2.4 汇控柜内应装设电动操动的小型断路器，用于控制分合闸操作回路。同一间隔内的多台隔离开关的电机电源，在端子（汇控柜）箱内必须分别设置独立的开断设备。

5.3.2.5 电动操动机构中所采用的电动机和仪表应符合相应的标准。

5.3.2.6 操动机构上应有能反映隔离开关分、合闸位置的指示器，并便于运行人员观察。指示器上应标明“分”、“合”字样。

5.3.2.7 隔离开关转动和传动部位应采取润滑措施和密封措施，在寒冷地区应采用防冻润滑剂。

5.3.2.8 控制柜应配有足够的端子排，以供设备内配线及外部电缆端头连接用。端子排及终端板与夹头均安装在电缆进口上部，每块端子排应有 10%~15%的备用端子，端子排应有防护措施。

5.3.2.9 所有辅助触点应在电气接线图上标明编号，并且连线至端子排，每只辅助开关及所有辅助触点的电气接线应编号。

5.3.2.10 分、合闸操作：动力操动机构，当其电压在下列范围内时，应保证隔离开关可靠的分闸和合闸。应包括以下情况：

- a) 电动操动机构的电动机接线端子的电压在其额定值的 85%~110%范围内时。
- b) 二次控制线圈、电磁联锁装置，当其线圈接线端子的电压在其额定值的 85%~110%范围内时（线圈温度不超过 80℃）。

5.3.2.11 操动机构内接线端子应为铜质。

#### 5.4 快速接地开关

5.4.1 技术参数见相应专用部分技术参数特性表。

5.4.2 操动机构：应能电动和手动操作；能就地操作和远方操作，就地操作和远方操作之间应装设联锁装置。

5.4.3 每组快速接地开关应装设一个机械式的分/合位置指示器，并便于运行人员观察，根据要求可以装设观察窗，以便操作人员检查触头的开合状态。

5.4.4 接地开关的接地端子应与本体外壳绝缘。

#### 5.5 检修接地开关

5.5.1 技术参数见相应专用技术规范技术参数特性表。

5.5.2 操动机构：可手动和电动操作，每组接地开关应装设一个机械式的分/合位置指示器，并便于运行人员观察；根据要求可以装设观察窗，以便操作人员检查触头的开合状态。

5.5.3 接地开关的接地端子应与本体外壳绝缘。

#### 5.6 电流互感器（TA）

5.6.1 技术参数见相应专用部分技术参数特性表。

5.6.2 所有从电流互感器引出的每一分接头的引线引到控制柜的端子排上，引线截面为大于或等于 4mm<sup>2</sup> 的软线。每个端子均应有明确的标记，并有接线图表明其接法、极性和变比。

5.6.3 对电流互感器应提供下列数据：励磁特性曲线、拐点电压、暂态特性、75℃时最大二次电阻值等。

5.6.4 对 TPY 型电流互感器的要求：

- a) PY 型套管电流互感器应设计和制造得使其剩磁不超过拐点电压对应磁密的 10%。
- b) 在标准的一次系统时间常数和 100%的直流分量偏移的条件下， $K_{SSC}$  暂态误差不应超过 10%。

5.6.5 所有电流互感器二次负载接线和信号线路应使用屏蔽的金属铠装电缆。

5.6.6 TA 二次回路 1min 工频耐压 3000V。

5.6.7 各组电流互感器相序排列应确保一致，电流互感器一次设计相位应与二次端子标示相符。

5.6.8 外置式电流互感器的二次线圈防护罩、二次接线端子盒应采取有效的防雨措施。

## 5.7 电压互感器 (TV)

5.7.1 技术参数见相应专用部分技术参数特性表。

5.7.2 各组电压互感器相序排列应确保一致，电压互感器一次设计相位应与二次端子标示相符。电压互感器的一次线圈接地端应与二次分开。

## 5.8 避雷器

5.8.1 技术参数见相应专用部分技术参数特性表。

## 5.9 套管

5.9.1 技术参数见相应专用部分技术参数特性表。

5.9.2 套管的伞裙应为不等径的大小伞，伞型设计应符合标准要求，两裙伸出之差 (P1-P2)  $\geq 15\text{mm}$ 。

5.9.3 套管的相邻裙间距离 (S) 与裙伸出长度 (P) 之比不应小于 0.9。

5.9.4 套管的有效爬电距离应考虑伞裙直径的影响。当平均直径大于 300mm 时，爬电距离增加 10%，当平均直径大于 500mm 时，爬电距离增加 20%。

5.9.5 应在绝缘子金属法兰与瓷件的胶装部位涂以性能良好的防水密封胶。

5.9.6 支柱瓷绝缘子应符合 GB/T 8287.1 的要求，支柱复合绝缘子应符合 GB/T 25096 的要求。

## 5.10 绝缘子

5.10.1 技术参数见相应专用部分技术参数特性表。

5.10.2 GIS 内绝缘件应逐只进行 X 射线探伤试验、工频耐压试验和局部放电试验，局部放电量不大于 3pC。

5.10.3 热性能试验应按每批不少于 5 个绝缘子，且每个进行 10 次热循环验证。

## 5.11 母线

5.11.1 技术参数见相应专用部分技术参数特性表。

5.11.2 GIS 母线宜采用低位布置方式，不宜采用高位布置方式。

## 5.12 壳体

5.12.1 技术参数见相应专用部分技术参数特性表。

5.12.2 壳体承受压力：能承受运行中正常的和内部故障时的压力。应包括以下情况：

- a) 对铸铝和铝合金外壳，型式试验压力为 5 倍的设计压力。
- b) 对焊接的铝外壳和焊接的钢外壳，型式试验压力为 3 倍的设计压力。
- c) 对隔板的型式试验压力应大于 3 倍的设计压力。

## 5.13 SF<sub>6</sub> 气体

5.13.1 技术参数见相应专用部分技术参数特性表。

5.13.2 生物毒性试验：无毒。

5.13.3 其他项目应符合 GB/T 12022 标准的规定。

5.13.4 应提交 SF<sub>6</sub> 气体生产厂的合格证书及分析报告。

5.13.5 应提供 110% SF<sub>6</sub> 气体。

## 6 试验

### 6.1

GIS 中所用元件均应按各自的产品标准进行型式试验、出厂试验和现场交接试验，并提供供货范围内各元件的型式试验和出厂试验报告。

## 6.2 型式试验

型式试验的目的在于验证 GIS 装置、控制回路、控制设备及辅助设备各种性能是否符合设计的要求。

6.2.1 各功能元件均应根据各自的标准在有代表性的布置间隔上进行完整的单相或三相试验。三相共箱型应按相应标准要求三相试验。

6.2.2 因条件限制，经卖方和买方协商同意，允许型式试验在具有代表性的总装或分装设备上运行。

6.2.3 由于型式、参数及可能的组合方式的多样性，对所有布置方式都进行型式试验是不现实的。任一种特定布置方式的性能试验数据，可用具有可比性的布置方式的试验数据来证实。

6.2.4 型式试验和验证的内容包括：

- a) 验证设备绝缘水平的试验以及辅助回路的绝缘试验。
- b) 验证无线电干扰电压（RIV）水平的试验（如果适用）。
- c) 验证设备所有部件温升的试验以及主回路电阻测量。
- d) 验证主回路和接地回路承载额定峰值耐受电流和额定短时耐受电流能力的试验。
- e) 验证所包含的开关装置开断关合能力的试验。
- f) 验证所包含的开关装置机械操作和行程· 时间特性测量。
- g) 验证外壳强度的试验。
- h) 外壳防护等级的验证。
- i) 气体密封性试验和气体状态测量。
- j) 电磁兼容性试验（EMC）。
- k) 辅助和控制回路的附加试验。
- l) 隔板的试验。
- m) 验证在极限温度下机械操作的试验。
- n) 验证热循环下性能的试验以及绝缘子的气体密封性试验。
- o) 接地连接的腐蚀试验
- p) 评估内部故障电弧效应的试验
- q) 噪声试验。
- r) 地震试验：可由卖方提供产品抗震性能计算书，该计算书应由国家认可的机构完成。

6.2.5 以下元件按各自标准提供试验报告：

- a) 绝缘件（绝缘隔板和支撑绝缘子）。
- b) 并联电容器。
- c) 合闸电阻。
- d) 互感器。
- e) 绝缘件。
- f) 套管。
- g) 避雷器。
- h) 伸缩节。
- i) 与变压器的连接（如需要）。

## 6.3 出厂试验

6.3.1 GIS 应在制造厂进行整体组装，对所有元件进行出厂试验。某些试验可在元件运输单元或完整的设施上进行。

6.3.2 出厂试验应保证产品的性能与进行过型式试验的设备相符。产品在拆前应对关键连接部位

和部件做好标记。

### 6.3.3 出厂试验项目包括：

- a) 主回路绝缘试验：应在装配完整的间隔或尽量完整的间隔上进行，145kV 及以上电压等级应进行工频耐压试验；252kV 及以上电压等级还应进行正负各三次雷电冲击耐压试验。
- b) 辅助和控制回路绝缘试验。
- c) 主回路电阻测量。
- d) 局部放电试验。
- e) 气体密封性试验。
- f) 机械试验。断路器、隔离开关和接地开关出厂试验时应进行不少于 200 次的机械操作试验（其中断路器每 100 次操作试验的最后 20 次应为重合闸操作试验），以保证触头充分磨合。200 次操作完成后应彻底清洁壳体内部，再进行其他出厂试验。断路器机械特性试验项目应包括时间、速度、合-分时间、速度行程曲线、辅助开关切换与主触头动作时间配合。
- g) 电气和其他辅助装置试验。
- h) 接线检查。
- i) SF6 气体湿度测量。
- j) 外壳和绝缘隔板的压力试验。绝缘件和瓷绝缘子的试验要求：145kV 及以上 GIS 用绝缘拉杆总装前应逐只进行工频耐压和局部放电试验，145kV 及以上 GIS 用绝缘子应逐只进行工频耐压和局部放电试验，145kV 及以上 GIS 用绝缘子还应逐只进行 X 光探伤检测；252kV 及以上瓷空心绝缘子应逐只进行超声纵波探伤检测。以上试验均应由 GIS 制造厂完成，并将试验结果随出厂试验报告提交用户。

### 6.4 现场交接试验

GIS 安装之后，应进行现场交接试验，试验项目包括：

- a) 主回路绝缘试验，145kV GIS 的交流耐压值应为出厂值的 100%。在工频耐压过程中进行局部放电测试，必要时可进行冲击耐压试验。
- b) 辅助回路绝缘试验。
- c) 主回路电阻测量。
- d) 气体密封性试验。
- e) 现场机械特性试验，现场机械特性试验，卖方应提供断路器的速度定义和参考机械行程特性曲线，及检测用传感器和安装附件。
- f) SF6 气体验收（充入电气设备前进行）。
- g) SF6 气体湿度及纯度测量（充入电气设备后进行）。
- h) 外观检查与核实。
- i) 局部放电试验。
- j) 各元件的现场试验。
- k) 气体密度继电器及压力表、安全阀的校验。
- l) 现场开合空载变压器试验（如果需要）。
- m) 现场开合并联电抗器试验（如果需要）。
- n) 现场开合空载线路充电电流试验（如果需要）。
- o) 现场开合空载电缆充电电流试验（如果需要）。

## 7 技术服务、设计联络、工厂检验和监造

### 7.1 技术服务

#### 7.1.1 概述：

- a) 卖方应指定一名工地代表，配合买方及安装承包商的工作。卖方应指派有经验的安装指导人员和试验工程师，对合同设备的安装、调试和现场试验等进行技术指导。卖方指导人员应对所有安装工作的正确性负责，除非安装承包商的工作未按照卖方指导人员的意见执行，但是，卖方指导人员应立即以书面形式将此情况通知了买方。
- b) 合同设备的安装工期为 2 周，买卖双方据此共同确认一份详尽的安装工序和时间表，作为卖方指导安装的依据，并列岀安装承包商应提供的人员和工具的类型及数量。
- c) 买卖双方应根据施工的实际工作进展，通过协商决定卖方技术人员的专业、人员数量、服务持续时间，以及到达和离开工地的日期。

#### 7.1.2 任务和责任：

- a) 卖方指定的工地代表，应在合同范围内与买方工地代表充分合作与协商，以解决有关的技术和工作问题。双方的工地代表，未经双方授权，无权变更和修改合同。
- b) 卖方技术人员应按合同规定完成有关设备的技术服务，指导、监督设备的安装、调试和验收试验。
- c) 卖方技术人员应对买方人员详细地解释技术文件、图纸、运行和维护手册、设备特性、分析方法 and 有关的注意事项等，以及解答和解决买方在合同范围内提出的技术问题。
- d) 卖方技术人员有义务对买方的运行和维护人员进行必要的培训。
- e) 卖方技术人员的技术指导应是正确的，如因错误指导而引起设备和材料的损坏，卖方应负责修复、更换和（或）补充，费用由卖方承担，该费用中还包括进行修补期间所发生的服务费。买方的有关技术人员应尊重卖方技术人员的技术指导。
- f) 卖方代表应充分理解买方对安装、调试工作提出的技术和质量方面的意见和建议，使设备的安装、调试达到双方都满意的质量。如因卖方原因造成安装或试验工作拖期，买方有权要求卖方的安装监督人员或试验工程师继续留在工地服务，且费用由卖方自理。如因买方原因造成安装或试验拖期，买方根据需要有要求卖方的安装监督人员或试验工程师继续留在工地服务，并承担有关费用。

### 7.2 设计联络会

7.2.1 为协调设计及其他方面的接口工作，根据需要买方与卖方应召开设计联络会。卖方应制订详细的设计联络会日程。签约后的 30 天内，卖方应向买方建议设计联络会方案，在设计联络会上买方有权对合同设备提出改进意见，卖方应按此意见作出改进。

#### 7.2.2 联络会主要内容：

- a) 决定最终布置尺寸，包括外形、套管引出方向、其他附属设备的布置；确定汇控柜内控制回路的接线逻辑方式、二次元件的选择及内部布置等。
- b) 复核投标产品的主要性能和参数，并进行确认。
- c) 检查总进度、质量保证程序及质控措施。
- d) 决定土建要求/运输尺寸和质量，以及工程设计的各种接口的资料要求。
- e) 讨论交货程序。
- f) 解决遗留问题。
- g) 讨论监造、工厂试验及检验问题。
- h) 讨论运输、安装、调试及验收试验。

7.2.3 其他需讨论的内容，如地点、日期、人数等在合同谈判时商定。

7.2.4 除上述规定的联络会议外，若遇重要事宜需双方进行研究和讨论，经各方同意可另召开联络会议解决。



7.2.5 每次会议均应签署会议纪要，该纪要作为合同的组成部分。

### 7.3 工厂检验和监造

7.3.1 买方有权派遣其检验人员到卖方及其分包商的车间场所，对合同设备的加工制造进行检验和监造。买方应将为该目的而派遣的代表人员名单以书面形式通知卖方。

7.3.2 卖方应积极配合买方的监造工作，并指定 1 名代表负责监造联系工作，及时向监造人员提供监造工作相关资料（包括但不限于此）：

- a) 重要的原材料的物理、化学特性和型号及必要的工厂检验报告。
- b) 重要外协零部件和附件的验收试验报告及重要零部件和附件的全部出厂例行试验报告。
- c) 设备出厂试验方案、试验报告、半成品试验报告。
- d) 型式试验报告。
- e) 产品改进和完善的技术报告。
- f) 与分包方的技术协议和分包合同副本。
- g) 设备的生产进度表。
- h) 设备制造过程中出现的质量问题的备忘录。
- i) 设备制造过程中出现有关设备质量和进度变更的文件。

7.3.3 设备的监造范围、监造方式、监造内容等监造具体内容由买方及其派遣的监造人员根据国家电网有限公司统一下发的设备监造大纲最终确定。

7.3.4 监造人员有权到生产合同设备的车间和部门了解生产信息，并提出监造中发现的问题（如有）。

7.3.5 卖方应在开始进行工厂试验前 2 周，通知买方及监造人员其试验方案（包括日程安排）。根据这个试验方案，买方有权确定对合同设备的哪些试验项目和阶段进行见证，并将在接到卖方关于安装、试验和检验的日程安排通知后 1 周内通知卖方。然后买方将派出技术人员前往卖方和（或）其制造商生产现场，以观察和了解该合同设备工厂试验的情况及其运输包装的情况。若发现任一货物的质量不符合合同规定的标准，或包装不满足要求，买方代表有权发表意见，卖方应认真考虑其意见，并采取必要措施以确保待运合同设备的质量，见证检验程序由双方代表共同协商决定。

7.3.6 若买方不派代表参加上述试验，卖方应在接到买方关于不派员到卖方和（或）其分包商工厂的通知后，或买方未按时派遣人员参加的情况下，自行组织检验。

7.3.7 监造人员将不签署任何质量证明文件，买方人员参加工厂检验既不能解除卖方按合同应承担的责任，也不替代到货后买方的检验。

7.3.8 买方有合同货物运到买方目的地以后进行检验、试验和拒收（如果必要时）的权利，卖方不得因该货物在原产地发运前已经由买方或其代表进行过监造和检验并已通过作为理由而进行限制。

7.3.9 买方人员参加工厂试验，包括会签任何试验结果，既不能免除卖方按合同规定应负的责任，也不能代替合同设备到达目的地后买方对其进行的检验。

7.3.10 如有合同设备经检验和试验不符合技术规范的要求，买方可以拒收，卖方应更换被拒收的货物，或进行必要的改造使之符合技术规范的要求，买方不承担上述费用。

**7.3.11 投标人在产品质保期内（不少于2年）实行免费保修，且对产品实行终身维修。**

## 8 一次、二次及土建接口要求

### 8.1 145kV GIS 设备

#### 8.1.1 电气一次接口

145kV 组合电器电气接口从结构型式、间隔中心距、套管相间距离等进行了分类统一，并根据组合电器接线形式、应用场合的不同形成 5 种电气接口。其中，接口 1 对应户外 GIS（单/双母线

接线) 布置方案, 接口 2 对应户内 GIS (双母线接线) 布置方案, 接口 3 对应户内 GIS (单母线接线、内桥接线) 布置方案, 接口 4 对应户内 GIS (线变组接线) 布置方案, 接口 5 对应户内 GIS (环入环出支接变压器组接线) 布置方案。

### 8.1.1.1 间隔外轮廓尺寸

对于常规海拔高度户外 GIS 布置方案, 进(出)线套管相间距离为 1500mm, 设备间隔底座宽度为 1200mm, 设备底座长度不得大于 6800mm (含汇控柜)。具体尺寸示意详见图 1、图 2。

对于户内 GIS 布置方案, 进(出)线套管相间距离为 1500mm, 设备间隔底座宽度为 1200mm, 设备底座长度不得大于 6800mm (双母线接线)/6000mm (其余接线形式)。室内高压电力电缆洞口按照 800mm (长) × 800mm (宽) 预留洞口, 以适应不同厂家电缆终端, 电缆安装后再对孔洞多余部分进行防火封堵。具体尺寸示意详见图 3。

145kV GIS 户外方案高海拔修正, 详见表 3。

表 3 145kV GIS 户外方案出线间隔套管高海拔修正表 (海拔高度 > 1000m)

符号	海拔 (m)	2000	3000	4000	5000
	出线套管相间距离 (mm)	2200	2750	2750	3000

GIS 套管颜色为棕色 (瓷); 外壳、支架等外表面均应涂漆, 颜色建议为海灰 B05。

### 8.1.1.2 布置形式

应包括以下内容:

#### a) 户外 GIS

常规海拔地区, 145kV 户外 GIS 出线间隔中心距按 7500mm (两回共一跨) 考虑, 其余间隔结合工程布置情况自行确定间隔间距。

设备平面布置示意图详见图 3。

145kV GIS 户外布置方案高海拔修正, 详见表 4。

表 4 145kV GIS 户外方案出线间隔中心距高海拔修正表 (海拔高度 > 1000m)

符号	海拔 (m)	2000	3000	4000	5000
	间隔中心距离 (mm)	7500	9500	9500	10 500

#### b) 户内 GIS

145kV 户内 GIS 出线间隔中心距宜选用 1000mm, 部分间隔可结合工程建筑物梁柱、电缆竖井位置等调整间隔宽度。

厂房高度按吊装元件考虑, 室内净高不小于 6500mm, 最大起吊重量不大于 3t。配电装置室纵向宽度净宽不小于 9000mm。根据 145kV GIS 室纵向尺寸情况, 预留巡视通道不应小于 1000mm, 主通道宽度宜为 2000mm~3500mm。

设备平面布置示意图详见图 1~图 4。

### 8.1.1.3 接地要求

应包括以下内容:

- 接地方案可采用设备直接引下接地或预埋接地件。接地件由土建施工单位预埋, 接地件以上的接地过渡块、接地排及安装辅材均为厂家提供。
- 每个气体隔室的壳体应互连并可靠接地, 接地回路应满足短路电流的动、热稳定要求。外

壳应接地。凡不属主回路或辅助回路的预定要接地的所有金属部分都应接地。外壳框架等的相互电气连接宜用紧固连接，以保证电气上连通，接地点应标以接地符号。

- c) 接地点的接触面和接地连线的截面积应能安全地通过故障接地电流。
- d) 紧固接地螺栓不少于 4 个 M12 螺栓或 2 个 M16 螺栓。接地点应标有接地符号。
- e) GIS接地应防止外壳产生危险感应电压，应防止外壳环流造成局部过热。

### 8.1.1.4 安装基础

GIS底座建议采用焊接固定在水平预埋钢板的基础上，也可采用地脚螺栓或化学锚栓方式固定。GIS伸缩节要能够适应装配调整、吸收基础间的相对位移和热胀冷缩的伸缩量，GIS底座必须能够适应如下土建施工误差：

- a) 每间隔基础预埋件水平最高和最低差不超过 2mm；
- b) 间隔之间所有尺寸允许误差不超过 3mm；
- c) 全部间隔所在区域尺寸允许偏差不超过 3mm；
- d) 对于 GIS出线套管支架，其高度应能保证外绝缘体最低部位距地面不小于 2500mm

### 8.1.1.5 安装示意图

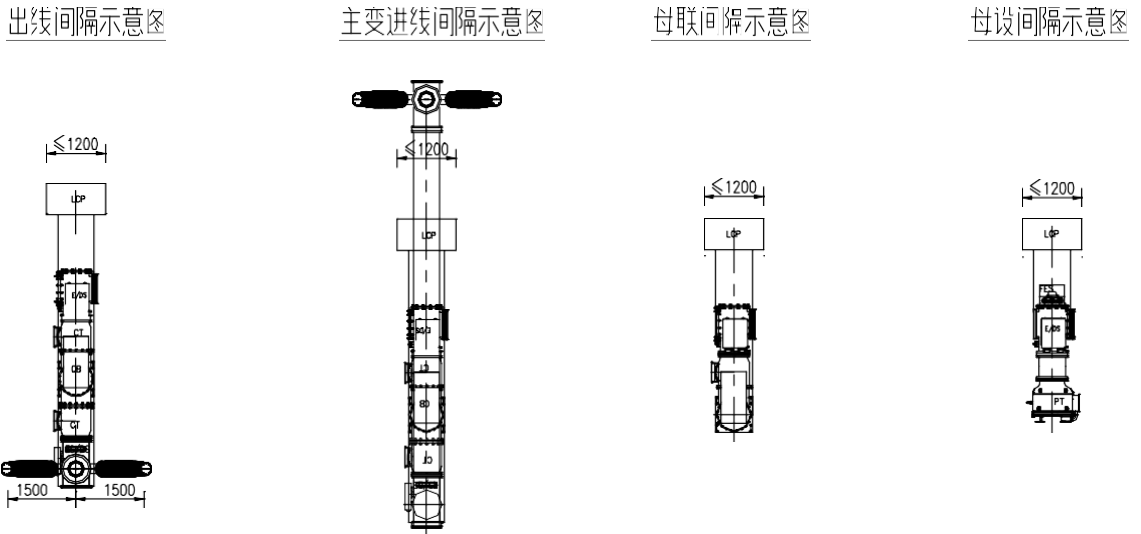


图 1 145kV GIS 户外方案设备外轮廓平面示意图 (1GIS—2000/40)

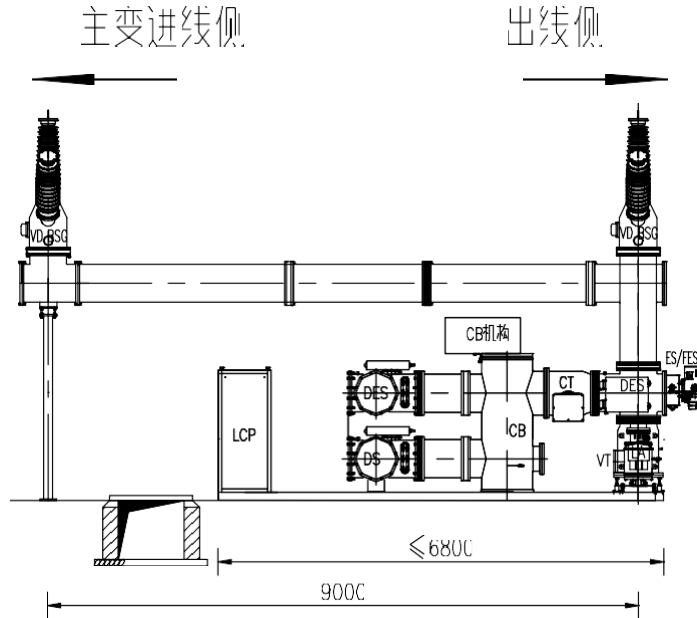


图 2 145kV GIS 户外方案设备外轮廓断面示意图 (1GIS—2000/40)

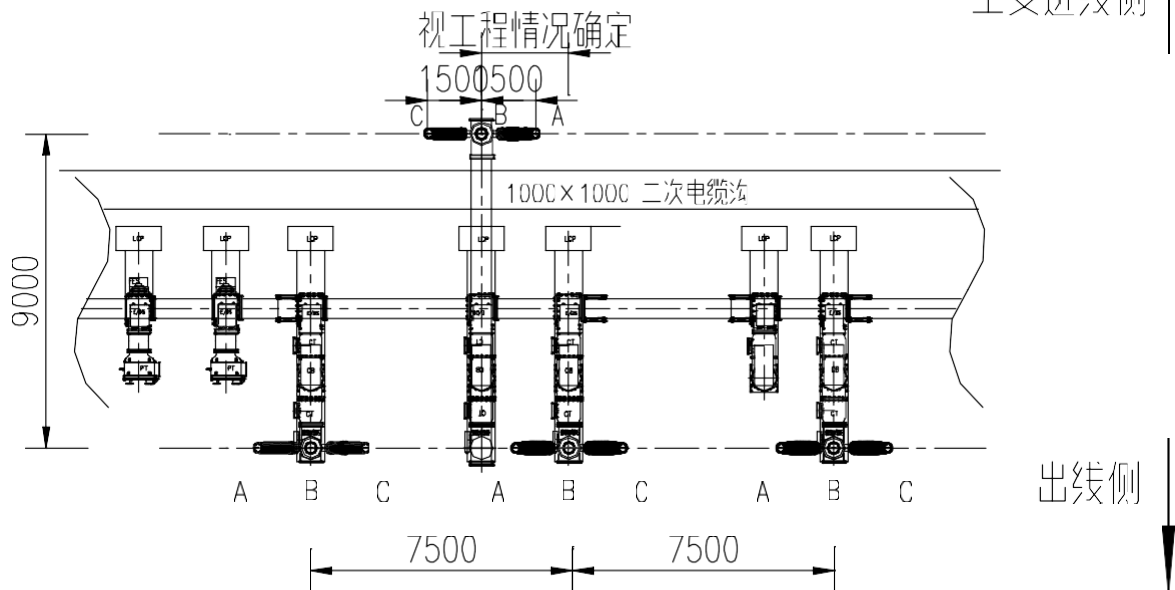
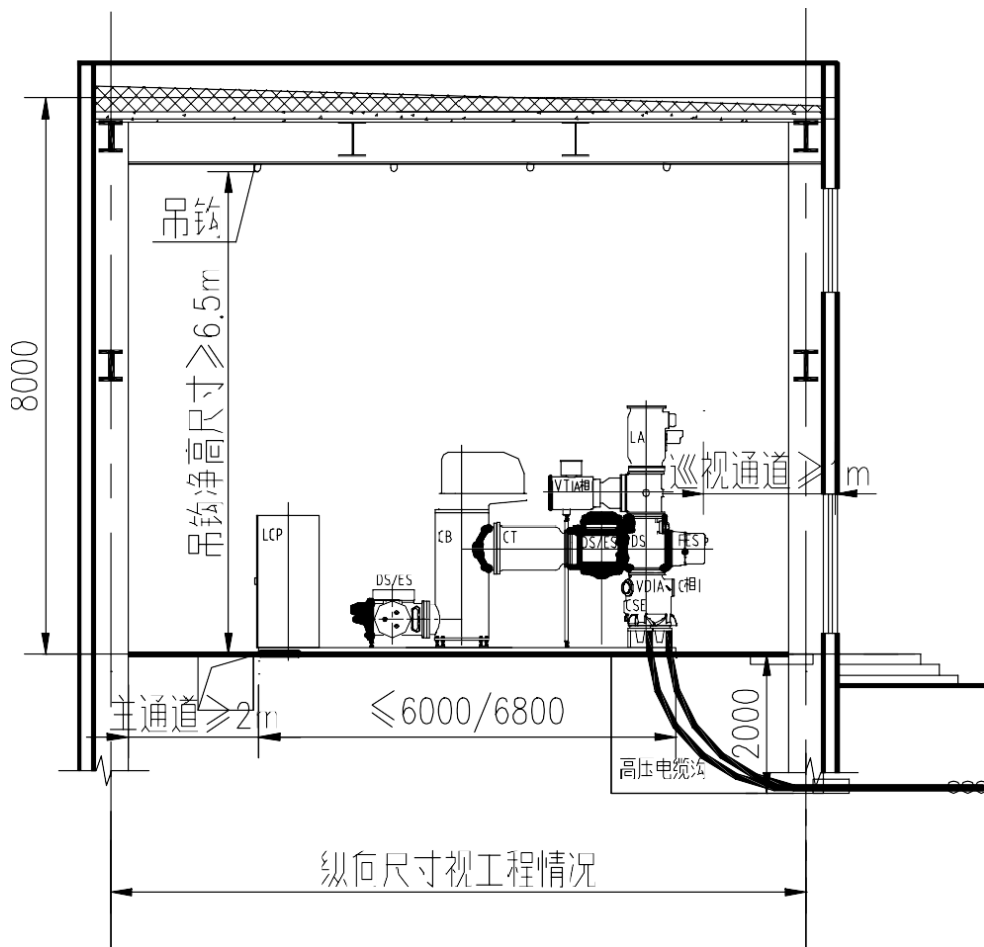


图3 145kV 户外 GIS 方案 (适用双母线接线、单母线接线) 平面布置示意图 (1GIS—2000/40)

图4 145kV GIS 户内方案设备外轮廓断面示意图 (1GIS—2000/40)



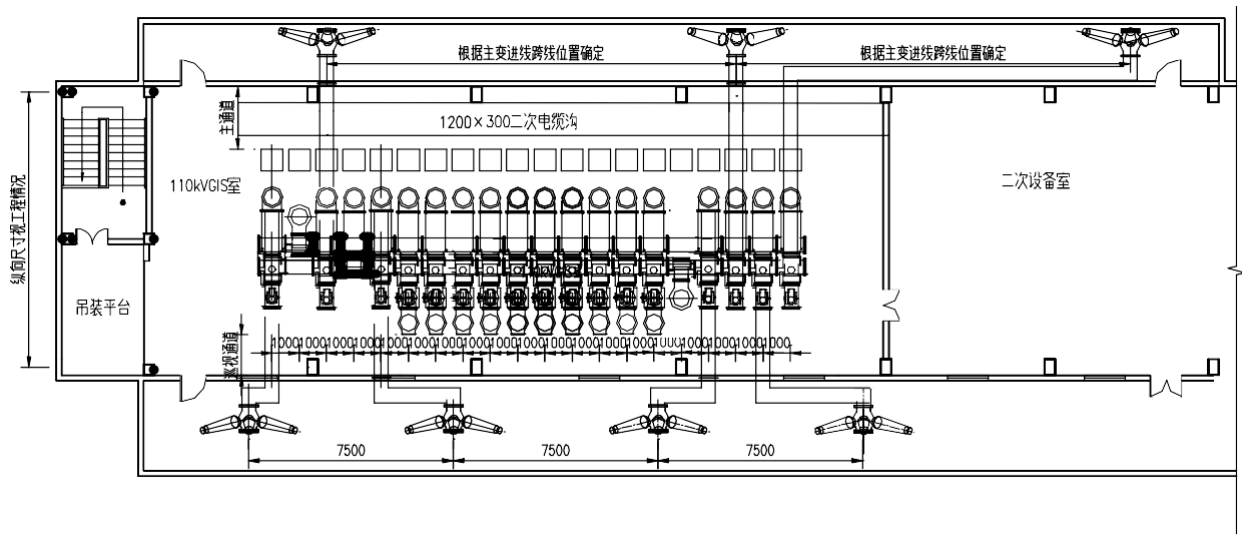


图5 145kV 户内 GIS 方案 (适用双母线接线) 平面布置示意图 (1GIS—2000/40)

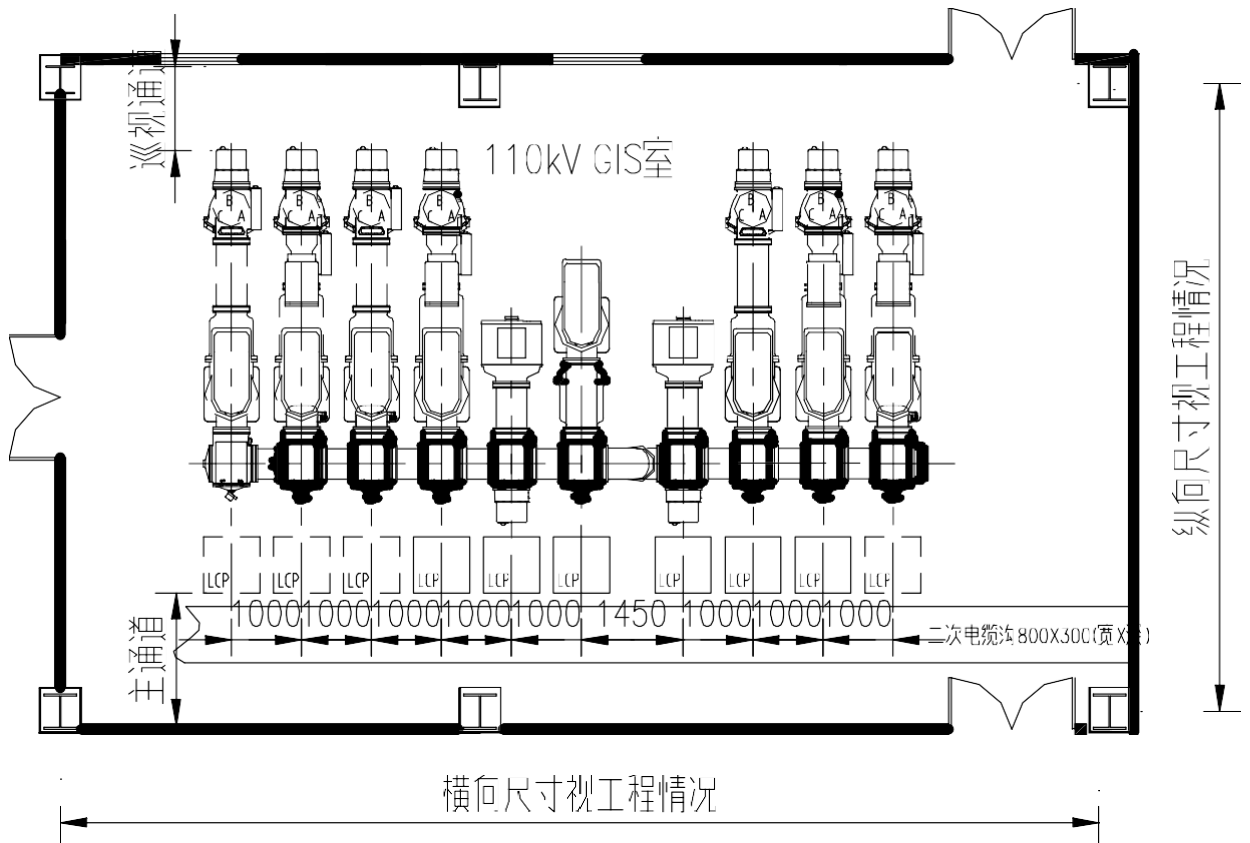


图 6 145kV 户内 GIS 方案（适用单母线接线、内桥接线）平面布置示意图（1GIS—2000/40）

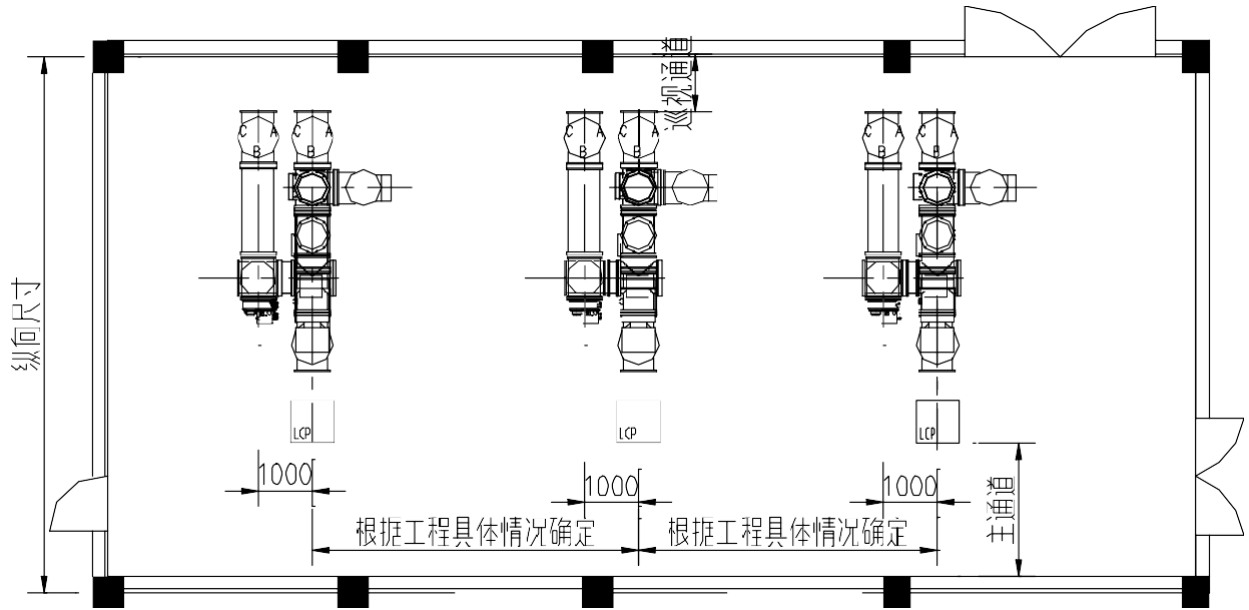


图 7 145kV 户内 GIS 方案（适用线变组接线）平面布置示意图（1GIS—2000/40）

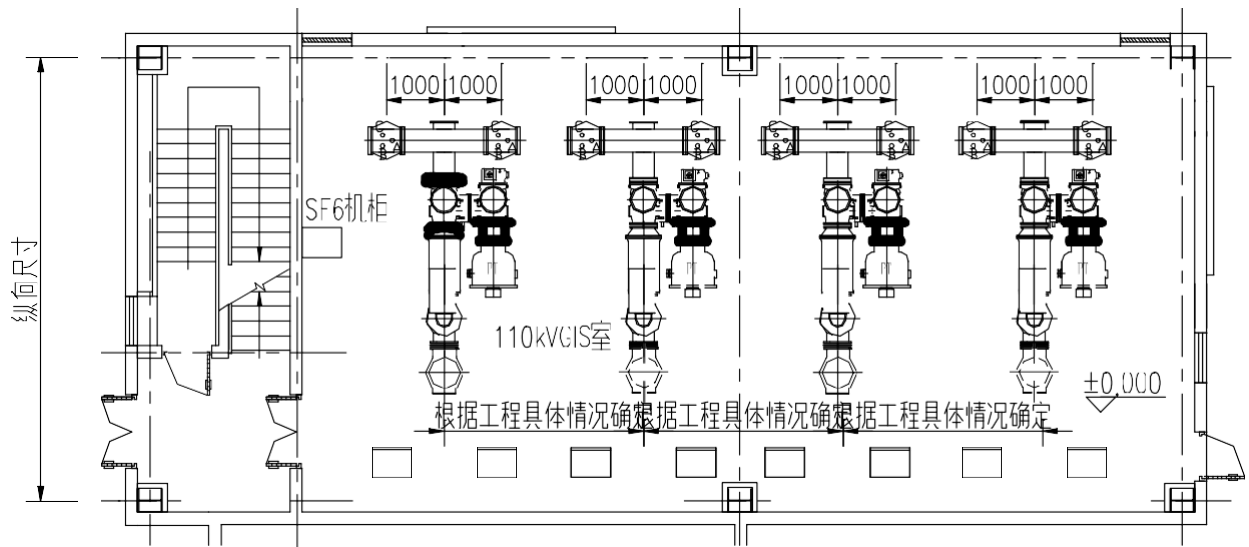


图 8 145kV 户内 GIS 方案（适用环入环出支接变压器组接线）平面布置示意图（1GIS—2000/40）

## 8.1.2 二次接口

根据一次设备的布置方案，电气二次接口从智能控制柜尺寸及设备布置、二次回路技术要求、电气二次安装接口技术要求、对外端子排接口、光回路接口及虚端子等六个方面进行了统一，共形成 1 个接口。

### 8.1.2.1 智能控制柜

应包括以下内容：

#### a) 技术参数及技术条件

智能控制柜技术参数及技术条件详见 Q/GDW 1430—2015《智能控制柜技术规范》。

#### b) 柜内设备布置原则

智能控制柜宜采用就地布置，柜内元器件布置顺序见表5。

表 5 屏（柜）正面元器件从上往下布置优先级顺序表

从上往下顺序	元器件名称
1	智能终端
2	光纤配线架

注：1. 具体组柜时，应根据具体屏（柜）所需布置的装置类型，按照本表的优先级顺序从上往下依次排列布置。

2. 屏（柜）上安装的最高设备的中心线离屏（柜）顶为 200mm；最低设备的中心线离柜底不低于 350mm。

合并单元、智能终端、合并单元智能终端集成装置通用技术条件详见《国家电网公司输变电工程智能变电站通用设备（二次设备）》第 16 篇~18 篇。

#### c) 柜体尺寸要求

户内智能控制柜尺寸为 800mm（宽度）×800mm（深度）×2200mm（高度）；户外智能控制柜尺寸为 1000mm（宽度）×900mm（深度）×2000mm（高度）或 1200mm（宽度）×900mm（深度）×2000mm（高度）两种规格。

智能控制柜柜面布置图详见图 99~图 106，110kV 采用模拟量采样方式时，110kV 线路、母联、主变间隔智能控制柜柜面布置图参考图 99~图 104。



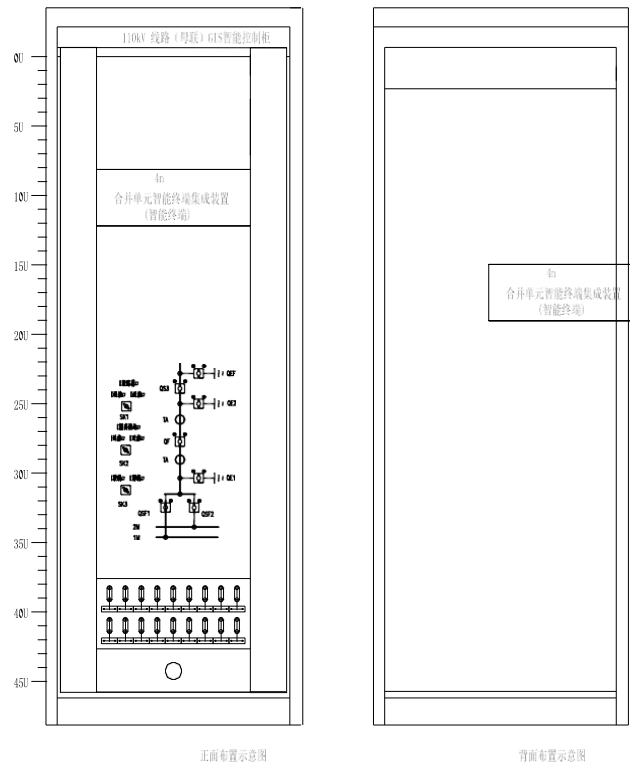


图9 智能控制柜典型布置图 1（线路、母联间隔，户外，数字量采样）  
（通用设备编号 1GIS—2000/40）

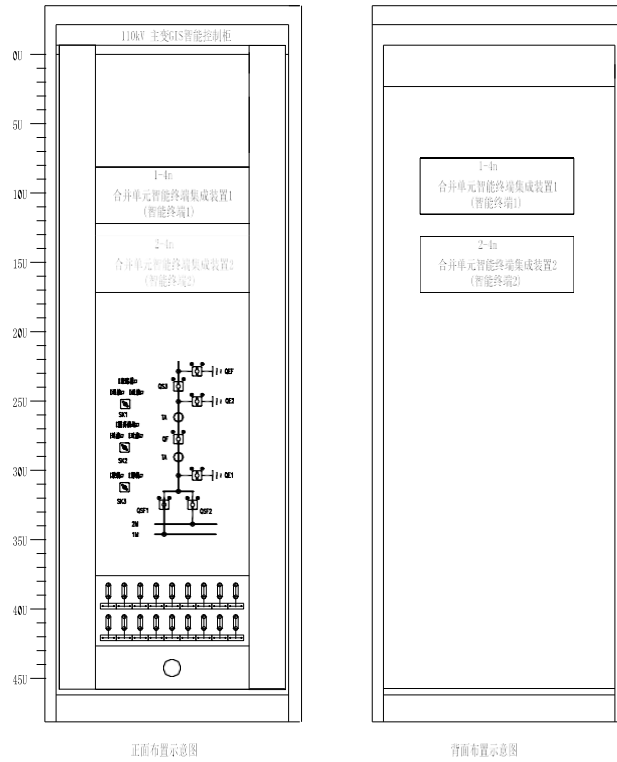


图10 智能控制柜典型布置图 2（主变间隔，户外，数字量采样）  
（通用设备编号 1GIS—2000/40）

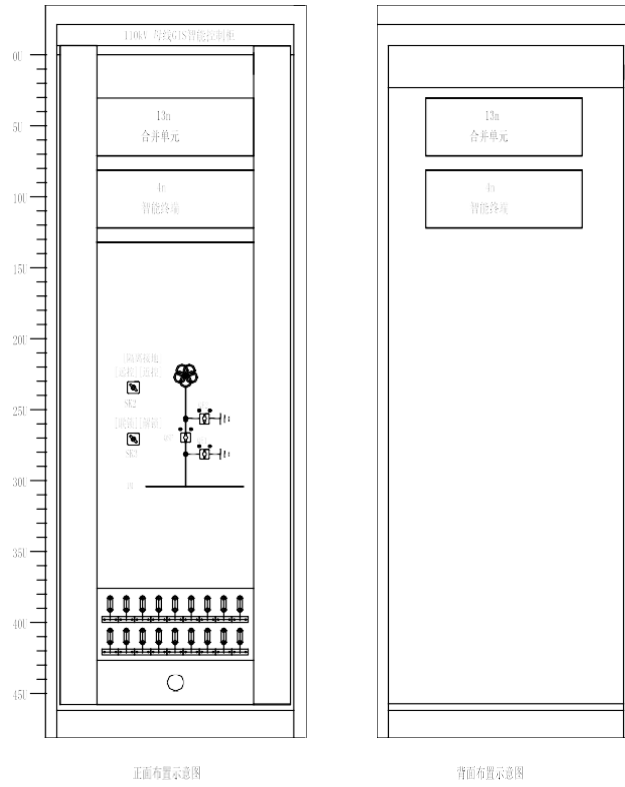


图 11 智能控制柜典型布置图 3（母线间隔，户外，数字量采样）  
（通用设备编号 1GIS—2000/40）

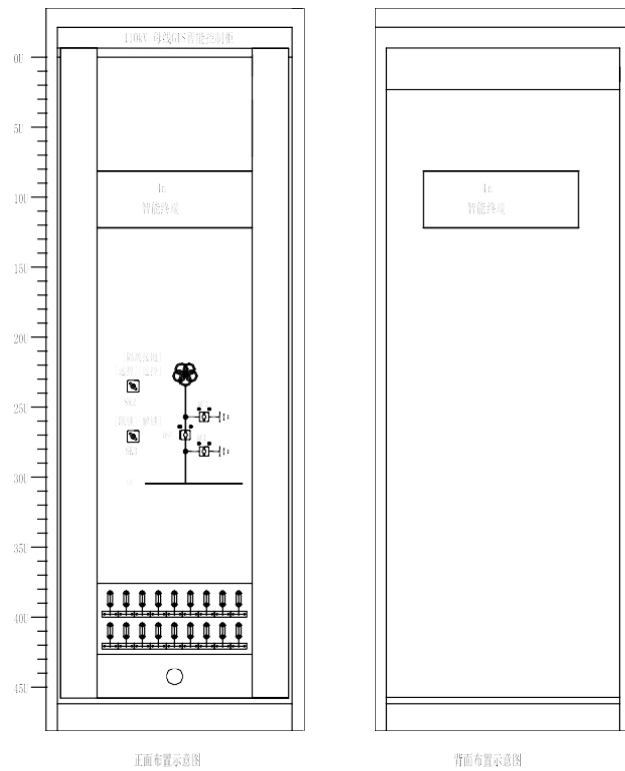


图 12 智能控制柜典型布置图 4（母线间隔，户外，模拟量采样）  
（通用设备编号 1GIS—2000/40）

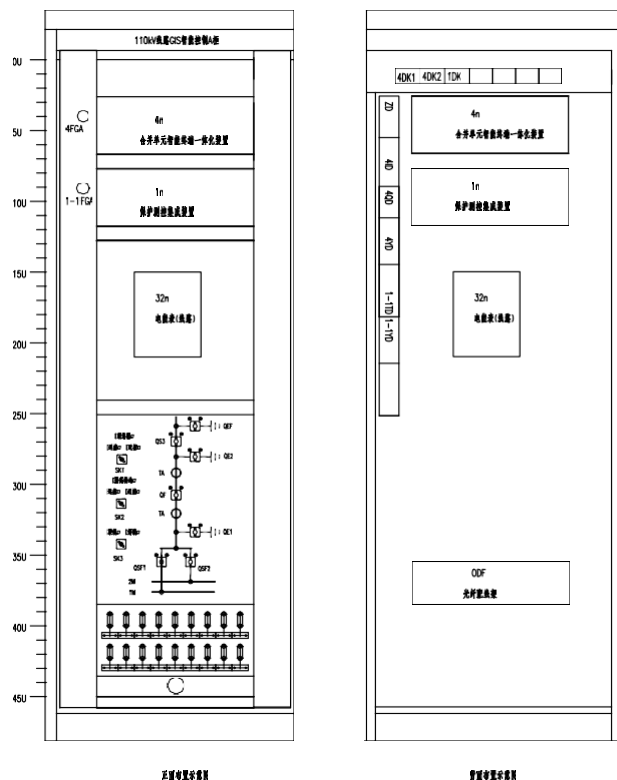


图 13 智能控制柜典型布置图 5（线路、母联间隔，户内，数字量采样）  
（通用设备编号 1GIS—2000/40）

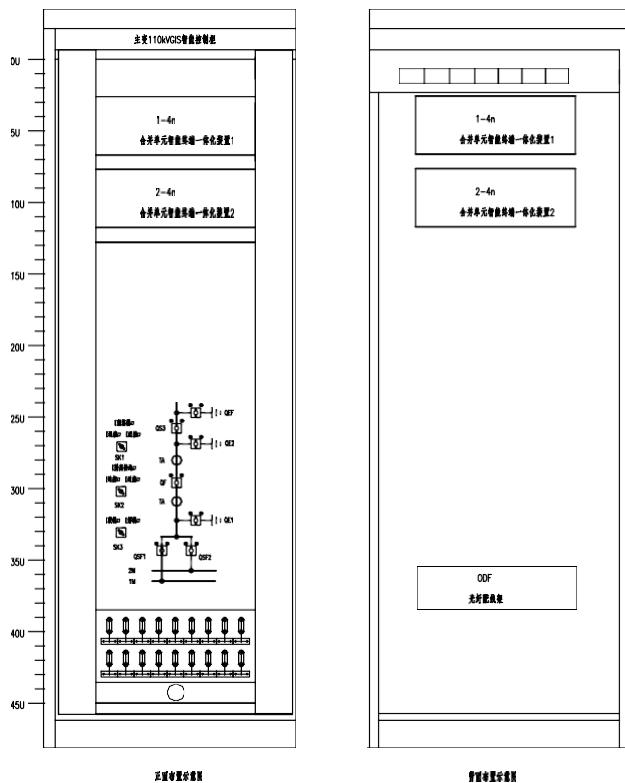


图 104 智能控制柜典型布置图 6（主变间隔，户内，数字量采样）  
（通用设备编号 1GIS—2000/40）

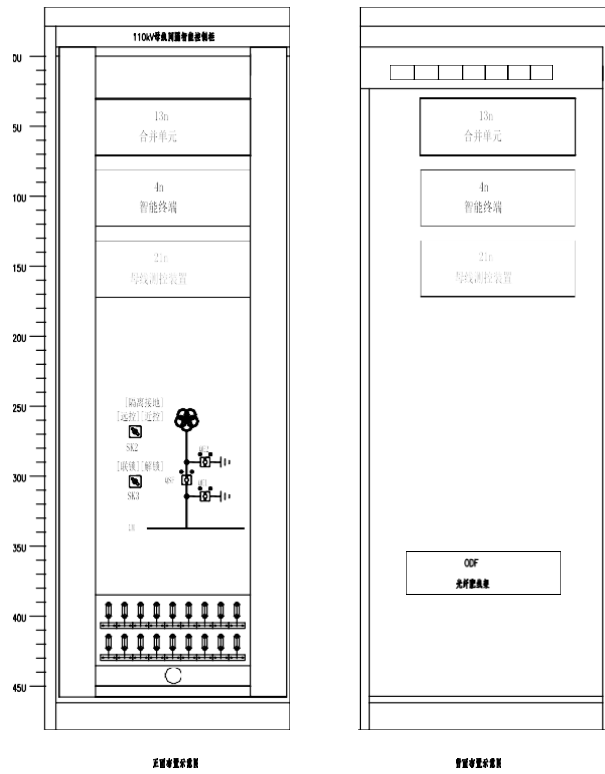


图 15 智能控制柜典型布置图 7（母线间隔，户内，数字量采样）  
（通用设备编号 1GIS—2000/40）

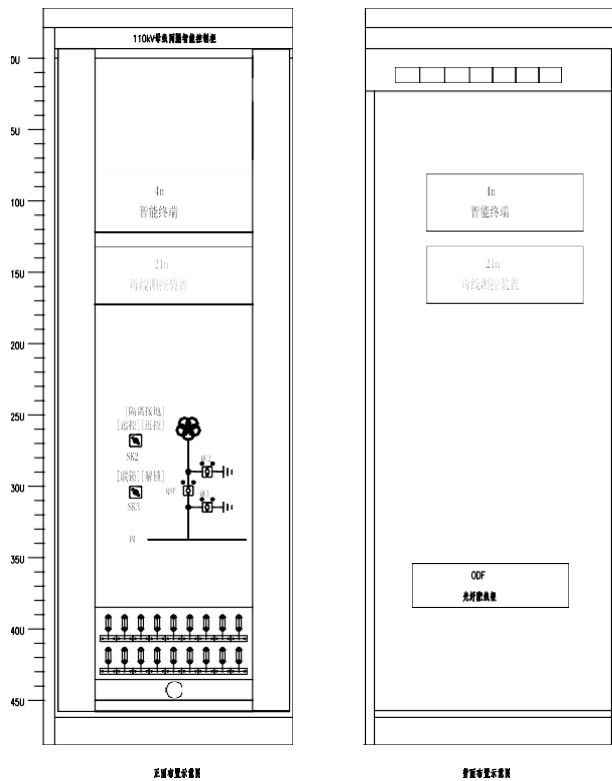


图 16 智能控制柜典型布置图 8（母线间隔，户内，模拟量采样）  
（通用设备编号 1GIS—2000/40）

d) 端子排

根据通用互换的原则，汇控柜端子排按不同功能进行划分，端子排布置应考虑各插件的位置，避免接线相互交叉。端子排列应符合标准，正、负极之间应有间隔，断路器的跳闸和合闸回路、直流(+)电源和跳合闸回路不能接在相邻端子上，端子排应编号。

智能控制柜内的端子排按照“功能分段”的原则分别设置：交流回路、直流回路，TA回路，TV回路，断路器控制及遥信回路，隔离、接地开关控制及遥信回路，辅助触点及报警回路等。

本节对 GIS智能控制柜对外接线端子排接口进行了统一，具体详见图 17~图 22。

1) 电流互感器部分端子排

图 17 为采用模拟量采样方式下的 145kV GIS 电流互感器端子排，该图中电流互感器端子排示意图1 适用于330kV 变电站主变110kV 侧间隔，电流互感器端子排示意图2 适用于330kV 变电站 110kV 线路、母联（分段）间隔。

图 108 为采用数字量采样方式下的 145kV GIS 电流互感器端子排，适用于极寒地区等将合并单元在室内组柜安装时的汇控柜的对外接口，其中电流互感器端子排示意图 3 适用于 220kV 及以下电压等级主变 110kV 侧间隔，电流互感器端子排示意图 4 适用于 110kV 线路、母联（分段）间隔。

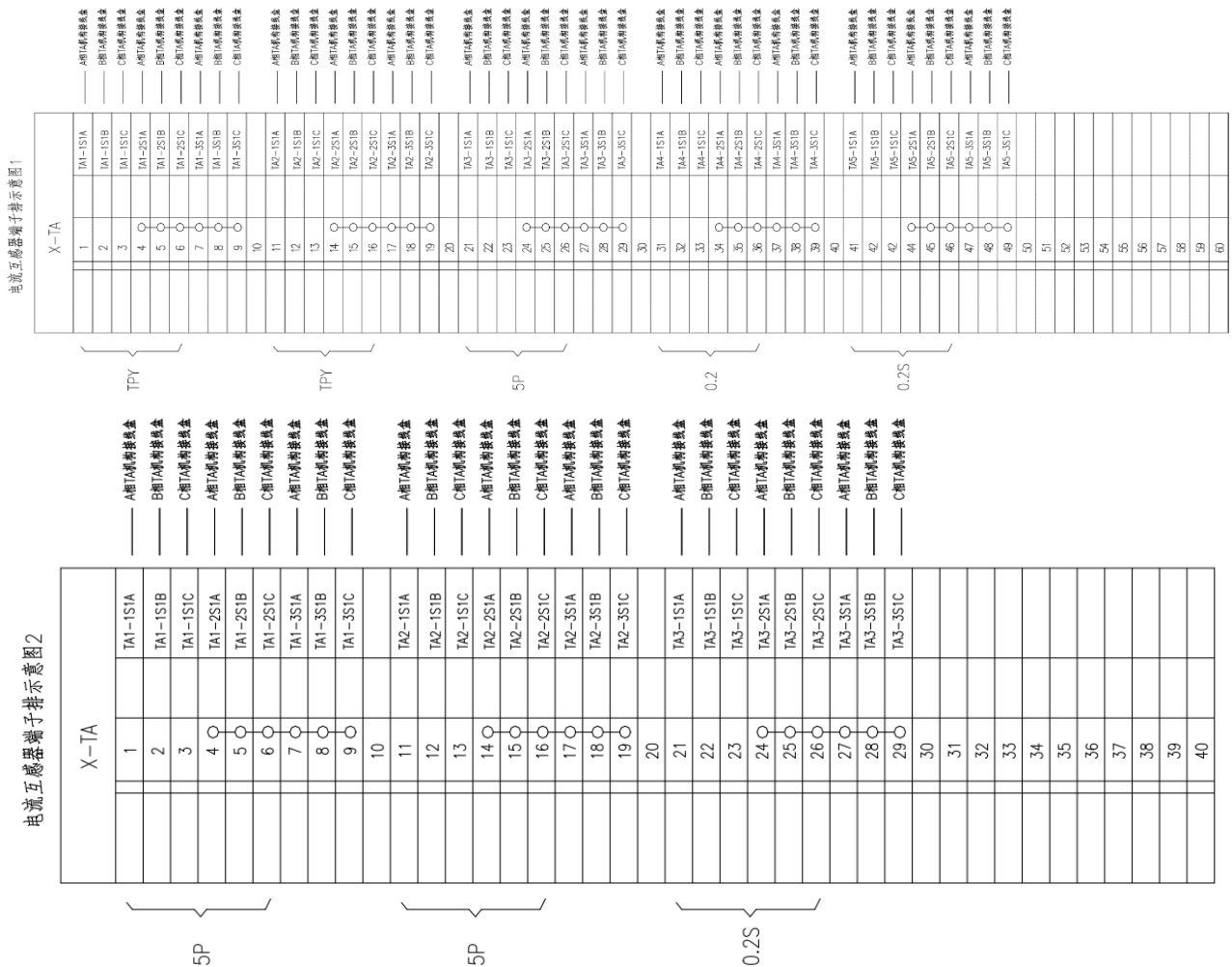
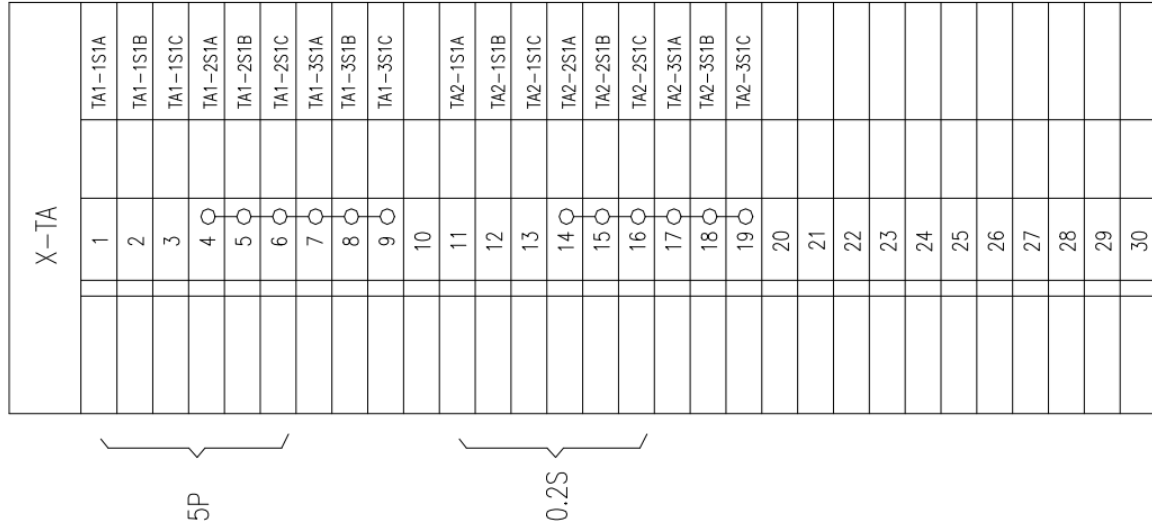


图 17 模拟量采样方式下的电流互感器 TA 回路端子接口图  
(通用设备编号 1GIS—2000/40)

电流互感器端子排示意图4



电流互感器端子排示意图3

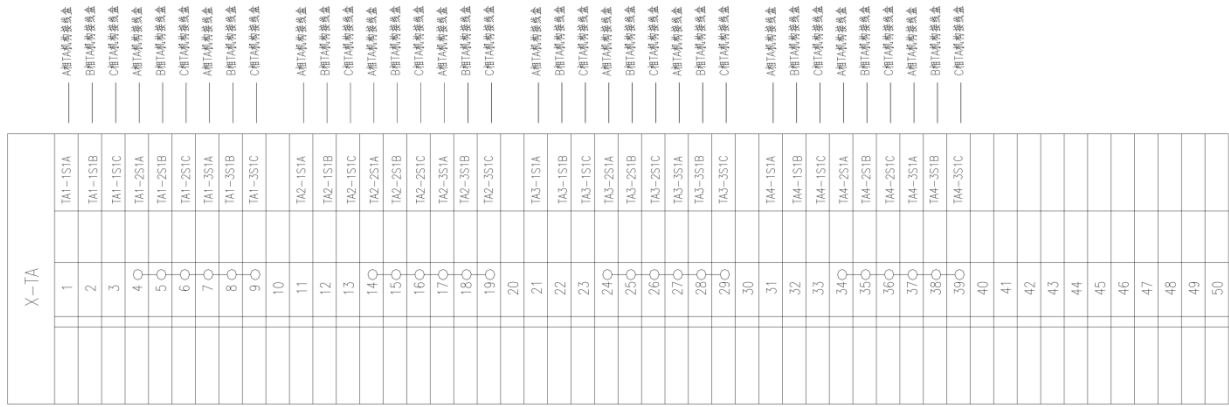


图 18 数字量采样方式下的电流互感器 TA 回路端子接口图  
(通用设备编号 1GIS—2000/40)

2) 电压互感器部分端子排

图 109 所示端子排接口图适用于采用模拟量采样方式及极寒地区等合并单元组柜安装于室内时的GIS 母线及线路间隔电压互感器。

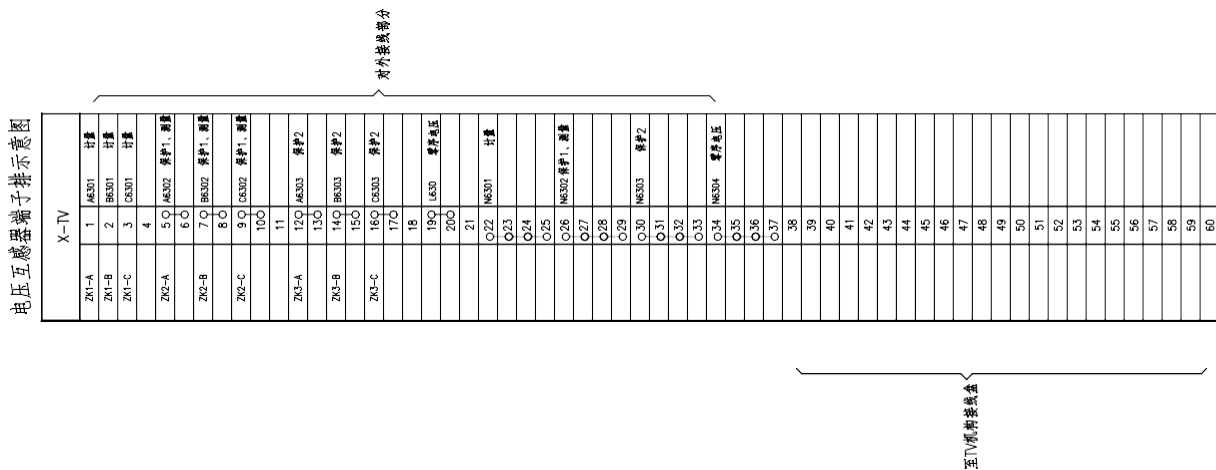


图 19 电压互感器 TV 回路端子接口图（通用设备编号 1GIS—2000/40）

3) 交直流电源端子排

图 20 所示端子排接口图适用于断路器间隔，主变间隔按两路总交流进线、两路总直流进线设置，其他间隔按两路总交流进线、一路总直流进线设置。

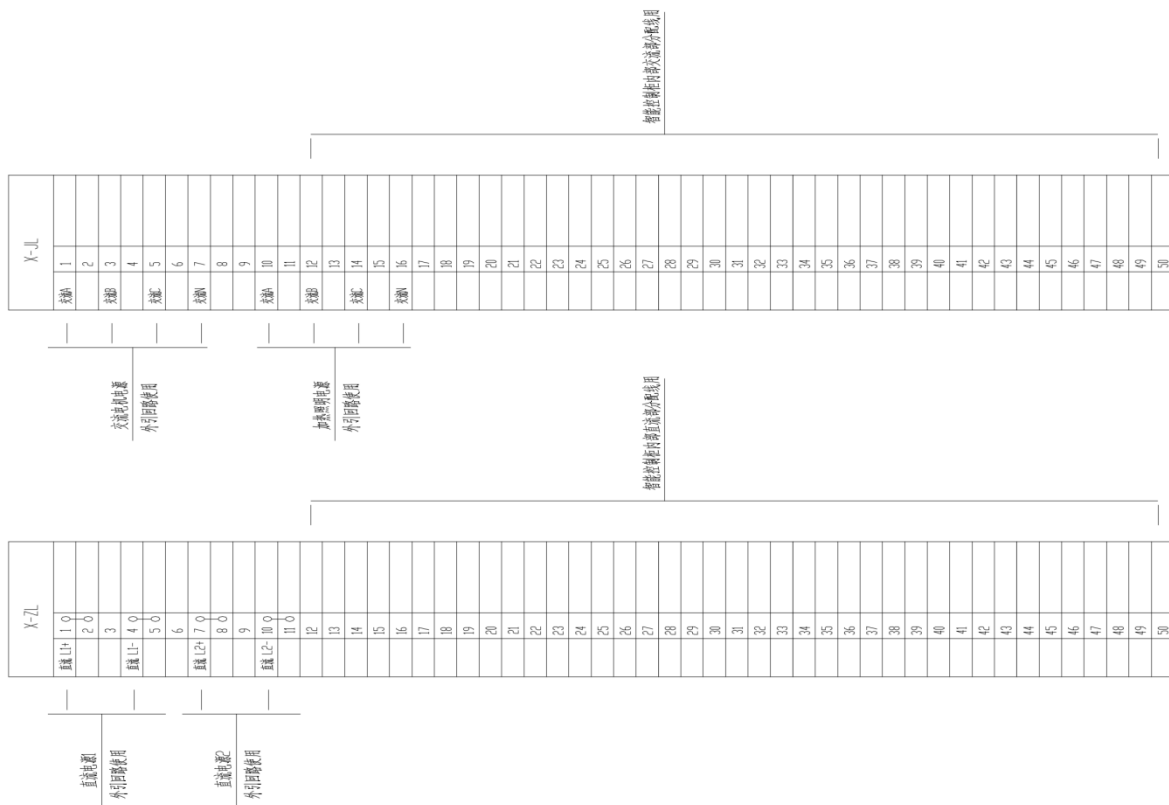


图 20 交直流电源端子接口图（通用设备编号 1GIS—2000/40）

4) 断路器、隔离开关、接地开关控制及信号端子排

图 21、图 22 所示端子排接口图适用于极寒地区等智能终端组柜安装于室内时的汇控柜的对外接口。

e) 光回路标准接口

双套保护的 SV 采样、GOOSE 跳闸控制回路等需要增强可靠性的两套系统，应采用各自独立的光缆及光纤插接盒。

145kV GIS断路器间隔（主变间隔除外）配置单套免熔接光纤插接盒，每套接口数量不宜小于24口；主变间隔配置双套免熔接光纤插接盒，每套接口数量不宜小于24口；145kV GIS母线间隔配置单套免熔接光纤插接盒，接口数量不宜小于72口。

f) 虚端子

合并单元虚端子图详见二次专业技术规范书。

智能终端虚端子图详见二次专业技术规范书。

合并单元智能终端集成装置虚端子图详见二次专业技术规范书。



## 告警回路

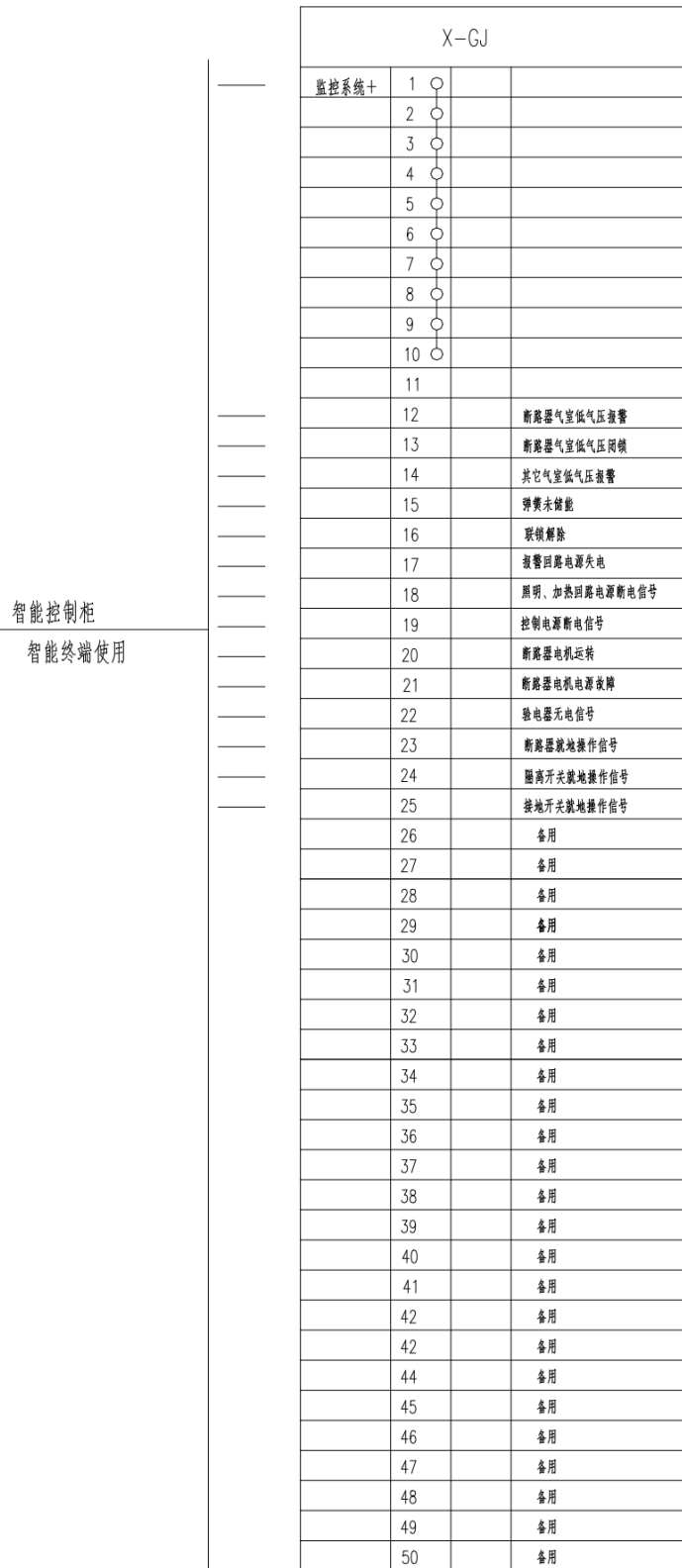


图 21 告警回路端子排接口图（通用设备编号 1GIS—2000/40）

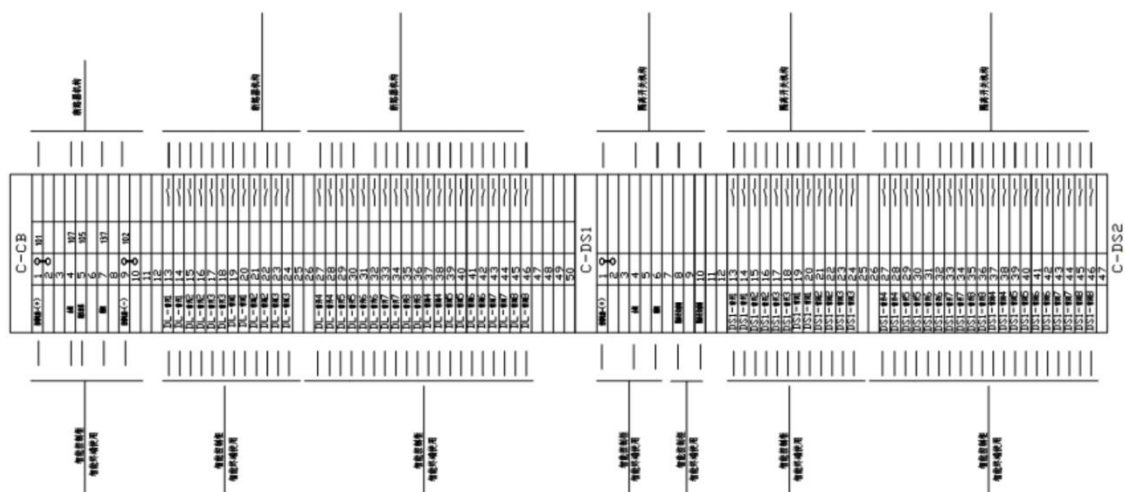


图 22 断路器、隔离开关二次回路端子排接口图  
(通用设备编号 1GIS—2000/40、1HGIS—2000/40)

#### 8.1.2.2 二次回路部分技术要求

应包括以下内容：

- a) 断路器应能实现三相电气联动操作。
- b) 断路器、隔离开关、接地开关均应能实现远方和就地操作，远方和就地之间应能切换。断路器的远方/就地切换开关应单独配置。远方/就地切换开关应配置辅助触点，两组常开、两组常闭，并引至端子排。
- c) 断路器操动机构应配置内部电气防跳回路。近控、远控时均应通过断路器内部的防跳回路实现防跳功能。
- d) 断路器应能实现 SF6 压力低报警及闭锁功能。报警及闭锁功能应分别提供两组完全独立的接点，其中压力低闭锁时每组各提供一副接点供用户使用。
- e) 液压机构应能实现压力异常报警及闭锁功能，应能提供两组完全独立的压力低闭锁接点，且每组应至少各提供一副接点供用户使用。弹簧机构应能实现未储能闭锁合闸功能，还需提供至少两副接点供用户使用。
- f) 断路器应提供监视分合闸回路完好性的对外接口。
- g) 应具备完善的“五防”操作闭锁功能，符合国家相关的规程规范和标准要求。闭锁回路应留有接口以方便外部闭锁接点的引入。
- h) 断路器、隔离开关、接地开关操作机构电动机电源以及隔离开关、接地开关的控制电源采用交流供电。加热及照明电源均匀分布在交流电源各相上。加热器、照明、操作及储能电源开关应独立设置。
- i) GIS的断路器控制及就地信号电源均采用直流供电。
- j) 除用于控制和其他辅助功能所需的辅助触点之外，每台断路器、隔离开关、接地开关应提供足够的辅助触点供用户使用，这些辅助触点均应是电气上独立的，并应引至端子排。
- k) 同一间隔内的多台隔离开关、接地开关的电机电源，在汇控柜内必须分别设置独立的开断设备。
- l) 交、直流回路不应共用同一根电缆，两套跳闸回路不应共用同一根电缆；控制和动力回路

不应共用同一根电缆。

- m) 时间继电器不应选用气囊式时间继电器。
- n) 断路器分闸回路不应采用 RC 加速设计。
- o) 隔离开关（接地开关）在电机回路失电时，控制回路不应自保持。

### 8.1.2.3 电气二次安装接口技术要求

应包括以下内容：

- a) GIS的智能控制柜应按断路器间隔进行配置，每个断路器间隔配置 1 面智能控制柜。
- b) 智能控制柜为前后开门。智能控制柜内应设有横向及竖向导线槽，所有设备安装的位置都应方便外部电缆从智能控制柜的底部进入。
- c) GIS本体至智能控制柜、智能控制柜之间的二次缆线均应采用屏蔽电缆。该部分缆线由制造厂提供，且制造厂应同时提供电缆明细清册及其敷设要求。
- d) 应提供金属配线槽以便于固定电缆，GIS本体上的二次缆线应敷设在配线槽内。
- e) 智能控制柜端子排的一侧为气体绝缘金属封闭开关设备机构到 GIS 端子排的接线，另一侧为 GIS 端子排到智能终端/合并单元背板的接线。
- f) 端子采用压接型端子，额定值为 1000V、10A，工频耐受电压为 2000V。TA 二次回路应提供标准的试验端子，便于断开或短接各装置的输入与输出回路；对所有装置的跳闸出口回路应提供各回路分别操作的试验部件或连接片，以便于必要时解除其出口回路。一个端子只允许接入一根导线。端子排间应有足够的绝缘，端子排应根据功能分段排列，并应至少留有 10%的备用端子，且可在必要时再增加。
- g) 智能控制柜上跳合闸回路应采用能接  $4\text{mm}^2$  截面电缆芯的端子，并且要求跳、合闸端子之间应有端子隔开。智能控制柜上电源回路应采用能接  $6\text{mm}^2$  截面电缆芯的端子，并且要求正、负极之间应有端子隔开。TA 和 TV 回路应采用能压接  $6\text{mm}^2$  截面电缆芯的端子。
- h) 智能控制柜体内部下方应设置二次接地专用铜排，截面不小于  $100\text{mm}^2$ ，接地端子为压接型。  
GIS电气设备本体与智能控制柜之间宜采用标准预制电缆连接，预制电缆可采用单端或双端预制型式。
- i) 智能控制柜至保护室、智能控制柜之间宜采用标准预制光缆连接，预制光缆择宜采用双端预制型式。

### 8.1.3 土建接口

145kV GIS、HGIS 土建接口从设备墩台基础预留插筋范围、户外进（出）线间隔套管基础间距、户内设备楼板结构层埋件等方面进行了分类统一，并根据电气布置形式的不同共形成 6 种电气接口。其中接口 1 对应户外 GIS 方案，接口 2 对应户内GIS 布置方案。

户外设备土建接口统一了设备墩台基础预留插筋范围和户外进（出）线间隔套管基础间距。设备墩台基础中心线与进出线套管基础中心线间距根据电气布置方案确定。大板基础根据不同设计条件确定，图中大板轮廓仅为示意。

户内设备土建接口统一了楼板结构层上一次埋件，待设备资料确认后根据设备资料在一次埋件上焊接槽钢或者工字钢。室内高压电力电缆洞口尺寸统一为 800mm（长）×800mm（宽）。

户内智能控制柜尺寸为 800mm（宽度）×800mm（深度）×2200mm（高度）；户外智能控制柜尺寸为 1000mm（宽度）×900mm（深度）×2000mm（高度）或 1200mm（宽度）×900mm（深度）×2000mm（高度）两种规格。

户外方案高海拔修正详见 8.4 节高海拔修正。

#### 8.1.3.1 户外设备

应包括以下内容：

##### a) 户外 GIS 基础

GIS 布置时，应根据外部条件要求，整体规划整个 GIS 间隔的合理组合，结合通用设计方案开展施工图设计。户外布置包括场地上的建、构筑物、留孔槽、接地装置及主电缆沟等。

布置户外 GIS 间隔的位置应根据进出线位置和总体布置设想确定，土建设置整体大板基础，大板基础位于地面以下，大板基础预留插筋（或植筋）。设备基础待设备资料确认后根据设备资料制作，二次浇筑上部基础混凝土。每个基础面预留钢筋区域的尺寸为 1500mm×7000mm。具体见示意图 23。

#### 8.1.3.2 户内设备

GIS 布置时，应根据外部条件要求，整体规划整个 GIS 间隔的合理组合，结合通用设计方案和 GIS 所在综合楼的整体要求，开展施工图设计。户内布置包括建、构筑物的基本结构、户内 GIS 专用预留孔槽的布置等。

布置户内 GIS 间隔的位置应根据进出线位置和总体布置设想确定。土建在楼板的结构层上设置一次埋件（长度 7m），待设备资料确认后根据设备资料在一次埋件上焊接校平用的槽钢或者工字钢，焊接完成后在楼板上浇筑二次轻质混凝土面层。安装时将带钢结构基础底座的 GIS 设备放置到经校平整后的槽钢或者工字钢上与预留埋件焊接。室内高压电力电缆洞口尺寸为 800mm（长）×800mm（宽）。

施工先后浇筑顺序及埋件平断面图见图 24和图 25。

#### 8.1.3.3 智能控制柜（汇控柜）基础

户内智能控制柜尺寸为 800mm（宽度）×800mm（深度）×2200mm（高度）；户外智能控制柜尺寸为 1000mm（宽度）×900mm（深度）×2000mm（高度）或 1200mm（宽度）×900mm（深度）×2000mm（高度）两种规格。当智能控制柜（汇控柜）不在 GIS 本体上时，下部利用 GIS 整体筏板基础，在整体筏板基础内预留插筋，智能控制柜（汇控柜）基础二次浇注。基础表面平整度误差应不大于 2mm。智能控制柜（汇控柜）与电缆沟之间设置电缆支沟或埋管。

智能控制柜（汇控柜）基础示意图见图 26。

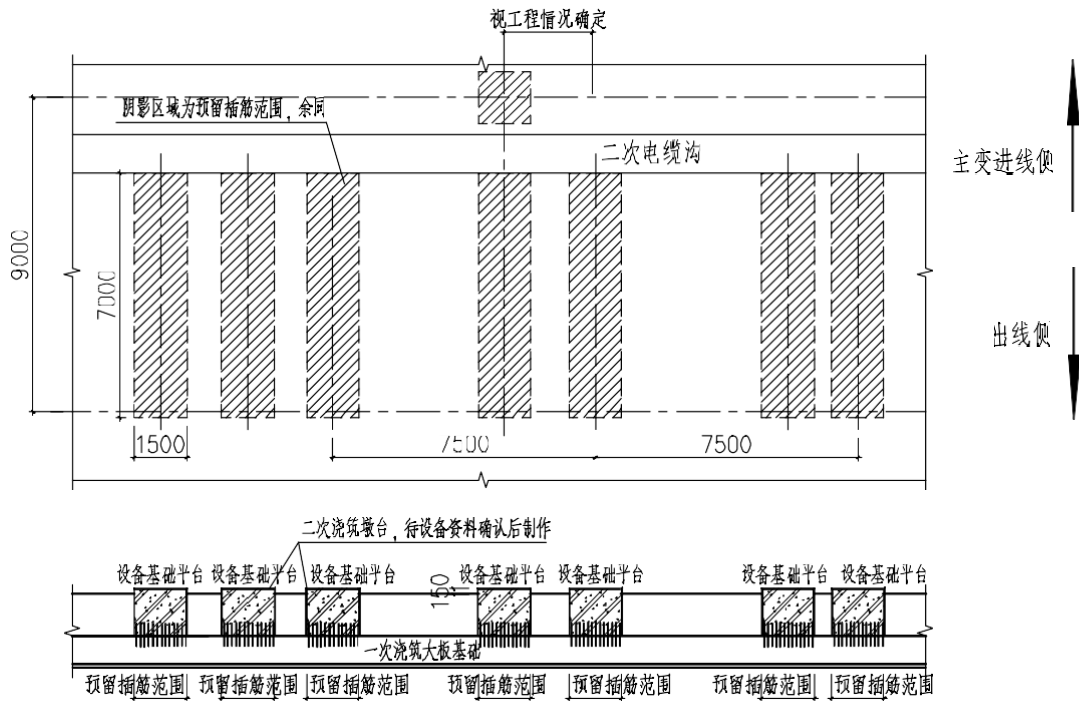


图 23 145kV 户外 GIS 方案（适用双母线接线、单母线接线）基础平、断面示意图  
（通用设备编号 1GIS—2000/40）

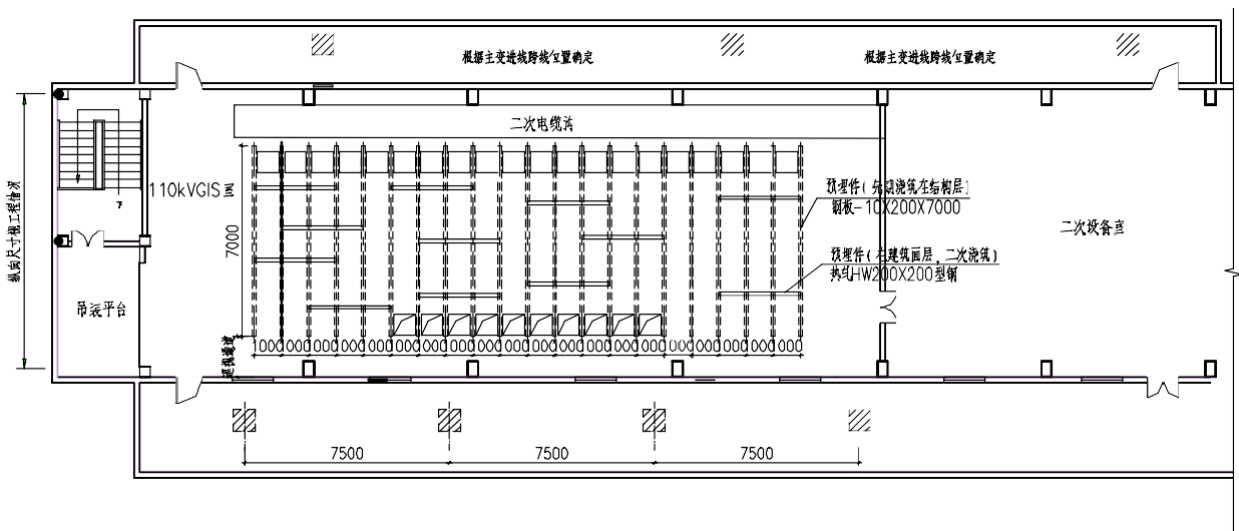


图 24 145kV 户内 GIS 方案基础平面布置示意图（通用设备编号 1GIS—2000/40）

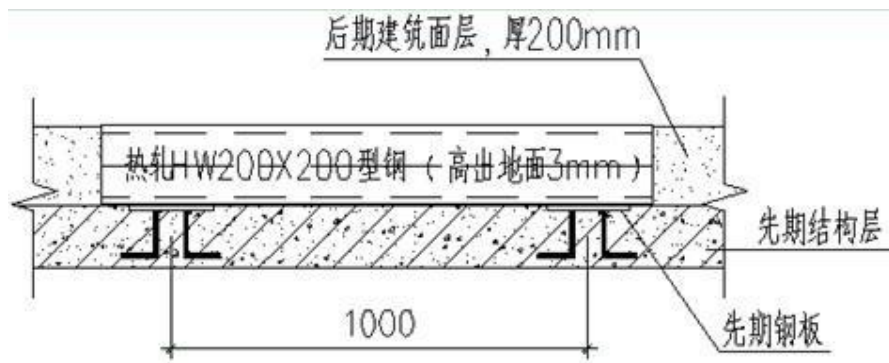


图 25 户内 GIS 基础断面示意图 (通用设备编号 1GIS—2000/40)

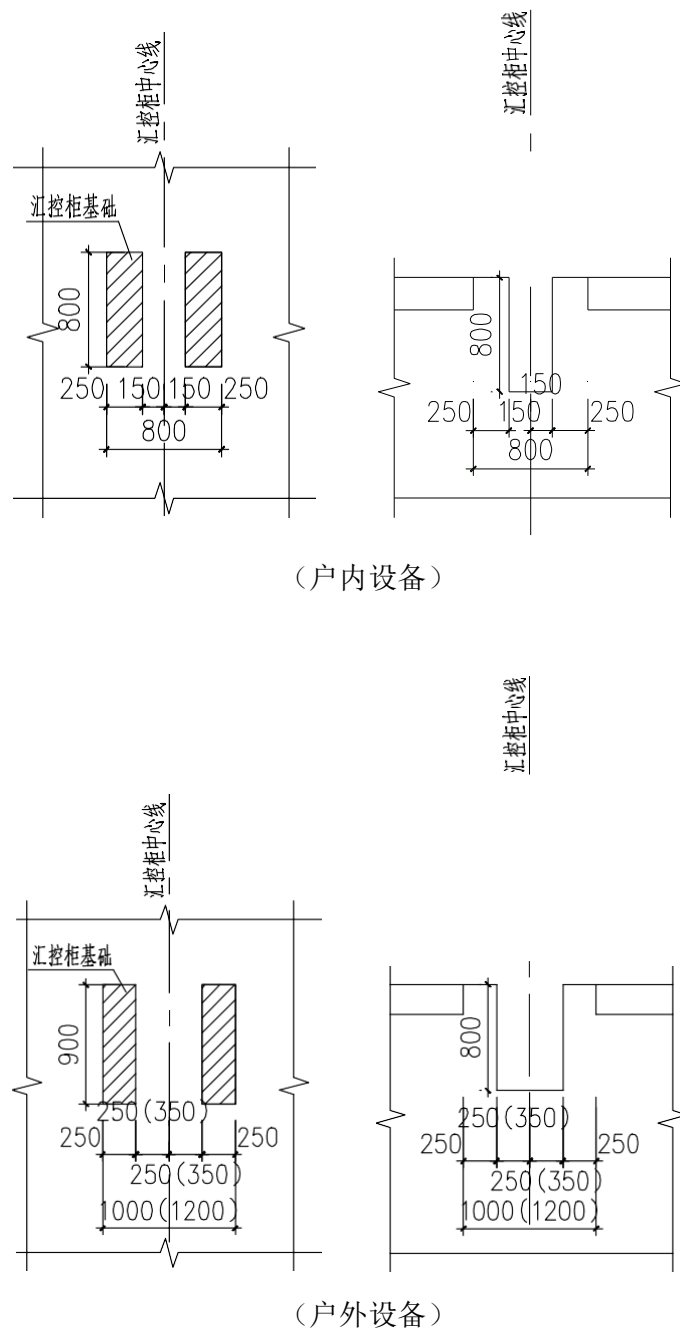


图 26 智能控制柜（汇控柜）基础示意图（通用设备编号 1GIS—2000/40）

## **Annex 3-1: Technical requirements**

### **1. Enterprise qualification requirements**

- The supplier must possess a valid qualification certificate issued by the relevant national authority for manufacturing high and low voltage switchgear and distribution cabinets.
- Hold the ISO9000 series certification of this system, and through the mandatory product certification (3C certification).
- The supplier must comply with the local power supply authority's filing requirements and all other market access conditions.
- The equipment manufacturer has more than 3 years of capability and experience in mass production of similar low and medium voltage cabinets and distribution cabinets in the carbide industry.

### **2. Scope of application of the technical conditions**

- 22kV medium-voltage switchgear (KYN28), DC screen. The equipment use and main technical parameters of the switchgear are detailed in the equipment list and relevant drawings.
- These technical requirements define the minimum acceptable standards for the equipment. In addition to meeting these requirements, the equipment must also comply with national standards, design specifications, and the most stringent applicable regulations.

### **3. environmental conditions**

- The products supplied in this contract should meet the environmental conditions of the project site. The ambient temperature of the product should not be lower than 45°C , and the manufacturer should be able to ensure that the product can operate reliably for a long period of time under the local ambient conditions).
- Installation location: within the Rayong Industrial Park, Thailand.
- Seismic intensity: 8 degrees
- Pollution level: 3
- Operating temperature: -15°C ~45°C
- Altitude: <1000m
- Relative humidity:



Maximum daily average relative humidity: 95 per cent.

Maximum approximate average relative humidity: 90 per cent.

#### **4. special specification**

- This contract requires the supplier to refine the final design drawings in accordance with the specified requirements, including the contents of the drawings, errata, detailed design of all the secondary drawings in the cabinet and submit the design confirmation can be out of the picture. In addition, the offer includes the cost of sending a person to the site to guide the installation of the site
- The supplier shall specify the number, name, use, etc. of each high-voltage switchgear (KYN28) and DC panel according to the equipment list. At the same time, the circuit number and purpose of each outlet circuit shall be marked out according to the system diagram, and a nameplate (metal or plastic) shall be made and fixed on each outlet circuit.
- All nameplates and logos are required to be labelled in both English and Chinese.
- Components such as switches in high voltage cabinets shall meet the filing requirements of the local power supply authority and all other local market access conditions.

#### **5. 22kV centre-mounted switchgear**

##### **5.1 Form and rating parameters**

- 1) Type: Metal armoured mid-mounted transfer switchgear (KYN28)
- ✓ Rated working voltage: 22kV
- ✓ Maximum working voltage: 24.2kV
- ✓ Rated frequency: 50Hz
- 2) Switchgear rating parameters:
- ✓ Lightning impulse voltage: 125kV (indicated in the tender document)
- ✓ 1min industrial frequency withstand voltage (RMS): 65kV (specified in the bidding document)
- ✓ Rated short-circuit breaking current 25kA
- ✓ Rated short circuit duration 4s
- ✓ Rated short-time withstand current 25kA

- ✓ Rated peak withstand current 80kA
- 3) Busbar dynamic stable current (peak): 63kA in the outlet cabinet, the main busbar in line with the relevant standards of 22KV busbar
- 4) Busbar thermal stability current (RMS, 4s): 25kA for outlet cabinet, main busbar in line with 22KV busbar related standards
- 5) Protection class: IP4X for the shell and IP3X for the interior.
- 6) Resistance to internal arcing conditions: (Provide the corresponding test report) 25kA for cable room; 25kA for switch room.
- 8) Temperature rise: cabinet touchable parts $\leq$  20K conductor surface $\leq$  45K
- 9) Main busbar material used is copper busbar: 100 $\times$  10 copper rows (brought in sets, tin-lined and fitted with insulating sheaths).
- 10) Switchgear cabinet top set up cabinet top small busbar, specification $\varnothing$  8 copper rods;
- 11) Cabinet colour: according to the owner's colour code, to be confirmed by the contractor before production;
- 12) Cabinet material: the cabinet is made of aluminium-zinc-coated sheet.
- 13) Insulation creepage: Pure porcelain $\geq$  18mm/kV; Organic $\geq$  20mm/kV.

## **5.2 Structural requirements**

- 1) The switchgear cabinet adopts metal-armoured, arc-resistant manual type switchgear to meet the requirements of "five-proof" interlocking, and the main busbar room, circuit breaker room, cable room and instrumentation room should be armoured and fully enclosed. The switchgear itself should be equipped with perfect mechanical and electrical locking.
- 2) Switchgear cabinet includes: busbar room, circuit breaker room, cable room, control instrument room, the protection level between each room is IP3X, the protection level of each room to the outside of the room is IP4X. if organic insulating materials, should be selected arc-resistant, high temperature resistant, flame retardant, low toxicity, non-absorbent moisture and has excellent mechanical strength and electrical insulation properties of the material (SMC or DMC).
- 3) The secondary wires of the switchgear itself should be protected by flame retardant

protection to avoid accidents caused by high voltage arcs burning the secondary equipment. Each cabinet should be connected to the metal groove for inter-cabinet control circuit wire connection.

- 4) The cabinet charged part of the insulating plate net distance: shall not be less than 30mm; cabinet relative to the ground and the air distance between phases: shall not be less than 180mm; the cabinet charged part of the relative ground and phase creepage distance: shall not be less than 240mm.
- 5) The main busbar and lead wires should be insulated, and can be insulated with thermoplastic insulating sleeves, and the insulation voltage resistance level should be more than 65kV.
- 6) Busbar and lead connection should be added with fire-retardant type insulated box.
- 7) The trolley should be pushed to the running position with an indication device in place.
- 8) The front of the switchgear should have a nameplate (factory name, model specification, date of shipment), a wiring simulation diagram, cabinet serial number, trolley serial number. Meters, signal relays and other components should be marked with the use of the sign box. Cabinet before and after the upper edge should be the road name, regulation number sign box.
- 9) The feeder cabinet is equipped with a mechanism of the door to have observation holes, easy to observe the mechanism of the opening and closing signs; cable room should have a cable observation window, and requires explosion-proof measures.
- 10) A transverse angle to support the cable head is to be added to the rear cabinet with a card hole in the upper part of the angle. Double holes for cable terminals.
- 11) The metal screws in the cabinet fixing the insulated partitions should be fitted with insulating nuts to ensure both insulation and strength.
- 12) Ventilation holes in the upper and lower parts of the switchgear should be equipped with a dust screen and meet protection class IP4X.
- 13) Add a M10 grounding bolt on the left side of the back of the cabinet, and there should be a grounding mark as a grounding point for hanging the earth wire.
- 14) The movable and static knives of the disconnecting switches shall be rounded, and the

busbar ends shall also be chamfered and wrapped with insulation.

- 15) Circuit breakers shall be mounted on a trolley with devices necessary for pulling out the movable parts, and components having the same parameters and construction shall be interchangeable.
- 16) The metal partitions of the switchgear shall be reliably earthed, and the earthing conductor and earthing switch shall be capable of withstanding the rated short-time withstand current and the rated peak withstand current.
- 17) The disconnecting plugs in the operating position shall be able to withstand the inrush of the rated short-time withstand current of each rated peak withstand current and ensure good contact.
- 18) Safety baffle: provide a set of metal baffle, automatically seal the three-phase fixed isolation contacts when the trolley is pulled out, and automatically open the metal baffle when the trolley is pushed in.
- 19) When the trolley is in the test position, the isolating plug is completely disconnected and the safety flaps are automatically closed (the upper and lower flaps can be opened and closed respectively) to prevent the operator from contacting the live parts.
- 20) The switchgear cabinet is a metal enclosure, the floor and walls cannot be used as part of the enclosure, cable connections are made in the lower part of the cabinet, and the cable room should have enough space. The height of the primary cable terminal from the ground should not be less than 700mm, and three cable wiring holes of 150mm should be reserved.
- 21) Each compartment of the switchgear is equipped with a pressure relief device of the same degree of protection as the housing, with pressure outlets positioned so as to ensure that there is no danger to the human body; the pressure relief device is closed under normal conditions, and in the event of an accident the pressure outlets are opened, releasing the internal pressure automatically and at the same time restricting internal faults to this compartment.
- 22) The busbar is electrolytic copper plate, installed in a separate busbar room, the busbar arrangement of phase A, B and C shall be in the order from top to bottom, or from left to right,

or from inside to outside (viewed from the front of the cabinet), and marked with the phase marking, i.e.: the first phase A in brown, the second phase B in black, and the third phase C in grey.

- 23) Grounding of metal parts: All metal parts (including all relays and instrument panels installed on the switchgear) should be grounded, and the grounding wire should be a copper conductor with a cross-section of not less than 10mm<sup>2</sup>, 150mm from the ground and insulated from the cabinet.
- 24) Earthing facilities: The earthing function should be part of the overall design of the switchgear, and all outgoing circuits must have earthing switches.
- 25) The switchgear shall cater for installation on the base of a through-length cable trench with two channels on either side.
- 26) The cabinet must be installed with temperature and humidity controller, and moisture removal electric heat. And can achieve over-temperature alarm.
- 27) The switchgear inlet and outlet modes are: cable inlet and outlet.

### **5.3 Switchgear lockout requirements**

- 1) Outgoing ground knife locking requirements: outgoing ground knife and handcart position mechanical locking.
- 2) The switchgear cable room door (including the sealing plate) should be interlocked with the grounding knife to ensure that the door can be opened only after the grounding knife is closed.
- 3) The trolley position contact used in the latching circuit shall be such that it remains switched on after the trolley nozzle has been moved a sufficiently safe distance from the static contact (including the service position).
- 4) The installation position of the charged display should ensure that the operation of the ground knife, grounded car when the operating personnel can see, should not be installed on the CT.
- 5) The latching of the ground cutter, grounding car and cabinet door should have an unlocking function.

➤ 6) Components in the switchgear cabinet should be equipped with interlocks, the trolley can only be pulled out when the circuit breaker is disconnected, the earth switch and the circuit breaker should have reliable interlocks, and for the operation of the earth switch there should be a clear indicator to show that there is no voltage on the outgoing side and that the circuit breaker is disconnected in order to prevent misoperation;

#### **5.4 Main electrical equipment in switchgear:**

➤ 1) Circuit breakers:

✓ Type: Vacuum Circuit Breaker

✓ Brand and model: according to the brand list, the parameters / grade is not lower than the drawing requirements

✓ Rated voltage: 22kV

✓ Rated current: see drawing for details

✓ 1min industrial frequency withstand voltage: 65kV.

✓ Lightning surge withstand voltage: 125kV

✓ Rated short-circuit breaking current: 25/31.5kA

✓ Rated short circuit duration: 4s

✓ Rated short-time withstand current: 25kA /31.5kA

✓ Rated peak withstand current: 63kA /80kA

✓ Electrical life: opening rated short-circuit current >30 times Closing time ≤ 0.2s Breaking time <0.05s Mechanical life >20000 times Plug mechanical life >3000 times.

✓ Manoeuvring mechanism:

● Number of breakout coils 1

● Number of closing coils 1

● Operating range of the breaking coil (65% to 120%) 110V DC

● Closing coil operating range (80% to 110%) 110V DC

● Operating range of the breaking coil (0 to 30%) 110V DC

● Motor 110V DC

● Cutting inductance current 0.5A ~ 15A, overvoltage multiplier does not exceed 2.5,

should provide test reports.

✓ Circuit breaker design

- The circuit breakers shall be of three-phase trolley type and the disconnecting plugs for the main circuit and all auxiliary circuits shall be of maintenance-free type. Each circuit breaker should have a set of mechanically linked closing position indicators and action counters, which should be installed in a position that is easy to observe. Service life of the switch: Guaranteed 20 years. The mechanical parts shall be maintenance free for not less than 3 years.
- The operating mechanism of the circuit breaker shall have an anti-trip function. Each part of the actuator shall be of fastened construction, with corrosion- and rust-resistant materials used where necessary. The overall design shall minimise mechanical vibration during operation. The breaker shall be designed so that the mechanical springs can store energy in either the "close" or "open" position. If the spring is not fully energised and the circuit breaker fails to close, an observable indicator, preferably of the mechanical type, should be provided to show the condition of the spring. A DC motor is used to automatically energise the spring mechanism. The operating spring of the mechanism should automatically begin to store energy immediately after the circuit breaker has fully closed. A manually operated energy storage device for emergency situations should be included in the mechanism. The spring energy storage arc-breaker is connected in series with double contacts or has an arc extinguishing function.
- Circuit breaker trolleys, when fully inserted, shall be provided with an effective means of grounding to the fixed cabinet. Trolleys of the same capacity may be interchanged.

✓ vacuum interrupter

- The change in on-off time during the electrical life test shall not be greater than 13 ms;
- The arc ignition time of the rear open phase in the electrical life test is not more than 15ms;
- The amplitude of splitting bounce is not more than 2mm; the closing bounce time is not more than 1ms.

- Spare parts: 3 each switching coils, 3 change-over switches, 3 micro switches, 2 secondary plugs (both sides).
- ✓ Brand requirements: see brand list
- 5) Grounding switch
- ✓  Rated short-time withstand current: 25kA (4s)
- ✓  Rated peak withstand current: 80kA
- ✓  At the maximum closing current (63kA), the permissible number of closures without maintenance shall be >2, mechanical >3000
- ✓  Operating mechanism: manual
- ✓ Brand requirements: see brand list (domestic quality brands)
- 6) Current Transformer:
- ✓  The current transformer shall fulfil the parameter requirements. When the secondary side is open circuit, the secondary side can withstand a voltage of 3000 V/1min, and the secondary winding of each CT is grounded at one point. Each form of CT magnetisation characteristic curve and 10% error characteristic curve of each parameter should be provided. Each CT should be independently marked and provided with wiring diagrams.
- ✓ Technical parameters
  - Type: Resin casting
  - Partial discharge: ≤ 10PC
  - Rated short-time withstand current: 40/31.5kA (4s)
  - Rated peak withstand current: 100/80kA
- ✓ Brand requirements: see brand list
- 7) Over-voltage protector
- ✓ See drawings for model and specification details.
  - System rated voltage RMS: 22KV
  - Protector rated voltage rms 24 KV
  - RMS Industrial Frequency Discharge Voltage ≯ 25KV
  - 1.2/50 peak shock discharge voltage ≧ 41 KV



- Peak residual voltage at steep inrush current ≥ 46 KV
  - Peak residual voltage under lightning surge current ≥ 41 KV
  - Peak residual voltage at operating inrush current ≥ 35 KV
  - 2mS square wave throughput capacity 800A
- Brand requirements: see brand list

### **5.5 Switchgear secondary technical requirements:**

- 1) Switchgear auxiliary power supply:
- ✓  Operating and display unit: 110V DC
  - ✓  Motor: 110V DC
  - ✓  Internal lighting: 220V AC
  - ✓  Heating resistance: 220V AC
- 2) Relay room, cable room should have a lighting device, lighting power supply voltage for AC 220V, and set up a special power switch.
- 3) The cabinet should have automatic heating and moisture repellent facilities. The power supply of the heater is 220V AC, one for each cable room and circuit breaker room, with a power of about 50W.
- 4) Each incoming and feeder circuit needs to be installed with a digital multi-function meter, which can display voltage, current, power, power factor, etc., with metering function and communication function (RS-485, MODBUS/RTU protocol).
- 5) Signal indication on the cabinet should be selected with energy-saving and long-life LEDs.
- 6) The cabinet should be selected Phoenix V0 flame retardant terminals, wires should have flame retardant properties. Transformer circuit conductor cross-section is not less than 4mm<sup>2</sup>.
- 7) Use a limit type for the connecting piece (lever).
- 8) The plug-in to be used shall have a positioning device, with no contact with live parts when reversed, and with directional markings.
- 9) Insert plugs must not be removed when the hand truck is in the working position.
- 10) The reclosing circuit in the plug-in, the contact of the switching circuit requires two to

keep one (refers to the use of the pins in parallel).

- 11) Circuit breaker dropping, closing circuit and reclosing (including self-injection) circuit and double contact.
- 12) Switch auxiliary contact at least 8 pairs (8 normally open, 8 normally closed), there should be 2 pairs of spare and lead to the terminal block.
- 13) The DC fuse uses a DC air switch.
- 14) The drop and close wires are connected above the pressure plate, and the reclosing positive is connected above the pressure plate.
- 15) Terminal rows and secondary plug-in between AC and DC, drop, close and positive and negative poles must be left between the gap or add a partition.
- 16) There should be 10% of the total number of empty terminals in the cabinet available to the user, with a minimum of not less than 10.
- 17) Relays, meters and operating buttons should be installed in a location that is easy to observe and operate.
- 18) The assembly and wiring of each piece of equipment should consider unobstructed access to all institutional components and the ability to complete disassembly and replacement work without interrupting the normal operation of adjacent equipment. The layout of all equipment in the panel should be such that the terminals can be easily accessed without the need for special tools, and the terminal numbers should be clearly visible.
- 19) Dynamic analogue line diagram on the panel (can display switch opening and closing status; handcart position, earth switch status, etc.).

#### **5.6 Control, protection systems**

- See drawing for model and parameters
- 24-hour current, voltage (phase/line), power, power factor monitoring and LCD panel display.
- Communication function (RS-485 interface, MODBUS/RTU protocol) .
- General technical parameter requirements
- ✓ Rated data

- Device power supply: DC/AC 86 ~ 265V
- Operating voltage: AC/DC220V , DC110V (subject to drawings)
- AC Voltage:  $100/\sqrt{3}V$  or 100V
- AC current: 5A or 1A
- Frequency: 50Hz
- ✓ power consumption
  - DC circuit: <10W (during normal operation); <15W (during protective action)
  - AC voltage circuit: <0.5VA/phase
  - AC current loop: <1VA/phase (In=5A); <0.5VA/phase (In=1A)
- ✓ overload capacity
  - AC voltage: 1.2 times rated voltage for continuous operation
  - Measuring current: 1.2 times rated current continuous operation
  - Protection current: 2 times rated current continuous operation
  - 10 times rated current, 10s allowed
  - 40 times rated current, 1s allowed
- ✓ Fixed value setting range and error
  - Maximum setting range of fixed value
    - ※ Voltage components: 1V ~ 120V
    - ※ Current element: 0.1In ~ 20In
    - ※ Frequency: 45.00Hz to 55.00Hz
    - ※ Time: 0.00s ~ 100.00s
  - fixing error
    - ※ Current and voltage setting:  $\leq \pm 3\%$  of the set value
    - ※ Fixed frequency:  $\leq \pm 0.02\text{Hz}$
    - ※ Constant angle:  $2 \leq \pm^\circ$
- ✓ Measurement accuracy
  - AC current, AC voltage: 0.2 level
  - Power: Class 0.5

- Integration of electricity: Class 1.0 (active), Class 2.5 (reactive)
- Frequency:  $\leq \pm 0.02\text{Hz}$
- SOE resolution:  $\leq 2\text{ms}$
- ✓ Tripping and closing outlet contact capacity
  - DC 250V, 6A can be switched on for a long time.
- Protection Function Requirements
  - ✓ Line protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, undervoltage protection, negative sequence overcurrent protection, three-phase primary reclosing and so on.
  - ✓ Busbar protection: busbar charging protection, three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, low voltage protection, negative sequence overcurrent protection, etc.
  - ✓ Transformer protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, low voltage protection, negative sequence overcurrent protection, non-electricity protection and so on.
  - ✓ Motor protection: quick-break protection, long starting time, blocking protection, negative sequence inverse time protection, overload protection, overheating protection, zero sequence overcurrent protection, overvoltage protection, low voltage protection, etc.
  - ✓ PT monitoring and switching device: PT parallel, I mother grounding alarm, II mother grounding alarm, I mother PT disconnection alarm, II mother PT disconnection alarm.
  - ✓ Capacitor protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overvoltage protection, unbalance protection, non-electricity protection, etc., capacitor casting and cutting.
- Brand requirements: see brand list

## **6. Technical Requirements for DC Screens**

- Model: GZDW31-110/110M 110Ah (Valve Regulated Sealed Lead Acid Battery)
- Main technical parameters:

- AC input voltage:  $380 \pm 15\%$ ,  $50\text{Hz} \pm 15\%$
- DC output voltage: 110V
- Float charging voltage: 198~290V
- Equal charging voltage: 230~315V
- Voltage regulation accuracy:  $\leq 0.5\%$
- Stabilisation accuracy:  $\leq 1\%$
- Ripple factor:  $\leq 0.3$  per cent
- Current imbalance between charging modules:  $\leq 5\%$
- Power factor:  $>0.9$
- Efficiency:  $>90$  per cent
- Dielectric strength: 2000V 1Min
- Ambient temperature:  $-5^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- Noise:  $\leq 60\text{dB}$
- 1 AC input (AC380V), 10 output circuits, 5 power circuits and 5 control circuits.
- Cabinet set current and voltage indication
- Cabinet set current and voltage indication
- Cabinet colour: beige grey (RAL7035) (tentative, to be confirmed by Party A before production)

➤ Key Performance Requirements

- The DC power supply screen adopts microcomputer-type high-frequency switching DC power supply cabinet, and the power supply cabinet should adopt modular high-frequency switching charging module, modular structure, N+1 hot standby mode, and be able to replace the on-line electrically powered plug-and-play.
- DC power supply screen consists of AC dual power switching unit, intelligent high-frequency switching charging module, battery pack, DC/DC converter, DC bus automatic (manual) voltage regulator, feeder unit, insulation fault monitoring device, intelligent monitoring unit and other components.
- The DC power screen uses dual chargers and dual batteries.

- Batteries must be labelled with the brand, model and place of origin, and adopt high-quality, good-performance valve-regulated lead-acid maintenance-free batteries.
  - Battery float life is not less than 10 years.
  - The charging device adopts intelligent high-frequency switching power supply charging module, and adopts N+1 ( $N \geq 2$ ) hot redundancy mode of parallel combination power supply, and the failure of any one module should not affect the normal operation of the system.
  - The charging module shall have the following functions:
    - ※ Good interchangeability
    - ※ Can be plugged and unplugged electrically
    - ※ Can be operated independently from the monitoring unit
    - ※ With current-limited charging and current-limited output functions
    - ※ Compensates for temperature changes in battery charging voltage
    - ※ With function to prevent overcharging of the battery
    - ※ With short-circuit, over-current and other protection and alarm measures
    - ※ Lightning protection on AC input
  - The module should use the appropriate switching control technology to increase the reliability of the power supply and improve the power factor.
  - The module should also have good flow homogeneity at small loads.
  - The microcomputer insulation online monitoring device measures and judges the busbar voltage, busbar-to-ground insulation resistance and the insulation condition of each feeder circuit, sends out an alarm signal when it is out of the normal range, and indicates the feeder circuit where the fault occurs, and sends the relevant signals to the monitoring system.
  - The DC bus voltage can be adjusted automatically or manually. If chopper stepless voltage regulation is selected, there must be measures to prevent power failure due to its damage.
- Monitoring unit:

- The monitoring unit adopts microcomputer type (full Chinese interface) products and should have the following functions:
- Self-diagnostics, power down and power back up after power down, etc.
- Monitoring of AC inlet voltage, output voltage and current of each rectifier, DC bus voltage and current, float charging voltage, charging current, battery output current and insulation voltage.
- Protection and alarm for the following conditions occurring in the equipment: abnormal AC voltage, charging device failure, abnormal bus voltage, abnormal battery, bus grounding, etc.
- It can detect the capacity of the battery and control the charger to automatically complete the charging of the battery and the conversion of the charging mode according to the charging characteristic curve and characteristics of the battery.
- 5 real-time monitoring of the operation status of the entire DC system, by RS485 communication interface with the substation comprehensive automation system of the upper monitoring machine communication, remote control, telemetry, telecommunication functions, open protocol, to meet the requirements of unmanned duty.
- Remote control volume: inlet switch, individual charging module on/off, battery equalisation and float conversion, etc.
- Remote measurement: AC input voltage, charging device output voltage and current, battery charging and discharging voltage and current, DC bus voltage and current, and so on.
- Remote signal quantity: device normal working status signal, fault status signal, DC bus over/under voltage, DC feeder insulation condition, AC power supply phase loss or interruption, switching status, etc.
- Status signals must be available on the complete set.
- The operating status display signals indicate at least the following:
  - ✘ Power input

- ※ Feeder switch position signals, etc.
- ※ The fault status display signals at least the following:
  - ※ Loss of pressure fault on incoming line
  - ※ Charging Module Failure
  - ※ DC bus voltage too high
  - ※ DC bus voltage too low
  - ※ Deterioration of DC power supply insulation
  - ※ Low battery voltage
  - ※ Battery failure
  - ※ Feeder circuit short circuit faults
- Measurement Meter:
  - Digital measurement meters are used. The accuracy of DC meter is not less than 1.0 grade, and the accuracy of additional shunt is not less than 0.5 grade. Selected current and voltmeter ranges have appropriate margins when considering overload operation.
  - Measurements include: AC supply voltage, float voltage, float current, bus voltage, output current, battery voltage, battery charging/discharging voltage, and discharge current.
- Structure type and cabinet components :
  - DC panels are mounted against the wall, with access to maintenance and wiring in front of the cabinet.
  - The front of the DC power supply panel cabinet adopts glass door, all the equipment is mounted on the mounting plate inside the cabinet, and the monitoring device and instrument are installed in the easy-to-observe position.
  - DC panels should be made of high-quality steel, and strict surface treatment, take appropriate anti-corrosion measures, made of panels and disc shelves should have sufficient mechanical strength to ensure that the components are installed and operated without shaking, disc panels and disc shelves without deformation.
  - The installation and alignment of components in the disc are required to be neat and



reliable. Reasonable arrangement, insulation between electrical appliances should be in line with the relevant provisions. The disc structure should be well ventilated.

- The wires introduced outside the lead-in and lead-out discs must pass through the terminal row, and there should be intervals between the high-current terminals, general terminals, and weak power terminals. The design of the terminal block should ensure convenient operation, maintenance and commissioning, and should give due consideration to correspond to the location of the equipment. The conductive part of the terminal row is copper, and the size should be matched with the connected cable. A certain number of terminals should be reserved in the disc.
- The electrical clearance, creepage distance, spacing distance, wiring and installation of external conductor terminals of DC equipment shall meet the provisions of relevant national standards.
- The disc layout should be simple and beautiful. The front of the disc adopts a full-opening method, and the position signals of each feeder switch should correspond to the switch, so as to facilitate the operation of the maintenance personnel.
- All components installed in the cabinet should be of high quality, and the main components (such as circuit breakers, indicator lights, buttons, etc.) should be made of original imported or domestic joint-venture factory production of the world's famous brand (ABB, SIEMENS, Schneider) products, and have good versatility and interchangeability, and should be indicated in the bidding documents with the models and manufacturers of the main components. Power supply module should pass the relevant identification and have mature use experience, and need to provide supporting documents.
- Conductors, wire colour, indicators, buttons, line troughs, painting, should be in line with the provisions of the relevant national or industry standards in force. Among them, conductors should be selected from copper wires, and DC busbars should be selected from copper busbars. Cross-section selection must meet the requirements of the system capacity. The specification of the selected conductor should be indicated in the bidding

document.

- The connectors of the same type of components should be universal and interchangeable, and should be reliable contact, easy to insert and remove. The contact resistance, insertion and extraction force, permissible current and life of the connectors should be in line with the provisions of the current national and relevant industry standards.
  - Enclosure protection grade: IP4X
  - Cabinet dimensions (width× depth× height): 800× 600× 2260 (mm), small variations allowed.
- Battery brand requirements: Shandong Qiyuan Storage Battery Co., Ltd, Tianjin Shengjie Science and Technology Development Co.

#### **7. Other requirements**

- Pre-drilled holes used for field installation or other holes that may lead to the ingress of dust, water and other objects must be covered with seals.
- Floor-mounted cabinets have hanging rings on top for easy installation. Drawing shelves are installed on the inside of the cabinet door for storing drawings and information. The product is shipped with a wooden base on the bottom of the cabinet, making it easy for a forklift to shovel in the bottom for transport.
- experimental
- ✓ Carefully check the design drawings and test the equipment with a written test report.
- ✓ The certificate of conformity and test report of the supporting equipment must comply with the technical standards of the respective products.

#### **8. Technical specifications and standards for switchgear**

Main standards for design, manufacture, inspection, implementation (shall follow and not be limited to the latest version or modified version of the following standards)

Standard Code	Standard Name
GB /T 3906-2020	3.6kV ~ 40.5kV AC metal-enclosed switchgear and controlgear

GB/T 11022-2020	Common technical requirements for standards for high-voltage alternating current switchgear and controlgear
JB/T 9661	Low-voltage withdrawable switchgear
GB/T 7251	Low-voltage switchgear and controlgear
GB/T 4208-2017	Enclosure protection class (IP code)
GB/T 11032-2020	AC Metal Oxide Zinc Surge Arresters without Gap
a)	Auxiliary standards for design, manufacture and inspection
Standard Code	Standard Name
GB/T 11022-2020	Common technical requirements for standards for high-voltage switchgear and controlgear
GB/T 17626.2-2018	Electromagnetic compatibility test and measurement techniques Electrostatic discharge immunity test

## **9. Services on the supply side**

### ➤ Training services

✓ The Supplier shall provide free site training to the main contractor's technicians, maintenance personnel and operators.

✓ The personnel provided by the supplier responsible for training should have more than 5 years of maintenance experience in similar products.

✓ Training materials are provided free of charge by the supplier.

### ➤ Installation and commissioning guidance services

✓ The supplier, not only as a supplier of equipment, shall actively liaise with the main contracting unit and the supervisory unit according to the requirements of the main contracting unit, cooperate with the installation work and be responsible for commissioning, participate in the project meeting, and be responsible for the operation results of the system accordingly.

### ➤ after-sales service

✓ The supplier's maintenance personnel need to arrive at the site within 24 hours after receiving the maintenance call and provide uninterrupted service until the end. The maintenance point needs to provide enough spare parts to adapt to the main contractor's maintenance needs.

✓ The supplier shall provide a warranty period for the entire equipment set as per the

contract terms. Additionally, free and timely repair and maintenance services must be ensured during the warranty period.

✓ Upon completion of the repair work, the supplier shall provide a report in triplicate to the main contractor, including the test report, analysis of the cause of the failure, measures to solve the problem, the time taken to complete the repair and the date of resumption of normal operation.

✓ After the expiry of the warranty period, the supplier shall provide lifelong maintenance service for the equipment.

## **10. Acceptance requirements**

### ➤ Scope of supply

✓ Complete capacitor compensation cabinets are supplied in integral in-situ mounting configurations.

✓ All the equipment within the scope of supply must be able to form a whole, complete its function and meet the requirements of the technical parameters, where the supply of insufficient parts, omissions and other reasons for the equipment can not operate normally or can not meet the performance requirements, the supplier is required to unconditionally make up for the equipment until the equipment can operate normally and meet the performance requirements.

✓ All equipment provided by the supplier must be accompanied by manuals, quality inspection certificates and other random related information, and provide proof of origin.

### ➤ handover of data

✓ The technical information is required to be in a bound volume, including the following:

- Outline drawings, foundation requirements drawings, nameplate drawings, primary and secondary drawings
- Factory test report and product qualification certificate
- Installation instructions
- Four copies of the above information

✓ During the execution of the works, specific requests for the provision of certain information will be made, which the Supplier shall accept unconditionally.

✓ The date on which the designated representative of the Demanding Party signs for the Technical Data shall be deemed to be the date of delivery of the Technical Data.

✓ For technical information not included in the contract but necessary for the work, the Supplier shall provide it free of charge in a timely manner upon discovery.

✓ If any shortage, loss or damage of technical data is found after inspection by the representative of the Demanding Party, the Supplier shall make up for it within 7 days.

➤ Receiving and inspection procedures

✓ Product protection

● Take rain, moisture, rust, shock and other measures to avoid in the transport process, due to vibration and collision caused by bearing and other parts of the damage. When the equipment leaves the factory, the packaging of parts should be sorted and boxed, following the principle of suitable for transport, easy to install and find.

● Prior to shipment, equipment shall be protected against corrosion, damage and debris during transport and storage.

## **附件 3-1：技术要求**

### **1. 企业资质要求**

- 供方应持有国家有关行业管理部门颁发的高低压柜和配电柜生产资质证明。
- 持有本系统的 ISO9000 系列认证证书，并通过强制性产品认证（3C 认证）。
- 供方须满足当地供电部门的备案要求及当地的其他所有的市场准入条件。
- 设备制造商在硬质合金行业有 3 年以上批量生产同类中低压柜和配电柜的能力和经历。

### **2. 技术条件适用范围**

- 22kV 中压开关柜（KYN28）、直流屏。开关柜的设备用途、主要技术参数详见设备清单及相关图纸。
- 本技术要求为设备满足的最低要求，设备除满足本技术要求外还需满足与国家标准、设计要求，并按其中的最严格的要求执行。

### **3. 环境条件**

- 本次合同内供货产品应满足该项目所在地环境条件。产品使用环境温度不低于 45℃，生产厂家须能保证其产品能在当地环境条件下长期可靠运行)
- 安装地点：泰国罗勇工业园区内。
- 地震烈度：8 度
- 污染等级：3 级
- 运行温度：-15℃~45℃
- 海拔高度： <1000m
- 相对湿度：
  - 最大日平均相对湿度：95%。
  - 最大约平均相对湿度：90%。

### **4. 特殊说明**

- 本合同要求供方按照图纸要求对提供的最终图纸进行深化设计, 包含图纸内容勘误、所有柜内二次图纸的详细设计等并报送设计确认方可出图。另外报价包含派专人到场对现场安装进行指导的相关费用
- 供方应按照设备清单注明每台高压开关柜 (KYN28)、直流屏的编号、名称、用途等。同时应按系统图标出每一出线回路的回路编号、用途等, 并制作铭牌 (金属或塑料制品) 固定在每一出线回路上。
- 所有铭牌、标识均要求中英文双语对照标注。
- 高压柜内的开关等元器件须满足当地供电部门的备案要求及当地的其他所有的市场准入条件。

## 5. 22kV 中置式开关柜

### 5.1 形式及额定参数

- 1)类型: 金属铠装中置移开式开关柜 (KYN28)
  - ✓ 额定工作电压: 22kV
  - ✓ 最高工作电压: 24.2kV
  - ✓ 额定频率: 50Hz
- 2)开关柜额定参数:
  - ✓ 雷电冲击电压: 125kV (投标文件注明)
  - ✓ 1min 工频耐压 (有效值): 65kV (投标文件注明)
  - ✓ 额定短路开断电流 25kA
  - ✓ 额定短路持续时间 4s
  - ✓ 额定短时耐受电流 25kA
  - ✓ 额定峰值耐受电流 80kA
- 3)母线动稳定电流 (峰值): 出线柜 63kA, 主母线符合 22KV 母线相关标准
- 4)母线热稳定电流 (有效值, 4s): 出线柜 25kA, 主母线符合 22KV 母线相关标准

- 5)防护等级：外壳 IP4X 内部 IP3X
- 6)耐内部电弧条件：（提供相应的试验报告）电缆室 25kA；开关室 25kA
- 8)温升：柜体可触摸部件  $\leq 20K$  导体表面  $\leq 45K$
- 9)主母线材料采用铜母线：100×10 铜排（成套带来，搪锡且加装绝缘护套）。
- 10)开关柜柜顶设置柜顶小母线，规格 $\phi 8$  铜棒；
- 11)柜体颜色：按业主色标，生产前须发包方确认；
- 12)柜体材料：柜体采用覆铝锌板。
- 13)绝缘爬距：纯瓷  $\geq 18\text{mm/kV}$ ；有机  $\geq 20\text{mm/kV}$

## 5.2 结构要求

- 1)开关柜采用金属铠装、耐电弧的手车型开关柜，满足“五防”闭锁要求，主母线室、断路器室、电缆室、仪表室等均需铠装全封闭。开关柜自身应装设完善的机械闭锁及电气闭锁。
- 2)开关柜包括：母线室、断路器室、电缆室、控制仪表室，各室之间的防护等级为 IP3X，各室对外的防护等级为 IP4X。若有有机绝缘材料，应选用耐电弧、耐高温、阻燃、低毒、不吸潮且具有优良机械强度和电气绝缘性能的材料(SMC 或 DMC)。
- 3)开关柜本身二次线外裸在开关室的的部分应加阻燃防护，避免因高压电弧烧毁二次设备引起的事故。各柜间应有联通的金属线槽，供柜间控制回路导线联接使用。
- 4)柜体内带电部分对绝缘板净距：不得小于 30mm;柜体内相对地及相间空气距离：不得 小于 180mm;柜体内带电部分相对地及相间外爬距：不得小于 240mm。
- 5)主母线及引线，应全部做绝缘处理，可用热塑绝缘套管进行绝缘，绝缘耐压水平应达到 65kV 以上。



- 6)母线及引线连接处应加阻燃型的绝缘盒。
- 7)手车推至运行位置应有到位指示装置。
- 8)开关柜的正面应有铭牌（厂名、型号规格、出厂日期）、一次接线模拟图、柜位序号、手车序号。表计、信号继电器等元件应有标明用途的标志框。柜前后上沿应有路名、调度号标志框。
- 9)馈电柜装有机机构的门上要有观察孔，便于观察机构的分、合闸指示牌；电缆室应有一个电缆观察窗，并要求有防爆措施。
- 10)在后柜内要加装一根支持电缆头的横向角钢，并在角钢上部开卡孔。电缆接线端子双孔。
- 11)柜内固定绝缘隔板的金属螺丝要加装绝缘螺帽，既要保证绝缘又要保证强度。
- 12)开关柜的上、下部的通风孔要加隔尘网，并达到防护等级 IP4X。
- 13)柜后左侧加一个 M10 接地螺栓，并要有接地标记作为接地点供挂地线用。
- 14)隔离开关的动、静刀应为圆角，母线端部也应倒圆角并包有绝缘。
- 15)断路器应安装在一个小车上，并带有拉出可动部分所必需的装置，具有相同参数和结构的各元件应能互换。
- 16)开关柜的金属隔板应可靠接地，接地导体和接地开关应能耐受额定短时耐受电流和额定峰值耐受电流。
- 17)在运行位置的隔离插头应能耐受额定短时耐受电流各额定峰值耐受电流的冲击，并保证接触良好。
- 18)安全挡板：提供一套金属挡板，手车拉出时自动封住三相固定隔离触头，手车推入时金属挡板自动打开。
- 19)当小车位于试验位置时，隔离插头完全断开，安全挡板自动关闭（上、下挡板可分别打开、关闭）以防止操作人员接触到带电部分。

- 20)开关柜是金属外壳，地板和墙壁均不能作为壳体的一部分，电缆连接在柜的下部进行，电缆室应有足够的空间。一次电缆端子距地面高度不小于 700mm，预留三个由 150mm 的电缆接线孔。
- 21)开关柜的各室均有与壳体相同的防护等级的压力释放装置，其压力出口的位置确保对人身没有危害，压力释放装置正常情况下关闭，在事故情况下压力出口打开，自动释放内部压力，同时将内部故障限制在本隔室内。
- 22)母线为电解铜板，装在单独的母线室内，母线排列 A、B、C 相顺序应为从上到下，或从左到右，或从里到外（从柜前观察），并标注相标，即：第一相 A 棕色，第二相 B 黑色，第三相 C 灰色。
- 23)金属部件的接地：所有金属部件（包括所有安装在开关柜上的继电器、仪表盘）外壳都应接地，接地线应为铜导体，其截面应不小于 10mm<sup>2</sup>，距地面 150mm，与柜体绝缘。
- 24)接地设施：接地功能应是开关柜整体设计的一部分，所有出线回路必须有接地开关。
- 25)开关柜应满足安装在两侧有两根槽钢的通长电缆沟的基础上。
- 26)柜内必须加装温湿度控制器，及除潮电热。并能实现超温报警。
- 27)开关柜进出线方式为：电缆上进上出。

### **5.3 开关柜闭锁要求**

- 1)出线地刀闭锁要求：出线地刀与手车位置机械闭锁。
- 2)开关柜电缆室门（包括封板）应与接地刀实现闭锁保证接地刀合上后方可开门。
- 3)闭锁回路使用的手车位置接点，应保证在手车插嘴离开静触头足够安全距离后保持接通（包括检修位置）。
- 4)带电显示器的安装位置应保证操作地刀、接地车时运行人员可以看到，不应

装 CT 上。

- 5)地刀、接地车、柜门的闭锁应具备解锁功能。
- 6)在开关柜里的元件应装有联锁，小车只有当断路器断开时才能拉出，接地开关和断路器应有可靠联锁，对于操作接地开关应有清楚的指示计指示出线侧无电压，且断路器断开以防误操作；

#### **5.4 开关柜内主要电气设备：**

- 1) 断路器：
  - ✓ 类型：真空断路器
  - ✓ 品牌及型号：按品牌清单，参数/档次不低于图纸要求
  - ✓ 额定电压：22kV
  - ✓ 额定电流：详见图纸
  - ✓ 1min 工频耐压：65kV。
  - ✓ 雷电冲击耐压：125kV
  - ✓ 额定短路开断电流：25/31.5kA
  - ✓ 额定短路持续时间：4s
  - ✓ 额定短时耐受电流：25kA /31.5kA
  - ✓ 额定峰值耐受电流：63kA /80kA
  - ✓ 电气寿命：开断额定短路电流>30 次 合闸时间≤0.2s 分闸时间 <0.05s 机械寿命>20000 次 插头机械寿命>3000 次。
  - ✓ 操动机构：
    - 分闸线圈个数 1
    - 合闸线圈个数 1
    - 分闸线圈动作范围 (65% ~ 120%) 110V DC
    - 合闸线圈动作范围 (80% ~ 110%) 110V DC

- 分闸线圈不动作范围 (0~30%) 110V DC
  - 电动机 110V DC
  - 切电感电流 0.5A ~ 15A 时, 过电压倍数不超过 2.5, 应提供试验报告。
- ✓ 断路器设计
- 断路器为三相手车式主回路及所有辅助回路的隔离插头应为免维护型。每个断路器应有一套机械联动的关合位置指示器及动作计数器, 其安装位置要易于观察。开关使用年限: 保证 20 年。机械部分免维护时间不得少于 3 年。
  - 断路器操动机构应有防跳功能。操动机构的每一部件应为紧固结构, 在必要部位使用防腐、防锈材料。整体的设计应使操作时产生的机械振动最小。断路器在“合”或“分”位置, 机械弹簧均能储能。如果弹簧未能完全储能, 断路器不能合闸, 应提供一个可观察的指示装置来表示弹簧的状态, 最好为机械型。直流电机用来给弹簧机构自动储能。断路器完全合闸后, 机构操作弹簧应立即自动开始储能。在机构里, 应有一套紧急情况下的手动操作储能装置。弹簧储能断弧双接点串接或具有消弧功能。
  - 断路器手车完全处于插入位置时, 应提供有效的接地方式与固定柜体相连。相同载流量的手车可以互换。
- ✓ 真空断路器
- ·在电寿命试验中开断时间的变化不得大于 13ms;
  - ·在电寿命试验中后开相的燃弧时间不大于 15ms;
  - ·分闸反弹幅值不大于 2mm; 合闸弹跳时间不大于 1ms。
  - ·备件: 分合闸线圈各 3 只, 转换开关 3 个, 微动开关 3 只, 二次插头 2 个 (两侧)。
- ✓ 品牌要求: 见品牌表
- 5) 接地开关

- ✓ ·额定短时耐受电流：25kA (4s)
- ✓ ·额定峰值耐受电流：80kA
- ✓ ·在最大关合电流（63kA)时，不维修允许合闸次数应>2次，机械>3000次
- ✓ ·操动机构：手动
- ✓ 品牌要求：见品牌表(国产优质品牌)
- 6)电流互感器：
  - ✓ ·电流互感器应满足参数要求。当二次侧开路时，二次侧能承受电压 3000 V/1min，每个 CT 的二次绕组一点接地。应提供每种形式各参数的 CT 磁化特性曲线和 10%误差特性曲线。每个 CT 应独立标号并提供接线图。
  - ✓ 技术参数
    - 类型：树脂浇铸
    - 局部放电量：≤10PC
    - 额定短时耐受电流：40/31.5kA (4s)
    - 额定峰值耐受电流：100/80kA
  - ✓ 品牌要求：见品牌表
- 7)过电压保护器
  - ✓ 型号和规格详见图纸。
    - 系统额定电压有效值：22KV
    - 保护器额定电压有效值 24 KV
    - 工频放电电压有效值<25KV
    - 1.2/50 冲击放电电压峰值>41 KV
    - 陡波冲击电流下残压峰值>46 KV
    - 雷电冲击电流下残压峰值>41 KV
    - 操作冲击电流下残压峰值>35 KV

- 2mS 方波通流容量 800A

- 品牌要求：见品牌表

### 5.5 开关柜二次技术要求：

- 1)开关柜辅助电源：

- ✓ ·操作及显示装置：110V DC

- ✓ ·电动机：110V DC

- ✓ ·内部照明：220V AC

- ✓ ·加热电阻：220V AC

- 2)继电器室、电缆室应有照明装置，照明电源电压为交流 220V，并设专用电源开关。

- 3)柜内应有自动加热驱潮设施。加热器电源为交流 220V。电缆室与断路器室各一个，功率为 50W 左右。

- 4)每个进线和馈线回路需安装数字式多功能表，可显示电压、电流、功率、功率因数等，带电计量功能和通讯功能（RS-485，MODBUS/RTU 协议）。

- 5)柜上信号指示应选用节能型长寿命的 LED。

- 6)柜内应选用凤凰 V0 级阻燃型端子，导线应具有阻燃性能。互感器回路导线截面不小于 4mm<sup>2</sup>。

- 7)连接片（压板）使用限位型。

- 8)所使用的插件须有定位装置，反向时带电部分不得接触，并有方向标志。

- 9)手车在工作位置时，插件插头不得拔出。

- 10)插件中的重合闸回路、分合闸的触头要求二保一（指插针并接使用）。

- 11)断路器掉、合闸回路及重合闸（包括自投）回路并双接点。

- 12)开关辅助接点至少 8 对（8 常开、8 常闭），应有 2 对备用并引至端子排。

- 13)直流保险采用直流空开。

- 14)掉、合闸线接压板上方，重合闸正极接压板上方。
- 15)端子排及二次插件的交、直流间，掉、合闸与正、负极之间必须留有空档或加隔板。
- 16)柜内应有总量 10%的空端子供用户使用，最少不应少于 10 个。
- 17)继电器、仪表及操作按钮的安装位置应便于观察及操作。
- 18)每件设备的装配和接线均应考虑在不中断相邻设备正常运行的条件下无障碍地接触各 机构器件并能完成拆卸、更换工作。盘内所有设备的布置应考虑在不需要专用工具的情况下方便地接触其接线端子，接线端子号应清晰可见。
- 19)面板上有动态模拟线路图（可显示开关分、合闸状态；手车位置，接地开关状态等）。

## 5.6. 控制、保护系统

- 型号和参数见图纸
- 24 小时的电流、电压（相/线）、功率、功率因数监测及液晶面板显示。
- 具有通讯功能（RS-485 接口，MODBUS/RTU 协议）。
- 通用技术参数要求
- ✓ 额定数据
  - 装置电源：DC/AC 86 ~ 265V
  - 操作电压：AC/DC220V ， DC110V（以图纸为准）
  - 交流电压： $100/\sqrt{3}$ V 或 100V
  - 交流电流：5A 或 1A
  - 频 率：50Hz
- ✓ 功率消耗
  - 直流回路： < 10W（正常工作）； < 15W（保护动作时）
  - 交流电压回路： < 0.5VA/相

- 交流电流回路： < 1VA/相 (In=5A) ; < 0.5VA/相 (In=1A)
- ✓ 过载能力
  - 交流电压： 1.2 倍额定电压连续工作
  - 测量电流： 1.2 倍额定电流连续工作
  - 保护电流： 2 倍额定电流连续工作
  - 10 倍额定电流，允许 10s
  - 40 倍额定电流，允许 1s
- ✓ 定值整定范围及误差
  - 定值最大整定范围
    - ※ 电压元件： 1V ~ 120V
    - ※ 电流元件： 0.1In ~ 20In
    - ※ 频率： 45.00Hz ~ 55.00Hz
    - ※ 时间： 0.00s ~ 100.00s
  - 定值误差
    - ※ 电流及电压定值：  $\leq \pm 3\%$  整定值
    - ※ 频率定值：  $\leq \pm 0.02\text{Hz}$
    - ※ 角度定值：  $\leq \pm 2^\circ$
- ✓ 测量精度
  - 交流电流、交流电压： 0.2 级
  - 功率： 0.5 级
  - 积分电度： 1.0 级 (有功) , 2.5 级 (无功)
  - 频率：  $\leq \pm 0.02\text{Hz}$
  - SOE 分辨率：  $\leq 2\text{ms}$
- ✓ 跳、合闸出口接点容量



- 可长期接通 DC 250V, 6A。

➤ 保护功能要求

- ✓ 线路保护：三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护、三相一次重合闸等。
- ✓ 母联保护：母充保护、三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护等。
- ✓ 变压器保护：三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护、非电量保护等。
- ✓ 电动机保护：速断保护、启动时间过长、堵转保护、负序反时限保护、过负荷保护、过热保护、零序过流保护、过电压保护、低电压保护等。
- ✓ PT 监控切换装置：PT 并列、I 母接地告警、II 母接地告警、I 母 PT 断线告警、II 母 PT 断线告警等。
- ✓ 电容器保护：三段式过流保护、反时限过流保护、零序过流保护、过电压保护、不平衡保护、非电量保护等、电容器投切等。

➤ 品牌要求：见品牌表

## 6. 直流屏技术要求

➤ 型号：GZDW31-110/110M 110Ah (阀控式密封铅酸蓄电池)

➤ 主要技术参数：

- 交流输入电压：380±15%,50Hz±15%
- 直流输出电压：110V
- 浮充电压：198~290V
- 均充电压：230~315V
- 稳压精度：≤0.5%
- 稳流精度：≤1%

- 纹波因数：≤0.3%
- 充电模块间电流不均衡度：≤5%
- 功率因数：>0.9
- 效率：>90%
- 介电强度：2000V 1Min
- 环境温度：-5°C~+40°C
- 噪声：≤60dB
- 交流输入为 1 路 (AC380V) ,输出回路为 10 个，其中 5 个为动力回路，5 个为控制回路
- 柜体设置电流、电压指示
- 柜体设置电流、电压指示
- 柜体颜色：米灰 (RAL7035) (暂定，制作前需甲方确认)

➤ 主要性能要求

- 直流电源屏采用微机型高频开关直流电源柜，电源柜应采用模块化高频开关充电模块，模块式结构，采用 N+1 热备方式，并能在线更换带电插拔。
- 直流电源屏由交流双电源切换单元、智能高频开关充电模块、蓄电池组、DC/DC 转换器、直流母线自动(手动)调压装置、馈电单元、绝缘故障监测装置、智能监控单元等组成。
- 直流电源屏采用双充电机双组电池。
- 蓄电池必须标明品牌、型号及出产地，采用高品质、性能良好的阀控式铅酸免维护蓄电池。
- 蓄电池浮充使用寿命不少于 10 年。
- 充电装置采用智能型高频开关电源充电模块，采用 N+1(N≥2)热冗余方式并联组合供电，任一个模块故障不应影响系统正常运行。

- 充电模块应具有如下功能：
  - ※ 良好的可互换性
  - ※ 可带电插拔
  - ※ 可脱离监控单元独立运行
  - ※ 具有限流充电和限流输出功能
  - ※ 可根据温度变化对电池充电电压进行补偿
  - ※ 具有防止蓄电池过充功能
  - ※ 具有短路、过流等保护及报警措施
  - ※ 交流输入端具有雷电防护措施
- 模块应采用相应的开关控制技术，提高电源的可靠性，改善功率因数。
- 模块在小负载情况下也应具有良好的均流性。
- 微机绝缘在线监测装置对母线电压、母线对地绝缘电阻及各馈出回路绝缘状况进行测量判断，超出正常范围时发出报警信号，并指示发生故障的馈出回路，把相关信号送至监控系统。
- 可自动或手动调整直流母线电压。如果选用斩波无级调压，必须有防止因其损坏造成断电的措施。
- 监控单元：
  - 监控单元采用微型机(全中文界面)产品并应具有以下功能：
    - 自诊断、掉电后来电自恢复等功能。
    - 监测交流进线电压、各整流装置的输出电压、电流，直流母线电压、电流，浮充电压，充电电流，蓄电池输出电流以及绝缘电压等。
    - 对设备发生下列状况进行保护并发出报警：交流电压异常、充电装置故障、母线电压异常、蓄电池异常、母线接地等。
    - 可以检测蓄电池容量，根据蓄电池的充电特性曲线及特点，控制充电机自动

完成对蓄电池的充电及充电方式的转换。

- 5 对整个直流系统的运行状态进行实时监控，由 RS485 通信接口与变电所综合自动化系统上位监控机通信，实现遥控、遥测、遥信功能，协议开放，满足无人值班的要求。
- 遥控量：进线开关，单个充电模块开/关机，电池均充和浮充转换等。
- 遥测量：交流输入电压、充电装置输出电压和电流、电池充放电电压和电流、直流母线电压和电流等。
- 遥信量：装置正常工作状态信号、故障状态信号、直流母线过/欠压、直流馈线绝缘状况、交流电源缺相或中断、开关状态等。
- 在整套装置上必须有状态显示信号
- 工作状态显示信号至少有下列指示：
  - ※ 电源投入
  - ※ 各馈电开关位置信号等
  - ※ 故障状态显示信号至少有下列内容：
    - ※ 进线失压故障
    - ※ 充电模块故障
    - ※ 直流母线电压过高
    - ※ 直流母线电压过低
    - ※ 直流电源绝缘下降
    - ※ 蓄电池电压过低
    - ※ 蓄电池故障
    - ※ 馈电回路短路故障
- 测量表计：
  - 采用数字测量表计。直流表计准确度不低于 1.0 级，附加分流器准确度不低

于 0.5 级。选用的电流、电压表量程考虑过负荷运行时有适当的裕度。

- 测量内容有：交流电源电压、浮充电压、浮充电流、母线电压、输出电流、蓄电池电压、蓄电池充/放电压、放电电流等。

➤ 结构型式及柜内元器件：

- 直流屏靠墙安装，柜前检修维护及接线。
- 直流电源屏柜体正面采用玻璃门，所有设备均装于柜内安装板上，监控装置及仪表安装于易于观测的位置。
- 直流屏均应采用优质钢材，并进行严格的表面处理，采取合适的防腐蚀措施，制成的面板和盘架应有足够的机械强度，保证元件安装后及操作时无摇晃，盘面板及盘架无变形等。
- 盘内元器件安装及走线要求整齐可靠。布置合理，电器间绝缘应符合相关规定。盘体结构应通风良好。
- 引进引出盘外的导线必须经过端子排，大电流端子、一般端子、弱电端子之间应间隔。端子排的设计应保证运行、检修、调试方便，并应适当考虑与设备位置对应。端子排导电部分为铜质，大小应与所接电缆相配套。盘内应预留一定数量的端子。
- 直流设备的电气间隙、爬电距离、间隔距离、外接导线端子的接线和安装，均应满足相关国标规定。
- 盘面布置应简洁、美观。盘面的正面采用全开门方式，各馈电开关的位置信号应与开关对应，便于维护人员的操作。
- 柜内安装的元器件均应采用优质元器件，主要元件（如断路器、指示灯、按

钮等)采用原装进口或国内合资厂生产的世界知名品牌(ABB、SIEMENS、Schneider)产品,并具有良好的通用性和互换性,应在投标文件中注明主要元器件的型号及厂家。电源模块应通过相关鉴定,并有成熟使用经验,并提供证明文件。

- 导线、导线颜色、指示灯、按钮、行线槽、涂漆,均应符合国家或行业现行的有关标准的规定。其中导线应选用铜线,直流母线选用铜母线。截面选择必须满足系统容量的要求。在投标文件中应注明选用导线的规格。
- 同类元器件的接插件应具有通用性和互换性,应接触可靠、插拔方便。接插件的接触电阻、插拔力、允许电流及寿命,均应符合国家及有关行业现行标准的规定。
- 外壳防护等级: IP4X
- 柜体尺寸(宽×深×高): 800×600×2260(mm),允许有小范围不同。
- 蓄电池品牌要求: 山东齐源蓄电池有限公司、天津盛杰科技发展有限公司、戈麦斯特(天津)科技有限公司

## 7. 其他要求

- 用做现场安装的预留孔或另外可能导致灰尘、水及其他物体进入的孔洞必须用密封件加以遮盖。
- 落地安装的柜体顶部设有吊环,易于安装。在柜门内侧安装图纸架,用于存放图纸和资料。产品出厂时,柜体的底部有木质底座,易于叉车铲入底部运输。
- 试验
- ✓ 仔细核对设计图纸,并对设备进行检测,并出书面检测报告。

- ✓ 配套设备合格证明书及试验报告必须符合各自产品技术标准。

## 8. 开关柜的技术规范及标准

设计、制造、检验、执行的主要标准（应遵循并不限于下列标准的最新版本或修改版本）

标准代号	标准名称
GB /T 3906-2020	3.6kV ~ 40.5kV 交流金属封闭开关设备和控制设备
GB/T 11022-2020	高压交流开关设备和控制设备标准的共用技术要求
JB/T 9661	低压抽出式成套开关设备
GB/T 7251	低压成套开关设备和控制设备
GB/T 4208-2017	外壳防护等级(IP 代码)
GB/T 11032-2020	交流无间隙金属氧化物避雷器

### a) 设计、制造、检验执行的辅助标准

标准代号	标准名称
GB/T 11022-2020	高压开关设备和控制设备标准的共用技术要求
GB/T 17626.2-2018	电磁兼容试验和测量技术 静电放电抗扰度试验

## 9. 供方的服务

### ➤ 培训服务

- ✓ 供方须对总包方的技术人员、维修人员及操作人员进行免费工地培训。
- ✓ 供方提供的负责培训的人员应具备同类产品 5 年以上的维修经验。
- ✓ 供方免费提供培训材料。

### ➤ 安装及试运行指导服务

- ✓ 供方不仅仅作为设备供方，应按总包方要求积极与总包单位、监理单位联系，配合安装工作并负责调试，参与项目会议，并对系统的运行结果负相应责任。

### ➤ 售后服务

- ✓ 供方维修人员需在接到维修电话后 24 小时内赶到现场，提供不间断的服

务直到结束。维修点需提供足够的备件以适应总包方维修需求。

✓ 供方须对整套设备按合同条款要求提供质保期，质保期内提供及时和免费维修保养服务。

✓ 维修工作完成后，供方需提供一式三份报告给总包方，包括测试报告、故障原因分析，解决措施，完成修理所费时间及恢复正常运行日期。

✓ 质保期满后，供方须提供设备的终身维修服务。

## 10. 验收要求

### ➤ 设备供货范围

✓ 提供完整的电容补偿柜，为整体就地安装结构。

✓ 所有供货范围内的设备，均必须能组成以整体，完成其功能并达到技术参数要求，凡因供货部件不足、遗漏等原因造成设备不能正常运行或达不到性能要求，供方均需无条件补足直至设备能正常运行并达到性能要求。

✓ 供方所提供的所有设备必须附带说明书、质量检验合格证等随机相关资料，并提供原产地证明。

### ➤ 资料交接

✓ 技术资料要求装订成册，包括以下内容：

- 外形图、基础要求图、铭牌图，一次图、二次图
- 出厂试验报告及产品合格证明
- 安装使用说明书
- 以上资料一式四份

✓ 在工程实施过程中，会对某些资料的提供提出具体要求，供方应无条件接受。

✓ 需方指定代表签收技术资料的日期视为技术资料交货日期。

✓ 对于未列入合同的技术资料，但是本工程所必需的，一经发现，供方应及



时免费提供。

- ✓ 需方代表检查后发现技术资料有短缺、遗失或损坏，供方应于 7 天内补齐。

➤ 验收程序

- ✓ 产品保护

- 采取防雨、防潮、防锈、防震等措施，以免在运输过程中，由于振动和碰撞引起轴承等部件的损坏。设备出厂时，零部件的包装应分类装箱，遵循适于运输、便于安装和查找的原则。
- 设备发运前，应采取保护措施，以防止在运输和储存期间遭受腐蚀、损伤及进入杂物。

## **Annex 3-1: Technical requirements**

### **1. Enterprise qualification requirements**

- The supplier shall hold the qualification certificate for the production of high and low voltage cabinets and distribution cabinets issued by the relevant national industry management department.
- Holds the ISO9000 series certification for this system, and has passed the mandatory product certification (3C certification).
- The supplier must comply with local power supply authority regulations and all relevant market access conditions.
- The equipment manufacturer has more than 3 years of capability and experience in mass production of similar low and medium voltage cabinets and distribution cabinets in the carbide industry.

### **2. Scope of application of the technical conditions**

- 22kV medium-voltage switchgear (KYN28) , DC screen. The equipment use and main technical parameters of the switchgear are detailed in the equipment list and relevant drawings.
- This technical requirements for the equipment to meet the minimum requirements, equipment in addition to meet the technical requirements also need to meet the national standards, design requirements, and according to the most stringent requirements of the implementation.

### **3. environmental conditions**

- The supplied products under this contract must meet the environmental conditions of the project site.

The manufacturer must ensure that the equipment can operate reliably and continuously under local environmental conditions.

- Installation location: Within Rayong Industrial Park, Thailand
- Seismic intensity: 8 degrees
- Pollution Level: Level 3

- Operating temperature: -15°C ~45°C
- Altitude: <1000m
- Relative humidity:
  - Maximum daily average relative humidity: 95%
  - Maximum approximate monthly average relative humidity: 90%

#### **4. special specification**

- This contract requires the supplier to deepen the design of the final drawings provided in accordance with the requirements of the drawings, including the contents of the drawings, errata, detailed design of all the secondary drawings in the cabinet and submit the design confirmation can be out of the picture. In addition, the offer includes the cost of sending a person to the site to guide the installation of the site
- The supplier shall indicate the number, name, use, etc. of each high-voltage switchgear (KYN28) and DC panel according to the equipment list. At the same time, the circuit number and purpose of each outlet circuit shall be marked out according to the system diagram, and a nameplate (metal or plastic) shall be made and fixed on each outlet circuit.
- All nameplates and logos are required to be labelled in both English and Chinese.
- Components such as switches in high voltage cabinets shall meet the filing requirements of the local power supply authority and all other local market access conditions.
- High-voltage cabinets need to be manufactured in accordance with the bidding requirements, and are branded original cabinets, and provide proof of origin documents. Vacuum circuit breaker, vacuum interrupter, microcomputer protection device, mutual transformer, grounding switch and switchgear of the same brand are provided by the seller in the high-voltage switchgear of this project.

#### **5. 22kV centre-mounted switchgear**

##### **5.1 Form and rating parameters**

- 1) Type: Metal armoured mid-mounted transfer switchgear (KYN28)

- ✓ Rated working voltage: 22kV
- ✓ Maximum working voltage: 24.2kV
- ✓ Rated frequency: 50Hz
- 2) Switchgear rating parameters:
  - ✓ Lightning impulse voltage: 125kV (indicated in the tender document)
  - ✓ 1min power frequency withstand voltage (RMS value): 65kV (specified in the tender document)
  - ✓ Rated short-circuit breaking current 25kA
  - ✓ Rated short circuit duration 4s
  - ✓ Rated short-time withstand current 25kA
  - ✓ Rated peak withstand current 80kA
- 3) Busbar dynamic stable current (peak): 63kA in the outlet cabinet, the main busbar in line with the relevant standards of 22KV busbar
- 4) Busbar thermal stability current (RMS, 4s): 25kA for outlet cabinet, main busbar in line with 22KV busbar related standards
- 5) Protection class: Housing IP4X Internal IP3X
- 6) Resistance to internal arcing conditions: (Provide the corresponding test report)
  - Cable room 25kA; switch room 25kA
- 8) Temperature rise: Touchable parts of the cabinet  $\leq 20K$  Conductor surface  $\leq 45K$
- 9) The main busbar material is copper busbar: 100× 10 copper rows (brought in sets, tin-lined and fitted with insulating sheaths).
- 10) Switchgear cabinet tops are provided with cabinet top mini bus bars, size  $\varnothing 8$  copper rods;
- 11) Cabinet colour: according to the owner's colour code, to be confirmed by the contractor before production;
- 12) Cabinet material: the cabinet is made of aluminium-zinc-coated sheet.
- 13) Insulation creepage: Pure porcelain  $\geq 18\text{mm/kV}$ ; Organic  $\geq 20\text{mm/kV}$ .

## **5.2 Structural requirements**

- 1) The switchgear cabinet adopts metal-armoured, arc-resistant manual type switchgear to meet the requirements of "five-proof" interlocking, and the main busbar room, circuit breaker room, cable room and instrumentation room should be armoured and fully enclosed. The switchgear itself should be equipped with perfect mechanical and electrical locking.
- 2) The switchgear cabinet includes: busbar room, circuit breaker room, cable room, control instrument room, the protection level between each room is IP3X , and the protection level of each room to the outside of the room is IP4X. If there is an organic insulating material, it should be selected as arc-resistant, high-temperature-resistant, flame-retardant, low-toxicity, non-absorbent, and has excellent mechanical strength and electrical insulation properties (SMC or DMC).
- 3) The secondary wires of the switchgear itself should be protected by flame retardant protection to avoid accidents caused by high voltage arcs burning the secondary equipment. Each cabinet should be connected to the metal groove for inter-cabinet control circuit wire connection.
- 4) ~~The net distance between the electrified part of the cabinet and the insulating board: not less than 30mm;~~ **the air distance between the relative ground and the phase of the switchgear cabinet with air as the insulating medium: not less than 180mm; the creepage distance between the electrified part of the cabinet and the relative ground and the phase of the cabinet: not less than 240mm; if the switchgear cabinet with composite insulation as the insulating medium, the minimum air gap should meet the following requirements: 24kV equipment should be not less than 60mm, the insulating material should meet the needs of long-term stable use, brand not less than imported Raychem, 3M. Not less than 60mm, the insulating material should meet the needs of long-term stable use, the brand is not less than the imported Raychem, 3M.**
- 5) The main busbar and lead wires shall all be insulated, and can be insulated with thermoplastic insulating sleeves, and the insulation voltage withstand level shall reach 65kV or above .

- 6) Busbar and lead connection should be added with fire-retardant type insulated box.
- 7) The trolley should be pushed to the running position with an indication device in place.
- 8) The front of the switchgear should have a nameplate (factory name, model specification, date of shipment), a wiring simulation diagram, cabinet serial number, trolley serial number. Meters, signal relays and other components should be marked with the use of the sign box. Before and after the cabinet along the upper edge should be the road name, regulation number sign box.
- 9) The feeder cabinet is equipped with a mechanism of the door to have observation holes, easy to observe the mechanism of the opening and closing signs; cable room should have a cable observation window, and requires explosion-proof measures.
- 10) A transverse angle to support the cable head is to be added to the rear cabinet with a card hole in the upper part of the angle. Cable terminals double hole .
- 11) The metal screws in the cabinet fixing the insulated partitions should be fitted with insulating nuts to ensure both insulation and strength.
- 12) Ventilation holes in the upper and lower parts of the switchgear should be equipped with a dust screen and meet protection class IP4X.
- 13) Add a M10 grounding bolt on the left side of the back of the cabinet, and there should be a grounding mark as a grounding point for hanging the earth wire.
- 14) The movable and static knives of the disconnecting switch shall be rounded, and the busbar ends shall also be chamfered and wrapped with insulation.
- 15) Circuit breakers shall be mounted on a trolley with devices necessary for pulling out the movable parts, and components having the same parameters and construction shall be interchangeable. The switchgear shall be equipped with an emergency breaking function, which shall allow emergency mechanical breaking of the circuit breaker door panel in case of emergency without any operating tools. All circuit breakers should be equipped with action counters, which are required to have correct

and reliable action, long service life, clear display, and be installed on the front of each cabinet trolley, which can be seen during operation. The circuit breakers have reliable mechanical anti-tripping function, completely avoiding the fault caused by the conflict with the coil monitoring circuit and avoiding the anti-tripping failure caused by the bonding of the electrical contact or disconnection of the anti-tripping relay, and the integrated security anti-tripping is a standby for each other to ensure the reliability. The wiring of all auxiliary switches of the operating mechanism adopts the same wiring of the same specification to ensure the interchangeability of the trolley except for special requirements, and the trolley is equipped with mechanical counter for counting when closing the gate, which should be installed on the panel of the trolley with observation holes, and the panel of the trolley of the circuit-breaker is equipped with mechanical switching status indication, spring energy-storage status indication and manual switching button, which are easy to be observed.

- 16) The metal partitions of the switchgear shall be reliably earthed, and the earthing conductor and earthing switch shall be capable of withstanding the rated short-time withstand current and the rated peak withstand current.
- 17) The disconnecting plugs in the operating position shall be able to withstand the inrush of the rated short-time withstand current of each rated peak withstand current and ensure good contact.
- 18) Safety baffle: provide a set of metal baffle, automatically seal the three-phase fixed isolation contacts when the trolley is pulled out, and automatically open the metal baffle when the trolley is pushed in.
- 19) When the trolley is in the test position, the isolating plug is completely disconnected and the safety flaps are automatically closed (the upper and lower flaps can be opened and closed respectively) to prevent the operator from contacting the live parts.
- 20) The switchgear cabinet is a metal enclosure, the floor and walls cannot be used as part of the enclosure, cable connections are made in the lower part of the cabinet, and

there should be enough space in the cable room. The height of the primary cable terminals from the ground is not less than 700mm , and three cable wiring holes of 150mm are reserved.

➤ 21) Each compartment of the switchgear is equipped with a pressure relief device of the same degree of protection as the housing, the pressure outlets of which are positioned in such a way as to ensure that there is no danger to the human body. The pressure relief device is closed under normal conditions and opens in the event of an accident, releasing the internal pressure automatically and limiting internal faults to this compartment.

➤ 22) The busbar is electrolytic copper plate, mounted in a separate busbar room, The busbar arrangement A, B, C phase sequence shall be from top to bottom, or left to right, or inside to outside (observed from the front of the cabinet), and marked with the phase label, i.e.: first phase A brown, second phase B black, third phase C grey.

➤ 23) Grounding of metal parts: All metal parts (including all relays and instrument panels installed on the switchgear) should be grounded, and the grounding wire should be a copper conductor with a cross-section of not less than 10mm<sup>2</sup>, 150mm from the ground and insulated from the cabinet.

➤ 24) Earthing facilities: The earthing function should be part of the overall design of the switchgear, and all outgoing circuits must have earthing switches.

➤ 25) The switchgear shall cater for installation on the base of a through-length cable trench with two channels on either side.

➤ 26) The cabinet must be equipped with a temperature and humidity controller, and moisture removal electric heat. And can realise the over-temperature alarm.

➤ 27) The switchgear inlet and outlet modes are: cable inlet and outlet.

### **5.3 Switchgear lockout requirements**

➤ 1) Outgoing ground cutter blocking requirements: Mechanical blocking of outgoing ground cutter and trolley position .

➤ 2) The switchgear cable room door (including the sealing plate) should be



interlocked with the grounding knife to ensure that the door can be opened only after the grounding knife is closed.

- 3) The trolley position contact used in the latching circuit shall be such that it remains switched on after the trolley nozzle has been moved a sufficiently safe distance from the static contact (including the service position).
- 4) The installation position of the charged display should ensure that the operation of the ground knife, grounded car when the operating personnel can see, should not be installed on the CT.
- 5) The latching of the ground cutter, grounding car and cabinet door should have an unlocking function.
- 6) Components in the switchgear cabinet should be equipped with interlocks, the trolley can only be pulled out when the circuit breaker is disconnected, the earth switch and the circuit breaker should have reliable interlocks, and for the operation of the earth switch there should be a clear indicator to show that there is no voltage on the outgoing side and that the circuit breaker is disconnected in order to prevent misoperation;

#### **5.4 Main electrical equipment in switchgear:**

- 1) Circuit breakers:
  - ✓ Type: Vacuum Circuit Breaker
  - ✓ Brand and model: according to the brand list, the parameters / grade is not lower than the drawing requirements
  - ✓ Rated voltage: 22kV
  - ✓ Rated current: see drawing for details
  - ✓ 1min IF withstand voltage: 65kV.
  - ✓ Lightning surge withstand voltage: 125kV
  - ✓ Rated short-circuit breaking current: 25 /31.5kA
  - ✓ Rated short circuit duration: 4s
  - ✓ Rated short-time withstand current: 25kA /31.5kA
  - ✓ Rated peak withstand current: 63kA /80kA

✓ Electrical life: opening and closing rated short-circuit current >30 times Closing time ≤ 0.2s Opening time <0.05s Mechanical life >20000 times Plug mechanical life >3000 times.

✓ The shell of the interrupter is made of ceramic material, and its vacuum degree should be ≤1.33×10<sup>-6</sup>Pa at the time of leaving the factory, and its validity is more than 20 years.

✓ Manoeuvring mechanism:

- Number of breakout coils 1
- Number of closing coils 1
- Operating range of the breaking coil (65% to 120% ) 110V DC
- Closing coil operating range (80% to 110%) 110V DC
- Operating range of the breaking coil (0 to 30%) 110V DC
- Motor 110V DC
- Cutting inductance current 0.5A ~ 15A, overvoltage multiplier does not exceed 2.5, should provide test reports.

✓ Circuit breaker design

- The circuit breakers shall be of three-phase trolley type and the disconnecting plugs for the main circuit and all auxiliary circuits shall be of maintenance-free type. Each circuit breaker should have a set of mechanically linked closing position indicators and action counters, which should be installed in a position that is easy to observe. Service life of the switch: Guaranteed 20 years. The mechanical parts shall be maintenance free for not less than 3 years.
- The operating mechanism of the circuit breaker shall have an anti-trip function. Each part of the actuator shall be of fastened construction, with corrosion- and rust-resistant materials used where necessary. The overall design shall minimise mechanical vibration during operation. The breaker shall be designed so that the mechanical springs can store energy in either the "close" or "open" position. If the spring is not fully energised and the circuit breaker fails to close, an

observable indicator, preferably of the mechanical type, should be provided to show the condition of the spring. A DC motor is used to automatically energise the spring mechanism. The operating spring of the mechanism should automatically begin to store energy immediately after the circuit breaker has fully closed. A manually operated energy storage device for emergency situations should be included in the mechanism. The spring energy storage arc-breaker is connected in series with double contacts or has an arc extinguishing function.

- Circuit breaker trolleys, when fully inserted, shall be provided with an effective means of grounding to the fixed cabinet. Trolleys of the same capacity may be interchanged.
- Vacuum circuit breakers are required to use plum blossom contacts with high market acceptance, and no other structural contact forms shall be used.

✓ vacuum interrupter

- During the electrical life test the change in on-time shall not be greater than 13ms ;
- The arc ignition time of the rear open phase in the electrical life test is not more than 15ms;
- The amplitude of tripping bounce is not more than 2mm; the closing bounce time is not more than 1ms.
- Spare parts: 3 each of breaking and closing coils, 3 changeover switches, 3 micro switches, 2 secondary plugs (both sides).

✓ Brand requirements: see brand list

➤ 5) Grounding switch

✓  Rated short-time withstand current: 25kA (4s)

✓  Rated peak withstand current: 80kA

✓  At the maximum closing current (63kA), the permissible number of closures without maintenance shall be >2, mechanical >3000

✓  Operating mechanism: manual

- ✓ Brand requirements: see brand list (domestic quality brands)
- 6) Current Transformer:
  - ✓  The current transformer shall fulfil the parameter requirements. When the secondary side is open circuit, the secondary side can withstand a voltage of 3000 V/1min, and the secondary winding of each CT is grounded at one point. Each form of CT magnetisation characteristic curve and 10% error characteristic curve of each parameter should be provided. Each CT should be independently marked and provided with wiring diagrams.
  - ✓ Technical parameters
    - Type: Resin casting
    - Partial discharge:  $\leq 10\text{PC}$
    - Rated short-time withstand current: 40/31.5kA (4s)
    - Rated peak withstand current: 100/80kA
  - ✓ Brand requirements: see brand list
- 7) Over-voltage protector
  - ✓ See drawings for model and specification details.
    - RMS system voltage rating: 22KV
    - Protector rated voltage rms 24 KV
    - RMS Industrial Frequency Discharge Voltage  $\leq 25\text{KV}$
    - 1.2/50 peak shock discharge voltage  $\geq 41\text{KV}$
    - Peak residual voltage under steep-wave inrush current  $\geq 46\text{KV}$
    - Peak residual voltage under lightning surge current  $\geq 41\text{KV}$
    - Peak residual voltage at operating inrush current  $\geq 35\text{KV}$
    - 2mS square wave throughput capacity 800A
  - Brand requirements: see brand list

### **5.5 Switchgear secondary technical requirements:**

- 1) Switchgear auxiliary power supply:
  - ✓  Operating and display unit: 110V DC

- ✓  Motor: 110V DC
- ✓  Internal lighting: 220V AC
- ✓  Heating resistance: 220V AC
- 2) Relay room, cable room should have a lighting device, lighting power supply voltage for AC 220V, and set up a special power switch.
- 3) The cabinet should have automatic heating and moisture repellent facilities. The power supply of the heater is 220V AC, one for each cable room and circuit breaker room, with a power of about 50W.
- 4) Each incoming and feeder circuit needs to be installed with a digital multi-function meter, which can display voltage, current, power, power factor, etc., with metering function and communication function (RS-485, MODBUS/RTU protocol).
- 5) Signal indication on the cabinet should be selected with energy-saving and long-life LEDs.
- 6) Phoenix V0 grade flame retardant terminals should be used in the cabinet and the conductors should be flame retardant. The cross-section of the transformer circuit conductor is not less than 4mm<sup>2</sup>.
- 7) Use a limit type for the connecting piece (lever).
- 8) The plug-in to be used shall have a positioning device, with no contact with live parts when reversed, and with directional markings.
- 9) Insert plugs must not be removed when the hand truck is in the working position.
- 10) The reclosing circuit in the plug-in, the contact of the switching circuit requires two to keep one (refers to the use of the pins in parallel).
- 11) Circuit breaker dropping, closing circuit and reclosing (including self-injection) circuit and double contact.
- 12) Switch auxiliary contact at least 8 pairs (8 normally open, 8 normally closed), there should be 2 pairs of spare and lead to the terminal block.
- 13) The DC fuse uses a DC air switch.
- 14) The drop and close wires are connected above the pressure plate, and the

reclosing positive is connected above the pressure plate.

- 15) Terminal rows and secondary plug-in between AC and DC, drop, close and positive and negative poles must be left between the gap or add a partition.
- 16) There should be 10% of the total number of empty terminals in the cabinet available to the user, with a minimum of not less than 10.
- 17) Relays, meters and operating buttons should be installed in a location that is easy to observe and operate.
- 18) The assembly and wiring of each piece of equipment should consider unobstructed access to all institutional components and the ability to complete disassembly and replacement work without interrupting the normal operation of adjacent equipment. The layout of all equipment in the panel should be such that the terminals can be easily accessed without the need for special tools, and the terminal numbers should be clearly visible.
- 19) Dynamic analogue line diagram on the panel (can display switch opening and closing status; handcart position, earth switch status, etc.).

## **5.6 Control, protection systems**

- See drawing for model and parameters
- 24-hour current, voltage (phase/line), power, power factor monitoring and LCD panel display.
- Communication function (RS-485 interface, MODBUS/RTU protocol) .
- General technical parameter requirements
- ✓ Rated data
  - Device power supply: DC/AC 86 ~ 265V
  - Operating voltage: AC/DC220V , DC110V (subject to drawings)
  - AC Voltage:  $100/\sqrt{3}V$  or 100V
  - AC current: 5A or 1A
  - Frequency: 50Hz
- ✓ power consumption

- DC circuit: <10W (during normal operation); <15W (during protective action)
- AC voltage circuit: <0.5VA/phase
- AC current loop: <1VA/phase (In=5A); <0.5VA/phase (In=1A)
- ✓ overload capacity
  - AC voltage: 1.2 times rated voltage for continuous operation
  - Measuring current: 1.2 times rated current continuous operation
  - Protection current: 2 times rated current continuous operation
  - 10 times rated current, 10s allowed
  - 40 times rated current, 1s allowed
- ✓ Fixed value setting range and error
  - Maximum setting range of fixed value
    - ※ Voltage components: 1V ~ 120V
    - ※ Current element: 0.1In ~ 20In
    - ※ Frequency: 45.00Hz to 55.00Hz
    - ※ Time: 0.00s ~ 100.00s
  - fixing error
    - ※ Current and voltage setting:  $\leq \pm 3\%$  of the set value
    - ※ Fixed frequency:  $\leq \pm 0.02\text{Hz}$
    - ※ Constant angle:  $2 \leq \pm^\circ$
- ✓ Measurement accuracy
  - AC current, AC voltage: 0.2 level
  - Power: Class 0.5
  - Integration of electricity: Class 1.0 (active), Class 2.5 (reactive)
  - Frequency:  $\leq \pm 0.02\text{Hz}$
  - SOE resolution:  $\leq 2\text{ms}$
- ✓ Tripping and closing outlet contact capacity
  - DC 250V, 6A can be switched on for a long time.
- Protection Function Requirements

- ✓ Line protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, undervoltage protection, negative sequence overcurrent protection, three-phase primary reclosing and so on.
- ✓ Busbar protection: busbar charging protection, three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, low voltage protection, negative sequence overcurrent protection, etc.
- ✓ Transformer protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, low voltage protection, negative sequence overcurrent protection, non-electricity protection and so on.
- ✓ Motor protection: quick-break protection, long starting time, blocking protection, negative sequence inverse time protection, overload protection, overheating protection, zero sequence overcurrent protection, overvoltage protection, low voltage protection, etc.
- ✓ PT monitoring and switching device: PT parallel, I mother grounding alarm, II mother grounding alarm, I mother PT disconnection alarm, II mother PT disconnection alarm.
- ✓ Capacitor protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overvoltage protection, unbalance protection, non-electricity protection, etc., capacitor casting and cutting.

➤ Brand requirements: see brand list

## **6. Technical Requirements for DC Screens**

- Model: GZDW31-110/110M 110Ah (Valve Regulated Sealed Lead Acid Battery)
- Main technical parameters:
  - AC input voltage:  $380 \pm 15\%$ ,  $50\text{Hz} \pm 15\%$
  - DC output voltage: 110V



- Float charging voltage: 198~290V
- Equal charging voltage: 230~315V
- Voltage regulation accuracy:  $\leq 0.5\%$
- Stabilisation accuracy:  $\leq 1\%$
- Ripple factor:  $\leq 0.3$  per cent
- Current imbalance between charging modules:  $\leq 5\%$
- Power factor:  $>0.9$
- Efficiency:  $>90$  per cent
- Dielectric strength: 2000V 1Min
- Ambient temperature:  $-5^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- Noise:  $\leq 60\text{dB}$
- 1 AC input (AC380V), 10 output circuits, 5 power circuits and 5 control circuits.
- Cabinet set current and voltage indication
- Cabinet set current and voltage indication
- Cabinet colour: beige grey (RAL7035) (tentative, to be confirmed by Party A before production)

➤ Key Performance Requirements

- The DC power supply screen adopts microcomputer-type high-frequency switching DC power supply cabinet, and the power supply cabinet should adopt modular high-frequency switching charging module, modular structure, N+1 hot standby mode, and be able to replace the on-line electrically powered plug-and-play.
- DC power supply screen consists of AC dual power switching unit, intelligent high-frequency switching charging module, battery pack, DC/DC converter, DC bus automatic (manual) voltage regulator, feeder unit, insulation fault monitoring device, intelligent monitoring unit and other components.
- The DC power screen uses dual chargers and dual batteries.
- Batteries must be labelled with the brand, model and place of origin, and adopt

high-quality, good-performance valve-regulated lead-acid maintenance-free batteries.

- Battery float life is not less than 10 years.
  - The charging device adopts intelligent high-frequency switching power supply charging module, and adopts N+1 ( $N \geq 2$ ) hot redundancy mode of parallel combination power supply, and the failure of any one module should not affect the normal operation of the system.
  - The charging module shall have the following functions:
    - ※ Good interchangeability
    - ※ Can be plugged and unplugged electrically
    - ※ Can be operated independently from the monitoring unit
    - ※ With current-limited charging and current-limited output functions
    - ※ Compensates for temperature changes in battery charging voltage
    - ※ With function to prevent overcharging of the battery
    - ※ With short-circuit, over-current and other protection and alarm measures
    - ※ Lightning protection on AC input
  - The module should use the appropriate switching control technology to increase the reliability of the power supply and improve the power factor.
  - The module should also have good flow homogeneity under small loads.
  - The microcomputer insulation online monitoring device measures and judges the busbar voltage, busbar-to-ground insulation resistance and the insulation condition of each feeder circuit, sends out an alarm signal when it is out of the normal range, and indicates the feeder circuit where the fault occurs, and sends the relevant signals to the monitoring system.
  - The DC bus voltage can be adjusted automatically or manually. If chopper stepless voltage regulation is selected, there must be measures to prevent power failure due to its damage.
- Monitoring unit:

- The monitoring unit adopts microcomputer type (full Chinese interface) products and should have the following functions:
- Self-diagnostics, power down and power back up after power down, etc.
- Monitoring of AC inlet voltage, output voltage and current of each rectifier, DC bus voltage and current, float charging voltage, charging current, battery output current and insulation voltage.
- Protection and alarm for the following conditions occurring in the equipment: abnormal AC voltage, charging device failure, abnormal bus voltage, abnormal battery, bus grounding, etc.
- It can detect the capacity of the battery and control the charger to automatically complete the charging of the battery and the conversion of the charging mode according to the charging characteristic curve and characteristics of the battery.
- 5 real-time monitoring of the operation status of the entire DC system, by RS485 communication interface with the substation comprehensive automation system of the upper monitoring machine communication, remote control, telemetry, telecommunication functions, open protocol, to meet the requirements of unmanned duty.
- Remote control volume: inlet switch, individual charging module on/off, battery equalisation and float conversion, etc.
- Remote measurement: AC input voltage, charging device output voltage and current, battery charging and discharging voltage and current, DC bus voltage and current, and so on.
- Remote signal quantity: device normal working status signal, fault status signal, DC bus over/under voltage, DC feeder insulation condition, AC power supply phase loss or interruption, switching status, etc.
- Status signals must be available on the complete set.
- The operating status display signals indicate at least the following:
  - ✘ Power input

- ※ Feeder switch position signals, etc.
- ※ The fault status display signals at least the following:
  - ※ Loss of pressure fault on incoming line
  - ※ Charging Module Failure
  - ※ DC bus voltage too high
  - ※ DC bus voltage too low
  - ※ Deterioration of DC power supply insulation
  - ※ Low battery voltage
  - ※ Battery failure
  - ※ Feeder circuit short circuit faults
- Measurement Meter:
  - Digital measurement meters are used. The accuracy of DC meter is not less than 1.0 grade, and the accuracy of additional shunt is not less than 0.5 grade. Selected current and voltmeter ranges have appropriate margins when considering overload operation.
  - Measurements include: AC supply voltage, float voltage, float current, bus voltage, output current, battery voltage, battery charging/discharging voltage, and discharge current.
- Structure type and cabinet components :
  - DC panels are mounted against the wall, with access to maintenance and wiring in front of the cabinet.
  - The front of the DC power supply panel cabinet adopts glass door, all the equipment is mounted on the mounting plate inside the cabinet, and the monitoring device and instrument are installed in the easy-to-observe position.
  - DC panels should be made of high-quality steel, and strict surface treatment, take appropriate anti-corrosion measures, made of panels and disc shelves should have sufficient mechanical strength to ensure that the components are installed and operated without shaking, disc panels and disc shelves without deformation.

- The installation and alignment of components in the disc are required to be neat and reliable. Reasonable arrangement, insulation between electrical appliances should be in line with the relevant provisions. The disc structure should be well ventilated.
- The wires introduced outside the lead-in and lead-out discs must pass through the terminal row, and there should be intervals between the high-current terminals, general terminals, and weak power terminals. The design of the terminal block should ensure convenient operation, maintenance and commissioning, and should give due consideration to correspond to the location of the equipment. The conductive part of the terminal row is copper, and the size should be matched with the connected cable. A certain number of terminals should be reserved in the disc.
- The electrical clearance, creepage distance, spacing distance, wiring and installation of external conductor terminals of DC equipment shall meet the provisions of relevant national standards.
- The disc layout should be simple and beautiful. The front of the disc adopts a full-opening method, and the position signals of each feeder switch should correspond to the switch, so as to facilitate the operation of the maintenance personnel.
- All components installed in the cabinet should be of high quality, and the main components (such as circuit breakers, indicator lights, buttons, etc.) should be made of original imported or domestic joint-venture factory production of the world's famous brand (ABB, SIEMENS, Schneider) products, and have good versatility and interchangeability, and should be indicated in the bidding documents with the models and manufacturers of the main components. Power supply module should pass the relevant identification and have mature use experience, and need to provide supporting documents.
- Conductors, wire colour, indicators, buttons, line troughs, painting, should be in

line with the provisions of the relevant national or industry standards in force.

Among them, conductors should be selected from copper wires, and DC busbars should be selected from copper busbars. Cross-section selection must meet the requirements of the system capacity. The specification of the selected conductor should be indicated in the bidding document.

- The connectors of the same type of components should be universal and interchangeable, and should be reliable contact, easy to insert and remove. The contact resistance, insertion and extraction force, permissible current and life of the connectors should be in line with the provisions of the current national and relevant industry standards.
- Enclosure protection grade: IP4X
- Cabinet dimensions (width× depth× height): 800× 600× 2260 (mm), small variations allowed.

➤ Battery brand requirements: Shandong Qiyuan Storage Battery Co., Ltd, Tianjin Shengjie Science and Technology Development Co.

## **7. Other requirements**

➤ Pre-drilled holes used for field installation or other holes that may lead to the ingress of dust, water and other objects must be covered with seals.

➤ Floor-mounted cabinets have hanging rings on top for easy installation. Drawing shelves are installed on the inside of the cabinet door for storing drawings and information. The product is shipped with a wooden base on the bottom of the cabinet, making it easy for a forklift to shovel in the bottom for transport.

➤ experimental

✓ Carefully check the design drawings and test the equipment with a written test report.

✓ The certificate of conformity and test report of the supporting equipment must comply with the technical standards of the respective products.

## **8. Technical specifications and standards for switchgear**

Main standards for design, manufacture, inspection, implementation (shall follow and not be limited to the latest version or modified version of the following standards)

Standard Code	Standard Name
GB /T 3906-2020	3.6kV ~ 40.5kV AC metal-enclosed switchgear and controlgear
GB/T 11022-2020	Common technical requirements for standards for high-voltage alternating current switchgear and controlgear
JB/T 9661	Low-voltage withdrawable switchgear
GB/T 7251	Low-voltage switchgear and controlgear
GB/T 4208-2017	Enclosure protection class (IP code)
GB/T 11032-2020	AC Metal Oxide Zinc Surge Arresters without Gap
a) Auxiliary standards for design, manufacture and inspection	
Standard Code	Standard Name
GB/T 11022-2020	Common technical requirements for standards for high-voltage switchgear and controlgear
GB/T 17626.2-2018	Electromagnetic compatibility test and measurement techniques Electrostatic discharge immunity test

## **9. Services on the supply side**

### ➤ Training services

✓ The Supplier shall provide free site training to the main contractor's technicians, maintenance personnel and operators.

✓ The personnel provided by the supplier responsible for training should have more than 5 years of maintenance experience in similar products.

✓ Training materials are provided free of charge by the supplier.

### ➤ Installation and commissioning guidance services

✓ The supplier, not only as a supplier of equipment, shall actively liaise with the main contracting unit and the supervisory unit according to the requirements of the main contracting unit, cooperate with the installation work and be responsible for commissioning, participate in the project meeting, and be responsible for the operation results of the system accordingly.

➤ after-sales service

✓ The supplier's maintenance personnel need to arrive at the site within 24 hours after receiving the maintenance call and provide uninterrupted service until the end. The maintenance point needs to provide enough spare parts to adapt to the main contractor's maintenance needs.

✓ The supplier shall provide a warranty period for the whole set of equipment in accordance with the terms of the contract, and provide timely and free repair and maintenance services during the warranty period.

✓ Upon completion of the repair work, the supplier shall provide a report in triplicate to the main contractor, including the test report, analysis of the cause of the failure, measures to solve the problem, the time taken to complete the repair and the date of resumption of normal operation.

✓ After the expiry of the warranty period, the supplier shall provide lifelong maintenance service for the equipment.

## **10. Acceptance requirements**

➤ Scope of supply

✓ Complete capacitor compensation cabinets are supplied in integral in-situ mounting configurations.

✓ All the equipment within the scope of supply must be able to form a whole, complete its function and meet the requirements of the technical parameters, where the supply of insufficient parts, omissions and other reasons for the equipment can not operate normally or can not meet the performance requirements, the supplier is required to unconditionally make up for the equipment until the equipment can operate normally and meet the performance requirements.

✓ All equipment provided by the supplier must be accompanied by manuals, quality inspection certificates and other random related information, and provide proof of origin.

➤ handover of data



✓ The technical information is required to be in a bound volume, including the following:

- Outline drawings, foundation requirements drawings, nameplate drawings, primary and secondary drawings
- Factory test report and product qualification certificate
- Installation instructions
- Four copies of the above information

✓ During the execution of the works, specific requests for the provision of certain information will be made, which the Supplier shall accept unconditionally.

✓ The date on which the designated representative of the Demanding Party signs for the Technical Data shall be deemed to be the date of delivery of the Technical Data.

✓ For technical information not included in the contract but necessary for the work, the Supplier shall provide it free of charge in a timely manner upon discovery.

✓ If any shortage, loss or damage of technical data is found after inspection by the representative of the Demanding Party, the Supplier shall make up for it within 7 days.

➤ Receiving and inspection procedures

✓ Product protection

- Take rain, moisture, rust, shock and other measures to avoid in the transport process, due to vibration and collision caused by bearing and other parts of the damage. When the equipment leaves the factory, the packaging of parts should be sorted and boxed, following the principle of suitable for transport, easy to install and find.
- Prior to shipment, equipment shall be protected against corrosion, damage and debris during transport and storage.

## **附件 3-1：技术要求**

### **1. 企业资质要求**

- 供方应持有国家有关行业管理部门颁发的高低压柜和配电柜生产资质证明。
- 持有本系统的 ISO9000 系列认证证书，并通过强制性产品认证（3C 认证）。
- 供方须满足当地供电部门的备案要求及当地的其他所有的市场准入条件。
- 设备制造商在硬质合金行业有 3 年以上批量生产同类中低压柜和配电柜的能力和经历。

### **2. 技术条件适用范围**

- 22kV 中压开关柜（KYN28）、直流屏。开关柜的设备用途、主要技术参数详见设备清单及相关图纸。
- 本技术要求为设备满足的最低要求，设备除满足本技术要求外还需满足与国家标准、设计要求，并按其中的最严格的要求执行。

### **3. 环境条件**

- 本次合同内供货产品应满足该项目所在地环境条件。产品使用环境温度不低于 45℃，生产厂家须能保证其产品能在当地环境条件下长期可靠运行)
- 安装地点：泰国罗勇工业园区内。
- 地震烈度：8 度
- 污染等级：3 级
- 运行温度：-15℃~45℃
- 海拔高度： <1000m
- 相对湿度：
  - 最大日平均相对湿度：95%。
  - 最大约平均相对湿度：90%。

### **4. 特殊说明**

- 本合同要求供方按照图纸要求对提供的最终图纸进行深化设计, 包含图纸内容勘误、所有柜内二次图纸的详细设计等并报送设计确认方可出图。另外报价包含派专人到场对现场安装进行指导的相关费用
- 供方应按照设备清单注明每台高压开关柜 (KYN28)、直流屏的编号、名称、用途等。同时应按系统图标出每一出线回路的回路编号、用途等, 并制作铭牌 (金属或塑料制品) 固定在每一出线回路上。
- 所有铭牌、标识均要求中英文双语对照标注。
- 高压柜内的开关等元器件须满足当地供电部门的备案要求及当地的其他所有的市场准入条件。
- 高压柜需按照招标要求制造, 且为品牌原厂柜, 并提供原产地证明文件。本次项目卖方提供的高压开关柜内所配置的真空断路器、真空灭弧室、微机保护装置、互感器、接地开关与开关柜同一品牌。

## **5. 22kV 中置式开关柜**

### **5.1 形式及额定参数**

- 1)类型: 金属铠装中置移开式开关柜 (KYN28)
  - ✓ 额定工作电压: 22kV
  - ✓ 最高工作电压: 24.2kV
  - ✓ 额定频率: 50Hz
- 2)开关柜额定参数:
  - ✓ 雷电冲击电压: 125kV (投标文件注明)
  - ✓ 1min 工频耐压 (有效值): 65kV (投标文件注明)
  - ✓ 额定短路开断电流 25kA
  - ✓ 额定短路持续时间 4s
  - ✓ 额定短时耐受电流 25kA

- ✓ 额定峰值耐受电流 80kA
- 3)母线动稳定电流（峰值）：出线柜 63kA，主母线符合 22KV 母线相关标准
- 4)母线热稳定电流（有效值，4s）：出线柜 25kA，主母线符合 22KV 母线相关标准
- 5)防护等级：外壳 IP4X 内部 IP3X
- 6)耐内部电弧条件：（提供相应的试验报告）电缆室 25kA；开关室 25kA
- 8)温升：柜体可触摸部件  $\leq 20K$  导体表面  $\leq 45K$
- 9)主母线材料采用铜母线：100×10 铜排（成套带来，搪锡且加装绝缘护套）。
- 10)开关柜柜顶设置柜顶小母线，规格 $\phi 8$  铜棒；
- 11)柜体颜色：按业主色标，生产前须发包方确认；
- 12)柜体材料：柜体采用覆铝锌板。
- 13)绝缘爬距：纯瓷  $\geq 18\text{mm/kV}$ ；有机  $\geq 20\text{mm/kV}$

## 5.2 结构要求

- 1)开关柜采用金属铠装、耐电弧的手车型开关柜，满足“五防”闭锁要求，主母线室、断路器室、电缆室、仪表室等均需铠装全封闭。开关柜自身应装设完善的机械闭锁及电气闭锁。
- 2)开关柜包括：母线室、断路器室、电缆室、控制仪表室，各室之间的防护等级为 IP3X，各室对外的防护等级为 IP4X。若有有机绝缘材料，应选用耐电弧、耐高温、阻燃、低毒、不吸潮且具有优良机械强度和电气绝缘性能的材料(SMC 或 DMC)。
- 3)开关柜本身二次线外裸在开关室的的部分应加阻燃防护，避免因高压电弧烧毁二次设备引起的事故。各柜间应有联通的金属线槽，供柜间控制回路导线联接使用。
- 4)柜体内带电部分对绝缘板净距，不得小于 30mm；单纯以空气作为绝缘介质

的开关柜柜体内相对地及相间空气距离：不得小于 180mm；柜体内带电部分相对地及相间外爬距：不得小于 240mm。若以复合绝缘作为绝缘介质的开关柜，最小空气间隙应满足下述要求：对 24kV 设备应不小于 60mm，绝缘材料应满足长期稳定使用需要，品牌不低于进口的 Raychem、3M。

- 5)主母线及引线，应全部做绝缘处理，可用热塑绝缘套管进行绝缘，绝缘耐压水平应达到 65kV 以上。
- 6)母线及引线连接处应加阻燃型的绝缘盒。
- 7)手车推至运行位置应有到位指示装置。
- 8)开关柜的正面应有铭牌（厂名、型号规格、出厂日期）、一次接线模拟图、柜位序号、手车序号。表计、信号继电器等元件应有标明用途的标志框。柜前后上沿应有路名、调度号标志框。
- 9)馈电柜装有机机构的门上要有观察孔，便于观察机构的分、合闸指示牌；电缆室应有一个电缆观察窗，并要求有防爆措施。
- 10)在后柜内要加装一根支持电缆头的横向角钢，并在角钢上部开卡孔。电缆接线端子双孔。
- 11)柜内固定绝缘隔板的金属螺丝要加装绝缘螺帽，既要保证绝缘又要保证强度。
- 12)开关柜的上、下部的通风孔要加隔尘网，并达到防护等级 IP4X。
- 13)柜后左侧加一个 M10 接地螺栓，并要有接地标记作为接地点供挂地线用。
- 14)隔离开关的动、静刀应为圆角，母线端部也应倒圆角并包有绝缘。
- 15)断路器应安装在一个小车上，并带有拉出可动部分所必需的装置，具有相同参数和结构的各元件应能互换。开关柜具备紧急分闸功能，在紧急情况下，无需任何操作工具，即可在断路器门板上进行紧急机械分闸。所有断路器均应配动作计数器，要求动作正确可靠，寿命长，显示清晰，安装于各柜手车正面，运行中可视。断路器具有可靠的机械防跳功能，完全避免与线圈监视回路冲突引起的

故障并避免电气接点粘结或防跳继电器断线导致的防跳失效，与综保防跳互为备用，保证可靠。所有操作机构各辅助开关的接线，除特殊要求外，同规格均采用相同的连线以保证手车的互换性，手车上配有机械式计数器，用于合闸时计数，计数器应安装在手车面板上，并有观察孔，断路器手车面板上设有机械式分合闸状态指示、弹簧储能状态指示和手动分合闸按钮，指示器易于观察。

- 16)开关柜的金属隔板应可靠接地，接地导体和接地开关应能耐受额定短时耐受电流和额定 峰值耐受电流。
- 17)在运行位置的隔离插头应能耐受额定短时耐受电流各额定峰值耐受电流的冲击，并保证接触良好。
- 18)安全挡板：提供一套金属挡板，手车拉出时自动封住三相固定隔离触头，手车推入时金属挡板自动打开。
- 19)当小车位于试验位置时，隔离插头完全断开，安全挡板自动关闭（上、下挡板可分别打 开、关闭）以防止操作人员接触到带电部分。
- 20)开关柜是金属外壳，地板和墙壁均不能作为壳体的一部分，电缆连接在柜的下部进行， 电缆室应有足够的空间。一次电缆端子距地面高度不小于 700mm，预留三个由 150mm 的电缆接线孔。
- 21)开关柜的各室均有与壳体相同的防护等级的压力释放装置，其压力出口的位置确保对人 身没有危害，压力释放装置正常情况下关闭，在事故情况下压力出口打开，自动释放内 部压力，同时将内部故障限制在本隔室内。
- 22)母线为电解铜板，装在单独的母线室内，母线排列 A、B、C 相顺序应为从上到下，或从左到右，或从里到外（从柜前观察），并标注相标，即：第一相 A 棕色，第二相 B 黑色，第三相 C 灰色。
- 23)金属部件的接地：所有金属部件（包括所有安装在开关柜上的继电器、仪表盘）外壳都 应接地，接地线应为铜导体，其截面应不小于 10mm<sup>2</sup>，距地面

150mm，与柜体绝缘。

- 24)接地设施：接地功能应是开关柜整体设计的一部分，所有出线回路必须有接地开关。
- 25)开关柜应满足安装在两侧有两根槽钢的通长电缆沟的基础上。
- 26)柜内必须加装温湿度控制器，及除潮电热。并能实现超温报警。
- 27)开关柜进出线方式为：电缆上进上出。

### 5.3 开关柜闭锁要求

- 1)出线地刀闭锁要求：出线地刀与手车位置机械闭锁。
- 2)开关柜电缆室门（包括封板）应与接地刀实现闭锁保证接地刀合上后方可开门。
- 3)闭锁回路使用的手车位置接点，应保证在手车插嘴离开静触头足够安全距离后保持接通（包括检修位置）。
- 4)带电显示器的安装位置应保证操作地刀、接地车时运行人员可以看到，不应装CT上。
- 5)地刀、接地车、柜门的闭锁应具备解锁功能。
- 6)在开关柜里的元件应装有联锁，小车只有当断路器断开时才能拉出，接地开关和断路器应有可靠联锁，对于操作接地开关应有清楚的指示计指示出线侧无电压，且断路器断开以防误操作；

### 5.4 开关柜内主要电气设备：

- 1) 断路器：
  - ✓ 类型：真空断路器
  - ✓ 品牌及型号：按品牌清单，参数/档次不低于图纸要求
  - ✓ 额定电压：22kV
  - ✓ 额定电流：详见图纸

- ✓ 1min 工频耐压：65kV。
- ✓ 雷电冲击耐压：125kV
- ✓ 额定短路开断电流：25/31.5kA
- ✓ 额定短路持续时间：4s
- ✓ 额定短时耐受电流：25kA /31.5kA
- ✓ 额定峰值耐受电流：63kA /80kA
- ✓ 电气寿命：开断额定短路电流>30 次 合闸时间≤0.2s 分闸时间 <0.05s 机械寿命>20000 次 插头机械寿命>3000 次。
- ✓ 灭弧室外壳采用陶瓷材料制造，出厂时其真空度应≤ $1.33\times 10^{-6}$ Pa，有效期大于 20 年。
- ✓ 操动机构：
  - 分闸线圈个数 1
  - 合闸线圈个数 1
  - 分闸线圈动作范围（65%~120%）110V DC
  - 合闸线圈动作范围（80%~110%）110V DC
  - 分闸线圈不动作范围（0~30%）110V DC
  - 电动机 110V DC
  - 切电感电流 0.5A ~ 15A 时，过电压倍数不超过 2.5，应提供试验报告。
- ✓ 断路器设计
  - 断路器为三相手车式主回路及所有辅助回路的隔离插头应为免维护型。每个断路器应有一套机械联动的关合位置指示器及动作计数器，其安装位置要易于观察。开关使用年限：保证 20 年。机械部分免维护时间不得少于 3 年。
  - 断路器操动机构应有防跳功能。操动机构的每一部件应为紧固结构，在必要部位使用防腐、防锈材料。整体的设计应使操作时产生的机械振动最小。



断路器在“合”或“分”位置，机械弹簧均能储能。如果弹簧未能完全储能，断路器不能合闸，应提供一个可观察的指示装置来表示弹簧的状态，最好为机械型。直流电机用来给弹簧机构自动储能。断路器完全合闸后，机构操作弹簧应立即自动开始储能。在机构里，应有一套紧急情况下的手动操作储能装置。弹簧储能断弧双接点串接或具有消弧功能。

- 断路器手车完全处于插入位置时，应提供有效的接地方式与固定柜体相连。相同载流量的手车可以互换。
- 真空断路器需采用市场认可度较高的梅花触头，不得采用其它结构的触头形式。

✓ 真空断路器

- ·在电寿命试验中开断时间的变化不得大于 13ms;
- ·在电寿命试验中后开相的燃弧时间不大于 15ms;
- ·分闸反弹幅值不大于 2mm; 合闸弹跳时间不大于 1ms。
- ·备件：分合闸线圈各 3 只，转换开关 3 个，微动开关 3 只，二次插头 2 个（两侧）。

✓ 品牌要求：见品牌表

➤ 5) 接地开关

✓ ·额定短时耐受电流：25kA (4s)

✓ ·额定峰值耐受电流：80kA

✓ ·在最大关合电流（63kA）时，不维修允许合闸次数应>2 次，机械>3000 次

✓ ·操动机构：手动

✓ 品牌要求：见品牌表(国产优质品牌)

➤ 6) 电流互感器：

✓ ·电流互感器应满足参数要求。当二次侧开路时，二次侧能承受电压 3000

V/1min，每个 CT 的二次绕组一点接地。应提供每种形式各参数的 CT 磁化特性曲线和 10%误差特性曲线。每个 CT 应独立标号并提供接线图。

✓ 技术参数

- 类型：树脂浇铸
- 局部放电量：≤10PC
- 额定短时耐受电流：40/31.5kA (4s)
- 额定峰值耐受电流：100/80kA

✓ 品牌要求：见品牌表

➤ 7)过电压保护器

✓ 型号和规格详见图纸。

- 系统额定电压有效值：22KV
- 保护器额定电压有效值 24 KV
- 工频放电电压有效值<25KV
- 1.2/50 冲击放电电压峰值>41 KV
- 陡波冲击电流下残压峰值>46 KV
- 雷电冲击电流下残压峰值>41 KV
- 操作冲击电流下残压峰值>35 KV
- 2mS 方波通流容量 800A

➤ 品牌要求：见品牌表

## 5.5 开关柜二次技术要求：

➤ 1)开关柜辅助电源：

- ✓ ·操作及显示装置：110V DC
- ✓ ·电动机：110V DC
- ✓ ·内部照明：220V AC

- ✓ ·加热电阻：220V AC
- 2)继电器室、电缆室应有照明装置，照明电源电压为交流 220V，并设专用电源开关。
- 3)柜内应有自动加热驱潮设施。加热器电源为交流 220V。电缆室与断路器室各一个，功率为 50W 左右。
- 4)每个进线和馈线回路需安装数字式多功能表，可显示电压、电流、功率、功率因数等，带电计量功能和通讯功能（RS-485，MODBUS/RTU 协议）。
- 5)柜上信号指示应选用节能型长寿命的 LED。
- 6)柜内应选用凤凰 V0 级阻燃型端子，导线应具有阻燃性能。互感器回路导线截面不小于 4mm<sup>2</sup>。
- 7)连接片（压板）使用限位型。
- 8)所使用的插件须有定位装置，反向时带电部分不得接触，并有方向标志。
- 9)手车在工作位置时，插件插头不得拔出。
- 10)插件中的重合闸回路、分合闸的触头要求二保一（指插针并接使用）。
- 11)断路器掉、合闸回路及重合闸（包括自投）回路并双接点。
- 12)开关辅助接点至少 8 对（8 常开、8 常闭），应有 2 对备用并引至端子排。
- 13)直流保险采用直流空开。
- 14)掉、合闸线接压板上方，重合闸正极接压板上方。
- 15)端子排及二次插件的交、直流间，掉、合闸与正、负极之间必须留有空档或加隔板。
- 16)柜内应有总量 10%的空端子供用户使用，最少不应少于 10 个。
- 17)继电器、仪表及操作按钮的安装位置应便于观察及操作。
- 18)每件设备的装配和接线均应考虑在不中断相邻设备正常运行的条件下无阻碍地接触各 机构器件并能完成拆卸、更换工作。盘内所有设备的布置应考虑在不需专用工具的情况下方便地接触其接线端子，接线端子号应清晰可见。

- 19)面板上有动态模拟线路图（可显示开关分、合闸状态；手车位置，接地开关状态等）。

## 5.6. 控制、保护系统

- 型号和参数见图纸
- 24 小时的电流、电压（相/线）、功率、功率因数监测及液晶面板显示。
- 具有通讯功能（RS-485 接口，MODBUS/RTU 协议,）。
- 通用技术参数要求
- ✓ 额定数据
  - 装置电源：DC/AC 86 ~ 265V
  - 操作电压：AC/DC220V ， DC110V（以图纸为准）
  - 交流电压： $100/\sqrt{3}V$  或 100V
  - 交流电流：5A 或 1A
  - 频率：50Hz
- ✓ 功率消耗
  - 直流回路： < 10W（正常工作）； < 15W（保护动作时）
  - 交流电压回路： < 0.5VA/相
  - 交流电流回路： < 1VA/相（In=5A）； < 0.5VA/相（In=1A）
- ✓ 过载能力
  - 交流电压： 1.2 倍额定电压连续工作
  - 测量电流： 1.2 倍额定电流连续工作
  - 保护电流： 2 倍额定电流连续工作
  - 10 倍额定电流，允许 10s
  - 40 倍额定电流，允许 1s
- ✓ 定值整定范围及误差

- 定值最大整定范围
  - ※ 电压元件: 1V ~ 120V
  - ※ 电流元件: 0.1In ~ 20In
  - ※ 频率: 45.00Hz ~ 55.00Hz
  - ※ 时间: 0.00s ~ 100.00s
- 定值误差
  - ※ 电流及电压定值:  $\leq \pm 3\%$ 整定值
  - ※ 频率定值:  $\leq \pm 0.02\text{Hz}$
  - ※ 角度定值:  $\leq \pm 2^\circ$
- ✓ 测量精度
  - 交流电流、交流电压: 0.2 级
  - 功率: 0.5 级
  - 积分电度: 1.0 级 (有功) , 2.5 级 (无功)
  - 频率:  $\leq \pm 0.02\text{Hz}$
  - SOE 分辨率:  $\leq 2\text{ms}$
- ✓ 跳、合闸出口接点容量
  - 可长期接通 DC 250V, 6A。
- 保护功能要求
  - ✓ 线路保护: 三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护、三相一次重合闸等。
  - ✓ 母联保护: 母充保护、三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护等。
  - ✓ 变压器保护: 三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护、非电量保护等。

- ✓ 电动机保护：速断保护、启动时间过长、堵转保护、负序反时限保护、过负荷保护、过热保护、零序过流保护、过电压保护、低电压保护等。
- ✓ PT 监控切换装置：PT 并列、I 母接地告警、II 母接地告警、I 母 PT 断线告警、II 母 PT 断线告警等。
- ✓ 电容器保护：三段式过流保护、反时限过流保护、零序过流保护、过电压保护、不平衡保护、非电量保护等、电容器投切等。

➤ 品牌要求：见品牌表

## 6. 直流屏技术要求

➤ 型号：GZDW31-110/110M 110Ah (阀控式密封铅酸蓄电池)

➤ 主要技术参数：

- 交流输入电压：380±15%,50Hz±15%
- 直流输出电压：110V
- 浮充电压：198~290V
- 均充电压：230~315V
- 稳压精度：≤0.5%
- 稳流精度：≤1%
- 纹波因数：≤0.3%
- 充电模块间电流不均衡度：≤5%
- 功率因数：>0.9
- 效率：>90%
- 介电强度：2000V 1Min
- 环境温度：-5°C~+40°C
- 噪声：≤60dB
- 交流输入为 1 路 (AC380V) ,输出回路为 10 个，其中 5 个为动力回路，5

个为控制回路

- 柜体设置电流、电压指示
- 柜体设置电流、电压指示
- 柜体颜色：米灰（RAL7035）（暂定，制作前需甲方确认）

➤ 主要性能要求

- 直流电源屏采用微机型高频开关直流电源柜，电源柜应采用模块化高频开关充电模块，模块式结构，采用 N+1 热备方式，并能在线更换带电插拔。
- 直流电源屏由交流双电源切换单元、智能高频开关充电模块、蓄电池组、DC/DC 转换器、直流母线自动(手动)调压装置、馈电单元、绝缘故障监测装置、智能监控单元等组成。
- 直流电源屏采用双充电机双组电池。
- 蓄电池必须标明品牌、型号及出产地，采用高品质、性能良好的阀控式铅酸免维护蓄电池。
- 蓄电池浮充使用寿命不少于 10 年。
- 充电装置采用智能型高频开关电源充电模块，采用 N+1(N≥2)热冗余方式并联组合供电，任一个模块故障不应影响系统正常运行。
- 充电模块应具有如下功能：
  - ※ 良好的可互换性
  - ※ 可带电插拔
  - ※ 可脱离监控单元独立运行
  - ※ 具有限流充电和限流输出功能
  - ※ 可根据温度变化对电池充电电压进行补偿
  - ※ 具有防止蓄电池过充功能
  - ※ 具有短路、过流等保护及报警措施

※ 交流输入端具有雷电防护措施

- 模块应采用相应的开关控制技术，提高电源的可靠性，改善功率因数。
- 模块在小负载情况下也应具有良好的均流性。
- 微机绝缘在线监测装置对母线电压、母线对地绝缘电阻及各馈出回路绝缘状况进行测量判断，超出正常范围时发出报警信号，并指示发生故障的馈出回路，把相关信号送至监控系统。
- 可自动或手动调整直流母线电压。如果选用斩波无级调压，必须有防止因其损坏造成断电的措施。

➤ 监控单元：

- 监控单元采用微型(全中文界面)产品并应具有以下功能：
- 自诊断、掉电后来电自恢复等功能。
- 监测交流进线电压、各整流装置的输出电压、电流，直流母线电压、电流，浮充电压，充电电流，蓄电池输出电流以及绝缘电压等。
- 对设备发生下列状况进行保护并发出报警：交流电压异常、充电装置故障、母线电压异常、蓄电池异常、母线接地等。
- 可以检测蓄电池容量，根据蓄电池的充电特性曲线及特点，控制充电机自动完成对蓄电池的充电及充电方式的转换。
- 5 对整个直流系统的运行状态进行实时监控，由 RS485 通信接口与变电所综合自动化系统上位监控机通信，实现遥控、遥测、遥信功能，协议开放，满足无人值班的要求。
- 遥控量：进线开关，单个充电模块开/关机，电池均充和浮充转换等。
- 遥测量：交流输入电压、充电装置输出电压和电流、电池充放电电压和电流、直流母线电压和电流等。
- 遥信量：装置正常工作状态信号、故障状态信号、直流母线过/欠压、直流



馈线绝缘状况、交流电源缺相或中断、开关状态等。

- 在整套装置上必须有状态显示信号
- 工作状态显示信号至少有下列指示：
  - ※ 电源投入
  - ※ 各馈电开关位置信号等
  - ※ 故障状态显示信号至少有下列内容：
    - ※ 进线失压故障
    - ※ 充电模块故障
    - ※ 直流母线电压过高
    - ※ 直流母线电压过低
    - ※ 直流电源绝缘下降
    - ※ 蓄电池电压过低
    - ※ 蓄电池故障
    - ※ 馈电回路短路故障
- 测量表计：
  - 采用数字测量表计。直流表计准确度不低于 1.0 级，附加分流器准确度不低于 0.5 级。选用的电流、电压表量程考虑过负荷运行时有适当的裕度。
  - 测量内容有：交流电源电压、浮充电压、浮充电流、母线电压、输出电流、蓄电池电压、蓄电池充/放电压、放电电流等。
- 结构型式及柜内元器件：
  - 直流屏靠墙安装，柜前检修维护及接线。
  - 直流电源屏柜体正面采用玻璃门，所有设备均装于柜内安装板上，监控装置及仪表安装于易于观测的位置。
  - 直流屏均应采用优质钢材，并进行严格的表面处理，采取合适的防腐蚀措施，

制成的面板和盘架应有足够的机械强度，保证元件安装后及操作时无摇晃，盘面板及盘架无变形等。

- 盘内元器件安装及走线要求整齐可靠。布置合理，电器间绝缘应符合相关规定。盘体结构应通风良好。
- 引进引出盘外的导线必须经过端子排，大电流端子、一般端子、弱电端子之间应间隔。端子排的设计应保证运行、检修、调试方便，并应适当考虑与设备位置对应。端子排导电部分为铜质，大小应与所接电缆相配套。盘内应预留一定数量的端子。
- 直流设备的电气间隙、爬电距离、间隔距离、外接导线端子的接线和安装，均应满足相关国标规定。
- 盘面布置应简洁、美观。盘面的正面采用全开门方式，各馈电开关的位置信号应与开关对应，便于维护人员的操作。
- 柜内安装的元器件均应采用优质元器件，主要元件（如断路器、指示灯、按钮等）采用原装进口或国内合资厂生产的世界知名品牌（ABB、SIEMENS、Schneider）产品，并具有良好的通用性和互换性，应在投标文件中注明主要元器件的型号及厂家。电源模块应通过相关鉴定，并有成熟使用经验，并提供证明文件。
- 导线、导线颜色、指示灯、按钮、行线槽、涂漆，均应符合国家或行业现行的有关标准的规定。其中导线应选用铜线，直流母线选用铜母线。截面选择

必须满足系统容量的要求。在投标文件中应注明选用导线的规格。

- 同类元器件的接插件应具有通用性和互换性，应接触可靠、插拔方便。接插件的接触电阻、插拔力、允许电流及寿命，均应符合国家及有关行业现行标准的规定。

- 外壳防护等级：IP4X

- 柜体尺寸（宽×深×高）：800×600×2260(mm),允许有小范围不同.

➤ 蓄电池品牌要求：山东齐源蓄电池有限公司、天津盛杰科技发展有限公司、戈麦斯特（天津）科技有限公司

## 7. 其他要求

➤ 用做现场安装的预留孔或另外可能导致灰尘、水及其他物体进入的孔洞必须用密封件加以遮盖。

➤ 落地安装的柜体顶部设有吊环，易于安装。在柜门内侧安装图纸架，用于存放图纸和资料。产品出厂时，柜体的底部有木质底座，易于叉车铲入底部运输。

➤ 试验

✓ 仔细核对设计图纸，并对设备进行检测，并出书面检测报告。

✓ 配套设备合格证明书及试验报告必须符合各自产品技术标准。

## 8. 开关柜的技术规范及标准

设计、制造、检验、执行的主要标准（应遵循并不限于下列标准的最新版本或修改版本）

标准代号	标准名称
GB /T 3906-2020	3.6kV ~ 40.5kV 交流金属封闭开关设备和控制设备
GB/T 11022-2020	高压交流开关设备和控制设备标准的共用技术要求
JB/T 9661	低压抽出式成套开关设备

GB/T 7251 低压成套开关设备和控制设备

GB/T 4208-2017 外壳防护等级(IP 代码)

GB/T 11032-2020 交流无间隙金属氧化物避雷器

a) 设计、制造、检验执行的辅助标准

标准代号 标准名称

GB/T 11022-2020 高压开关设备和控制设备标准的共用技术要求

GB/T 17626.2-2018 电磁兼容试验和测量技术 静电放电抗扰度试验

## 9. 供方的服务

### ➤ 培训服务

- ✓ 供方须对总包方的技术人员、维修人员及操作人员进行免费工地培训。
- ✓ 供方提供的负责培训的人员应具备同类产品 5 年以上的维修经验。
- ✓ 供方免费提供培训材料。

### ➤ 安装及试运行指导服务

✓ 供方不仅仅作为设备供方，应按总包方要求积极与总包单位、监理单位联系，配合安装工作并负责调试，参与项目会议，并对系统的运行结果负相应责任。

### ➤ 售后服务

✓ 供方维修人员需在接到维修电话后 24 小时内赶到现场，提供不间断的服务直到结束。维修点需提供足够的备件以适应总包方维修需求。

✓ 供方须对整套设备按合同条款要求提供质保期，质保期内提供及时和免费维修保养服务。

✓ 维修工作完成后，供方需提供一式三份报告给总包方，包括测试报告、故障原因分析，解决措施，完成修理所费时间及恢复正常运行日期。

- ✓ 质保期满后，供方须提供设备的终身维修服务。

## 10. 验收要求

### ➤ 设备供货范围

- ✓ 提供完整的电容补偿柜，为整体就地安装结构。
- ✓ 所有供货范围内的设备，均必须能组成以整体，完成其功能并达到技术参数要求，凡因供货部件不足、遗漏等原因造成设备不能正常运行或达不到性能要求，供方均需无条件补足直至设备能正常运行并达到性能要求。

- ✓ 供方所提供的所有设备必须附带说明书、质量检验合格证等随机相关资料，并提供原产地证明。

➤ 资料交接

- ✓ 技术资料要求装订成册，包括以下内容：
  - 外形图、基础要求图、铭牌图，一次图、二次图
  - 出厂试验报告及产品合格证明
  - 安装使用说明书
  - 以上资料一式四份
- ✓ 在工程实施过程中，会对某些资料的提供提出具体要求，供方应无条件接受。
- ✓ 需方指定代表签收技术资料的日期视为技术资料交货日期。
- ✓ 对于未列入合同的技术资料，但是本工程所必需的，一经发现，供方应及时免费提供。
- ✓ 需方代表检查后发现技术资料有短缺、遗失或损坏，供方应于 7 天内补齐。

➤ 验收程序

- ✓ 产品保护
  - 采取防雨、防潮、防锈、防震等措施，以免在运输过程中，由于振动和碰撞引起轴承等部件的损坏。设备出厂时，零部件的包装应分类装箱，遵循适于运输、便于安装和查找的原则。
  - 设备发运前，应采取保护措施，以防止在运输和储存期间遭受腐蚀、损伤

及进入杂物。

## **Annex 3-1: Technical requirements**

### **1. Supplier Qualification Requirements**

- The supplier shall hold the qualification certificate for the production of high and low voltage cabinets and distribution cabinets issued by the relevant national industry management department.
- Hold the ISO9000 series certification of this system, and through the mandatory product certification (3C certification).
- The supplier must comply with the registration requirements of the local power authority and all other local market entry conditions.
- The manufacturer must have at least three years of experience in the mass production of similar high- and low-voltage cabinets and distribution panels in the automotive industry.

### **2. Scope of application of the technical conditions**

- 22kV high-voltage switchgear (KYN28), DC screen. The equipment use and main technical parameters of the switchgear are detailed in the equipment list and relevant drawings.
- This technical requirements for the equipment to meet the minimum requirements, equipment in addition to meet the technical requirements also need to meet the national standards, design requirements, and according to the most stringent requirements of the implementation.

### **3. environmental conditions**

- The products supplied in this contract should meet the environmental conditions of the project site. The product's operating ambient temperature should not exceed 45°C , and the manufacturer should be able to ensure that the product can operate reliably for a long period of time under the local ambient conditions).
- Installation Location: Inside Thailand Golden Heron Cemented Carbide Production Base, Block D61, Block 1, WHA Weihua East Coast Industrial Estate, Chonburi, Thailand.

- Seismic intensity: 8 degrees
- Pollution Level: 3
- Operating temperature: -15°C ~45°C
- Altitude: <1000m
- Relative humidity:
  - Maximum daily average relative humidity: 95 per cent.
  - Maximum approximate average relative humidity: 90 per cent.

#### **4. special specification**

- This contract requires the supplier to deepen the design of the final drawings provided in accordance with the requirements of the drawings, including the contents of the drawings, errata, detailed design of all the secondary drawings in the cabinet and submit the design confirmation can be out of the picture. In addition, the offer includes the cost of sending a person to the site to guide the installation of the site
- The supplier must clearly mark each high-voltage switchgear (KYN28) and DC panel with its serial number, model, purpose, and specifications according to the equipment list. At the same time, the circuit number and purpose of each outlet circuit shall be marked out according to the system diagram, and a nameplate (metal or plastic) shall be made and fixed on each outlet circuit.
- All nameplates, labels, and markings must be provided in both English and Chinese.
- Components such as switches in high voltage cabinets shall meet the filing requirements of the local power supply authority and all other local market access conditions.

#### **5. 22kV centre-mounted switchgear**

##### **5.1 Form and rating parameters**

- 1) Type: Metal-clad withdrawable switchgear (KYN28)
- ✓ Rated working voltage: 22kV
- ✓ Maximum working voltage: 24.2kV



- ✓ Rated frequency: 50Hz
- 2) Switchgear rating parameters:
  - ✓ Lightning impulse withstand voltage: 125kV (indicated in the tender document)
  - ✓ 1min industrial frequency withstand voltage (RMS): 65kV (specified in the bidding document)
  - ✓ Rated short-circuit breaking capacity 25kA
  - ✓ Rated short-circuit duration: 4s
  - ✓ Rated short-time withstand current 25kA
  - ✓ Rated peak withstand current 80kA
- 3) Busbar dynamic stable current (peak): 63kA in the outlet cabinet, the main busbar conforms to the relevant standards of 22KV busbar.
- 4) Busbar rated short-time withstand current (RMS, 4s): 25kA in the outlet cabinet, main busbar in line with the relevant standards for 22KV busbar
- 5) Degree of protection: IP4X for the external enclosure, IP3X for internal compartments.
- 6) Resistance to internal arcing conditions: (Provide the corresponding test report) 25kA for cable room; 25kA for switch room.
- 8) Temperature rise: cabinet touchable parts  $\leq 20K$  conductor surface  $\leq 45K$
- 9) Main busbar material used is copper busbar: 100× 10 copper rows (brought in sets, tin-lined and fitted with insulating sheaths).
- 10) Switchgear cabinet top set up cabinet top small busbar, specification  $\varnothing 8$  copper rods;
- 11) Cabinet colour: according to the owner's colour code, to be confirmed by the contractor before production;
- 12) Cabinet material: the cabinet is made of aluminium-zinc-coated sheet.
- 13) Insulation creepage: Pure porcelain  $\geq 18\text{mm/kV}$ ; Organic  $\geq 20\text{mm/kV}$ .

## **5.2 Structural requirements**

- 1) The switchgear cabinet adopts metal-armoured, arc-resistant manual type

switchgear to meet the requirements of "five-proof" interlocking, and the main busbar room, circuit breaker room, cable room and instrumentation room should be armoured and fully enclosed. The switchgear itself should be equipped with perfect mechanical and electrical locking.

- 2) Switchgear cabinet includes: busbar room, circuit breaker room, cable room, control instrument room, the protection level between each room is IP3X, the protection level of each room to the outside of the room is IP4X. If organic insulating materials, should be selected arc-resistant, high temperature resistant, flame retardant, low toxicity, non-absorbent moisture and has excellent mechanical strength and electrical insulation properties of the material (SMC or DMC).
- 3) The secondary wires of the switchgear itself should be protected by flame retardant protection to avoid accidents caused by high voltage arcs burning the secondary equipment. Each cabinet should be connected to the metal groove for inter-cabinet control circuit wire connection.
- 4) The cabinet charged part of the insulating plate net distance: shall not be less than 30mm; cabinet relative to the ground and the air distance between phases: shall not be less than 180mm; the cabinet charged part of the relative ground and phase creepage distance: shall not be less than 240mm.
- 5) The main busbar and lead wires should be insulated, and can be insulated with thermoplastic insulating sleeves, and the insulation voltage resistance level should be more than 65kV.
- 6) Busbar and lead connection should be added with fire-retardant type insulated box.
- 7) The circuit breaker trolley must have a position indication device to confirm proper engagement in the operating position.
- 8) The front of the switchgear should have a nameplate (factory name, model specification, date of shipment), a wiring simulation diagram, cabinet serial number, trolley serial number. Meters, signal relays and other components should be marked

with the use of the sign box. Cabinet before and after the upper edge should be the road name, regulation number sign box.

- 9) The feeder cabinet is equipped with a mechanism of the door to have observation holes, easy to observe the mechanism of the opening and closing signs; cable room should have a cable observation window, and requires explosion-proof measures.
- 10) A transverse angle to support the cable head is to be added to the rear cabinet with a card hole in the upper part of the angle. Double holes for cable terminals.
- 11) The metal screws in the cabinet fixing the insulated partitions should be fitted with insulated nuts to ensure both insulation and strength.
- 12) Ventilation holes in the upper and lower parts of the switchgear should be equipped with a dust screen and meet protection class IP4X.
- 13) Add a M10 grounding bolt on the left side of the back of the cabinet, and there should be a grounding mark as a grounding point for hanging the earth wire.
- 14) The movable and static knives of the disconnecting switches shall be rounded, and the busbar ends shall also be chamfered and wrapped with insulation.
- 15) Circuit breakers shall be mounted on a trolley with devices necessary for pulling out the movable parts, and components having the same parameters and construction shall be interchangeable.
- 16) The metal partitions of the switchgear shall be reliably earthed, and the earthing conductor and earthing switch shall be capable of withstanding the rated short-time withstand current and the rated peak withstand current.
- 17) The disconnecting plugs in the operating position shall be able to withstand the inrush of the rated short-time withstand current of each rated peak withstand current and ensure good contact.
- 18) Safety baffle: provide a set of metal baffle, automatically seal the three-phase fixed isolation contacts when the trolley is pulled out, and automatically open the metal baffle when the trolley is pushed in.
- 19) When the trolley is in the test position, the isolating plug is completely

disconnected and the safety flaps are automatically closed (the upper and lower flaps can be opened and closed respectively) to prevent the operator from contacting the live parts.

➤ 20) The switchgear cabinet is a metal enclosure, the floor and walls cannot be used as part of the enclosure, cable connections are made in the lower part of the cabinet, and the cable room should have enough space. The cable room should have enough space. The height of the primary cable terminal from the ground should not be less than 700mm, and three cable wiring holes of 150mm should be reserved.

➤ 21) Each compartment of the switchgear is equipped with a pressure relief device of the same degree of protection as the housing, with pressure outlets positioned so as to ensure that there is no danger to the human body; the pressure relief device is closed under normal conditions, and in the event of an accident the pressure outlets are opened, releasing the internal pressure automatically and at the same time restricting internal faults to this compartment.

➤ 22) The busbar is electrolytic copper plate, installed in a separate busbar room, the busbar arrangement of phase A, B and C shall be in the order from top to bottom, or from left to right, or from inside to outside (viewed from the front of the cabinet), and marked with the phase marking, i.e.: the first phase A in brown, the second phase B in black, and the third phase C in grey.

➤ 23) Grounding of metal parts: All metal parts (including all relays and instrument panels installed on the switchgear) should be grounded, and the grounding wire should be a copper conductor with a cross-section of not less than 10mm<sup>2</sup>, 150mm from the ground and insulated from the cabinet.

➤ 24) Earthing facilities: The earthing function should be part of the overall design of the switchgear, and all outgoing circuits must have earthing switches.

➤ 25) The switchgear shall cater for installation on the base of a through-length cable trench with two channels on either side.

➤ 26) The cabinet must be installed with temperature and humidity controller, and

moisture removal electric heat. And can achieve over-temperature alarm.

➤ 27) The switchgear inlet and outlet modes are: cable inlet and outlet.

### **5.3 Switchgear lockout requirements**

➤ 1) Outgoing ground knife locking requirements: outgoing ground knife and handcart position mechanical locking.

➤ 2) The switchgear cable room door (including the sealing plate) should be interlocked with the grounding knife to ensure that the door can be opened only after the grounding knife is closed.

➤ 3) The trolley position contact used in the latching circuit shall be such that it remains switched on after the trolley nozzle has been moved a sufficiently safe distance from the static contact (including the service position).

➤ 4) The installation position of the charged display should ensure that the operation of the ground knife, grounded car when the operating personnel can see, should not be installed on the CT.

➤ 5) The latching of the ground cutter, grounding car and cabinet door should have an unlocking function.

➤ 6) Components in the switchgear cabinet should be equipped with interlocks, the trolley can only be pulled out when the circuit breaker is disconnected, the earth switch and the circuit breaker should have reliable interlocks, and for the operation of the earth switch there should be a clear indicator to show that there is no voltage on the outgoing side and that the circuit breaker is disconnected in order to prevent misoperation;

### **5.4 Main electrical equipment in switchgear:**

➤ 1) Circuit breakers:

✓ Type: Vacuum Circuit Breaker

✓ Brand and model: according to the brand list, the parameters / grade is not lower than the drawing requirements

✓ Rated voltage: 22kV

✓ Rated current: see drawing for details

- ✓ 1min industrial frequency withstand voltage: 65kV.
- ✓ Lightning surge withstand voltage: 125kV
- ✓ Rated short-circuit breaking capacity: 25/31.5kA
- ✓ Rated short circuit duration: 4s
- ✓ Rated short-time withstand current: 25kA /31.5kA
- ✓ Rated peak withstand current: 63kA /80kA
- ✓ Electrical life: opening rated short-circuit current >30 times Closing time ≤ 0.2s  
Breaking time <0.05s Mechanical life >20000 times Plug mechanical life >3000 times.
- ✓ Manoeuvring mechanism:
  - Number of breakout coils 1
  - Number of closing coils 1
  - Operating range of the breaking coil (65% to 120%) 110V DC
  - Closing coil operating range (80% to 110%) 110V DC
  - Operating range of the breaking coil (0 to 30%) 110V DC
  - Motor 110V DC
  - Cutting inductance current 0.5A ~ 15A, overvoltage multiplier does not exceed 2.5, should provide test reports.
- ✓ Circuit breaker design
  - The circuit breakers shall be of three-phase trolley type and the disconnecting plugs for the main circuit and all auxiliary circuits shall be of maintenance-free type. Each circuit breaker should have a set of mechanically linked closing position indicators and action counters, which should be installed in a position that is easy to observe. Service life of the switch: Guaranteed 20 years. The mechanical parts shall be maintenance free for not less than 3 years.
  - The operating mechanism of the circuit breaker shall have an anti-trip function. Each part of the actuator shall be of fastened construction, with corrosion- and rust-resistant materials used where necessary. The overall design shall minimise mechanical vibration during operation. The breaker shall be designed so that the

mechanical springs can store energy in either the "close" or "open" position. If the spring is not fully energised and the circuit breaker fails to close, an observable indicator, preferably of the mechanical type, should be provided to show the condition of the spring. A DC motor is used to automatically energise the spring mechanism. The operating spring of the mechanism should automatically begin to store energy immediately after the circuit breaker has fully closed. A manually operated energy storage device for emergency situations should be included in the mechanism. The spring energy storage arc-breaker is connected in series with double contacts or has an arc extinguishing function.

- Circuit breaker trolleys, when fully inserted, shall be provided with an effective means of grounding to the fixed cabinet. Trolleys of the same capacity may be interchanged.

✓ vacuum interrupter

- The change in on-off time during the electrical life test shall not be greater than 13 ms;
- The arc ignition time of the rear open phase in the electrical life test is not more than 15ms;
- The amplitude of splitting bounce is not more than 2mm; the closing bounce time is not more than 1ms.
- Spare parts: 3 each switching coils, 3 change-over switches, 3 micro switches, 2 secondary plugs (both sides).

✓ Brand requirements: see brand list

➤ 5) Grounding switch

- ✓  Rated short-time withstand current: 25kA (4s)
- ✓  Rated peak withstand current: 80kA
- ✓  At the maximum closing current (63kA), the permissible number of closures without maintenance shall be >2, mechanical >3000
- ✓  Operating mechanism: manual

- ✓ Brand requirements: see brand list (domestic quality brands)
  - 6) Current Transformer:
    - ✓  The current transformer shall fulfil the parameter requirements. When the secondary side is open circuit, the secondary side can withstand a voltage of 3000 V/1min, and the secondary winding of each CT is grounded at one point. Each form of CT magnetisation characteristic curve and 10% error characteristic curve of each parameter should be provided. Each CT should be independently marked and provided with wiring diagrams.
    - ✓ Technical parameters
      - Type: Resin casting
      - Partial discharge:  $\leq 10\text{PC}$
      - Rated short-time withstand current: 40/31.5kA (4s)
      - Rated peak withstand current: 100/80kA
    - ✓ Brand requirements: see brand list
  - 7) Over-voltage protector
    - ✓ See drawings for model and specification details.
      - System rated voltage RMS: 22KV
      - Protector rated voltage rms 24 KV
      - RMS Industrial Frequency Discharge Voltage  $\leq 25\text{KV}$
      - 1.2/50 peak shock discharge voltage  $\geq 41\text{KV}$
      - Peak residual voltage at steep inrush current  $\geq 46\text{KV}$
      - Peak residual voltage under lightning surge current  $\geq 41\text{KV}$
      - Peak residual voltage at operating inrush current  $\geq 35\text{KV}$
      - 2mS square wave throughput capacity 800A
    - Brand requirements: see brand list
- 5.5 Switchgear secondary technical requirements:**
- 1) Switchgear auxiliary power supply:
    - ✓  Operating and display unit: 110V DC



- ✓ □ Motor: 110V DC
- ✓ □ Internal lighting: 220V AC
- ✓ □ Heating resistance: 220V AC
- 2) Relay room, cable room should have a lighting device, lighting power supply voltage for AC 220V, and set up a special power switch.
- 3) The cabinet should have automatic heating and moisture repellent facilities. The power supply of the heater is 220V AC, one for each cable room and circuit breaker room, and the power is about 50W.
- 4) Each incoming and feeder circuit needs to be installed with a digital multi-function meter, which can display voltage, current, power, power factor, etc., with metering function and communication function (RS-485, MODBUS/RTU protocol).
- 5) Signal indication on the cabinet should be made with energy-saving and long-life LEDs.
- 6) The cabinet should be selected Phoenix V0 flame retardant terminals, wires should have flame retardant properties. Transformer circuit conductor cross-section is not less than 4mm<sup>2</sup>.
- 7) Use a limit type for the connecting piece (lever).
- 8) The plug-in to be used shall have a positioning device, with no contact with live parts when reversed, and with directional markings.
- 9) Insert plugs must not be removed when the hand truck is in the working position.
- 10) The reclosing circuit in the plug-in, the contact of the switching circuit requires two to keep one (refers to the use of the pins in parallel).
- 11) Circuit breaker dropping, closing circuit and reclosing (including self-injection) circuit and double contact.
- 12) Switch auxiliary contact at least 8 pairs (8 normally open, 8 normally closed), there should be 2 pairs of spare and lead to the terminal block.
- 13) The DC fuse uses a DC air switch.
- 14) The drop and close wires are connected above the pressure plate, and the

reclosing positive is connected above the pressure plate.

- 15) Terminal rows and secondary plug-in between AC and DC, drop, close and positive and negative poles must be left between the gap or add a partition.
- 16) There should be 10% of the total number of empty terminals in the cabinet available to the user, with a minimum of not less than 10.
- 17) Relays, meters and operating buttons should be installed in a location that is easy to observe and operate.
- 18) The assembly and wiring of each piece of equipment should consider unobstructed access to all institutional components and the ability to complete disassembly and replacement work without interrupting the normal operation of adjacent equipment. The layout of all equipment in the panel should be such that the terminals can be easily accessed without the need for special tools, and the terminal numbers should be clearly visible.
- 19) Dynamic analogue line diagram on the panel (can display switch opening and closing status; handcart position, earth switch status, etc.).

## **5.6 Control, protection systems**

- See drawing for model and parameters
- 24-hour current, voltage (phase/line), power, power factor monitoring and LCD panel display.
- Communication function (RS-485 interface, MODBUS/RTU protocol) .
- General technical parameter requirements
- ✓ Rated data
  - Device power supply: DC/AC 86 ~ 265V
  - Operating voltage: AC/DC220V , DC110V (subject to drawings)
  - AC Voltage:  $100/\sqrt{3}V$  or 100V
  - AC current: 5A or 1A
  - Frequency: 50Hz
- ✓ power consumption

- DC circuit: <10W (during normal operation); <15W (during protective action)
- AC voltage circuit: <0.5VA/phase
- AC current loop: <1VA/phase (In=5A); <0.5VA/phase (In=1A)
- ✓ overload capacity
  - AC voltage: 1.2 times rated voltage for continuous operation
  - Measuring current: 1.2 times rated current continuous operation
  - Protection current: 2 times rated current continuous operation
  - 10 times rated current, 10s allowed
  - 40 times rated current, 1s allowed
- ✓ Fixed value setting range and error
  - Maximum setting range of fixed value
    - ※ Voltage components: 1V ~ 120V
    - ※ Current element: 0.1In ~ 20In
    - ※ Frequency: 45.00Hz to 55.00Hz
    - ※ Time: 0.00s ~ 100.00s
  - fixing error
    - ※ Current and voltage setting:  $\leq \pm 3\%$  of the set value
    - ※ Fixed frequency:  $\leq \pm 0.02\text{Hz}$
    - ※ Constant angle:  $2 \leq \pm^\circ$
- ✓ Measurement accuracy
  - AC current, AC voltage: 0.2 level
  - Power: Class 0.5
  - Integration of electricity: Class 1.0 (active), Class 2.5 (reactive)
  - Frequency:  $\leq \pm 0.02\text{Hz}$
  - SOE resolution:  $\leq 2\text{ms}$
- ✓ Tripping and closing outlet contact capacity
  - DC 250V, 6A can be switched on for a long time.
- Protection Function Requirements

- ✓ Line protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, undervoltage protection, negative sequence overcurrent protection, three-phase primary reclosing and so on.
- ✓ Busbar protection: busbar charging protection, three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, low voltage protection, negative sequence overcurrent protection, etc.
- ✓ Transformer protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overload protection, overvoltage protection, low voltage protection, negative sequence overcurrent protection, non-electricity protection and so on.
- ✓ Motor protection: quick-break protection, long starting time, blocking protection, negative sequence inverse time protection, overload protection, overheating protection, zero sequence overcurrent protection, overvoltage protection, low voltage protection, etc.
- ✓ PT monitoring and switching device: PT parallel, I mother grounding alarm, II mother grounding alarm, I mother PT disconnection alarm, II mother PT disconnection alarm.
- ✓ Capacitor protection: three-stage overcurrent protection, inverse time overcurrent protection, zero sequence overcurrent protection, overvoltage protection, unbalance protection, non-electricity protection, etc., capacitor casting and cutting.

➤ Brand requirements: see brand list

## **6. Technical Requirements for DC Screens**

- Model: GZDW31-110/110M 110Ah (Valve Regulated Sealed Lead Acid Battery)
- Main technical parameters:
  - AC input voltage:  $380 \pm 15\%$ ,  $50\text{Hz} \pm 15\%$
  - DC output voltage: 110V

- Float charging voltage: 198~290V
- Equal charging voltage: 230~315V
- Voltage regulation accuracy:  $\leq 0.5\%$
- Stabilisation accuracy:  $\leq 1\%$
- Ripple factor:  $\leq 0.3$  per cent
- Current imbalance between charging modules:  $\leq 5\%$
- Power factor:  $>0.9$
- Efficiency:  $>90$  per cent
- Dielectric strength: 2000V 1Min
- Ambient temperature:  $-5^{\circ}\text{C} \sim +40^{\circ}\text{C}$
- Noise:  $\leq 60\text{dB}$
- 1 AC input (AC380V), 10 output circuits, 5 power circuits and 5 control circuits.
- Cabinet set current and voltage indication
- Cabinet set current and voltage indication
- Cabinet colour: beige grey (RAL7035) (tentative, to be confirmed by Party A before production)

➤ Key Performance Requirements

- The DC power supply screen adopts microcomputer-type high-frequency switching DC power supply cabinet, and the power supply cabinet should adopt modular high-frequency switching charging module, modular structure, N+1 hot standby mode, and be able to replace the on-line electrically powered plug-and-play.
- DC power supply screen consists of AC dual power switching unit, intelligent high-frequency switching charging module, battery pack, DC/DC converter, DC bus automatic (manual) voltage regulator, feeder unit, insulation fault monitoring device, intelligent monitoring unit and other components.
- The DC power screen uses dual chargers and dual batteries.
- Batteries must be labelled with the brand, model and place of origin, and adopt

high-quality, good-performance valve-regulated lead-acid maintenance-free batteries.

- Battery float life is not less than 10 years.
  - The charging device adopts intelligent high-frequency switching power supply charging module, and adopts N+1 ( $N \geq 2$ ) hot redundancy mode of parallel combination power supply, and the failure of any one module should not affect the normal operation of the system.
  - The charging module shall have the following functions:
    - ※ Good interchangeability
    - ※ Can be plugged and unplugged electrically
    - ※ Can be operated independently from the monitoring unit
    - ※ With current-limited charging and current-limited output functions
    - ※ Compensates for temperature changes in battery charging voltage
    - ※ Battery overcharge prevention function
    - ※ With short-circuit, over-current and other protection and alarm measures
    - ※ Lightning protection on AC input
  - The module should use the appropriate switching control technology to increase the reliability of the power supply and improve the power factor.
  - The module should also have good flow homogeneity at small loads.
  - The microcomputer insulation online monitoring device measures and judges the busbar voltage, busbar-to-ground insulation resistance and the insulation condition of each feeder circuit, sends out an alarm signal when it is out of the normal range, and indicates the feeder circuit where the fault occurs, and sends the relevant signals to the monitoring system.
  - The DC bus voltage can be adjusted automatically or manually. If chopper stepless voltage regulation is selected, there must be measures to prevent power failure due to its damage.
- Monitoring unit:

- The monitoring unit adopts microcomputer type (full Chinese interface) products and should have the following functions:
- Self-diagnostics, power down and power back up after power down, etc.
- Monitoring of AC inlet voltage, output voltage and current of each rectifier, DC bus voltage and current, float charging voltage, charging current, battery output current and insulation voltage.
- Protection and alarm for the following conditions occurring in the equipment: abnormal AC voltage, charging device failure, abnormal bus voltage, abnormal battery, bus grounding, etc.
- It can detect the capacity of the battery and control the charger to automatically complete the charging of the battery and the conversion of the charging mode according to the charging characteristic curve and characteristics of the battery.
- 5 real-time monitoring of the operation status of the entire DC system, by RS485 communication interface with the substation comprehensive automation system of the upper monitoring machine communication, remote control, telemetry, telecommunication functions, open protocol, to meet the requirements of unmanned duty.
- Remote control volume: inlet switch, individual charging module on/off, battery equalisation and float conversion, etc.
- Remote measurement: AC input voltage, charging device output voltage and current, battery charging and discharging voltage and current, DC bus voltage and current, and so on.
- Remote signal quantity: device normal working status signal, fault status signal, DC bus over/under voltage, DC feeder insulation condition, AC power supply phase loss or interruption, switching status, etc.
- Status signals must be available on the complete set.
- The operating status display signals indicate at least the following:
  - ✘ Power input

- ※ Feeder switch position signals, etc.
- ※ The fault status display signals at least the following:
  - ※ Loss of pressure fault on incoming line
  - ※ Charging Module Failure
  - ※ DC bus voltage too high
  - ※ DC bus voltage too low
  - ※ Deterioration of DC power supply insulation
  - ※ Low battery voltage
  - ※ Battery failure
  - ※ Feeder circuit short circuit faults
- Measurement Meter:
  - Digital measurement meters are used. The accuracy of DC meter is not less than 1.0 grade, and the accuracy of additional shunt is not less than 0.5 grade. Selected current and voltmeter ranges have appropriate margins when considering overload operation.
  - Measurements include: AC supply voltage, float voltage, float current, bus voltage, output current, battery voltage, battery charging/discharging voltage, and discharge current.
- Structure type and cabinet components :
  - DC panels are mounted against the wall, with access to maintenance and wiring in front of the cabinet.
  - The front of the DC power supply panel cabinet adopts glass door, all the equipment is mounted on the mounting plate inside the cabinet, and the monitoring device and instrument are installed in the easy-to-observe position.
  - DC panels should be made of high-quality steel, and strict surface treatment, take appropriate anti-corrosion measures, made of panels and disc shelves should have sufficient mechanical strength to ensure that the components are installed and operated without shaking, disc panels and disc shelves without deformation.



- The installation and alignment of components in the disc are required to be neat and reliable. Reasonable arrangement, insulation between electrical appliances should be in line with the relevant provisions. The disc structure should be well ventilated.
- The wires introduced outside the lead-in and lead-out discs must pass through the terminal row, and there should be intervals between the high-current terminals, general terminals, and weak power terminals. The design of the terminal block should ensure convenient operation, maintenance and commissioning, and should give due consideration to correspond to the location of the equipment. The conductive part of the terminal row is copper, and the size should be matched with the connected cable. A certain number of terminals should be reserved in the disc.
- The electrical clearance, creepage distance, spacing distance, wiring and installation of external conductor terminals of DC equipment shall meet the provisions of relevant national standards.
- The disc layout should be simple and beautiful. The front of the disc adopts a full-opening method, and the position signals of each feeder switch should correspond to the switch, so as to facilitate the operation of the maintenance personnel.
- All components installed in the cabinet should be of high quality, and the main components (such as circuit breakers, indicator lights, buttons, etc.) should be made of original imported or domestic joint-venture factory production of the world's famous brand (ABB, SIEMENS, Schneider) products, and have good versatility and interchangeability, and should be indicated in the bidding documents with the models and manufacturers of the main components. Power supply module should pass the relevant identification and have mature use experience, and need to provide supporting documents.
- Conductors, wire colour, indicators, buttons, line troughs, painting, should be in

line with the provisions of the relevant national or industry standards in force.

Among them, conductors should be selected from copper wires, and DC busbars should be selected from copper busbars. Cross-section selection must meet the requirements of the system capacity. The specification of the selected conductor should be indicated in the bidding document.

- The connectors of the same type of components should be universal and interchangeable, and should be reliable contact, easy to insert and remove. The contact resistance, insertion and extraction force, permissible current and life of the connectors should be in line with the provisions of the current national and relevant industry standards.
- Enclosure protection grade: IP4X
- Cabinet dimensions (width× depth× height): 800× 600× 2260(mm), small variations allowed.

➤ Battery brand requirements: Shandong Qiyuan Storage Battery Co., Ltd, Tianjin Shengjie Science and Technology Development Co.

## **7. Other requirements**

➤ Pre-drilled holes used for field installation or other holes that may lead to the ingress of dust, water and other objects must be covered with seals.

➤ Floor-mounted cabinets have hanging rings on top for easy installation. Drawing shelves are installed on the inside of the cabinet door for storing drawings and information. The product is shipped with a wooden base on the bottom of the cabinet, making it easy for a forklift to shovel in the bottom for transport.

➤ experimental

✓ Carefully check the design drawings and test the equipment with a written test report.

✓ The certificate of conformity and test report of the supporting equipment must comply with the technical standards of the respective products.

## **8. Technical specifications and standards for switchgear**

Main standards for design, manufacture, inspection, implementation (shall follow and not be limited to the latest version or modified version of the following standards)

Standard Code	Standard Name
GB /T 3906-2020	3.6kV ~ 40.5kV AC metal-enclosed switchgear and controlgear
GB/T 11022-2020	Common technical requirements for standards for high-voltage alternating current switchgear and controlgear
JB/T 9661	Low-voltage withdrawable switchgear
GB/T 7251	Low-voltage switchgear and controlgear
GB/T 4208-2017	Enclosure protection class (IP code)
GB/T 11032-2020	AC Metal Oxide Zinc Surge Arresters without Gap
a)	Auxiliary standards for design, manufacture and inspection
Standard Code	Standard Name
GB/T 11022-2020	Common technical requirements for standards for high-voltage switchgear and controlgear
GB/T 17626.2-2018	Electromagnetic compatibility test and measurement techniques Electrostatic discharge immunity test

## **9. Services on the supply side**

### **➤ Training services**

✓ The Supplier shall provide free site training to the main contractor's technicians, maintenance personnel and operators.

✓ The personnel provided by the supplier responsible for training should have more than 5 years of maintenance experience in similar products.

✓ Training materials are provided free of charge by the supplier.

### **➤ Installation and commissioning guidance services**

✓ The supplier, not only as a supplier of equipment, shall actively liaise with the main contracting unit and the supervisory unit according to the requirements of the main contracting unit, cooperate with the installation work and be responsible for commissioning, participate in the project meeting, and be responsible for the operation

results of the system accordingly.

➤ after-sales service

✓ The supplier's maintenance personnel need to arrive at the site within 24 hours after receiving the maintenance call and provide uninterrupted service until the end. The maintenance point needs to provide enough spare parts to adapt to the main contractor's maintenance needs.

✓ The supplier shall provide a warranty period for the whole set of equipment in accordance with the terms of the contract, and provide timely and free repair and maintenance services during the warranty period.

✓ Upon completion of the repair work, the supplier shall provide a report in triplicate to the main contractor, including the test report, analysis of the cause of the failure, measures to solve the problem, the time taken to complete the repair and the date of resumption of normal operation.

✓ After the expiry of the warranty period, the supplier shall provide lifelong maintenance service for the equipment.

## **10. Acceptance requirements**

➤ Scope of supply

✓ Complete capacitor compensation cabinets are supplied in integral in-situ mounting configurations.

✓ All the equipment within the scope of supply must be able to form a whole, complete its function and meet the requirements of the technical parameters, where the supply of insufficient parts, omissions and other reasons for the equipment can not operate normally or can not meet the performance requirements, the supplier is required to unconditionally make up for the equipment until the equipment can operate normally and meet the performance requirements.

✓ All equipment provided by the supplier must be accompanied by manuals, quality inspection certificates and other random related information, and provide proof of origin.

➤ handover of data

✓ The technical information is required to be in a bound volume, including the following:

- Outline drawings, foundation requirements drawings, nameplate drawings, primary and secondary drawings
- Factory test report and product qualification certificate
- Installation instructions
- Four copies of the above information

✓ During the execution of the works, specific requests for the provision of certain information will be made, which the Supplier shall accept unconditionally.

✓ The date on which the designated representative of the Demanding Party signs for the Technical Data shall be deemed to be the date of delivery of the Technical Data.

✓ For technical information not included in the contract but necessary for the work, the Supplier shall provide it free of charge in a timely manner upon discovery.

✓ If any shortage, loss or damage of technical data is found after inspection by the representative of the Demanding Party, the Supplier shall make up for it within 7 days.

➤ Receiving and inspection procedures

✓ Product protection

- Take rain, moisture, rust, shock and other measures to avoid in the transport process, due to vibration and collision caused by bearing and other parts of the damage. When the equipment leaves the factory, the packaging of parts should be sorted and boxed, following the principle of suitable for transport, easy to install and find.
- Prior to shipment, equipment shall be protected against corrosion, damage and debris during transport and storage.

## **附件 3-1：技术要求**

### **1. 企业资质要求**

- 供方应持有国家有关行业管理部门颁发的高低压柜和配电柜生产资质证明。
- 持有本系统的 ISO9000 系列认证证书，并通过强制性产品认证（3C 认证）。
- 供方须满足当地供电部门的备案要求及当地的其他所有的市场准入条件。
- 设备制造商在汽车行业有 3 年以上批量生产同类高低压柜和配电柜的能力和  
经验。

### **2. 技术条件适用范围**

- 22kV 高压开关柜（KYN28）、直流屏。开关柜的设备用途、主要技术参数详见设备清单及相关图纸。
- 本技术要求为设备满足的最低要求，设备除满足本技术要求外还需满足与国家标准、设计要求，并按其中的最严格的要求执行。

### **3. 环境条件**

- 本次合同内供货产品应满足该项目所在地环境条件。产品使用环境温度不低于 45℃，生产厂家须能保证其产品能在当地环境条件下长期可靠运行)
- 安装地点：泰国春武里府 WHA 伟华东海岸工业区 1 号 D61 区块的泰国金鹭硬质合金生产基地内。
- 地震烈度：8 度
- 污染等级：3 级
- 运行温度：-15℃~45℃
- 海拔高度： <1000m
- 相对湿度：
  - 最大日平均相对湿度：95%。
  - 最大约平均相对湿度：90%。

#### 4. 特殊说明

- 本合同要求供方按照图纸要求对提供的最终图纸进行深化设计, 包含图纸内容勘误、所有柜内二次图纸的详细设计等并报送设计确认方可出图。另外报价包含派专人到场对现场安装进行指导的相关费用
- 供方应按照设备清单注明每台高压开关柜 (KYN28)、直流屏的编号、名称、用途等。同时应按系统图标出每一出线回路的回路编号、用途等, 并制作铭牌 (金属或塑料制品) 固定在每一出线回路上。
- 所有铭牌、标识均要求中英文双语对照标注。
- 高压柜内的开关等元器件须满足当地供电部门的备案要求及当地的其他所有的市场准入条件。

#### 5. 22kV 中置式开关柜

##### 5.1 形式及额定参数

- 1)类型: 金属铠装中置移开式开关柜 (KYN28)
  - ✓ 额定工作电压: 22kV
  - ✓ 最高工作电压: 24.2kV
  - ✓ 额定频率: 50Hz
- 2)开关柜额定参数:
  - ✓ 雷电冲击电压: 125kV (投标文件注明)
  - ✓ 1min 工频耐压 (有效值): 65kV (投标文件注明)
  - ✓ 额定短路开断电流 25kA
  - ✓ 额定短路持续时间 4s
  - ✓ 额定短时耐受电流 25kA
  - ✓ 额定峰值耐受电流 80kA
- 3)母线动稳定电流 (峰值): 出线柜 63kA, 主母线符合 22KV 母线相关标准

- 4)母线热稳定电流（有效值，4s）：出线柜 25kA，主母线符合 22KV 母线相关标准
- 5)防护等级：外壳 IP4X 内部 IP3X
- 6)耐内部电弧条件：（提供相应的试验报告）电缆室 25kA；开关室 25kA
- 8)温升：柜体可触摸部件 ≤20K 导体表面 ≤45K
- 9)主母线材料采用铜母线：100×10 铜排（成套带来，搪锡且加装绝缘护套）。
- 10)开关柜柜顶设置柜顶小母线，规格∅8 铜棒；
- 11)柜体颜色：按业主色标，生产前须发包方确认；
- 12)柜体材料：柜体采用覆铝锌板。
- 13)绝缘爬距：纯瓷 ≥18mm/kV；有机 ≥20mm/kV

## 5.2 结构要求

- 1)开关柜采用金属铠装、耐电弧的手车型开关柜，满足“五防”闭锁要求，主母线室、断路器室、电缆室、仪表室等均需铠装全封闭。开关柜自身应装设完善的机械闭锁及电气闭锁。
- 2)开关柜包括：母线室、断路器室、电缆室、控制仪表室，各室之间的防护等级为 IP3X，各室对外的防护等级为 IP4X。若有有机绝缘材料，应选用耐电弧、耐高温、阻燃、低毒、不吸潮且具有优良机械强度和电气绝缘性能的材料(SMC 或 DMC)。
- 3)开关柜本身二次线外裸在开关室的的部分应加阻燃防护，避免因高压电弧烧毁二次设备引起的事故。各柜间应有联通的金属线槽，供柜间控制回路导线联接使用。
- 4)柜体内带电部分对绝缘板净距：不得小于 30mm;柜体内相对地及相间空气距离：不得 小于 180mm;柜体内带电部分相对地及相间外爬距：不得小于 240mm。



- 5)主母线及引线，应全部做绝缘处理，可用热塑绝缘套管进行绝缘，绝缘耐压水平应达到 65kV 以上。
- 6)母线及引线连接处应加阻燃型的绝缘盒。
- 7)手车推至运行位置应有到位指示装置。
- 8)开关柜的正面应有铭牌（厂名、型号规格、出厂日期）、一次接线模拟图、柜位序号、手车序号。表计、信号继电器等元件应有标明用途的标志框。柜前后上沿应有路名、调度号标志框。
- 9)馈电柜装有机机构的门上要有观察孔，便于观察机构的分、合闸指示牌；电缆室应有一个 电缆观察窗，并要求有防爆措施。
- 10)在后柜内要加装一根支持电缆头的横向角钢，并在角钢上部开卡孔。电缆接线端子双孔。
- 11)柜内固定绝缘隔板的金属螺丝要加装绝缘螺帽，既要保证绝缘又要保证强度。
- 12)开关柜的上、下部的通风孔要加隔尘网，并达到防护等级 IP4X。
- 13)柜后左侧加一个 M10 接地螺栓，并要有接地标记作为接地点供挂地线用。
- 14)隔离开关的动、静刀应为圆角，母线端部也应倒圆角并包有绝缘。
- 15)断路器应安装在一个小车上，并带有拉出可动部分所必需的装置，具有相同参数和结构的各元件应能互换。
- 16)开关柜的金属隔板应可靠接地，接地导体和接地开关应能耐受额定短时耐受电流和额定 峰值耐受电流。
- 17)在运行位置的隔离插头应能耐受额定短时耐受电流各额定峰值耐受电流的冲击，并保证接触良好。
- 18)安全挡板：提供一套金属挡板，手车拉出时自动封住三相固定隔离触头，手车推入时金属挡板自动打开。

- 19)当小车位于试验位置时，隔离插头完全断开，安全挡板自动关闭（上、下挡板可分别打 开、关闭）以防止操作人员接触到带电部分。
- 20)开关柜是金属外壳，地板和墙壁均不能作为壳体的一部分，电缆连接在柜的下部进行， 电缆室应有足够的空间。一次电缆端子距地面高度不小于 700mm，预留三个由 150mm 的电缆接线孔。
- 21)开关柜的各室均有与壳体相同的防护等级的压力释放装置，其压力出口的位置确保对人 身没有危害，压力释放装置正常情况下关闭，在事故情况下压力出口打开，自动释放内 部压力，同时将内部故障限制在本隔室内。
- 22)母线为电解铜板，装在单独的母线室内，母线排列 A、B、C 相顺序应为从上到下，或从左到右，或从里到外（从柜前观察），并标注相标，即：第一相 A 棕色，第二相 B 黑色，第三相 C 灰色。
- 23)金属部件的接地：所有金属部件（包括所有安装在开关柜上的继电器、仪表盘）外壳都 应接地，接地线应为铜导体，其截面应不小于 10mm<sup>2</sup>，距地面 150mm ，与柜体绝缘。
- 24)接地设施：接地功能应是开关柜整体设计的一部分，所有出线回路必须有接地开关。
- 25)开关柜应满足安装在两侧有两根槽钢的通长电缆沟的基础上。
- 26)柜内必须加装温湿度控制器，及除潮电热。并能实现超温报警。
- 27)开关柜进出线方式为：电缆上进上出。

### **5.3 开关柜闭锁要求**

- 1)出线地刀闭锁要求：出线地刀与手车位置机械闭锁。
- 2)开关柜电缆室门（包括封板）应与接地刀实现闭锁保证接地刀合上后方可开门。
- 3)闭锁回路使用的手车位置接点，应保证在手车插嘴离开静触头足够安全距离

后保持接通 (包括检修位置)。

➤ 4)带电显示器的安装位置应保证操作地刀、接地车时运行人员可以看到, 不应装 CT 上。

➤ 5)地刀、接地车、柜门的闭锁应具备解锁功能。

➤ 6)在开关柜里的元件应装有联锁, 小车只有当断路器断开时才能拉出, 接地开关和断路器应有可靠联锁, 对于操作接地开关应有清楚的指示计指示出线侧无电压, 且断路器断开以防误操作;

#### **5.4 开关柜内主要电气设备:**

➤ 1) 断路器:

✓ 类型: 真空断路器

✓ 品牌及型号: 按品牌清单, 参数/档次不低于图纸要求

✓ 额定电压: 22kV

✓ 额定电流: 详见图纸

✓ 1min 工频耐压: 65kV。

✓ 雷电冲击耐压: 125kV

✓ 额定短路开断电流: 25/31.5kA

✓ 额定短路持续时间: 4s

✓ 额定短时耐受电流: 25kA /31.5kA

✓ 额定峰值耐受电流: 63kA /80kA

✓ 电气寿命: 开断额定短路电流 >30 次 合闸时间 ≤0.2s 分闸时间 <0.05s 机械寿命 >20000 次 插头机械寿命 >3000 次。

✓ 操动机构:

● 分闸线圈个数 1

● 合闸线圈个数 1

- 分闸线圈动作范围 (65% ~ 120%) 110V DC
- 合闸线圈动作范围 (80% ~ 110%) 110V DC
- 分闸线圈不动作范围 (0 ~ 30%) 110V DC
- 电动机 110V DC
- 切电感电流 0.5A ~ 15A 时, 过电压倍数不超过 2.5, 应提供试验报告。

✓ 断路器设计

- 断路器为三相手车式主回路及所有辅助回路的隔离插头应为免维护型。每个断路器应有一套机械联动的关合位置指示器及动作计数器, 其安装位置要易于观察。开关使用年限: 保证 20 年。机械部分免维护时间不得少于 3 年。
- 断路器操动机构应有防跳功能。操动机构的每一部件应为紧固结构, 在必要部位使用防腐、防锈材料。整体的设计应使操作时产生的机械振动最小。断路器在“合”或“分”位置, 机械弹簧均能储能。如果弹簧未能完全储能, 断路器不能合闸, 应提供一个可观察的指示装置来表示弹簧的状态, 最好为机械型。直流电机用来给弹簧机构自动储能。断路器完全合闸后, 机构操作弹簧应立即自动开始储能。在机构里, 应有一套紧急情况下的手动操作储能装置。弹簧储能断弧双接点串接或具有消弧功能。
- 断路器手车完全处于插入位置时, 应提供有效的接地方式与固定柜体相连。相同载流量的手车可以互换。

✓ 真空断路器

- ·在电寿命试验中开断时间的变化不得大于 13ms;
- ·在电寿命试验中后开相的燃弧时间不大于 15ms;
- ·分闸反弹幅值不大于 2mm; 合闸弹跳时间不大于 1ms。
- ·备件: 分合闸线圈各 3 只, 转换开关 3 个, 微动开关 3 只, 二次插头 2 个 (两侧)。

✓ 品牌要求: 见品牌表

➤ 5) 接地开关

- ✓ ·额定短时耐受电流：25kA (4s)
- ✓ ·额定峰值耐受电流：80kA
- ✓ ·在最大关合电流（63kA）时，不维修允许合闸次数应>2次，机械>3000次
- ✓ ·操动机构：手动
- ✓ 品牌要求：见品牌表(国产优质品牌)

➤ 6) 电流互感器：

- ✓ ·电流互感器应满足参数要求。当二次侧开路时，二次侧能承受电压 3000 V/1min，每个 CT 的二次绕组一点接地。应提供每种形式各参数的 CT 磁化特性曲线和 10%误差特性曲线。每个 CT 应独立标号并提供接线图。

✓ 技术参数

- 类型：树脂浇铸
- 局部放电量：≤10PC
- 额定短时耐受电流：40/31.5kA (4s)
- 额定峰值耐受电流：100/80kA

- ✓ 品牌要求：见品牌表

➤ 7) 过电压保护器

- ✓ 型号和规格详见图纸。
  - 系统额定电压有效值：22KV
  - 保护器额定电压有效值 24 KV
  - 工频放电电压有效值<25KV
  - 1.2/50 冲击放电电压峰值>41 KV
  - 陡波冲击电流下残压峰值>46 KV
  - 雷电冲击电流下残压峰值>41 KV

- 操作冲击电流下残压峰值 $\geq 35$  KV

- 2mS 方波通流容量 800A

➤ 品牌要求：见品牌表

### 5.5 开关柜二次技术要求：

➤ 1)开关柜辅助电源：

- ✓ ·操作及显示装置：110V DC

- ✓ ·电动机：110V DC

- ✓ ·内部照明：220V AC

- ✓ ·加热电阻：220V AC

➤ 2)继电器室、电缆室应有照明装置，照明电源电压为交流 220V，并设专用电源开关。

➤ 3)柜内应有自动加热驱潮设施。加热器电源为交流 220V。电缆室与断路器室各一个，功率为 50W 左右。

➤ 4)每个进线和馈线回路需安装数字式多功能表，可显示电压、电流、功率、功率因数等，带电计量功能和通讯功能（RS-485，MODBUS/RTU 协议）。

➤ 5)柜上信号指示应选用节能型长寿命的 LED。

➤ 6)柜内应选用凤凰 V0 级阻燃型端子，导线应具有阻燃性能。互感器回路导线截面不小于 4mm<sup>2</sup>。

➤ 7)连接片（压板）使用限位型。

➤ 8)所使用的插件须有定位装置，反向时带电部分不得接触，并有方向标志。

➤ 9)手车在工作位置时，插件插头不得拔出。

➤ 10)插件中的重合闸回路、分合闸的触头要求二保一（指插针并接使用）。

➤ 11)断路器掉、合闸回路及重合闸（包括自投）回路并双接点。

➤ 12)开关辅助接点至少 8 对（8 常开、8 常闭），应有 2 对备用并引至端子排。

- 13)直流保险采用直流空开。
- 14)掉、合闸线接压板上方，重合闸正极接压板上方。
- 15)端子排及二次插件的交、直流间，掉、合闸与正、负极之间必须留有空档或加隔板。
- 16)柜内应有总量 10%的空端子供用户使用，最少不应少于 10 个。
- 17)继电器、仪表及操作按钮的安装位置应便于观察及操作。
- 18)每件设备的装配和接线均应考虑在不中断相邻设备正常运行的条件下无阻碍地接触各 机构器件并能完成拆卸、更换工作。盘内所有设备的布置应考虑在不需 要专用工具的情况下方便地接触其接线端子，接线端子号应清晰可见。
- 19)面板上有动态模拟线路图（可显示开关分、合闸状态；手车位置，接地开 关状态等）。

## 5.6. 控制、保护系统

- 型号和参数见图纸
- 24 小时的电流、电压（相/线）、功率、功率因数监测及液晶面板显示。
- 具有通讯功能（RS-485 接口，MODBUS/RTU 协议,）。
- 通用技术参数要求
- ✓ 额定数据
  - 装置电源：DC/AC 86 ~ 265V
  - 操作电压：AC/DC220V ， DC110V（以图纸为准）
  - 交流电压： $100/\sqrt{3}V$  或 100V
  - 交流电流：5A 或 1A
  - 频 率：50Hz
- ✓ 功率消耗
  - 直流回路： < 10W（正常工作）； < 15W（保护动作时）

- 交流电压回路： < 0.5VA/相
- 交流电流回路： < 1VA/相 ( $I_n=5A$ ) ; < 0.5VA/相 ( $I_n=1A$ )
- ✓ 过载能力
  - 交流电压： 1.2 倍额定电压连续工作
  - 测量电流： 1.2 倍额定电流连续工作
  - 保护电流： 2 倍额定电流连续工作
  - 10 倍额定电流，允许 10s
  - 40 倍额定电流，允许 1s
- ✓ 定值整定范围及误差
  - 定值最大整定范围
    - ※ 电压元件： 1V ~ 120V
    - ※ 电流元件： 0.1 $I_n$  ~ 20 $I_n$
    - ※ 频率： 45.00Hz ~ 55.00Hz
    - ※ 时间： 0.00s ~ 100.00s
  - 定值误差
    - ※ 电流及电压定值：  $\leq \pm 3\%$  整定值
    - ※ 频率定值：  $\leq \pm 0.02\text{Hz}$
    - ※ 角度定值：  $\leq \pm 2^\circ$
- ✓ 测量精度
  - 交流电流、交流电压： 0.2 级
  - 功率： 0.5 级
  - 积分电度： 1.0 级 (有功) , 2.5 级 (无功)
  - 频率：  $\leq \pm 0.02\text{Hz}$
  - SOE 分辨率：  $\leq 2\text{ms}$



- ✓ 跳、合闸出口接点容量
  - 可长期接通 DC 250V, 6A。
- 保护功能要求
  - ✓ 线路保护：三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护、三相一次重合闸等。
  - ✓ 母联保护：母充保护、三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护等。
  - ✓ 变压器保护：三段式过流保护、反时限过流保护、零序过流保护、过负荷保护、过电压保护、低电压保护、负序过流保护、非电量保护等。
  - ✓ 电动机保护：速断保护、启动时间过长、堵转保护、负序反时限保护、过负荷保护、过热保护、零序过流保护、过电压保护、低电压保护等。
  - ✓ PT 监控切换装置：PT 并列、I 母接地告警、II 母接地告警、I 母 PT 断线告警、II 母 PT 断线告警等。
  - ✓ 电容器保护：三段式过流保护、反时限过流保护、零序过流保护、过电压保护、不平衡保护、非电量保护等、电容器投切等。
- 品牌要求：见品牌表

## 6. 直流屏技术要求

- 型号：GZDW31-110/110M 110Ah (阀控式密封铅酸蓄电池)
- 主要技术参数：
  - 交流输入电压：380±15%,50Hz±15%
  - 直流输出电压：110V
  - 浮充电压：198~290V
  - 均充电压：230~315V
  - 稳压精度：≤0.5%

- 稳流精度：≤1%
  - 纹波因数：≤0.3%
  - 充电模块间电流不均衡度：≤5%
  - 功率因数：>0.9
  - 效率：>90%
  - 介电强度：2000V 1Min
  - 环境温度：-5°C~+40°C
  - 噪声：≤60dB
  - 交流输入为 1 路 (AC380V) ,输出回路为 10 个，其中 5 个为动力回路，5 个为控制回路
  - 柜体设置电流、电压指示
  - 柜体设置电流、电压指示
  - 柜体颜色：米灰 (RAL7035) (暂定，制作前需甲方确认)
- 主要性能要求
- 直流电源屏采用微机型高频开关直流电源柜，电源柜应采用模块化高频开关充电模块，模块式结构，采用 N+1 热备方式，并能在线更换带电插拔。
  - 直流电源屏由交流双电源切换单元、智能高频开关充电模块、蓄电池组、DC/DC 转换器、直流母线自动(手动)调压装置、馈电单元、绝缘故障监测装置、智能监控单元等组成。
  - 直流电源屏采用双充电机双组电池。
  - 蓄电池必须标明品牌、型号及出产地，采用高品质、性能良好的阀控式铅酸免维护蓄电池。
  - 蓄电池浮充使用寿命不少于 10 年。
  - 充电装置采用智能型高频开关电源充电模块，采用 N+1(N≥2)热冗余方式并

联组合供电，任一个模块故障不应影响系统正常运行。

- 充电模块应具有如下功能：
    - ※ 良好的可互换性
    - ※ 可带电插拔
    - ※ 可脱离监控单元独立运行
    - ※ 具有限流充电和限流输出功能
    - ※ 可根据温度变化对电池充电电压进行补偿
    - ※ 具有防止蓄电池过充功能
    - ※ 具有短路、过流等保护及报警措施
    - ※ 交流输入端具有雷电防护措施
  - 模块应采用相应的开关控制技术，提高电源的可靠性，改善功率因数。
  - 模块在小负载情况下也应具有良好的均流性。
  - 微机绝缘在线监测装置对母线电压、母线对地绝缘电阻及各馈出回路绝缘状况进行测量判断，超出正常范围时发出报警信号，并指示发生故障的馈出回路，把相关信号送至监控系统。
  - 可自动或手动调整直流母线电压。如果选用斩波无级调压，必须有防止因其损坏造成断电的措施。
- 监控单元：
- 监控单元采用微型机(全中文界面)产品并应具有以下功能：
  - 自诊断、掉电后来电自恢复等功能。
  - 监测交流进线电压、各整流装置的输出电压、电流，直流母线电压、电流，浮充电压，充电电流，蓄电池输出电流以及绝缘电压等。
  - 对设备发生下列状况进行保护并发出报警：交流电压异常、充电装置故障、母线电压异常、蓄电池异常、母线接地等。

- 可以检测蓄电池容量，根据蓄电池的充电特性曲线及特点，控制充电机自动完成对蓄电池的充电及充电方式的转换。
- 5 对整个直流系统的运行状态进行实时监控，由 RS485 通信接口与变电所综合自动化系统上位监控机通信，实现遥控、遥测、遥信功能，协议开放，满足无人值班的要求。
- 遥控量：进线开关，单个充电模块开/关机，电池均充和浮充转换等。
- 遥测量：交流输入电压、充电装置输出电压和电流、电池充放电电压和电流、直流母线电压和电流等。
- 遥信量：装置正常工作状态信号、故障状态信号、直流母线过/欠压、直流馈线绝缘状况、交流电源缺相或中断、开关状态等。
- 在整套装置上必须有状态显示信号
- 工作状态显示信号至少有下列指示：
  - ※ 电源投入
  - ※ 各馈电开关位置信号等
  - ※ 故障状态显示信号至少有下列内容：
    - ※ 进线失压故障
    - ※ 充电模块故障
    - ※ 直流母线电压过高
    - ※ 直流母线电压过低
    - ※ 直流电源绝缘下降
    - ※ 蓄电池电压过低
    - ※ 蓄电池故障
    - ※ 馈电回路短路故障
- 测量表计：

- 采用数字测量表计。直流表计准确度不低于 1.0 级，附加分流器准确度不低于 0.5 级。选用的电流、电压表量程考虑过负荷运行时有适当的裕度。
  - 测量内容有：交流电源电压、浮充电压、浮充电流、母线电压、输出电流、蓄电池电压、蓄电池充/放电压、放电电流等。
- 结构型式及柜内元器件：
- 直流屏靠墙安装，柜前检修维护及接线。
  - 直流电源屏柜体正面采用玻璃门，所有设备均装于柜内安装板上，监控装置及仪表安装于易于观测的位置。
  - 直流屏均应采用优质钢材，并进行严格的表面处理，采取合适的防腐蚀措施，制成的面板和盘架应有足够的机械强度，保证元件安装后及操作时无摇晃，盘面板及盘架无变形等。
  - 盘内元器件安装及走线要求整齐可靠。布置合理，电器间绝缘应符合相关规定。盘体结构应通风良好。
  - 引进引出盘外的导线必须经过端子排，大电流端子、一般端子、弱电端子之间应间隔。端子排的设计应保证运行、检修、调试方便，并应适当考虑与设备位置对应。端子排导电部分为铜质，大小应与所接电缆相配套。盘内应预留一定数量的端子。
  - 直流设备的电气间隙、爬电距离、间隔距离、外接导线端子的接线和安装，均应满足相关国标规定。
  - 盘面布置应简洁、美观。盘面的正面采用全开门方式，各馈电开关的位置信号应与开关对应，便于维护人员的操作。

- 柜内安装的元器件均应采用优质元器件，主要元件（如断路器、指示灯、按钮等）采用原装进口或国内合资厂生产的世界知名品牌（ABB、SIEMENS、Schneider）产品，并具有良好的通用性和互换性，应在投标文件中注明主要元器件的型号及厂家。电源模块应通过相关鉴定，并有成熟使用经验，并提供证明文件。
- 导线、导线颜色、指示灯、按钮、行线槽、涂漆，均应符合国家或行业现行的有关标准的规定。其中导线应选用铜线，直流母线选用铜母线。截面选择必须满足系统容量的要求。在投标文件中应注明选用导线的规格。
- 同类元器件的接插件应具有通用性和互换性，应接触可靠、插拔方便。接插件的接触电阻、插拔力、允许电流及寿命，均应符合国家及有关行业现行标准的规定。
- 外壳防护等级：IP4X
- 柜体尺寸（宽×深×高）：800×600×2260(mm),允许有小范围不同。
- 蓄电池品牌要求：山东齐源蓄电池有限公司、天津盛杰科技发展有限公司、戈麦斯特（天津）科技有限公司

## **7. 其他要求**

- 用做现场安装的预留孔或另外可能导致灰尘、水及其他物体进入的孔洞必须用密封件加以遮盖。
- 落地安装的柜体顶部设有吊环，易于安装。在柜门内侧安装图纸架，用于存放图纸和资料。产品出厂时，柜体的底部有木质底座，易于叉车铲入底部运输。
- 试验

- ✓ 仔细核对设计图纸，并对设备进行检测，并出书面检测报告。
- ✓ 配套设备合格证明书及试验报告必须符合各自产品技术标准。

## 8. 开关柜的技术规范及标准

设计、制造、检验、执行的主要标准（应遵循并不限于下列标准的最新版本或修改版本）

标准代号	标准名称
GB /T 3906-2020	3.6kV ~ 40.5kV 交流金属封闭开关设备和控制设备
GB/T 11022-2020	高压交流开关设备和控制设备标准的共用技术要求
JB/T 9661	低压抽出式成套开关设备
GB/T 7251	低压成套开关设备和控制设备
GB/T 4208-2017	外壳防护等级(IP 代码)
GB/T 11032-2020	交流无间隙金属氧化物避雷器

### a) 设计、制造、检验执行的辅助标准

标准代号	标准名称
GB/T 11022-2020	高压开关设备和控制设备标准的共用技术要求
GB/T 17626.2-2018	电磁兼容试验和测量技术 静电放电抗扰度试验

## 9. 供方的服务

### ➤ 培训服务

- ✓ 供方须对总包方的技术人员、维修人员及操作人员进行免费工地培训。
- ✓ 供方提供的负责培训的人员应具备同类产品 5 年以上的维修经验。
- ✓ 供方免费提供培训材料。

### ➤ 安装及试运行指导服务

- ✓ 供方不仅仅作为设备供方，应按总包方要求积极与总包单位、监理单位联系，配合安装工作并负责调试，参与项目会议，并对系统的运行结果负相应责任。

### ➤ 售后服务

✓ 供方维修人员需在接到维修电话后 24 小时内赶到现场，提供不间断的服务直到结束。维修点需提供足够的备件以适应总包方维修需求。

✓ 供方须对整套设备按合同条款要求提供质保期，质保期内提供及时和免费维修保养服务。

✓ 维修工作完成后，供方需提供一式三份报告给总包方，包括测试报告、故障原因分析，解决措施，完成修理所费时间及恢复正常运行日期。

✓ 质保期满后，供方须提供设备的终身维修服务。

## 10. 验收要求

### ➤ 设备供货范围

✓ 提供完整的电容补偿柜，为整体就地安装结构。

✓ 所有供货范围内的设备，均必须能组成以整体，完成其功能并达到技术参数要求，凡因供货部件不足、遗漏等原因造成设备不能正常运行或达不到性能要求，供方均需无条件补足直至设备能正常运行并达到性能要求。

✓ 供方所提供的所有设备必须附带说明书、质量检验合格证等随机相关资料，并提供原产地证明。

### ➤ 资料交接

✓ 技术资料要求装订成册，包括以下内容：

- 外形图、基础要求图、铭牌图，一次图、二次图
- 出厂试验报告及产品合格证明
- 安装使用说明书
- 以上资料一式四份

✓ 在工程实施过程中，会对某些资料的提供提出具体要求，供方应无条件接受。

✓ 需方指定代表签收技术资料的日期视为技术资料交货日期。



✓ 对于未列入合同的技术资料，但是本工程所必需的，一经发现，供方应及时免费提供。

✓ 需方代表检查后发现技术资料有短缺、遗失或损坏，供方应于 7 天内补齐。

➤ 验收程序

✓ 产品保护

- 采取防雨、防潮、防锈、防震等措施，以免在运输过程中，由于振动和碰撞引起轴承等部件的损坏。设备出厂时，零部件的包装应分类装箱，遵循适于运输、便于安装和查找的原则。
- 设备发运前，应采取保护措施，以防止在运输和储存期间遭受腐蚀、损伤及进入杂物。

## **Technical Specification for 22kV Capacitor Compensation Sets**

### **1 Qualification Requirements**

- 1.1 Manufacturers must possess a switchgear production qualification certificate issued by the relevant national regulatory authority; Additionally, they must provide an official test report issued by a national authoritative agency for compensation and filtering products.
- 1.2 This system should have ISO9000 series certification, as well as certifications for occupational health and safety management systems, and environmental management systems. Additionally, the equipment should be certified with compulsory product certification (3C).
- 1.3 The equipment manufacturer must have at least 3 years of experience in mass-producing similar types of switchgear.
- 1.4 Supply manufacturers and products must meet the local power supply department's record requirements and local market access conditions.

### **2 Scope of the contract**

See list and drawings.

Switchgear model, purpose, main technical parameters are detailed in the equipment list and relevant drawings.

### **3 environmental conditions**

Environmental conditions in  
the area of this product

Installation Location: Indoor

Seismic intensity: 8 degrees

Pollution level: Class II, no serious dirt chemical corrosion and severe vibration; nominal creepage distance value  $\geq 20\text{mm/kV}$ . Operating temperature:  $-20^{\circ}\text{C} \sim +45^{\circ}\text{C}$

Altitude:  $<1000\text{m}$

Relative humidity:

The average value of relative humidity measured over a period does not exceed 95 per cent.

The average value of water vapour pressure measured over a 24-hour period does not exceed 2.2 kPa. The average value of monthly relative humidity does not exceed 90 per cent.

The average monthly water vapour pressure does not exceed 1.8 kPa.

#### **4 technical requirement**

4.1 The supplier shall indicate the number, name and purpose of each switchgear cabinet in accordance with the equipment list and drawings, and make a nameplate to be fixed on each switchgear cabinet.

4.2 High-voltage automatic reactive power compensation complete sets of devices

1) Technical conditions of the device

- System standard voltage: 22KV
- Maximum working voltage: 24.2KV
- Rated frequency: 50Hz
- Reactivity: 6 per cent
- Number of phases: 3
- Power factor: above 0.9 with sufficient compensation capacity.
- Insulation level: Power frequency withstand voltage of 42 kV and impulse withstand voltage of 75 kV.
- Automatic Switching: The system must automatically operate and adjust according to the network's reactive power demands and voltage control requirements, eliminating the need for manual intervention. This ensures fast reactive power compensation and enhances the system's power factor to exceed 0.9.
- Control System: A fully digital intelligent control system with microprocessor-based monitoring and automatic regulation.
- Automatic Adjustment: The system must be capable of rapid response and automatic adjustment without manual intervention. The compensation capacity should dynamically adjust according to load fluctuations, ensuring comprehensive and automatic compensation of voltage and reactive power while preventing overcompensation and reactive power reversal.
- Capacitors must be equipped with dedicated high-voltage expulsion fuses for short-circuit protection to ensure safe operation to ensure safe operation of the equipment.
- Series reactors are used to limit inrush currents during capacitor bank switching and to ensure stable operation.
- Suppresses system harmonics and ensures normal equipment operation.

- Structural requirements of reasonable design, easy to use, can be manually operated, can also be synchronised with the load casting and cutting, maintenance-free operation, power saving effect is significant, reduce electricity expenses.
- Improvement of the quality of power supply and normal output of electrical equipment.
- Reduce line losses, transformer losses.
- It is required that capacitive compensation devices should be capable of suppressing higher harmonics.
- Reduces the apparent power supplied, increases the load capacity of transmission and substation equipment lines, and extends the life of electrical control equipment.
- Equipped with comprehensive protection mechanisms, including over-voltage, under-voltage, open-delta voltage protection, overcurrent protection, and fast disconnection safeguards.
- The compensator should have complete protection measures and a high degree of automation, and be able to exit automatically in the event of an external fault or power failure, and resume operation automatically after power supply.
- The controller must feature an LCD display capable of showing operational mode, switching group status, voltage, current, power factor, and reactive power for each bus section.
- Fault information can be viewed: determine and display one (or two) overvoltage or (undervoltage) capacitor faults.
- Requirements for the capacitor bank fully sealed maintenance-free, easy to adjust the device capacity, safe and reliable.

## 2) Device design structure

- High-voltage automatic reactive power compensation complete set of devices consists of vacuum contactor, high-voltage shunt capacitor bank, dry-type iron core reactor, voltage transformer, lightning arrester and ancillary equipment, capacitor bank is cast by vacuum contactor. The device adopts cabinet structure, The operation panel must be freely accessible, while the rear enclosure panel shall remain securely sealed, the side plate and the top cover plate of the device are in the form of bolted closed, and to ensure easy installation. The side panels, rear closure plate, and top cover of the cabinet must be constructed from high-quality 2.0mm thick cold-rolled steel for enhanced durability and structural integrity, and the front door plate is made of high-quality cold-rolled steel plate with thickness of 2.5mm. Except for the cover plate, the rest of the panels are required to be treated with electrostatic spraying after removing rust (beige grey RAL7032), and the protection level is IP3X.
- The compensation unit must be equipped with an efficient ventilation system to ensure that the temperature rise of accessible enclosure surfaces and panels remains within 20°C.

- The bottom of the cabinet frame has a grounding bolt or grounding plate.
  - Electromagnetic Interlock: The device must feature an electromagnetic interlock mechanism to prevent the front panel from being opened when the busbar is live and the capacitor is in operation. The interlock must also prevent access if the capacitor has been switched off but has not fully discharged.
  - Power connection method: Cable inlet
- 3) Controller:
- The controller must support a fully Chinese-character menu operation, featuring an intuitive human-machine interface (HMI) and a serial communication interface. It must also provide intelligent diagnostics and optimal control functionality.
  - The system must support remote communication functionality and be compatible with high-voltage outgoing cabinets at the distribution center. It must integrate with security and protection devices to ensure seamless signal transmission
- 4) shunt capacitor
- Adopting full-film dielectric capacitor, installed in the cabinet, the shell of the capacitor is directly grounded, the capacitor is of reliable quality, with good inrush current resistance and long service life.
  - Rated voltage:  $24.2/\sqrt{3}$  KV
  - Frequency: 50Hz
  - Number of phases: single-phase
  - Capacitance deviation: The permissible capacitance deviation of capacitors is -5% to +10% of the rated capacitance of the device. Between any two lines of three-phase capacitors, the capacitance and the ratio of the maximum value to the minimum value shall not exceed 1.04. The ratio of the maximum and minimum capacitance of each series section of the capacitor bank shall not exceed 1.02.
  - The tangent of the dielectric loss angle of the capacitor must not exceed 0.0005 under rated frequency and voltage at an ambient temperature of 20°C. The capacitor losses shall not be more than 0.0005 at the rated frequency and rated voltage.
  - Capacitors must be capable of continuous operation at up to 1.1 times the rated voltage and up to 1.3 times the rated current without degradation.
  - Media structure: Full film media structure, benzyltoluene impregnated.
  - The temperature inside the case shall not exceed 65°C when the capacitor is operated at rated voltage, rated current and rated frequency.

The impregnant temperature of the internal unit capacitors shall not exceed 85°C.

- The inrush current generated when the capacitor bank is put into operation should be limited to less than 20 times of the rated current of the capacitor bank. Capacitor shell explosion resistance  $\geq 8\text{KJ}$ .

#### 5) Dry-type iron core series reactor

Sets of compensation device using three-phase compensation reactor, can ensure that the compensation device is put into operation, the switching capacitor will not resonate with the system, to ensure the reliable operation of the compensation device. And can reduce the inrush current of the capacitor bank and avoid harmonic amplification of the capacitor bank, while avoiding high capacitor operating voltage, over-voltage is easy to generate when switching.

- Model: CKSC-24
- Rated voltage: 24KV
- Frequency: 50Hz
- Number of phases: three-phase
- Reactance: 6 per cent
- Insulation class: Class F
- Industrial frequency test voltage (RMS): 65KV
- Lightning shock: 125KV
- Adoption of epoxy resin vacuum casting, film degassing process
- Iron core adopts noise reduction technology to meet the requirements of low noise operation
- Requires excellent dynamic thermal stability and excellent atmospheric overvoltage and operational overvoltage tolerance.
- Clean appearance, low noise, maintenance-free operation

6) Each reactor has a nameplate with the name of the manufacturer, voltage, capacity and other relevant technical parameters.

#### 7) Vacuum contactors

The contactor is resistant to frequent operation, the arc extinguishing chamber does not need to be overhauled, there is no oil leakage problem compared with oil less circuit breakers, and can meet the requirements of the

The requirements for long-term work are sufficient.

- Model: xxxx-24
- Rated voltage: 24KV
- Frequency: 50Hz
- Number of phases: three-phase
- Rated current: 200-630A
- Rated closing current (RMS): 4-6.3KA
- Rated dynamic thermal stability current: 4-6.3KA
- Rated maximum breaking current: 3.2-5.04KA
- Lightning impact withstand voltage: 125KV
- Rated short-time withstand current: 6.3KA
- Rated peak withstand current: 16KA

8) voltage transformer

- Model: JDZJ-22
- Maximum working voltage: 24KV
- Frequency: 50Hz
- Number of phases: single-phase
- Accuracy level: 0.5
- Capacity: 50VA      Maximum capacity: 400VA
- Shunt voltage transformer can timely discharge the remaining charge of the capacitor bank, reduce again into the capacitor bank when the inrush current, to prevent overcurrent caused by the explosion of the capacitor bank, and even threaten the personal safety of the operating personnel; Voltage transformer is also a measurement, relay and open delta protection function.

- 9) Zinc oxide surge arresters:
- Model: HY5WR-32/84
  - Rated voltage: 22KV
  - Frequency: 50Hz
  - Maximum system operating voltage: 24KV
  - The surge arrester is installed in parallel with the capacitor bank to provide effective overvoltage protection.
  - Residual voltage of lightning impulse current at 5kA nominal discharge current  $\leq 72$  kV.
  - Operational inrush current residual voltage  $\leq 65$  kV.
  - 2mS Square wave impulse withstand current: 150A.
- 10) The cabinet must be constructed from high-quality aluminum-zinc alloy plates with a minimum thickness of 2.0mm.
- 11) Capacitors and reactors must be covered by a three-year warranty. If any issues arise within this period, replacements shall be provided free of charge. If failures occur more than three times within three years, the warranty period will be extended by two additional years.

If the components burn out and fail, the warranty period will be postponed for 2 years, and the quality guarantee will be deducted.

- 12) **Within 15 days of contract signing, the subcontractor must submit two hard copies of the design documentation for the purchased equipment to the main contractor, along with one electronic copy for review and verification.**

**(blueprints and stamps), 1 electronic . for the design unit to refine/review the design. The equipment submittal drawings include and are not limited to the following:**

- Provide comprehensive design drawings of the capacitor unit;
- Overall layout of capacitor unit, foundation layout, location of foundation embedded parts, location of cable channel, location of grounding point
- All secondary wiring diagrams, electrical schematics, terminal block diagrams, secondary electrical interlocking diagrams related to the design of capacitor devices.
- Other design mandatory drawings or information.



### 13) Technical specifications and standards for switchgear

The design, manufacturing, inspection, and implementation of the equipment must comply with the latest versions of the following standards, but not be limited to them.

- GB50227-95 Design Code for Shunt Capacitor Sets
- GB3986.2-89 High-voltage shunt capacitors
- JB7111-93 High-voltage shunt capacitor devices
- DL/T604-1996 Technical conditions for ordering high-voltage shunt capacitor devices
- DL462-92 Technical conditions for ordering series reactors for high-voltage shunt capacitors
- JB5346-1998 Series reactors
- GB311-83 Discharge Coils
- GB191 Standard for Packaging, Storage and Transportation
- GB11032-2000 Metal Zinc Oxide Surge Arrester without Gap in Communication
- JB3840 High-voltage fuses for single-unit protection of shunt capacitors
- GB11024 High-voltage shunt capacitor durability test
- IEC-60 High Voltage Test Techniques
- DL/T486 Technical conditions for ordering AC high-voltage disconnecting switches
- GB16927.1 High Voltage Test Techniques
- GB4208 Enclosure Protection Grade IP Code
- GB50227 Design Code for Shunt Capacitor Sets

# 22kV 电容补偿成套装置技术规范

## 1 资质要求

- 1.1 生产厂家应持有国家有关行业管理部门颁发的开关柜生产资质证明；同时提供补偿滤波产品由国家权威机构部门出具的实验报告。
- 1.2 本系统的 ISO9000 系列认证证书，职业健康安全管理体系认证、环境管理体系认证。并通过强制性产品认证（3C 认证）
- 1.3 设备制造商应具有 3 年以上批量生产同类开关柜的能力和经历。
- 1.4 供货厂家及产品均须满足当地供电部门的备案要求及当地的市场准入条件

## 2 合同范围

见清单及图纸。

开关柜型号、用途、主要技术参数详见设备清单及相关图纸。

## 3 环境条件

本次产品该区域的环境条件

安装地点：户内

地震烈度：8 度

污染等级：II 级，无严重污秽化学腐蚀和剧烈振动；公称爬电比距值 $\geq 20\text{mm/kV}$ 。

运行温度： $-20^{\circ}\text{C}\sim+45^{\circ}\text{C}$

海拔高度： $<1000\text{m}$

相对湿度：

在 24 小时内测得的相对湿度的平均值不超过 95%。

在 24 小时内测得的水蒸气压力的平均值不超过 2.2kPa。

月相对湿度的平均值不超过 90%。

月水蒸气压力的平均值不超过 1.8kPa。

#### 4 技术要求

4.1 供货方应按照设备清单及图纸注明每台开关柜的编号、名称、用途等，并制作铭牌固定在每一台开关柜上。

#### 4.2 高压自动无功功率补偿成套装置

##### 1) 装置的技术条件

- 系统标准电压：22KV
- 最高工作电压：24.2KV
- 额定频率：50Hz
- 电抗率：6%
- 相数：3
- 功率因数：补偿容量足够的情况下达到 0.9 以上
- 绝缘水平：工频耐压 42kV，冲击耐压 75 kV
- 能够根据电网系统无功功率大小和电压控制要求自动投切与调节，不需要人工干预，快速补偿无功功率，提高系统功率因数达到 0.9 以上。
- 采用全数字化智能控制系统，由微机监测、智能调节。
- 能够快速响应，自动投切与调节，不需要人工干预。能够根据负荷变化自动调整补偿容量，实现对电压、无功功率的自动综合补偿与调节，避免过补和无功倒送现象。
- 应该采用电容器专用高压喷逐式熔断器作为短路保护、确保设备安全运行。
- 采用串联电抗器，减小合闸涌流，保护电容器组可靠运行。
- 抑制系统谐波，保证设备正常运行。
- 结构要求设计合理，使用方便，可手动操作，也可与负荷同步投切，免维护运行，

节电效果显著，减少电费开支。

- 改善供电质量，提高电气设备的正常出力。
- 降低线路损耗、变压器损耗。
- 要求电容补偿装置应能抑制高次谐波。
- 降低供电的视在功率，增加输变电设备线路的负荷能力，延长电气控制设备的使用寿命。
- 具有过压、欠压、开三角电压保护、过流和速断保护。
- 补偿器应该保护措施齐全，自动化程度高，能在外部故障或停电时自动退出，送电后自动恢复运行。
- 控制器要求液晶显示，可运行方式、投切组别、以及每段母线的电压、电流、功率因数、无功功率。
- 可查看故障信息：判断并显示一段（或二段）过压或（欠压）电容故障。
- 要求电容器组全密封免维护，装置调容方便，安全可靠。

## 2) 装置设计结构

- 高压自动无功功率补偿成套装置由真空接触器、高压并联电容器组、干式铁芯电抗器、电压互感器、避雷器和附属设备组成，电容器组由真空接触器来投切。装置采用柜式结构，操作面板可以自由开启，装置的后封闭板不能开启，装置侧面板及顶盖板均采用栓结封闭形式，并保证安装方便。装置的侧板、后封闭板和盖板采用厚 2.0 mm 的优质冷轧钢板，前门板采用厚 2.5 mm 的优质冷轧钢板，除盖板外，其余板面要求除锈后静电喷塑处理（米灰 RAL7032），防护等级 IP3X。
- 补偿装置应有良好的通风系统，保证可触及外壳和面板温升不超过 20°C。
- 柜体框架底部带有接地螺栓或接地板。

- 电磁连锁：装置应设电磁连锁，确保母线有电，电容器处于运行状态或电容器虽已退出运行，但未完成放电时，面门不能打开。

- 进线方式：电缆进线方式

### 3) 控制器：

- 要求实现全汉字化菜单式操作，具有良好的人机界面，并具有串行通讯接口。智能判断、优化控制。

- 要求带远传功能，能与配电所的对应高压出线柜的综保装置实现信号接口兼容。

### 4) 并联电容器

- 采用全膜介质电容器，柜内安装，电容器的外壳直接接地，该电容器质量可靠，具有良好的耐涌流能力，使用寿命长。

- 额定电压：24.2/ $\sqrt{3}$  KV

- 频率：50Hz

- 相数：单相

- 电容偏差：电容器允许的电容偏差为装置额定电容的-5%--+10%。三相电容器的任何两线路之间,其电容和最大值与最小值之比不超过 1.04。电容器组各串联段的最大与最小电容之比不超过 1.02。

- 电容器损耗角正切值在温度 20°C时，在额定频率和额定电压下不大于 0.0005。

- 电容器在不超过 1.1 倍的额定电压下长期运行，电容器在不超过 1.3 倍的额定电流下长期运行。

- 介质结构：全膜介质结构，苜基甲苯浸渍。

- 电容器在额定电压、额定电流和额定频率下运行时，箱壳内的温度不超过 65oC，内部单元电容器的浸渍剂温度不超过 85oC。

- 电容器组投入运行瞬间产生的涌流应限制在电容器组额定电流 20 倍以下。电容器外壳耐爆能力 $\geq 8\text{KJ}$ 。

#### 5) 干式铁芯串联电抗器

成套补偿装置采用三相补偿电抗器，可以保证补偿装置投入运行后，投切电容器时不会与系统发生谐振，确保补偿装置的可靠工作。且能降低电容器组的合闸涌流及避免电容器组产生谐波放大现象，同时避免造成电容器运行电压高，分闸时较易产生过电压。

- 型号：CKSC-24
- 额定电压：24KV
- 频率：50Hz
- 相数：三相
- 电抗率：6%
- 绝缘等级：F 级
- 工频试验电压（有效值）：65KV
- 雷电冲击：125KV
- 采用环氧树脂真空浇注、薄膜脱气工艺
- 铁芯采用降噪技术，满足低噪音运行的要求
- 要求具有优良的动热稳定性及优异的大气过电压及操作过电压耐受能力
- 产品外觀光洁、噪声低、免维护运行

#### 6) 每台电抗器有铭牌，标有制造厂名、电压、容量等相关技术参数

#### 7) 真空接触器

该接触器耐频繁操作，灭弧室不需检修，与少油断路器相比不存在渗漏油问题，可满足长期工作的要求。

- 型号: xxxx-24
- 额定电压: 24KV
- 频率: 50Hz
- 相数: 三相
- 额定电流: 200-630A
- 额定关合电流(有效值): 4-6.3KA
- 额定动热稳定电流: 4-6.3KA
- 额定最大分断电流: 3.2-5.04KA
- 雷击冲击耐受电压: 125KV
- 额定短时耐受电流: 6.3KA
- 额定峰值耐受电流: 16KA

#### 8) 电压互感器

- 型号: JDZJ-22
- 最高工作电压: 24KV
- 频率: 50Hz
- 相数: 单相
- 准确级次: 0.5 级
- 容量: 50VA 最大容量: 400VA
- 并联电压互感器能及时将电容器组剩余电荷泄放掉, 减小再次投入电容器组时产生的涌流, 防止因过流造成电容器组爆炸, 甚至威胁运行人员人身安全; 电压互感器还兼起测量、继电和开三角保护的功能。

9) 氧化锌避雷器:

- 型号: HY5WR-32/84
- 额定电压: 22KV
- 频率: 50Hz
- 系统最高运行电压: 24KV
- 该避雷器与电容器并联起保护电容器的作用。
- 5kA 标称放电电流下的雷电冲击电流残压 $\leq 72$  kV。
- 操作冲击电流残压 $\leq 65$  kV。
- 2mS 方波冲击耐受电流: 150A。

10) 柜体材料: 采用优质覆铝锌板, 厚度不小于 2.0mm;

11) 电容和电抗须有三年的质保期, 三年内出现任何问题免费更换, 三年内发生三次以上元器件烧毁故障的, 质保期顺延 2 年, 并扣除质量保证金。

**12) 合同签订后 15 天内, 分包方向总包方提供所采购设备的设计提资图纸资料纸质版 2 份 (蓝图并盖章), 电子版 1 份。以便设计单位完善/复核设计内容。设备提资图纸包含并不限于以下内容:**

- 提供完整的电容器装置设计图;
- 电容器装置总体布置图, 基础布置图, 基础预埋件位置图, 电缆槽位置, 接地点位置
- 电容器装置与设计相关的所有二次接线图, 电气原理图、接线端子排图、二次电气连锁图
- 其他设计必须图纸或资料。



### 13) 开关柜的技术规范及标准

设计、制造、检验、执行的主要标准(应遵循并不限于下列标准的最新版本或修改版本)

- GB50227-95 《并联电容器成套装置设计规范》
- GB3986.2-89 《高压并联电容器》
- JB7111-93 《高压并联电容器装置》
- DL/T604-1996 《高压并联电容器装置订货技术条件》
- DL462-92 《高压并联电容器用串联电抗器订货技术条件》
- JB5346-1998 《串联电抗器》
- GB311-83 《放电线圈》
- GB191 《包装贮运标准》
- GB11032-2000 《交流无间隙金属氧化物避雷器》
- JB3840 《并联电容器单台保护用高压熔断器》
- GB11024 《高压并联电容器耐久性试验》
- IEC—60 《高压试验技术》
- DL/T486 《交流高压隔离开关订货技术条件》
- GB16927.1 《高电压试验技术》
- GB4208 《外壳防护等级 IP 代码》
- GB50227 《并联电容器成套装置设计规范》

# **Technical Specification for 22kV Earthing Resistance**

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## 0 Scope of supply

Serial number	Earthing Resistance Cabinet	Substation Name	Quantity	Installation Location
1	Stainless steel Earthing Resistance Cabinet (incl. CT) (Subject to final construction drawings)	115KV substation	2 sets (Subject to final construction drawings)	within the home

The specific delivery date is determined according to Party A's notification.

## 1 General Provisions

### 1.1 General provisions

1 Bidders shall have the qualifications required by the tender notice, as detailed in the commercial section of the tender documents.

2 Bidders shall carefully read all the terms and conditions set out in the bidding documents, including these technical specifications (general and special parts of the technical specifications). The neutral grounding resistance device (hereinafter referred to as grounding resistance) provided by the bidder shall comply with the requirements specified in the bidding documents.

3 The technical specification of this bidding document puts forward the technical requirements on the technical parameters, performance, structure and test of **neutral point earthing resistance device**.

4 This bidding document puts forward the minimum technical requirements and does not stipulate all the technical details, nor does it fully cite the provisions of the relevant standards and norms, the bidder shall provide brand-new products that comply with the latest version of the standards cited in this technical specification and the technical requirements of this bidding document, and if there is inconsistency between the cited standards or if the standards used in this bidding document do not coincide with the standards implemented by the bidders , it shall be executed according to the standard with higher requirements.

5 If the bidder does not submit in writing a discrepancy to the provisions of the technical specifications of

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the present solicitation documents, it means that the equipment supplied by the bidder fully complies with the requirements of the present solicitation documents. Any inconsistency with the requirements of these solicitation documents must be listed in the "table of technical differences" item by item.

6 The technical specifications of the present solicitation documents shall be annexed to the ordering contract and shall have the same legal effect as the contract. Matters not covered in the technical specifications of the present solicitation documents shall be determined by the contracting parties during the contract negotiations.

7 If there is any contradiction between the commercial aspects of these technical specifications and the Commercial Section of the solicitation documents, the Commercial Section shall prevail.

8 If there is a conflict between the provisions of the general part of the technical specifications of these solicitation documents and the special part of the technical specifications, the special part shall prevail.

## **1.2 Qualification documents to be provided by bidders**

Bidders must submit the following qualification documents as part of their bid. Failure to do so will result in disqualification.

1 5 sets of sales records and successful operation records (provided in the format of Appendix A of the special part of the technical specifications) of the products tendered by the bidder or the manufacturer within 3 years and the corresponding end-user's proof of use.

2 The bidder or manufacturer should provide the authoritative authorities issued by the ISO-9000 series of certificates or equivalent quality assurance system certification.

3 The bidder or manufacturer shall provide documentation of the technical and major equipment and other production capabilities required to fulfil the contract.

4 The bidder shall provide documentation of its ability to fulfil its obligations for the maintenance, repair and other services of the contract equipment.

5 The bidder or the manufacturer shall provide the bidding product all valid type test report issued by the authority.

6 The bidder or manufacturer shall provide a detailed list of suppliers of important outsourced or ancillary components in the bid product and inspection reports.

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7 The bidder or manufacturer shall provide a letter of commitment to supply the supplier of imported key components in the bidding product.

### **1.3 Scope of application**

1 The scope of application of this specification is limited to the products tendered for this project. It covers design, structure, performance, installation, testing, commissioning and on-site services and technical services.

2 The successful bidder shall, not later than 5 days after signing, submit to the Purchaser a production schedule, including details of product design, material procurement, product manufacture, in-plant testing, and transport, to define each part of the work and its progress.

3 In the event of any delay in the progress of the work, the seller shall promptly explain to the buyer the reasons, consequences and remedial measures taken.

### **1.4 Requirements for design drawings, specifications and test reports**

#### **1.4.1 Approval and delivery of drawings and plans**

1 All drawings and explanatory documents to be confirmed by the purchaser shall be submitted by the seller to the purchaser for approval within 5 days after the contract has entered into force. These shall include *drawings of the neutral earth resistance device in outline, section, arrangement, assembly, foundation, transport dimensions, transport mass, centre of gravity, total weight*, etc. The Buyer shall have the right to make amendments at the time of validation. The purchaser has the right to propose changes during validation.

Any modifications deemed necessary by the Buyer and approved by the Seller shall not result in additional costs to the Buyer. Any loss of material purchased or processed without final approval of the drawings by the Buyer shall be borne solely by the Seller.

2 The Seller shall provide the Buyer with the final version of the official drawings and a set of official CD-ROMs, which must be stamped or signed by the factory, within 2 days after receiving the Buyer's confirmation of the drawings (including amendments made by the Approved Party).

3 The finished product shall correspond to the final confirmed drawings. The Buyer's approval of the drawings does not relieve the Seller of its responsibility for the correctness of its drawings. If the drawings are further modified by the Seller's technical personnel when the equipment is installed on site, the Seller

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shall re-collect the drawings into a catalogue and formally submit it to the Buyer, and shall ensure that the installed equipment is in full conformity with the drawings.

4 Format of drawings: all drawings should have title column, corresponding number, all symbols and parts of the sign, the text is in ***Chinese***, and the use of SI international system of units. For imported equipment in Chinese mainly, when the buyer has questions about the English part, the seller should be a written explanation.

The seller shall provide the buyer, free of charge, with all final drawings, data and instructions. The drawings shall include ***the drawings referred to in paragraph 1.4.1*** and shall ensure that the Buyer can maintain the equipment supplied in accordance with the final version of the drawings and replace parts during operation.

#### 1.4.2 Requirements for instructions

- 1 Operating Conditions and technical parameters of neutral earth resistance devices.
- 2 Complete description and technical data of the structure, installation, commissioning, operation, maintenance, overhaul and all accessories of the neutral point earth resistance device and main components.
- 3 Unpacking and lifting: the quality of the transport unit, precautions for lifting and unpacking, and special lifting equipment.
- 4 ASSEMBLY: Transport units shall be clearly labelled and coded, with assembly diagrams noting the transport unit number.
- 5 Preparation for installation: Requirements for foundation construction, dimensions of external terminals, location of cable entry points, grounding, and information on connection methods, dimensions and arrangement of various pipes.
- 6 Final installation acceptance: field handover test items and test methods.
- 7 Maintenance: Maintenance instructions for major components and classification, procedures and scope of repair work.
- 8 Operation and maintenance: Matters to be noted in operation and control indicators, maintenance cycles and maintenance programmes for major components.
- 9 Technical data for the individual components and all accessories of the neutral point earth resistance

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device.

- 10 A more detailed description of the structural features, equipment and its components.
- 11 Instructions for the use of spare parts, special tools and special instrumentation.
- 12 The instructions are in Chinese.

#### 1.4.3 Test reports

The seller shall provide the following test reports:

- 1 Type test report and factory test report of neutral point earthing resistance device.
- 2 Type test report and factory test report of the main components of the neutral point earthing resistance device.

3 When the product design, process, production conditions or the use of materials and major components have been significantly changed to affect the product performance, should do the corresponding type test and provide test reports.

#### 1.4.4 Delivery time and quantity of drawings, specifications and test reports, etc.

### **1.5 Standards and norms**

1.5.1 All equipment and spare parts in the contract, including all accessories and equipment obtained by the seller from third parties, shall comply with the latest version of the power industry standards (DL), national standards (GB) and IEC standards and the International System of Units (SI), which are the minimum requirements for the equipment, with the exception of the technical parameters and requirements stipulated in these specifications. If the bidder adopts its own standards or specifications, it must provide the buyer with copies in Chinese and English (if any) and obtain the buyer's consent before adopting them, but they cannot be lower than the relevant provisions of DL, GB and IEC.

#### 1.5.2 Standards implemented

The following standards contain provisions which, by reference in this standard, constitute provisions of this standard. The versions shown were in effect at the time of publication of the standards. All standards are subject to revision, and parties using this standard should explore the possibility of using the most recent versions of the standards listed below.

GB/T14048.1	Low-voltage switchgear and controlgear General provisions
GB/T16927	High voltage test technology



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GB4208	Shell protection grade (IP code)
GB311.1	Insulation fit of high-voltage transmission and distribution equipment
GB 50150	Standard for handover test of electrical equipment for electrical installation works
IEEE32	Standard Requirements, Terminology and Test Procedures for Neutral Point Earthing Devices
ANSI/IEEE std32-1972 (reapproved February 1991)	
DL/T78	Neutral grounding resistors for power distribution systems
DL/T620	Overvoltage protection and insulation coordination of AC electrical installations
JB6319	Basic Technical Requirements for Resistors
Shangdian Sisheng (2006) No.550 Q/SDJ1151-2006 Technical Specification for Neutral Point Grounders	

1.5.3 All bolts, double-ended bolts, threads, pipe threads, bolt clamps, and nuts must comply with ISO (International Organisation for Standardisation) and SI (International System of Units) standards.

### **1.6 Technical parameters and information to be submitted by bidders**

- 1 Technical parameter response sheets, technical deviation sheets and related technical information.
- 2 Characteristic parameters and features of the tendered product.
- 3 Relevant technical documents and information required for co-operation with other equipment.
- 4 Detailed primary wiring diagram, layout diagram and external dimensions of the equipment.
- 5 Type test report.

### **1.7 Spare parts**

1 The seller shall provide the necessary and recommended spare parts with their respective unit prices (to be completed in the commercial section).

2 All spare parts should be brand new and interchangeable with the corresponding parts of the same type of equipment already installed.

3 All spare parts should be packed in separate boxes and packaged in such a way that they are protected against dust, moisture, damage, etc., and shipped together with the main equipment, and labelled

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"spare parts" to distinguish them from the main body.

### **1.8 Specialised Tools and Instruments Instruments**

1 The seller shall provide the necessary and recommended *specialised tools and instrumentation* and list their unit prices (fill in the commercial part).

2 All specialised tools and instruments must be brand new and accompanied by detailed information on their use.

3 Special tools and instruments should be packed in separate boxes, indicating "special tools" and "instruments", and labelled as moisture-proof, dust-proof, fragile, upward, do not invert, etc., and shipped together with the main equipment.

### **1.9 Installation, commissioning, performance testing, commissioning and acceptance**

1 The installation and commissioning of the contract equipment will be carried out by the buyer under the guidance of the seller's technical personnel in accordance with the provisions of the technical documents and instructions provided by the seller.

2 Performance tests, commissioning and acceptance of contract equipment are carried out in accordance with the standards, protocols and specifications set out in this specification.

3. Upon completion of the installation of the contract equipment, the buyer and the seller shall inspect and confirm the installation work and sign a certificate of installation work in two copies, one for each party.

4 The equipment may only enter trial operation after successfully passing installation, commissioning, and performance testing. After the trial operation, the seller and the buyer should sign the acceptance certificate of the contract equipment (the trial operation time is agreed in the contract negotiation). The certificate shall consist of two copies, one for each party.

5 If one or more of the technical indicators during the installation, commissioning, performance test, trial operation and warranty period fails to meet the requirements of the technical part of the contract, the seller and the buyer shall jointly analyse the reasons and distinguish the responsibilities, and if it is due to the reasons of manufacturing or involves the part of the claim, it shall be carried out according to the relevant provisions of the commercial part.

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## 2 Technical Requirements

### 2.1 Operating Conditions

- 1 Elevation: <1000m;
- 2 Outdoor type, heat dissipation conditions according to indoor requirements;
- 3 Maximum Ambient Temperature: +40°C ;
- 4 Maximum monthly average temperature: +35°C ;
- 5 Maximum average annual temperature: +20°C ;
- 6 Minimum Ambient Temperature: -15°C ;
- 7 Maximum daily temperature difference: 25°C ;
- 8 Highest monthly average relative humidity: 90 per cent (25°C );
- 9 Creepage ratio distance: 28 mm/kV;
- 10 Seismic intensity: Horizontal ground acceleration 0.2g; vertical acceleration 0.1g.

### 2.2 Technical parameters (the following parameters are subject to the final construction drawings)

- 1 System short circuit apparent capacity: 240 MVA for 22 kV system;
- 2 Rated voltage: 24kV;
- 3 System rated frequency: 50 Hz;
- 4 Ground zero sequence current: 1000A;
- 5 Grounding short circuit time: 10 seconds;
- 6 Resistor resistance: 5.7Ω;
- 7 Enclosure Protection: Rated IP23;
- 8 Resistor material: Stainless steel.
- 9 Current Transformer 2× (600/5A, 10P20, 20VA)

### 2.3 General requirements

2.3.1 Requirements for resistors simple structure, reliable performance, corrosion resistance, vibration resistance, high reliability, long life, small size, light weight, high strength of the resistive element, good ductility, no breakage, high melting point, oxidation resistance, and resistance value is stable, small change with temperature, resistance value precision.

2.3.2 Resistor material: stainless steel resistor element.

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2.3.3 Structure: The resistors are of cabinet type. Each group of resistors by a number of resistors in series, parallel and become. Each resistor is supported by a frame made of stainless steel plate with stainless steel resistor elements inside. The elements have holes on all four sides for assembly. Between each piece of components with high temperature silicone organic insulating washers and fixed in sets of high temperature insulating tube on the metal rod, and then use argon arc welding will be connected to the components in series or parallel circuit. The protection level of the whole structure is IP23, and the distance between the electrical components inside the resistor cabinet must be more than 125mm, and the cross section of copper wires connecting the resistor sections to the external leads is not less than 100mm<sup>2</sup>. The bottom of the resistor cabinet must be mounted at least 200mm above the ground.

2.3.4 Resistors can be stacked and used to ensure good heat dissipation after stacking without reducing their capacity.

2.3.5 The structure of the shell should be easy to install and maintain, and should be made of stainless steel material shell, the shell has a reliable grounding terminal (bolt diameter not less than 12mm).

2.3.6 All metal fittings are assembled by the seller at the factory in accordance with strict technical regulations and are subjected to tests and final inspection.

2.3.7 Individual resistors of the same type shall have the same electrical performance and be interchangeable.

2.3.8 Resistors are to be supplied in sets by the seller. The whole set of resistors shall be wired top in and bottom out.

2.3.9 All purchased parts of the resistor must be identified and have product certification, in line with the corresponding standard requirements.

2.3.10 The strut insulators and bushings of resistors shall comply with the requirements of the relevant standards. Insulating sleeves and supporting insulators shall be selected from heat-resistant and high-temperature-resistant components.

2.3.11 Incoming and outgoing wires: upper inlet and lower outlet (upper inlet is porcelain casing, lower outlet is grounded through CT).

2.3.12 Resistor sheet support rod end of the use of high-temperature insulation sleeve, support rod in the middle of the unthreaded, the two ends of the outer diameter of the thread shall not be greater than the

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middle of the outer diameter.

2.3.13 The enclosure must feature a ventilation system with an air inlet at the bottom plate and an air outlet at the upper section of the side panel.

#### 2.3.14 Nameplates

There is a nameplate in line with the national standard, the nameplate is made of corrosion-resistant materials, the words and symbols should be clear and durable, the nameplate installation location should be clearly visible.

The nameplate should be clearly marked: name and model of the resistance cabinet, rated voltage level, short-time current and time, resistance value, manufacturer, year and month of manufacture and product number.

### **3 Tests**

#### 3.1 Type test

The Seller shall provide the Buyer with the following type test reports:

3.1.1 General inspection (including electrical clearance, creepage distance, external dimensions, installation dimensions and safety earthing)

3.1.2 Temperature rise test (permissible load current test under short-time operation)

3.1.3 Dielectric properties test

3.1.4 Shock vibration resistance test

3.1.5 Resistance value error measurement tests

3.1.6 Tests for resistance to abnormal heat and fire hazards

3.1.7 Damp heat resistance test

3.1.8 Rust resistance test

3.1.9 Tests for comparison with the leakage trace index (CTI value)

3.1.10 Mechanical testing of terminal blocks

#### **3.2 Factory test**

Seller shall provide Buyer with the following factory test reports:

3.2.1 Visual inspection (including assessment of external appearance, assembly quality, nameplates, markings, components, and protective coatings).

3.2.2 General inspections

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3.2.3 Resistance measurement per resistor

3.2.4 Measurement of total resistance of each resistor group after analogue assembly

3.2.5 Insulation resistance measurement

3.2.6 Power Frequency Withstand Voltage Test

### **3.3 Field trials**

3.3.1 Measurement of the resistance value of each resistor

3.3.2 Measurement of total resistance of each resistor group after assembly

3.3.3 Insulation resistance measurement

3.3.4 Power Frequency Withstand Voltage Test after assembly

## **4 Technical services, design liaison, factory inspection**

### **4.1 Technical services**

#### **4.1.1 General**

1 The seller shall appoint a site representative to co-operate with the buyer and the installation contractor. The Seller shall assign experienced installation instructors and test engineers to provide technical guidance for the installation, commissioning and site testing of the contract equipment. The Seller's instructor shall be responsible for the correctness of all installation work, unless the Installation Contractor's work is not carried out in accordance with the advice of the Seller's instructor, but the Seller's instructor shall immediately notify the Purchaser in writing of this fact.

2 The contract equipment is to be installed over a period of \_\_\_ weeks, whereby the seller and buyer mutually agree on a detailed installation process and schedule as a basis for the seller's direction of the installation, listing the types and Quantity of personnel and tools to be supplied by the installation contractor.

3 The seller and the buyer shall decide by agreement on the speciality of the seller's technicians, the number of personnel, the duration of their services, and the dates of their arrival at and departure from the site, in the light of the actual progress of work on the construction.

#### **4.1.2 Tasks and responsibilities**

1 The site representative appointed by the seller shall, within the scope of the contract, fully co-operate and consult with the buyer's site representative in order to solve relevant technical and working

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problems. The site representatives of both parties shall not have the right to change or amend the contract without the authorisation of both parties.

2 The seller's technical personnel shall complete the technical service of the equipment concerned, guide and supervise the installation, commissioning and acceptance test of the equipment in accordance with the provisions of the contract.

3 The seller's technical personnel shall explain in detail to the buyer's personnel the technical documents, drawings, operation and maintenance manuals, characteristics of the equipment, methods of analysis and relevant precautions, etc., as well as answering and resolving technical questions raised by the buyer within the scope of the contract.

4 The seller's technical personnel shall be obliged to assist the buyer in the necessary training of personnel for operation and maintenance on site.

5. The technical instructions of the seller's technicians shall be correct, and the seller shall be responsible for repairing, replacing and/or replenishing the equipment and materials at the seller's expense in the event of damage caused by incorrect instructions, which shall also include service charges incurred during the period when the repairs are carried out. The buyer's technicians concerned shall respect the technical instructions of the seller's technicians.

6. The seller's representative shall fully understand the buyer's technical and quality comments and suggestions on the installation and commissioning work, so that the installation and commissioning of the equipment shall be of a quality satisfactory to both parties. If the installation or test work is delayed for reasons attributable to the Seller, the Buyer shall have the right to request the Seller's installation supervisors or test engineers to remain at the site at the Seller's own expense. If the installation or test is delayed due to the buyer's reasons, the buyer shall have the right to request the seller's installation supervisors or test engineers to continue to stay at the site at the seller's expense.

#### **4.2 Design liaison meetings**

1 In order to coordinate design and other interfaces, the buyer and the seller shall hold design liaison meetings as required. The seller shall draw up a detailed programme for the design liaison meetings. Within 5 days after signing the contract, the seller shall propose to the buyer a programme for the design liaison meetings, at which the buyer shall have the right to suggest improvements to the contract equipment, and

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the seller shall make improvements in accordance with such suggestions.

2 Main elements of the liaison meeting:

(1) Determine the final layout dimensions, including the shape and arrangement of other ancillary equipment;

(2) Review the main performance and parameters of the circuit breaker and confirm them;

(3) Check the overall progress, quality assurance procedures and quality control measures;

(4) Determine civil engineering requirements, transport dimensions and weights, and information requirements for the various interfaces of the engineering design;

(5) Discussion of delivery procedures;

(6) Addressing legacy issues;

(7) Discuss transport, installation, commissioning and acceptance tests;

3 Other elements to be discussed, e.g., location, dates, number of persons, etc., to be agreed upon during contract negotiations.

4 In addition to the liaison meetings provided for above, if there are important matters that need to be studied and discussed between the two parties, another liaison meeting may be convened with the consent of the parties to resolve the matter.

5 Minutes shall be signed for each meeting and shall form an integral part of the contract.

#### **4.3 Factory inspection**

1 The Buyer shall be entitled to send its inspectors to the workshop premises of the Seller and its subcontractors to inspect the fabrication of the contract equipment.

2 If, after inspection and testing, there is any contract equipment that does not conform to the technical specifications, the buyer may refuse to accept it and the seller shall replace it without compensation.

3 After the contract equipment has been shipped to the buyer, the buyer's right to inspect, test and reject (if necessary) shall not be limited by the fact that the contract equipment has been inspected and passed by the buyer or its representative prior to shipment at the place of origin.

4 The Seller shall notify the Buyer of its schedule at \_\_\_ months prior to the commencement of the factory tests. According to this schedule, the Buyer shall determine the items to be witnessed and notify the



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Seller within\_\_\_ days.

5 In order to gain a field understanding of the contractual equipment, the seller shall organise a training session for the buyer in its own factory.

# 22kV接地电阻技术规范书

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## 0 供货范围

序号	接地电阻柜	变电站名称	数量	安装位置
1	不锈钢接地电阻柜 (包括 CT) (以最终施工图为准)	115KV 变电站	2 套 (以最终 施工图为准)	户内

具体交货日期根据甲方通知确定。

## 1 总则

### 1.1 一般规定

- 1 投标人应具备招标公告所要求的资质，具体资质要求详见招标文件的商务部分。
- 2 投标人须仔细阅读包括本技术规范(技术规范通用和专用部分)在内的招标文件阐述的全部条款。

投标人提供的中性点接地电阻装置(以下简称接地电阻)应符合招标文件所规定的要求。

3 本招标文件技术规范提出了对 中性点接地电阻装置 的技术参数、性能、结构、试验等方面的技术要求。

4 本招标文件提出的是最低限度的技术要求，并未对一切技术细节做出规定，也未充分引述有关标准和规范的条文，投标人应提供符合本技术规范引用标准的最新版本标准和本招标文件技术要求的全新产品，如果所引用的标准之间不一致或本招标文件所使用的标准与投标人所执行的标准不一致时，按要求较高的标准执行。

5 如果投标人没有以书面形式对本招标文件技术规范的条文提出差异，则意味着投标人提供的设备完全符合本招标文件的要求。如有与本招标文件要求不一致的地方，必须逐项在“技术差异表”中列出。

6 本招标文件技术规范将作为订货合同的附件，与合同具有同等的法律效力。本招标文件技术规范未尽事宜，由合同签约双方在合同谈判时协商确定。

7 本技术规范中涉及有关商务方面的内容，如与招标文件的《商务部分》有矛盾时，以《商务部分》为准。

- 8 本招标文件技术规范中通用部分各条款如与技术规范专用部分有冲突，以专用部分为准。

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## 1.2 投标人应提供的资格文件

投标人在投标文件中应提供下列有关资格文件，否则视为非响应性投标。

- 1 投标人或制造商投标产品的 3 年内 5 套销售记录和成功运行记录（按技术规范专用部分附录 A 的格式提供）及相应的最终用户的使用情况证明。
- 2 投标人或制造商应提供权威机关颁发的 ISO-9000 系列的认证书或等同的质量保证体系认证证书。
- 3 投标人或制造商应提供履行合同所需的技术和主要设备等生产能力的文件资料。
- 4 投标人应提供有能力履行合同设备维护保养、修理及其他服务义务的文件。
- 5 投标人或制造商应提供投标产品全部有效的由权威机构出具的型式试验报告。
- 6 投标人或制造商应提供一份详细的投标产品中重要外购或配套部件供应商清单及检验报告。
- 7 投标人或制造商应提供投标产品中进口关键元件供应商的供货承诺函。

## 1.3 适用范围

- 1 本规范的适用范围仅限于本工程的投标产品。内容包括设计、结构、性能、安装、试验、调试及现场服务和技术服务。
- 2 中标人应不晚于签约后 5 天内，向买方提出一个生产进度计划，包括产品设计、材料采购、产品制造、厂内测试以及运输等详情，以确定每部分工作及其进度。
- 3 工作进度如有延误，卖方应及时向买方说明原因、后果及采取的补救措施等。

## 1.4 对设计图纸、说明书和试验报告的要求

### 1.4.1 图纸及图纸的认可和交付

- 1 所有需经买方确认的图纸和说明文件，均应由卖方在合同生效后的 5 天内提交给买方进行审定认可。这些资料包括 中性点接地电阻装置的外形图、剖面图、布置图、组装图、基础图、运输尺寸、运输质量、重心、总重量 等。买方审定时有权提出修改意见。

凡买方认为需要修改且经卖方认可的，不得对买方增加费用。在未经买方对图纸作最后认可前任何采购或加工的材料损失应由卖方单独承担。

- 2 卖方在收到买方确认图纸（包括认可方修正意见）后，应于 2 天内向买方提供最终版的正式图纸和一套正式的光盘，正式图纸必须加盖工厂公章或签字。

- 3 完工后的产品应与最后确认的图纸一致。买方对图纸的认可并不减轻卖方关于其图纸的正确性的责任。设备在现场安装时，如卖方技术人员进一步修改图纸，卖方应对图纸重新收编成册，正

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式递交买方，并保证安装后的设备与图纸完全相符。

4 图纸的格式：所有图纸均应有标题栏、相应编号、全部符号和部件标志，文字均用中文，并使用 SI 国际单位制。对于进口设备以中文为主，当买方对英文局部有疑问时，卖方应进行书面解释。

卖方免费提供给买方全部最终版的图纸、资料及说明书。其中图纸应包括 1.4.1 第1款所涉及的图纸，并且应保证买方可按最终版的图纸资料对所供设备进行维护，并在运行中进行更换零部件等工作。

#### 1.4.2 说明书的要求

- 1 中性点接地电阻装置的使用条件和技术参数。
- 2 中性点接地电阻装置及主要元件的结构、安装、调试、运行、维护、检修和全部附件的完整说明和技术数据。
- 3 开箱和起吊：运输单元的质量，起吊和开箱的注意事项及专用的起吊用具等。
- 4 组装：运输单元应有清楚的标志和代号，注有运输单元号的组装示意图。
- 5 安装准备：基础施工的要求，外部接线端子的尺寸，电缆进入地点位置，接地以及各种管道的连接方式、尺寸和布置等资料。
- 6 最终的安装验收：现场交接试验项目及试验方法。
- 7 维护：主要元件的维护说明以及维修工作的分类、程序和范围。
- 8 运行检修：运行中应注意的事项及控制指标，主要元件的检修周期和检修方案。
- 9 中性点接地电阻装置各个元件和所有附件的技术数据。
- 10 结构特征、设备及其元件的更详细的说明。
- 11 备品备件、专用工具和专用仪器仪表的使用说明。
- 12 说明书使用中文。

#### 1.4.3 试验报告

卖方应提供下列试验报告：

- 1 中性点接地电阻装置的型式试验报告和出厂试验报告。
- 2 中性点接地电阻装置主要元件的型式试验报告和出厂试验报告。
- 3 当产品的设计、工艺、生产条件或使用的材料及主要元件发生重大改变而影响到产品性能时，应做相应的型式试验并提供试验报告。

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#### 1.4.4 图纸、说明书及试验报告等资料的交付时间、数量

### 1.5 标准和规范

1.5.1 合同中所有设备、备品备件，包括卖方从第三方获得的所有附件和设备，除本规范中规定的技术参数和要求外，其余均应遵照最新版本的电力行业标准（DL）、国家标准（GB）和 IEC 标准及国际单位制（SI），这是对设备的最低要求。投标人如果采用自己的标准或规范，必须向买方提供中文和英文(若有)复印件并经买方同意后方可采用，但不能低于 DL、GB 和 IEC 的有关规定。

#### 1.5.2 执行的标准

下列标准所包含的条文，通过在本标准中引用而构成为本标准的条文。在标准出版时，所示版本均为有效。所有标准都会被修订，使用本标准的各方应探讨使用下列标准最新版本的可能性。

GB/T14048.1	低压开关设备和控制设备 总则
GB/T16927	高电压试验技术
GB4208	外壳防护等级（IP 代码）
GB311.1	高压输配电设备的绝缘配合
GB 50150	电气装置安装工程电气设备交接试验标准
IEEE32	中性点接地装置的标准要求、术语和试验程序
ANSI/IEEE std32-1972（1991 年 2 月重新批准）	
DL/T78	配电系统中性点接地电阻器
DL/T620	交流电气装置的过电压保护和绝缘配合
JB6319	电阻器基本技术要求

上电司生（2006）550 号 Q/SDJ1151-2006 中性点接地器技术规范

1.5.3 所有螺栓、双头螺栓、螺纹、管螺纹、螺栓夹及螺母均应遵守国际标准化组织（ISO）和国际单位制（SI）的标准。

### 1.6 投标人必须提交的技术参数和信息

- 1 技术参数响应表、技术偏差表及相关技术资料。
- 2 投标产品的特性参数和特点。
- 3 与其它设备配合所需的相关技术文件和信息。
- 4 设备详细的一次接线图、布置图及外形尺寸。
- 5 型式试验报告。

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## 1.7 备品备件

- 1 卖方应提供必备和推荐的 备品备件，并分别列出其单价（商务部分填写）。
- 2 所有备品备件应为全新产品，与已经安装同型号设备的相应部件能够互换。
- 3 所有备品备件应单独装箱，包装应能防尘、防潮、防止损坏等，与主设备一并发运，并标注“备品备件”以区别本体。

## 1.8 专用工具与仪器仪表

- 1 卖方应提供必备和推荐的 专用工具和仪器仪表，并列出具单价（商务部分填写）。
- 2 所有专用工具与仪器仪表必须是全新的，并附详细的使用说明资料。
- 3 专用工具与仪器仪表应单独装箱，注明“专用工具”、“仪器仪表”，并标明防潮、防尘、易碎、向上、勿倒置等字样，同主设备一并发运。

## 1.9 安装、调试、性能试验、试运行和验收

- 1 合同设备的安装、调试将由买方根据卖方提供的技术文件和说明书的规定在卖方技术人员指导下进行。
- 2 合同设备的性能试验、试运行和验收根据本规范规定的标准、规程规范进行。
- 3 完成合同设备安装后，买方和卖方应检查和确认安装工作，并签署安装工作证明书，共两份、双方各执一份。
- 4 设备安装、调试和性能试验合格后方可投入试运行。试运行后买卖双方应签署合同设备的验收证明书（试运行时间在合同谈判中商定）。该证明书共两份，双方各执一份。
- 5 如果安装、调试、性能试验、试运行及质保期内技术指标一项或多项不能满足合同技术部分要求，买卖双方共同分析原因，分清责任，如属制造方面的原因，或涉及索赔部分，按商务部分有关条款执行。

## 2 技术要求

### 2.1 使用条件

- 1 海拔： <1000m;
- 2 户外式，散热条件按户内要求；
- 3 最高环境温度： +40℃；
- 4 最高月平均气温： +35℃；



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- |              |                           |
|--------------|---------------------------|
| 5 最高年平均气温:   | +20℃;                     |
| 6 最低环境气温:    | -15℃;                     |
| 7 最大日温差:     | 25℃;                      |
| 8 最高月平均相对湿度: | 90% (25℃);                |
| 9 爬电比距:      | 28mm/kV;                  |
| 10 地震烈度:     | 地面水平加速度 0.2g; 垂直加速度 0.1g。 |

## 2.2 技术参数 (下面参数以最终施工图为准)

- |             |                        |
|-------------|------------------------|
| 1 系统短路表观容量: | 22kV 系统 240MVA;        |
| 2 额定电压:     | 24kV;                  |
| 3 系统额定频率:   | 50Hz;                  |
| 4 接地零序电流:   | 1000A;                 |
| 5 接地短路时间:   | 10 秒;                  |
| 6 电阻器阻值:    | 5.7Ω;                  |
| 7 外壳保护:     | IP23;                  |
| 8 电阻器材料:    | 不锈钢。                   |
| 9 电流互感器     | 2× (600/5A、10P20、20VA) |

## 2.3 通用要求

2.3.1 要求电阻器结构简单、性能可靠、耐腐蚀、耐振动、可靠性高、寿命长、体积小、重量轻,电阻元件强度高、延展性好、不断裂、熔点高、抗氧化能力强,并且阻值稳定、随温度变化小、阻值精度高。

2.3.2 电阻材料:采用不锈钢电阻元件。

2.3.3 结构:电阻器采用柜式。每组电阻器由若干台电阻器串、并联而成。每台电阻器两端为不锈钢板制成的构架支撑,内装不锈钢电阻元件。元件四边均有孔,供组装使用。各片元件之间用耐高温含硅有机绝缘垫圈隔开并固定在套有耐高温的绝缘管的金属杆上,再采用氩弧焊将元件连成串联或并联回路。整体结构的防护等级为 IP23。电阻柜内部电气元件距离必须大于 125mm。电阻器对外引线电阻器节与节之间的连接铜线截面不小于 100mm<sup>2</sup>。电阻柜底部离地高度为 200mm。

2.3.4 电阻器可以叠装使用,叠装后保证有良好的散热效果,不致降低其容量。

2.3.5 壳体的结构应便于安装和维护,应采用不锈钢材料外壳,壳体有可靠的接地端子(螺栓直径

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不小于 12mm)。

2.3.6 所有金属配件均由卖方在厂内按严格的技术规定装配好，并经过试验和最后的检查。

2.3.7 同型号的单台电阻器的电气性能应相同，具有互换性。

2.3.8 电阻器由卖方成套供应。整组电阻器的接线上进下出。

2.3.9 电阻器的所有外购件必须经过鉴定并有产品合格证，符合相应标准要求。

2.3.10 电阻器的支柱绝缘子和套管应符合相关标准的要求。绝缘套管及支持绝缘子应选用耐热、耐高温元件。

2.3.11 进出线方式：上进下出（上进为瓷套管，下出通过 CT 接地）。

2.3.12 电阻片支撑杆端部采用耐高温的绝缘套，支撑杆中部无螺纹，两端螺纹外径不得大于中部外径。

2.3.13 箱体通风应采用底板进风侧板上部出风的结构。

2.3.14 铭牌

有符合国标的铭牌，铭牌用耐腐蚀材料制成，字样、符号应清晰耐久，铭牌安装位置应明显可见。

铭牌应清晰标明：电阻柜名称及型号、额定电压等级、短时通流及时间、电阻值、制造厂、制造年月及产品编号。

### 3 试验

#### 3.1 型式试验

卖方应向买方提供以下型式试验报告：

3.1.1 一般检查（包括电气间隙、爬电距离、外形尺寸、安装尺寸和安全接地等）

3.1.2 温升试验（短时工作制下的允许负载电流试验）

3.1.3 介电性能试验

3.1.4 耐冲击振动性能试验

3.1.5 电阻值误差测量试验

3.1.6 抗非正常热和着火危险试验

3.1.7 耐湿热试验

3.1.8 抗锈性能试验

3.1.9 相比漏电起痕指数（CTI 值）的测试

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### 3.1.10 接线端子机械性能试验

## 3.2 出厂试验

卖方应向买方提供以下出厂试验报告：

### 3.2.1 外观检查（包括外观和装配质量、铭牌、标志、零部件和镀层等检查）

### 3.2.2 一般检查

### 3.2.3 每台电阻器电阻测量

### 3.2.4 模拟组装后每组电阻器总电阻测量

### 3.2.5 绝缘电阻测量

### 3.2.6 工频耐压试验

## 3.3 现场试验

### 3.3.1 每台电阻器的电阻值测量

### 3.3.2 组装后每组电阻器总电阻测量

### 3.3.3 绝缘电阻测量

### 3.3.4 组装后进行工频耐压试验

## 4 技术服务、设计联络、工厂检验

### 4.1 技术服务

#### 4.1.1 概述

1 卖方应指定一名工地代表，配合买方及安装承包商的工作。卖方应指派有经验的安装指导人员和试验工程师，对合同设备的安装、调试和现场试验等进行技术指导。卖方指导人员应对所有安装工作的正确性负责，除非安装承包商的工作未按照卖方指导人员的意见执行，但是，卖方指导人员应立即以书面形式将此情况通知了买方。

2 合同设备的安装工期为\_\_\_周，买卖双方据此共同确认一份详尽的安装工序和时间表，作为卖方指导安装的依据，并列岀安装承包商应提供的人员和工具的类型及数量。

3 买卖双方应该根据施工的实际工作进展，通过协商决定卖方技术人员的专业、人员数量、服务持续时间、以及到达和离开工地的日期。

#### 4.1.2 任务和责任

1 卖方指定的工地代表，应在合同范围内与买方工地代表充分合作与协商，以解决有关的技术

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和工作问题。双方的工地代表，未经双方授权，无权变更和修改合同。

2 卖方技术人员应按合同规定完成有关设备的技术服务，指导、监督设备的安装、调试和验收试验。

3 卖方技术人员应对买方人员详细地解释技术文件、图纸、运行和维护手册、设备特性、分析方法和有关的注意事项等，以及解答和解决买方在合同范围内提出的技术问题。

4 卖方技术人员有义务协助买方在现场对运行和维护的人员进行必要的培训。

5 卖方技术人员的技术指导应是正确的，如因错误指导而引起设备和材料的损坏，卖方应负责修复、更换和（或）补充，费用由卖方承担，该费用中还包括进行修补期间所发生的服务费。买方的有关技术人员应尊重卖方技术人员的技术指导。

6 卖方代表应充分理解买方对安装、调试工作提出的技术和质量方面的意见和建议，使设备的安装、调试达到双方都满意的质量。如因卖方原因造成安装或试验工作拖期，买方有权要求卖方的安装监督人员或试验工程师继续留在工地服务，且费用由卖方自理。如因买方原因造成安装或试验拖期，买方根据需要有权要求卖方的安装监督人员或试验工程师继续留在工地服务，并承担有关费用。

## 4.2 设计联络会

1 为协调设计及其它方面的接口工作，根据需要买方与卖方应召开设计联络会。卖方应制定详细的设计联络会日程。签约后的5天内，卖方应向买方建议设计联络会方案，在设计联络会上买方有权对合同设备提出改进意见，卖方应按此意见作出改进。

2 联络会主要内容：

- (1) 决定最终布置尺寸，包括外形和其它附属设备的布置；
- (2) 复核断路器的主要性能和参数，并进行确认；
- (3) 检查总进度、质量保证程序及质控措施；
- (4) 决定土建要求，运输尺寸和重量，以及工程设计的各种接口的资料要求；
- (5) 讨论交货程序；
- (6) 解决遗留问题；
- (7) 讨论运输、安装、调试及验收试验；

3 其它需讨论的内容，如：地点、日期、人数等在合同谈判时商定。

4 除上述规定的联络会议外，若遇重要事宜需双方进行研究和讨论，经各方同意可另召开联络

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会议解决。

5 每次会议均应签署会议纪要，该纪要作为合同的组成部分。

### **4.3 工厂检验**

1 买方有权派遣其检验人员到卖方及其分包商的车间场所，对合同设备的加工制造进行检验。

2 如经检验和试验有不符合技术规范的设备，买方可以拒收，卖方应无偿给予更换。

3 合同设备运到买方后，买方有进行检验、试验和拒收（如果必要时）的权力，不得因该合同设备在原产地发运以前已经由买方或其代表进行过检验并已通过作为理由而受到限制。

4 卖方应在开始进行工厂试验前\_\_\_个月，通知买方其日程安排。根据这个日程安排，买方需确定要见证的项目，并在\_\_\_天内通知卖方。

5 为对合同设备进行实地了解，卖方应在本厂内组织一次对买方的培训。

# **Fault Recording Technical Specification**

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## 0 Scope of supply

Serial Number	Equipment Name	Substation Name	Quantity	Installation Location
1	Fault Recorder Screen	115KV substation	1 side	within the home

## 1 Implementation standards

This fault recorder complies with IEC 255-221 international standards.

## 2 Equipment operating environmental conditions:

Installation Location: Indoor;

Altitude:  $\leq 1000\text{m}$ ;

Ambient Temperature:  $-5^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  ;

Average annual maximum humidity: 90 per cent (ambient temperature  $20^{\circ}\text{C}$  ).

## 3 Technical requirements

(1) The fault recorder must be a fully digital embedded system with a dedicated startup element. It must be capable of locally outputting recorded data and transmitting it to a remote system.

(2) The fault recorder shall be reliably activated and start recording in the event of a system fault or oscillation.

(3) The fault recorder shall have an access circuit for an external starting contact.

(4) The fault recorder shall be capable of continuously recording multiple fault waveforms.

(5) The fault recorder shall have a ranging function with an error of less than 3 per cent.

(6) The fault recorder must be capable of recording and storing electrical waveforms from at least 80ms before fault initiation until fault resolution. It must support an adjustable sampling frequency of up to 10kHz per analog channel when all 48 analog channels are active.

(7) The fault recorder shall be able to provide a brief report of fault information after start-up, including: faulted component, fault type, start-up volume and fault ranging results.

(8) The resolution of the event volume recording element  $\leq 1\text{ms}$ , and the time of action shall be printable



when recording.

(9) The memory of the local fault recorder system is not less than 256M, the hard disc is not less than 80GB, and the printer is equipped locally.

(10) The bidder must provide analysis software capable of processing current and voltage waveforms to extract fault location, active power, reactive power, and harmonic data. The master software shall be able to run on WIND0W2000 platform and achieve multi-task operation, and can apply WIND0W2000's print management and dial-up network functions, with complete fault information remote transmission, analysis, archiving and processing functions, and the record format of the fault file shall be able to be converted into COMTRADE format.

(11) The fault recorder shall have sufficient signal indicators, alarm signals and event record output contacts.

(12) Fault recorders shall have timed detection and local and remote test functions.

(13) The fault recorder cabinet must be equipped with flame-retardant Phoenix terminals. Current circuit wiring must be 2.5mm<sup>2</sup>, and voltage circuit wiring must also be 2.5mm<sup>2</sup>. and 2.5 mm<sup>2</sup> for voltage circuit wiring. All electrical components, assemblies and the whole machine shall have high reliability and interchangeability.

(14) Fault recorder device adopts plug-in structure, each plug-in should be in good contact, reliable and durable, and have measures to prevent vibration off.

(15) The cabinet is illuminated.

(16) Main technical parameters and performance of the device:

Analogue:	48 channels
Switching volume:	128 channels
Input Voltage:	110V DC, 220V AC.

(17) The voltage quantity is connected to the fault recorder through an air mini-switch. The power consumption of AC current circuit is not more than 0.5VA per phase, the rated value of AC current is 5A, and the overload multiplier is 20 times. The thermal stability of the input circuit meets the requirements of the line standard.

(18) The power consumption of the AC voltage circuit is not more than 0.5VA per phase and the AC voltage is rated at 100V.

(19) The power consumption of the DC power circuit is not more than 100VA, and the DC switch is a small

DC air switch.

(20) In the event of large system disturbances such as short-circuit faults, system oscillations, frequency breakdowns and voltage breakdowns, the fault recorder device shall be capable of automatically recording the changes in electrical Quantity during the whole process of the disturbance and the action behaviour of the protective devices. When the system dynamic process is terminated, the recording is automatically stopped.

(21) Analogue accuracy: 16-bit AD accuracy.

(22) Receive GPS satellite timing signals, including minute pulses, second pulses, IRIG-B format.

(23) The Bidder shall use and be able to provide, as required by the Bidder, the 103 statute for the remote transmission of data from this Fault Recorder.

(24) A communication box (TX-01) is installed in the cabinet, which has the function of interfacing with the remote transmission system.

(25) Cabinet external dimensions (H× W× D): 2260× 800× 600mm. Cabinet colour: RAL7035.

## **4 Design coordination**

### 4.1 Endorsement of the map

Within one week after the contract is signed, the bidder will provide the screen layout plan to the design institute for confirmation, and then provide the schematic diagram, screen layout plan and CAD drawing of terminal row to the design institute when the confirmation is completed.

The tenderer has the right to propose modifications to the tenderer's drawings for the supply of equipment, for which the tenderer shall not be liable for any additional costs. The tenderer shall make changes in the drawings in accordance with the modifications made by the tenderer.

Any risk and loss incurred by the tenderer due to advance procurement of materials or processing and manufacturing before receiving final approval of the drawings from the tenderer shall be borne by the tenderer.

The fact that the drawings are approved by the Tenderer does not relieve the Tenderer of its responsibility for the completeness and correctness of its drawings.

### 4.2 Final diagram

Within 2 weeks of receipt of the approved drawings from the buyer, the tenderer shall send all the final approved drawings and the removable hard disk containing the CAD files of the final drawings to the concerned unit, the CAD version used shall be Auto-CAD 2000 or 2004.

Products shall be manufactured in accordance with the confirmed final drawings.

4.3 The tenderer provides three sets of each of the following randomised technical data:

- a. Instructions for use of the device.
- b. Technical specifications of the device.
- c. Unit screen layout and terminal block diagrams.

#### **4 After-sales service**

(1) The bidder must provide on-site support at no additional cost, including commissioning assistance, troubleshooting, and training for site personnel.

(2) Three years after the commercial commissioning of the fault recorder, the bidder will implement three guarantees for the product, and the bidder will provide free maintenance for the damage of the parts caused by the device itself.

# 故障录波技术规范书

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## 0 供货范围

序号	名称	变电站名称	数量	安装位置
1	故障录波器屏	115KV 变电站	1 面	户内

## 1 执行标准

本故障录波器产品执行 IEC（255—221）国际标准。

## 2 设备工作环境条件：

安装地点：	户内；
海拔高度：	不超过 1000m；
环境温度：	-5℃～50℃；
年平均最大湿度：	90%（环境温度 20℃）。

## 3 技术要求

(1) 故障录波器应采用数字嵌入式，有独立的启动元件，并具有将其记录的信息就地输出并向远方传送的功能。

(2) 故障录波器应在系统发生故障或振荡时可靠启动并开始录波。

(3) 故障录波器应具有外部启动接点的接入回路。

(4) 故障录波器应能连续记录多次故障波形。

(5) 故障录波器应具有测距功能，其误差应小于 3%。

(6) 故障录波器应能记录和保存从故障前至少 80ms 到故障结束停止记录时的电气波形，采样频率可选，48 路模拟量同时工作时，每个模拟通道最高采样频率 10kHz。

(7) 故障录波器启动后应能提供简要的故障信息报告，包括：故障元件、故障类型、启动量和故障测距结果等。

(8) 事件量记录元件的分辨率 $\leq 1\text{ms}$ ，记录时应可打印出动作时间。

(9) 就地故障录波器系统存储器不低于 256M，硬盘不低于 80GB，就地配打印机。

(10) 投标方应提供有关软件用于分析电流电压波形，以得到故障测距、有功、无功、谐波等数

据。主站软件应能在 WIND0W2000 平台上运行，并能实现多任务操作，可应用 WIND0W2000 的打印管理和拨号网络等功能，具有完备的故障信息远传、分析、存档处理功能，故障文件的记录格式应能转化为 COMTRADE 格式。

(11) 故障录波器应有足够的信号指示灯、告警信号及事件记录输出接点。

(12) 故障录波器应具有定时检测及就地和远方试验功能。

(13) 故障录波器柜上的接线端子应具有阻燃性能，接线端子采用凤凰端子，电流回路接线为 2.5 平方毫米，电压回路接线为 2.5 平方毫米。所有电气元器件、组件及整机应具有高度的可靠性和可换性。

(14) 故障录波器装置采用插件式结构，各插件应接触良好，可靠耐用，并具有防止震脱措施。

(15) 柜内装有照明。

(16) 装置主要技术参数和性能：

模拟量：                48 路

开关量：                128 路

输入电压：              直流 110V，交流 220V。

(17) 电压量经过空气小开关接入故障录波仪。交流电流回路功耗每相不大于 0.5VA，交流电流额定值为 5A，过载倍数为 20 倍。输入回路热稳定满足行标要求。

(18) 交流电压回路功耗每相不大于 0.5VA，交流电压额定值为 100V。

(19) 直流电源回路功耗不大于 100VA，直流开关采用直流空气小开关。

(20) 当系统发生大扰动如短路故障、系统振荡、频率崩溃及电压崩溃时，故障录波器装置应能自动地记录扰动全过程的电气量变化及保护装置的动作行为。当系统动态过程终止后，自动停止记录。

(21) 模拟量精度： 16 位 AD 精度。

(22) 接收 GPS 卫星对时信号，包括分脉冲，秒脉冲，IRIG-B 格式。

(23) 根据投标方需要，投标方应使用并能提供用于该故障录波仪数据远传的 103 规约。

(24) 柜内装设通讯箱 (TX—01)，具备与远方传输系统接口功能。

(25) 柜体外形尺寸 (高×宽×深)：2260×800×600mm。柜体颜色：RAL7035。

## 4 设计配合

### 4.1. 认可图

合同签订后一周内投标方提供屏面布置图交设计院确认，待确认完毕向设计院提供屏的原理图、屏

面布置图和端子排 CAD 图。

招标方有权对供货设备的投标方图纸提出修改意见，对此招标方不承担任何附加费用。投标方应根据招标方的修改意见，在图纸上进行修改。

在收到招标方对图纸的最终认可之前，投标方因提前采购材料或加工制造而发生的任何风险和损失由投标方自行承担。

图纸经招标方认可，并不能解除投标方对其图纸的完整性和正确性应负的责任。

#### 4.2 最终图

投标方在收到买方的认可图纸的 2 周内，应将全部最终认可图纸和含有最终图 CAD 文件的移动硬盘发送有关单位，所用的 CAD 版本应为 Auto-CAD 2000 或 2004。

产品应按照经确认的最终图纸制造。

#### 4.3. 投标方提供下列随机技术资料各三套：

- a. 装置使用说明书。
- b. 装置技术说明书。
- c. 装置屏面布置图和端子排图。

### 4 售后服务

- (1) 投标方免费派人到现场指导调试，协商解决装置的有关技术问题，并培训现场人员。
- (2) 故障录波器商业投运后三年内由投标方对产品实行三包，由于装置本身原因造成的部件损坏由投标方免费提供维修。



# **Technical specification for AC and DC system equipment**

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## 0 Scope of supply

Equipment Name		Quantity	Delivery Time	Remarks
DC system	DC Charging Cabinet	1 side		4 high frequency switching power supply modules
	DC Feeder Cabinet	1 side		DC110V
	battery cabinet	1 side		200Ah, 2V/pc, 52pcs in total. Valve-controlled (subject to final design drawings)
AC screen		2 sides		

## 1 General Provisions

The high-frequency switching DC power supply panel must comply with the following standards:

DL/T 724                      Technical regulations for the operation and maintenance of direct-current devices with storage batteries for power systems

DL/T 637                      Technical Conditions for Ordering Valve-Regulated Sealed Lead-Acid Batteries

DL/T 459                      Technical conditions for ordering DC power supply cabinets for power systems

GB3859.1                      Semiconductor power converter

GB4942.2                      Low-voltage Electrical Appliance Shell Protection Grade

GB/T 4208                      Enclosure protection level

GB/T 13384                      General Technical Conditions for Packaging of Electromechanical Products

GB/T 17626.2                      Electromagnetic compatibility Test and measurement techniques Electrostatic discharge

GB7261                      Basic Test Methods for Relays and Relay Protection Devices

GB1984                      AC High Voltage Circuit Breakers

DL402                      AC High Voltage Circuit Breakers

## 2 Environmental conditions of use

Ambient Temperature:        -15°C ~+50°C ;

Maximum daily temperature:    +40°C ;

Relative humidity:            ≧ 90 per cent;

Altitude:                      ≦1000m;

Noise level:                    ≦55dB;

Seismic intensity resistance: Level 8 is equivalent to a horizontal acceleration of 0.2g and a vertical acceleration of 0.1g.

## 3 Technical parameters of the DC power supply unit

AC Input voltage:	Three-phase 380V $\pm$ 15 per cent;
AC power frequency:	50 $\pm$ 5Hz;
DC rated voltage:	110V;
DC output voltage:	90 to 130V (continuously adjustable);
Current stabilisation accuracy:	< $\pm$ 0.5% (at 10% to 100% I <sub>e</sub> );
Voltage regulation accuracy:	< $\pm$ 0.5% (at 10% to 100% I <sub>e</sub> );
Module overheating protection:	Shuts down and alarms when heat sink temperature exceeds 75.5 $\pm$ 0.5 $^{\circ}$ C ;
Module operating voltage:	Three-phase 380V $\pm$ 20%;
Efficiency:	>90 per cent;
Noise Level::	$\leq$ 50dB;
Communication interface:	Meet automation system requirements (e.g. RS-232, RS-485);
Battery capacity:	200Ah.

#### 4 DC system components

The DC system uses a single-busbar wiring configuration, consisting of one set of chargers and one set of batteries.

Contains four high-frequency switching charging modules, two on the combining mother and two on the controlling mother.

### 5 DC power supply technical requirements

#### 5.1 DC output voltage

90-130V DC, components work properly at low output voltages.

#### 5.2 AC power distribution units

Dual 380V power input channels with automatic and manual switching. Each serves as a backup for the other. A certain road over-voltage, under-voltage, phase loss, should be able to automatically switch to another AC power supply. And it is required that the AC power supply switching voltage corresponds to the working voltage of the module, i.e. when the AC power supply voltage exceeds the rated voltage  $\pm$  by 15%, the AC power supply switching should be acted, and when the AC power supply voltage exceeds the rated voltage  $\pm$  by 20%, an alarm signal will be sent.

AC input with lightning protection and alarm function (nominal discharge current greater than 40kA, residual voltage less than 1kV), anti-surge function.

#### 5.3 Charging module

The module has an output current and voltage display window.

Each module's autonomous output voltage is factory calibrated at 2.23  $\times$  52 (V) (DC110V systems). Modules can be plugged and unplugged for replacement without affecting system operation. If any module fails

during operation, the system will issue a fault signal and the faulty module will automatically exit. The module output is connected to the DC bus via the busbar.

The module shall be capable of autonomous equalisation and reliable operation when the monitor is withdrawn from operation.

With over-voltage, over-current protection and automatic current limiting, alarm and other functions.

Module paralleling equalisation imbalance:  $\leq 5\%$

Ripple value:  $\leq 0.1\%$  (resistive load)

#### **5.4 Digital display**

There are six digital meters on each charging screen: AC input voltage (can be switched between phases), DC output voltmeter, DC output ammeter, battery voltage, battery charging and discharging ammeter, and ripple meter. The digital table work power supply from the respective DC bus, and there are protection elements. The battery charge/discharge meter adopts five and a half digit meter, which can display two digits after the decimal point. Other meters can display one digit after the decimal point. The meter should be certified by the qualification unit approved by Shanghai Electric Power Company.

#### **5.5 Contact alarm function**

In addition to the monitoring device RS485 telemetry and telecommunication alarms, the following relay node alarm functions shall be available:

There are bus over-voltage and under-voltage relay alarm devices independent of the monitoring device (for DC110V system: over-voltage 125V, under-voltage 110V;), which do not affect the voltage abnormality alarm when the monitoring device is out of voltage or malfunctioning, and there is a pre-test function.

There are relay alarms for monitoring device failures.

Telemetry: control bus voltage, float charge current, battery voltage, each battery voltage, charge current, input AC three-phase voltage, DC screen battery temperature, feeder switch fault trip and other RS485 serial signals.

Signals: high-frequency switching power supply working status, battery fuse melting, charger and each subsidiary device (including module, monitoring unit, DC insulation detection, battery detection) failure, DC bus voltage abnormality, each section of the AC power supply failure (AC phase loss, AC undervoltage) delay 10 seconds alarm, lightning arrester breakdown, DC system insulation degradation and selection of wires, battery voltage abnormality (including single battery), feeder circuit breaker tripping (each feeder circuit breaker combined with a pay contact), etc. (including single battery overrun), feeder circuit breaker tripping (each feeder circuit breaker is combined into one pay contact), and so on. The above signals can be put into/out of operation through the monitor interface soft pressure plate. When a certain fault occurs, the soft pressure plate can be manually withdrawn from the monitor, and should not be sent to the telecommunication, but it does not affect the other fault signals sent to the telecommunication, and when the fault is recovered, the soft pressure plate will be put into operation automatically.

## 5.6 Monitoring systems

### 5.6.1 Real-time display, alarm; parameter setting and control functions.

The monitoring system shall be able to start the whole DC system back to normal working condition after the station power is lost.

The monitoring system must prevent misadjustments, false shutdowns, and alarm failures that could compromise the safe operation of the DC system. It can display the current and voltage of each module and the current and voltage of each meter.

### 5.6.2 The monitor pair has two communication ports and a USB port:

Communicate with the local backend machine via RS485/RS232 port, and the backend machine provides only one communication port;

The other communication port supports TCP/IP protocol through 10/100BaseT (RJ-45), which can facilitate on-site address setting and remote data transmission at the same time.

Party B provides the protocol and completes the communication with the upper computer. Ensure the implementation of the three remote (telecommunication, telemetry, remote control) functions, factory shielding remote control function.

Transmitted telemetry see 5.5 Monitor pair down with not less than 3 input interfaces and 3 alarm input empty contacts, accept insulation monitoring devices, battery monitors, inverters, etc. telecommunication and data transmission. The communication protocol is provided by the downstream equipment plant, and the upstream equipment completes the forwarding. (Specific transmission volume to be negotiated separately)

And have spare telecommunication, telemetry input interface.

The historical data of the monitor (including the voltage value of each single unit of the battery) can be downloaded through the USB interface.

### 5.6.3 Ability to collect DC insulation monitor ground resistance data at regular intervals

Record the daily positive and negative grounding resistance values, take a point every hour, plot the daily change of grounding resistance graph or curve, save 10 days of recording volume;

Record the lowest ground resistance value for each day, a little each day, and plot it on a graph or curve that can be used to see how the ground resistance has changed over the last month.

The received information can be output through the communication port.

5.6.4 It has the function of automatic battery charging management: it can automatically carry out the conversion of both floating and charging according to the test results, and it has the functions of charging procedure, long-term operation procedure, AC interruption recovery procedure, current limitation of battery charging, temperature compensation of floating charging voltage (the temperature probe must be installed in the same installation space of the battery), and regular equal charging, etc. It also has the means or records to reflect the above performance. And there are test (adjustment) means or records reflecting the existence of the above performance. And can set, modify and display the above parameters.

Normal charging procedure of valve-regulated sealed lead-acid battery pack (3 months a cycle): Charge with  $0.1C_{10A}$  constant current, the voltage reaches the set value of  $2.35V \times n$ , the charger automatically switches to constant voltage charging, when the charging current is gradually reduced to  $0.01C_{10A}$ , the microcomputer starts to time the charging of the battery, after charging  $0.01C_{10A}$  for 3h, the microcomputer controls the charging of the float charging device and automatically switches to the float charging state. operation with a voltage of  $2.25V \times n$ .

Another condition for switching to equalisation: switching to equalisation capacity ratio, i.e. the monitoring module controls the system to equalise the battery when the battery capacity drops to a certain level. Capacity ratio = (existing capacity  $\div$  nominal capacity)  $\times$  100%, this value reflects the depth of battery discharge. The setting range is from 1 to 100%, usually set at 50 to 80%, and the setting is 80%.

Delayed alarm when charging current is greater than  $0.01 C_{10A}$  current during float charging state.

After 10 minutes of AC power failure, AC comes back to power, and the charger is floating to even charging.

When the temperature of the battery picked up by the monitor  $> 45$  degrees, turn to float charging. When the battery charging current in the range of  $0.01C_{10A} < I < 0.05C_{10A}$  continue to maintain a certain value for 3 hours unchanged (change  $< 0.02C_{10A}$ ), turn to float charging.

When overvoltage occurs in a single cell, switch to float charging.

Temperature compensation shall be set to  $0.003V/\text{section}$  (adjustable) for a total of 9 sections (adjustable), and the total compensation voltage shall be calculated automatically.

Current limiting function: The output current is limited by 105% of  $I_e$ , which is the rated output current of a single module. When a short-circuit occurs at the output terminal, the output current will be output according to the maximum current-limiting value, the output voltage will drop, and the voltage will return to normal automatically after the short-circuit disappears.

The input voltage of the HF module should be:

(1) Input over-voltage protection, with a shutdown alarm function when the input voltage is  $1.2U_e$ , and should be automatically restored when the power grid is normal;

(2) Input undervoltage alarm, the monitoring device has an alarm function when the input voltage is  $0.8U_e$ ;

(3) Output over-voltage protection, can be arbitrarily set by the monitoring system, the output over-voltage value is required to be set to 135V, after the output over-voltage, the shutdown alarm will be issued, and the module needs to be restarted and recovered;

(4) Output under-voltage protection, can be set arbitrarily by the monitoring system, the output under-voltage voltage value is required to be set at 100V, and the monitoring device shall alarm after the output is under-voltage.

5.6.5 Automatic and manual switching of equalisation/floatation can be achieved and can be put into/out of operation as required.

5.6.6 There are not less than 100 historical alarm messages that do not disappear after power down.

5.6.7 All parameter settings and clearing of fault records must be confirmed by password.

5.6.8 Cancellation of the in-monitor discharge procedure.

### **5.7 Control busbar output continuous current**

The control busbar outputs a continuous current value of 40A.

### **5.8 Busbar voltage**

DC screen AC power loss, the battery gapless to the bus power supply, the implementation of automatic voltage regulation, the DC (control) bus voltage instantaneous fluctuations shall not be less than 90% of the nominal DC voltage.

### **5.9 Control of busbar voltage fluctuations during inrush currents**

The control bus voltage shall fluctuate by no more than 10 per cent when the inrush current is supplied to the load, which is mainly supplied by the battery bank.

### **5.10 Feeder units**

The DC screen feeder has a total of 25 returns (subject to final construction drawings), which include:

63A, 7-way;

40A, 1 way;

32A, 12-way;

16A, 3-way;

10A, 2-way.

Actual quantities will be determined by the design and construction drawings.

All circuits use circuit breakers with closing light indication, and the circuit breakers shall be equipped with fault alarm contacts.

DC switch type test report is provided with the screen.

### **5.11 Batteries and battery testing**

5.11.1 This DC system will be mated to a 200Ah (2V/cell) battery.

5.11.2 Battery fuse must be selected DC fuse, 200Ah and the following capacity of the battery pack, the DC fuse rated current in accordance with the battery one hour rate of discharge current selection.

The 200Ah battery fuse current rating is limited to 200A.

5.11.3 Battery requirements

Sealed lead-acid batteries are used, and the batteries should be able to be used normally under the condition of ambient temperature  $-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$ . Battery life: 10 years and above ( $25^{\circ}\text{C}$ ), provide type test report.

Battery voltage equalisation: the open circuit voltage difference between any two batteries in a group of batteries should be no more than 60mV. The operating voltage deviation of the float-charged battery pack should be  $\pm 50\text{mV}$ .

For imported batteries, the agent's certificate and the original imported product documents should be



provided.

The manufacturer shall provide the product factory 10 hours rate full capacity test including (each section of the single voltage value).

The parameter values, characteristic curves and test reports to be provided for the storage batteries shall be implemented according to the requirements of the relevant documents of Shanghai Municipal Electric Power Company.

5.11.4 The DC screen is equipped with a set of battery 80% U<sub>e</sub> outgoing circuits, with the positive terminal coming from a set of battery 80% taps and connected to the output terminals via a DC air switch. The 80% DC air switch has a capacity of 25 A and is positioned at the rear of the screen, with the output connected to the terminals.

5.11.5 A battery discharge switch 40A (200Ah) is provided for each charging panel.

5.11.6 Battery tester: it can measure the voltage and current of each battery at regular intervals, and the measured values should be able to be displayed on the DC monitor display in serial number order and transmitted remotely. Each battery screen has temperature sampling point.

## **5.12 Insulation monitoring**

With DC grounding line selection function, online detection of DC power system insulation. When the DC power system grounding or insulation level is lower than the specified value (can be adjusted), the insulation detection device should be reliable action, DC line selection device can be automatically selected which one road insulation defects, try to pull open the grounding line insulation alarm to return to normal judgement time should be less than 2 seconds, and displayed on the monitoring screen, record the event related parameters and timely remote transmission and alarm.

Insulation monitoring devices for testing the insulation of DC system branch circuits shall have the following functions:

Install detection sensors in all DC branch circuits and battery circuits, the sensors should be of the same batch, and the sensor signal wires must be accessed sequentially in order.

The insulation monitoring branch number shall be marked at the same time in the centre below the corresponding switch (battery symbol) on the face of the DC screen.

All the factory technical data of insulation monitor (should have the inspection data of insulation monitor, sensor, etc. of the manufacturing factory) shall be shipped to Party A with the screen, with Party B's test conclusion reflecting the working condition of the component.

Display and record the grounding branch number, polarity, insulation resistance value (measurement error not greater than 10% of the set value) and time of occurrence.

The system must monitor the insulation status of both the positive and negative DC busbars, recording polarity, resistance values, and fault occurrence times.

## **5.13 The monitor power supply, voltage sampling and other bus lead units should have**

## **protection units.**

### **5.14 Pressure regulators**

Buck selection requirements for the silicon chain of the valve-controlled battery pack:  $2.35V (2V/cell) \times n-110$ .

The voltage regulator shall have both manual and automatic voltage regulation functions and shall maintain continuous power supply to the control bus.

## **6 Technical requirements for AC station power screens**

(1) Input three-phase four-wire 380V/50Hz AC power supply two ways, automatic switching.

(2) Outlet circuit as per drawing. All switches are Siemens 5SJ series products.

(3) Electricity meter is installed in the cabinet, and a visual hole is opened on the door of the cabinet to view the reading of the electricity meter, and the junction box is installed in the door of the cabinet.

(4) Latching power supply (WYKD-110/5A) is installed on the upper door panel.

(5) Three-phase AC current, voltage and loss of voltage signals are uploaded to the comprehensive automation system through the DC screen, and the DC screen fault and AC loss of voltage signals should have hard contact outputs.

(6) Configuration: as per the attached drawings and annexes.

(7) For an AC system with two panels, the cabinet size of each panel (height  $\times$  width  $\times$  depth):  $2260 \times 800 \times 600$ mm. Cabinet colour: RAL7035.

## **7 Process and reliability requirements**

(1) Expected indicators of system reliability: MTBF greater than 10 years

(2) Shunt, battery fuse, busbar, etc. must take into account the load capacity of one hour discharge rate current of the matching battery to ensure that the system works reliably.

(3) AC phases, DC positive and negative conductors shall be marked with different colours.

(4) The DC output terminals are Weidmüller or Phoenix, mounted upright on the second side of the DC screen, with the terminal ports for the external cables against the inside of the screen and taking into account the space required for the cables to be mounted and fixed against the side of the screen. Between each circuit with more visible isolation sheet isolation, in order to distinguish each circuit.

High-current output terminals should be considered for cable connection and fixing needs, with a height of  $>300$ mm above the ground.

Weidmüller or Phoenix terminals are used for the null contact output. Line troughs are provided on both sides of the DC screen.

(5) Protective fuses for in-unit devices are centrally located for easy access.

(6) The battery main fuse and the same terminal of the battery 80% tap shall be set adjacent to each other.

+Distance between + and - (>30mm). Battery warning fuse with connector.

If the battery screen is provided, the maximum number of batteries in each layer of the screen is 2 batteries in front and back, the height of the layer according to the height of the battery to consider the need for battery measurement space, and to meet the battery group on the floor loading is not more than 8000N per square metre.

(7) The requirements for on-line switching of DC air switches during operation can be met. The wiring of the air switches shall meet the principle of top-in/bottom-out and the polarity requirements.

(8) Busbars and busbars are fitted with colour-coded insulating heat-shrinkable tubing, and there are no exposed copper rows.

(9) The location numbering of the components in the screen and the numbering of the components are consistent with the drawings, and the functions of all operable components are labelled in Chinese.

(10) The structure of the cabinet is safe and reliable; components, especially wearing parts, are installed for easy maintenance and dismantling; each component board should have a dustproof device; the insulation monitor and the lower part of the screen have isolation security measures; and the front glass door is followed by a heat dissipation door.

(11) Ventilation and heat dissipation shall be considered for screen equipment. Ventilation should be ensured to dissipate the heat of the equipment under maximum load conditions.

The screen is made of grounded copper rows with a cross-section of not less than 100mm<sup>2</sup>. The equipment should have protective earthing.

(12) The power supply monitoring lamp shall be a low heat-generating LED indicator with a long-term operating voltage of 127V, arranged above the corresponding switch and not obviously offset from the corresponding switch, with the nameplate arranged below the switch.

(13) Screen drawing DC analogue diagram.

(14) The DC system has three panels, the cabinet size of each panel (height × width × depth): 2260 × 800 × 600mm. Cabinet colour: RAL7035.

## **8 Technical information**

(1) Provide design drawings and CAD discs within one week for design confirmation (only responsible for the main wiring principle, component parameters are accounted for by the manufacturer).

(2) According to the requirements of each paragraph of the technical agreement, with the screen to provide factory inspection reports, certificates of conformity; and to provide with the actual screen cabinet in line with the complete and detailed information on the use of instructions, electrical drawings, terminal wiring diagrams, equipment list in four copies, provide spare parts.

## 9 Appendix

### Typical Configuration Table for Station Power Panels

Component Name	Model Specification	unit (of measure)	quantities	note
AC ammeter	42L1-A 150/5	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	3	Quantity to be determined from construction drawings
AC voltmeter	42L1-V 0-450V	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	1	Quantity to be determined from construction drawings
Indicator lamps (signalling lamps)	AD3 220V	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	6	Quantity to be determined from construction drawings
Latching power supply unit	WYKD-2, 110V 5A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	1	Quantity to be determined from construction drawings
changeover switch	PC9092-3	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	1	Quantity to be determined from construction drawings
kilowatt-hour meter	DT862-4 3× 380/220V 3× 1.5(6)A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	1	Quantity to be determined from construction drawings
Meter test kit	PJ	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	1	Quantity to be determined from construction drawings
current transformer	LMZ1-0.5 150/5	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	3	Quantity to be determined from construction drawings
fuse	NT2	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	3	Quantity to be determined from construction drawings
air switch	5SJ6 4P 32A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	8	Quantity to be determined from construction drawings
air switch	5SJ6 4P 40A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	6	Quantity to be determined from construction drawings
air switch	5SJ6 4P 50A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	2	Quantity to be determined from construction drawings
air switch	5SJ6 4P 63A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	2	Quantity to be determined from construction drawings
air switch	5SJ6 2P 32A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	4	Quantity to be determined from construction drawings
air switch	5SJ6 2P 16A	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	6	Quantity to be determined from construction drawings
Current Test Terminal	SD-12-2	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	4	Quantity to be determined from construction drawings
air switch	5SJ2 206	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	6	Quantity to be determined from construction drawings
wiring terminal	Weidmüller	classifier for birds and certain	200	Quantity to be determined

<b>Component Name</b>	<b>Model Specification</b>	<b>unit (of measure)</b>	<b>quantities</b>	<b>note</b>
		animals, one of a pair, some utensils, vessels etc		from construction drawings
cabinet	GK	classifier for heavy objects, such as machines, TVs, computers; theater performances	1	right-hand door

#### 9.4 DC power system diagram



# 交、直流系统设备技术规范书

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## 0 供货范围

设备名称		数量	交货时间	备注
直流系统	直流充电柜	1 面		高频开关电源模块 4 只
	直流馈线柜	1 面		DC110V
	蓄电池柜	1 面		200Ah, 2V/只, 共 52 只, 阀控式(以最终设计图纸为准)
交流屏		2 面		

## 1 总则

高频开关直流电源屏应符合并达到以下标准：

DL/T 724	《电力系统用蓄电池直流装置运行与维护技术规程》
DL/T 637	《阀控式密封铅酸蓄电池订货技术条件》
DL/T 459	《电力系统直流电源柜订货技术条件》
GB3859.1	《半导体电力变流器》
GB4942.2	《低压电器外壳防护等级》
GB/T 4208	《外壳保护等级》
GB/T 13384	《机电产品包装通用技术条件》
GB/T 17626.2	《电磁兼容 试验和测试技术 静电》
GB7261	《继电器及继电保护装置基本试验方法》
GB1984	《交流高压断路器》
DL402	《交流高压断路器》

## 2 使用环境条件

环境温度：	-15℃~+50℃；
日最高温度：	+40℃；
相对湿度：	≧90%；
海拔高度：	不超过 1000m；
噪声水平：	低于 55dB；
抗地震烈度：	8 级相当于水平加速度 0.2g，垂直加速度 0.1g。

### 3 直流电源装置技术参数

交流输入电压:	三相 380V $\pm$ 15%;
交流电源频率:	50 $\pm$ 5Hz;
直流额定电压:	110V;
直流输出电压:	90~130V (连续可调);
稳流精度:	< $\pm$ 0.5% (在 10%~100% $I_e$ 时);
稳压精度:	< $\pm$ 0.5% (在 10%~100% $I_e$ 时);
模块过热保护:	散热器温度超过 75 $\pm$ 5 $^{\circ}$ C时关机并报警;
模块工作电压:	三相 380V $\pm$ 20%;
效率:	>90%;
噪声:	$\leq$ 50dB;
通信接口:	满足自动化系统要求 (如 RS-232、RS-485);
蓄电池容量:	200Ah。

### 4 直流系统构成

直流系统主接线采用单母线接线形式, 一组充电器、一组蓄电池。

含四个高频开关充电模块, 合母上二个, 控母上二个。

### 5 直流电源技术要求

#### 5.1 直流输出电压

90-130V DC, 在低输出电压时各部件工作正常。

#### 5.2 交流配电单元

两路 380V 电源输入, 互为备用, 可手动、自动投切。某路过压, 欠压, 缺相, 应能自动瞬时切换至另一路交流电源。且要求交流电源切换电压与模块工作电压相对应, 即交流电源电压超出额定电压 $\pm$ 15%时, 交流电源切换就应动作, 交流电源电压超出额定电压 $\pm$ 20%时, 发报警信号。

交流输入具备雷击防护及告警功能 (标称放电电流大于 40kA, 残压小于 1kV), 防浪涌功能。

#### 5.3 充电模块

模块有输出电流电压显示窗口。

每个模块自主输出电压出厂整定值为  $2.23 \times 52$  (V) (DC110V 系统)。模块可带电插拔更换,不影响系统运行。运行中任一模块故障,系统发出故障信号,故障模块自动退出。模块输出后经汇流排接向直流母线。

监控器退出工作时,模块应能自主均流、可靠运行。

具有过电压、过电流保护和自动限流、报警等功能。

模块并机均流不平衡度:  $\leq 5\%$

纹波值:  $\leq 0.1\%$  (阻性负载)

## 5.4 数显表

每充电屏上有六块数显表:交流输入电压(可各相切换)、直流输出电压表、直流输出电流表、蓄电池电压、蓄电池充放电电流表,纹波表。数字表工作电源取自各自的直流母线,且有保护元件。蓄电池充放电表采用五位半数表,能显示小数点后两位数。其它表能显示小数点后一位数。表计需经上海市电力公司认可的资质单位检定。

## 5.5 接点告警功能

除监控装置 RS485 遥测、遥信报警外,应具有以下继电器节点报警功能:

有独立于监控装置的母线过、欠压继电器报警装置(对 DC110V 系统:过压 125V、欠压 110V;),当监控装置失压、故障时不影响电压异常报警,且有预试功能。

有监控装置故障的继电器报警。

遥测:控制母线电压、浮充电流、电池电压、每节电池电压、充电电流、输入交流三相电压、直流屏电池温度,馈线开关故障跳闸等 RS485 串口信号。

信号:高频开关电源工作状态、蓄电池熔断器熔断、充电器及各附属装置(包括模块、监控单元、直流绝缘检测、蓄电池检测)故障、直流母线电压异常、每段交流电源故障(交流缺相、交流欠压)延时 10 秒报警、避雷器击穿、直流系统绝缘降低及选线情况、蓄电池电压异常(包括单体电池越限)、馈线断路器跳闸(各馈线断路器合并成一付接点)等。以上信号可通过监控器界面软压板进行投入/退出运行,当某个故障发生时,可通过监控器手动把软压板退出,不应发遥信,但不影响其它故障信号发遥信,当故障恢复时,软压板自动投入。

## 5.6 监控系统

5.6.1 有实时显示、报警;参数设置及控制功能。

站用电失却后来电，监控系统应能启动整个直流系统恢复正常工作状态。

监控器无论发生何种性质的故障，均不得发生对模块误调整、误关机、拒报警等影响直流系统安全运行的结果。

能显示各模块电流电压及各表计的电流电压。

#### 5.6.2 监控器对上有二个通讯口和一个 USB 接口：

通过 RS485/RS232 口与本地后台机通讯，且后台机仅提供一个通讯端口；

另一通讯口通过 10/100BaseT (RJ-45)，支持 TCP/IP 协议，可方便现场设置地址，同时进行远方数据传输。

乙方提供规约并完成与上位机通信。确能实施三遥（遥信、遥测、遥控）功能，出厂时屏蔽遥控功能。

传送的遥测量见 5.5 监控器对下有不少于 3 个输入接口及 3 个告警输入空接点，接受绝缘监测装置、蓄电池监测仪、逆变等的遥信及数据传输。由下行设备厂提供通信规约，上行设备完成转发。（具体传递量另行协商）

并有备用遥信，遥测输入接口。

通过 USB 接口可以下载监控器的历史数据（包括蓄电池的每只单体电压值）。

#### 5.6.3 能定时采集直流绝缘监测仪对地电阻数据

将每天的正负接地电阻值记录下来，每小时采一点，绘制成每天的接地电阻的变化图表或曲线，保存 10 天的记录量；

将每天的最低接地电阻值记录下来，每天记录一点，绘制成可供调看最近一个月接地电阻变化的图表或曲线。

接收的信息可通过通讯口输出。

5.6.4 具有蓄电池自动充电管理功能：可自动根据检测结果进行均浮充转换，具有充电程序、长期运行程序、交流中断恢复程序，有蓄电池充电限流、浮充电压温度补偿（温探必须装于蓄电池的同一安装空间内）、定时均充等功能。并有反映上述性能存在的测（调）试手段或记录。并能对上述参数设定、修改及显示。

阀控式密封铅酸蓄电池组正常充电程序（3 个月一循环）：用 0.1C10A 恒流充电，电压达到整定值  $2.35V \times n$  时，充电机自动转为恒压充电，当充电电流逐渐减少，达到 0.01C10A 时，微机开始计时，以 0.01C10A 充电 3h 后，微机控制充电浮充电装置自动转为浮充电状态运行，电压为  $2.25V \times n$ 。

转均充的另一个条件：转均充容量比，即电池容量下降到一定程度时，监控模块控制系统对电池进行均充。容量比=（现有容量÷标称容量）×100%，此值反应了电池放电的深浅程度。设置范围为 1~100%，一般设置在 50~80%，设置为 80%。

浮充状态时充电电流大于 0.01 C<sub>10A</sub> 电流时延时告警。

交流停电 10 分钟后，交流再来电，充电机浮充转均充。

当监控器采到的电池温度>45 度，转浮充。当蓄电池充电电流在 0.01C<sub>10A</sub><I<0.05C<sub>10A</sub> 范围内持续保持某个值 3 个小时不变（变化<0.02C<sub>10A</sub>），转浮充。

单节电池出现过压时，转浮充。

温度补偿应设置成 0.003V/节（可整定），共 9 节（可整定），总补偿电压自动计算。

限流功能：输出电流按 105%I<sub>e</sub> 定值进行限流，I<sub>e</sub> 为单一模块额定输出电流。当输出端发生短路时按最大限流定值输出电流，输出端电压随之下降，短路消失后电压自动恢复正常。

高频模块的输入电压应有：

- （1） 输入过压保护，在输入电压 1.2U<sub>e</sub> 时具备关机报警功能，当电网正常时应自动恢复；
- （2） 输入欠压报警，在输入电压 0.8U<sub>e</sub> 时，监控装置具有报警功能；
- （3） 输出过压保护，可由监控系统任意设定，要求输出过压电压值设定为 135V，输出过压后，关机报警，需模块重新启动后恢复；
- （4） 输出欠压保护，可由监控系统任意设定，要求输出欠压电压值设定为 100V，输出欠压后，监控装置应报警。

5.6.5 能实现均充/浮充的自动和手动转换，可根据需要投入/退出运行。

5.6.6 有不少于 100 条历史告警信息，掉电后不会消失。

5.6.7 所有参数设置及故障记录的清除均须通过密码确认方可执行。

5.6.8 取消监控器内放电程序。

## 5.7 控制母线输出持续电流

控制母线输出持续电流值 40A。

## 5.8 母线电压

直流屏交流失电时，电池无间隙向母线供电，实行自动调压，其直流（控制）母线电压瞬间波动不得低于直流标称电压的 90%。

## 5.9 冲击电流时控制母线电压的波动

在向负载提供冲击电流时，其控制母线电压的波动应不大于 10%，冲击电流主要由蓄电池组提供。

## 5.10 馈线单元

直流屏馈线一共 25 回（以最终施工图为准），其中包括：

63A，7 路；

40A，1 路；

32A，12 路；

16A，3 路；

10A，2 路。

实际数量由设计施工图确定。

所有回路均采用断路器，并有合闸灯光指示，断路器应配有故障报警接点。

随屏提供直流开关型式试验报告。

## 5.11 蓄电池及电池检测

5.11.1 本直流系统将 与 200Ah（2V/节）蓄电池相配。

5.11.2 蓄电池熔丝必须选用直流熔丝，200Ah 及以下容量的蓄电池组，其直流熔丝额定电流按照蓄电池一小时率放电电流选择。

200Ah 蓄电池熔丝额定电流限定为 200A。

5.11.3 蓄电池要求

采用密封铅酸蓄电池，蓄电池在环境温度  $-10^{\circ}\text{C}\sim+45^{\circ}\text{C}$  条件下应能正常使用。蓄电池使用寿命：10 年及以上（ $25^{\circ}\text{C}$ ），提供型式试验报告。

电池电压均衡性：应满足一组蓄电池中任意二个电池的开路电压差不超过 60mV。浮充蓄电池组运行电压偏差值  $\pm 50\text{mV}$ 。

对进口蓄电池，应提供代理证书及原装进口的产品证明文件。

厂家应提供产品出厂 10 小时率全容量试验包括（每节单体电压值）。

有关蓄电池需提供的参数值、特性曲线及试验报告按上海市电力公司有关文件要求执行。

5.11.4 直流屏上设有蓄电池 80%U<sub>e</sub> 一组出线回路，正极来自一组蓄电池 80%抽头，并经直流空气开关接到输出端子。80%直流空气开关容量为 25A，位置安放在屏后，输出接至端子。

5.11.5 各充电屏设电池放电开关 40A（200Ah）一只。

5.11.6 蓄电池检测仪：能定时测量蓄电池每瓶的电压、电流，测量数值均应能在直流监控器显示屏上按序号顺序显示和远传。每面蓄电池屏有温度采样点。

## 5.12 绝缘监测

具有直流接地选线功能，在线检测直流电源系统绝缘情况。当直流电源系统接地或绝缘水平低于规定值（可整定）后，绝缘检测装置应可靠动作，直流选线装置能自动选出哪一支路绝缘存在缺陷，试拉开接地选线绝缘报警恢复正常判断时间应小于 2 秒，并显示于监测屏上，记录该事件相关参数并及时远传和报警。

检测直流系统支路绝缘的绝缘监测装置应具有以下功能：

在所有直流支路及蓄电池回路安装检测传感器，传感器应同一批次，传感器信号连线必须按顺序依次接入。

绝缘监测支路编号应同时标志在直流屏屏面相应的开关（电池标志）下方正中。

绝缘监视仪所有出厂技术资料（应有制造厂绝缘监视仪、传感器等检查数据），随屏发运至甲方，并附有反映该部件工作状况的乙方试验结论。

显示并记录接地支路编号、极性、绝缘电阻值（测量误差不大于整定值的 10%）及发生时间。

分别或同时检测直流母线正极、负极绝缘状况，显示并记录接地母线的极性、电阻值及发生时间。

## 5.13 监控器电源、电压采样等母线引下单元应有保护单元。

## 5.14 调压装置

阀控电池组硅链的降压选择要求： $2.35V(2V/节) \times n - 110$ 。

调压装置应具有手动及自动调压功能，且应保持控制母线连续供电。

## 6 交流站用电屏的技术要求

- (1) 输入三相四线 380V/50Hz 交流电源二路，自动切换。
- (2) 出线回路按图纸。所有开关采用西门子 5SJ 系列产品。
- (3) 柜内安装电度表，柜门上开可视孔可查看电度表读数，接线盒安装于柜门内。
- (4) 上门板安装闭锁电源（WYKD-110/5A）。
- (5) 三相交流电流、电压及失压信号通过直流屏上传至综合自动化系统，直流屏故障、交流失压

信号应具备硬接点输出。

(6) 备配置：按附图与附件。

(7) 一套交流系统共两面屏，每面屏的柜体尺寸（高×宽×深）：2260×800×600mm。柜体颜色：RAL7035。

## 7 工艺及可靠性要求

(1) 系统可靠性预计指标：MTBF 大于 10 年

(2) 分流器、蓄电池熔丝、母排等必须考虑相配电池一小时放电率电流的负荷容量，保证系统工作可靠。

(3) 交流各相、直流正负导线应有不同色标。

(4) 直流输出端子采用魏德米勒或凤凰，直立安装在直流屏二侧，连接外部电缆的端子口靠屏内侧并考虑电缆靠屏侧安装固定所需空间。在每一回路之间用较醒目隔离片隔离，以分清每一回路。

大电流输出端子要考虑电缆连接和固定需要，离地高度>300mm。

空接点输出采用魏德米勒或凤凰端子。直流屏两侧设置行线槽。

(5) 机内装置保护熔丝集中安装于便于检修的位置。

(6) 蓄电池总熔丝及蓄电池 80%抽头的同极端头，应相邻设置。+、- 间拉开距离 (>30mm)。

蓄电池告警熔丝加接插件。

若提供电池屏，屏内每层前后最多布排 2 只电池，层高按照电池高度考虑电池测量空间的需要，并满足蓄电池组对地坪荷重不大于 8000N 每平方。

(7) 能满足运行中在线调换直流空气开关的要求。空气开关的接线应满足上进下出原则，并符合极性要求。

(8) 母线、汇流排加装带色标的绝缘热缩套管，无裸露铜排。

(9) 屏内元件位置编号、元件编号与图纸一致，并且所有可操作部件均用中文标明功能，

(10) 柜体结构安全、可靠；元件特别是易损件安装便于维护拆装，各元件板应有防尘装置，绝



缘监测仪与屏体下部有隔离保安措施，前玻璃门后散热门。

(11) 屏体设备要考虑通风、散热。要保证最大负荷条件下设备散热的通风量。

屏内采用截面不小于 100mm<sup>2</sup> 接地铜排。设备应有保护接地。

(12) 电源监视灯应采用低发热的 LED 指示灯，长期工作电压 127V，布置于对应的开关上方，且不明显偏置于对应开关，铭牌布置于开关的下方。

(13) 屏面画直流模拟图。

(14) 直流系统共三面屏，每面屏的柜体尺寸（高×宽×深）：2260×800×600mm。柜体颜色：RAL7035。

## 8 技术资料

(1) 一周内提供设计图、CAD 盘片，供设计确认（仅对主接线原理负责，元件参数由制造厂核算）。

(2) 按照技术协议各款项要求，随屏提供出厂检查报告，合格证；并提供与实际屏柜相符的完整详细的使用说明资料、电气图纸、端子排接线图，设备清单等一式四份，提供备品备件。

## 9 附录

站用电屏典型配置表

元器件名称	型号规格	单位	数量	备注
交流电流表	42L1-A 150/5	只	3	数量具体由施工图确定
交流电压表	42L1-V 0-450V	只	1	数量具体由施工图确定
指示灯（信号灯）	AD3 220V	只	6	数量具体由施工图确定
闭锁电源装置	WYKD-2, 110V 5A	只	1	数量具体由施工图确定
转换开关	PC9092-3	只	1	数量具体由施工图确定
电度表	DT862-4 3×380/220V 3×1.5（6）A	只	1	数量具体由施工图确定
电度表试验盒	PJ	只	1	数量具体由施工图确定
电流互感器	LMZ1-0.5 150/5	只	3	数量具体由施工图确定
熔断器	NT2	只	3	数量具体由施工图确定
空气开关	5SJ6 4P 32A	只	8	数量具体由施工图确定
空气开关	5SJ6 4P 40A	只	6	数量具体由施工图确定
空气开关	5SJ6 4P 50A	只	2	数量具体由施工图确定
空气开关	5SJ6 4P 63A	只	2	数量具体由施工图确定
空气开关	5SJ6 2P 32A	只	4	数量具体由施工图确定
空气开关	5SJ6 2P 16A	只	6	数量具体由施工图确定
电流试验端子	SD-12-2	只	4	数量具体由施工图确定
空气开关	5SJ2 206	只	6	数量具体由施工图确定
接线端子	魏德米勒	只	200	数量具体由施工图确定
柜体	GK	台	1	右开门

## 9.4 直流电源系统图



Fire alarm systems  
(technical specifications section)

## 1 Technical specification requirements

### 1.1 Environmental conditions of use

#### 1.2.1.1 Ambient air temperature

Maximum temperature: 50 C°

Minimum temperature: -10 C°

#### 1.2.1.2 Ambient relative humidity: multi-year average relative value: 90 %RH.

#### 1.2.1.3 Seismic intensity: 7 degrees.

Horizontal acceleration: 0.2g

Vertical acceleration: 0.1g

#### 1.2.1.4 Protection level: indoor IP40, outdoor IP56

1.2.1.5 Anti-electromagnetic interference requirements: the anti-electromagnetic interference performance of all kinds of components of the automatic fire alarm system should meet the requirements of the corresponding standards.

### 1.2 Equipment specification

The automatic fire alarm system consists of a fire alarm controller installed in the control room, providing monitoring and control of fire alarm operations in areas such as transformers, switch rooms, and cable mezzanines., and is capable of realising the operation of the fire alarm and control system and sharing of information in the whole range. The automatic fire alarm system provided by the supplier shall be able to operate reliably under the specific conditions of the substation to ensure the correctness and stability of the system.

The controller should be able to real-time display of fire alarm, fault, status information, and can be printed in chronological order of historical information; detection of the alarm area, any point of the alarm, can be issued sound and light alarm signals, display text information.

#### 1.2.1 System Components:

Fire alarm controllers (including linkage controllers and manual operation systems)

Detection systems (comprising various modules, detectors, and manual alarm triggers)

Audible and visual fire alarm devices

Backup DC power supply unit

Dedicated firefighting telephone

Interfaces for integration with fire suppression systems

#### 1.2.2 Fire alarm zoning:

##### 1.2.2.1 The fire controller is located in the control room.

##### 1.2.2.2 Fire alarm areas

Depending on the substation, the system is divided into zones for detection and control.

#### 1.2.3 System functional requirements:

##### 1.2.3.1 System components: one set of fire alarm control system.

1.2.3.2 The detection circuit of the fire alarm controller adopts a two-bus system, with preference given to the ring circuit structure, and all detection and alarm devices and their modules are wired in a polarised manner.

The fire alarm controller should be able to use multi-wire manual control for important equipment such as rain shower alarm valve groups, wet alarm groups, fire pumps, etc., and have direct manual control functions and indicator lights on the controller.

Detect fire, sound and light alarms and activate the fire extinguishing system automatically, manually and locally manually, and monitor the operation of fire fighting and extinguishing facilities.

1.2.3.3 The type of alarm triggering device and its installation location shall be in accordance with the requirements for the use of the area to be protected and shall be confirmed by the Demanding Party.

1.2.3.4 Manual fire alarm buttons must be installed throughout the area, with at least one button in each fire protection zone. The maximum walking distance to the nearest button must not exceed 30 meters.

Indoor fire hydrants are equipped with manual alarm buttons, and the fire alarm and control system is equipped to monitor the fire hydrant system.

1.2.3.5 Each alarm triggering device must provide both audible and visual alerts on the control panel. The alarm position must be clearly displayed in Simplified Chinese. Each controller shall adopt a highly integrated main control board, with no proportional mixing of alarm and linkage points per circuit, not less than 128 points.

1.2.3.6 The control panel must display faults in each fire detection circuit and provide multiple output contacts for system integration.

1.2.3.7 The control panel shall be capable of displaying the area, part and time of the fire.

1.2.3.8 The control panel shall also have functions such as fault alarm, self-test and clock. The sound and lighting of both the fault alarm and the fire alarm should be differentiated, and the area where the fault occurs should be displayed. When the fire alarm and fault alarm occur at the same time, the fire alarm takes priority. The clock is required to display the time of fire occurrence; the time of the first fire alarm; and the internal automatic continuous timekeeping.

1.2.3.9 Fire detector selection must consider power station characteristics (e.g., high-frequency electromagnetic interference). When configuring automatic linkage or activating fire suppression, a combination of smoke-sensitive, temperature-sensitive, and linear heat detectors (either of the same or different types) must be used. For the automatic fire extinguishing system, both should be set up two-way fire detection system, when either one of the alarm, the alarm signal should be sent to the control panel, when the two detectors alarm at the same time, the automatic interlocking to start the fire extinguishing system. For the poor environment of the region, such as cable tunnels, shafts, bridges, etc., should be used line temperature sensor detector, line temperature sensor detector laying in the bridge line temperature sensor detector of each circuit length should not exceed 200 metres.

1.2.3.10 The supplier shall be provided with two 220AC 50Hz power supplies (one UPS power supply and one security power supply) to the fire alarm panel. When the supplier needs other levels of power supply, it shall provide its own transformer and other conversion devices. The power supply of each equipment within the scope of supply shall be solved by the supplier.

The control panel must include a dedicated backup battery and an automatic charger. The backup battery must provide continuous operation for at least 8 hours under worst-case conditions.

1.2.3.11 Fire communication systems:

Manual alarm points must be installed at intercom telephone jacks. Fire alarm telephone extensions must be provided at regional alarm panels and key locations in manned areas.

1.2.3.12 The Supplier shall provide a linkage control interface with the relevant automatic fire extinguishing system.

1.2.3.13 The system interface must support passive contact or 24V DC signaling, as specified by the client's requirements.

1.2.4 Control requirements

When a detector or monitoring module generates a fire alarm signal, the system must

automatically distinguish between true and false alarms. False alarm signals must be logged but should not trigger an alarm; for the real alarm signal, the system should be able to open the sound and light alarm to prompt the staff. At the same time should also be able to automatically / manually start the fire pump, automatically open the corresponding area of the special fire extinguishing equipment for automatic fire extinguishing.

#### 1.2.5 Component requirements

1.2.5.1 When selecting fire detectors, they should be chosen according to the characteristics of the fire and the environment of the detection point. The detectors should be moisture-proof, water seepage-proof, electronically coded, with low power consumption and strong anti-interference capability. Priority should be given to products complying with the RoHS directive.

1.2.5.2 The capacity of the control system shall not be less than the total number of detection zones in the alarm area, with a margin of 20 per cent.

1.2.5.3 Any malfunction of one of the light alarm devices and the sound alarm device shall not affect the normal operation of the other device. The alarm bell shall ring clearly and loudly with stable sound quality; the striking post shall be of high strength, safe and reliable, and of good appearance.

1.2.5.4 The fire alarm controller is required to have automatic detection, adjustable sensitivity, automatic fault monitoring, and be able to accurately judge the authenticity of the fire; **have data uploading function (RS485/232, TCP/IP interface), the system has a good expansion function, and provide the corresponding communication protocols, to achieve remote signal transmission or control; have a passive output contact of the fire alarm signal;** adopt rechargeable battery as the backup power for data storage. Rechargeable battery is used as backup power for data storage.

1.2.5.5 Infrared beam smoke detectors consist of a transmitter and a receiver with a protection length of 5 to 100 metres and a distance between beams of light  $\leq$  14 metres; they can automatically compensate for environmental changes such as dust and temperature; they are easy to install and commission and can be mounted on walls or ceilings with the necessary accessories.

1.2.5.6 Manual alarm button requires beautiful appearance, can meet the needs of various environments; high reliability and stability; the use of restorable start parts, special key reset.

1.2.5.7 The short-circuit isolator automatically isolates the fault with a fault isolation display.

1.2.5.8 The failure of one controller or module does not affect the normal operation of other controllers and modules.

1.2.5.9 A power failure shall be a recoverable failure of the system, and once the power is restored, the controller and modules shall automatically resume normal operation without any intervention by the operator.

1.2.5.10 The automatic fire alarm system provided by the Supplier shall be implemented in accordance with the relevant fire prevention norms and national standards of China.

## 2 Project requirements component

The supplier is responsible for the implementation of the fire alarm system in accordance with the drawing information provided by the demand side and the actual conditions of the substation, with the design, manufacture, testing, supply, responsible for the implementation of the construction, commissioning, commissioning of fire detection, to ensure that through the local fire department acceptance.

## 2.1 List of Goods Required

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
1	Fire Alarm Controller	Including backup power supply, with upload linkage function, access to a minimum of 128 points; including upload communication module, communication protocol;	<p>Rated voltage: 220VAC; 50HZ</p> <p>Power Consumption: ≤ 55W</p> <p>Backup power supply: two 12V/4AH batteries</p> <p>Bus voltage: 18-24V</p> <p>Cable system: 2-bus</p> <p>Output circuit: 1 circuit</p> <p>Number of system addresses: 256 points</p> <p>Output relay signal: 1 group fire relay signal, 1 group alarm relay signal</p> <p>Multi-line linkage: optional</p> <p>2-channel start and stop signal output bus linkage discs</p> <p>Ambient conditions: Temperature 0°C ~ +50°C ; Humidity ≤ 92%</p> <p>Meet the standard: GB4717-2005 fire alarm controller general technical conditions</p>	interleave	1



serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
2	audible and visual alarm		<p>Operating voltage: 24V            Quiescent current: ≤ 400 μA            Alarm current: &lt;40 mA            External power supply: DC24V            Flash intensity: 32CD            Sound pressure level: 80DB            Addressing range: 1 to 254            Operating environment: Temperature 0°C to +50°C ; Relative humidity ≤ 92 %.            Structural features: φ104mm× 40mm Swivel connection            Housing Material: Red ABS</p>	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	
3	Photoelectric Smoke Detector (Intelligent)		<p>Working voltage: 12V            Quiescent current: ≤ 350 μA            Alarm current: &lt;7.4 mA            Addressing range: 1 to 127            Operating environment: Temperature 0°C to +50°C ; Relative humidity ≤ 92 %.            Structural features: Thin profile φ103mm× 46mm Swivel connection            Shell material: milky white ABS</p>	classifier for individual things or people, general, catch-all classifier	
4	Photoelectric smoke detector (explosion-proof)			classifier for individual things or people, general, catch-all classifier	

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
5	Explosion-proof barrier			classifier for individual things or people, general, catch-all classifier	
6	Infrared beam smoke detector		<p>Operating voltage: DC24V  Operating current: ≤ 15mA  Alarm current: ≤ 20mA  Maximum distance for shooting: 100m  Minimum distance for firing: 9m  Protection distance on both sides left and right: ≤ 7m  Ambient temperature: -20~55°C  Ambient humidity: 95% RH (40 2) ± °C  Overall dimensions: Φ130×97mm  Installation: wall-mounted</p>	right	
7	Intelligent temperature sensing detector		<p>Working voltage: 12V  Quiescent current: ≤ 350 μA  Alarm current: &lt; 7.4 mA  Addressing range: 1 to 127  Operating environment:  Temperature 0°C to +50°C ;  Relative humidity ≤ 92 %.  Structural features: Thin profile φ103mm×46mm  Swivel connection  Shell material: milky white ABS</p>	classifier for individual things or people, general, catch-all classifier	

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
8	Composite temperature and smoke detectors			classifier for individual things or people, general, catch-all classifier	
9	Intelligent Addressable Manual Fire Alarm Button		<p>Working voltage: 18-24V</p> <p>Quiescent current: <math>\leq 350 \mu\text{A}</math></p> <p>Alarm current: <math>&lt; 3 \text{ mA}</math></p> <p>Addressing range: 1 to 254</p> <p>Operating environment: Temperature <math>0^{\circ}\text{C}</math> to <math>+50^{\circ}\text{C}</math> ; Relative humidity <math>\leq 92 \%</math>.</p> <p>Construction features: <math>86\text{mm} \times 86\text{mm} \times 43\text{mm}</math></p> <p>Plug-in connection to the base</p> <p>Housing Material: Red ABS</p> <p>Meet the standard: GB19880-2005</p>	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	
10	Detector base		<p>Structural features: Diameter <math>103\text{mm} \times 10\text{mm}</math></p> <p>Installation: Shed roof mounted, fixed to 86H50 pre-embedded box</p> <p>Body material: milky white ABS</p>	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	
11	Temperature-sensitive cables ( $138^{\circ}\text{C}$ )	For main transformer, outdoor type, recoverable type	<p>Detector Type: Recoverable Cable Type Wired Temperature Sensing Fire Detector</p> <p>Operating voltage: DC24V</p> <p>Allowable range: DC16V ~ DC28V</p> <p>Quiescent current <math>\leq 40\text{mA}</math></p> <p>Alarm current <math>\leq 60\text{mA}</math></p> <p>Alarm reset: power failure reset</p> <p>with metal sheath</p>	surname Mi	

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
12	Temperature-sensitive cable (105 )°C	For cable trenches (wells), shielded, recoverable	Detection method: temperature detection Size: Outer diameter: 3.5mm 4.5mm Scope of use: Fire-fighting key places Type: Line Detector Working power supply: DC24V Ambient humidity: 95 (%)	surname Mi	
13	Temperature-sensitive cable clamps		Installation and use, no need to punch holes, welding fixing bracket, is a strong magnet fixing, easy installation	classifier for individual things or people, general, catch-all classifier	
14	Temperature-sensitive cable termination box		Operating voltage: 24Vdc Allowable voltage range: 12V~30Vdc Working current: Monitoring current≤35mA Alarm current≤50mA Fault current≤20mA Capacity: 1-way double-core temperature-sensitive cable (≤400m) Output interface: Fire alarm normally open (alarm closed) contact capacity 2A/30Vdc Fault Normally Closed (Fault Condition Open) Contact Capacity 2A/30Vdc	classifier for individual things or people, general, catch-all classifier	

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
15	input module		<p>Working voltage: 12V            Quiescent current: <math>\leq 350 \mu\text{A}</math>            Alarm current: <math>&lt; 7.4 \text{ mA}</math>            Addressing range: 1 to 127            Operating environment:            Temperature <math>0^{\circ}\text{C}</math> to <math>+50^{\circ}\text{C}</math> ;            Relative humidity <math>\leq 92 \%</math>.            Structural features: <math>100\text{mm} \times 82\text{mm} \times 34\text{mm}</math> Plug-in connection to the base            Case Material: Ivory ABS</p>	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	
16	output module		<p>Operating voltage: DC24V            Operating current: <math>&lt; 20 \text{ mA}</math>            Number of contacts: one pair of normally open, normally closed contacts            Contact capacity: DC24V, 7A; AC250, 7A            Operating environment:            Temperature <math>0^{\circ}\text{C}</math> to <math>+50^{\circ}\text{C}</math> ;            Relative humidity <math>\leq 92 \%</math>.            Structural features: <math>94\text{mm} \times 74\text{mm} \times 36\text{mm}</math></p>	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	
17	Short Circuit Isolator		<p>Working voltage: DC12V            Load current: <math>&lt; 200 \text{ mA}</math>            Number of carriers: <math>\leq 32</math> coded devices            Operating environment:            Temperature <math>0^{\circ}\text{C}</math> to <math>+50^{\circ}\text{C}</math> ;            Relative humidity <math>\leq 92 \%</math>.            Construction features:  <math>100\text{mm} \times 82\text{mm} \times 34\text{mm}</math></p>	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
18	Fire Resistant Flame Retardant Signal Cable	2× 2.5	Automatic fire alarm system power supply lines, fire linkage control lines should be fire-resistant copper wire and cable, alarm bus, fire emergency broadcasting and consumer telephones and other transmission lines should be fire-resistant wire and cable.	surname Mi	
19	Thermal cable signal repeater	Quotation on request			
20	Fire-fan linkage controller	Meeting engineering needs		interleave	
21	debugging system		This site fire alarm system manufacturers need to provide 25 related linkage control interface and related accessory equipment: cut off the fire area and related areas of non-fire power supply function, when it is necessary to cut off the normal lighting, it is appropriate to cut off the automatic sprinkler system or fire hydrant system action period.	interleave	
22	Fire display panel			classifier for birds and certain animals, one of a pair, some utensils, vessels etc	
23	Fire Door Monitoring System		The number of door magnets in this system should meet the site requirements	interleave	

serial number	Name	Type and specification	Technical parameters	unit (of measure)	quantities
24	fire broadcast		Including 2 broadcast tweeters	interleave	
25	Firefighting calls		Includes firefighting mainframe and extensions on demand	interleave	
26	Instruction installation fee, equipment commissioning fee			term (in a mathematical formula)	
27	Fire-fighting power switching box	Input: 2-way AC220V. Output: DC24V, the number of circuits to meet the needs of the project.		interleave	
28	auxiliary ingredients		Modular box, buried pipes for fire fighting need to meet the site requirements (the successful manufacturer to provide specific parameters and quantities of installation equipment, consumables, etc., to be procured by Party A)	interleave	
29	radiator	2260mm× 800mm× 600mm		top	

Note: The quantity of materials in the technical parameter table is only the reference quantity for technical specification, and the actual quantity shall prevail.

## 2.2 Necessary spare parts, special tools and instrumentation

Table 1 Necessary spare parts, special tools and instruments Table of supply

serial number	Name Title	Single bit	Project unit requirements		Bidder Response		Remarks
			Models and specifications	quantities	Models and specifications	quantities	
1							
2							
3							

serial number	Name Title	Single bit	Project unit requirements		Bidder Response		Remarks
			Models and specifications	quantities	Models and specifications	quantities	
4							
5							

### 2.3 Drawing submission units

Drawings and information to be confirmed shall be submitted by the seller to the units listed in table 2.

Table 2 Drawings submitted by the seller subject to validation and the receiving unit

Submission of drawings, names of information	Name, address, postcode and telephone number of the unit receiving the drawings	Number of copies submitted
Endorsement drawings, final drawings (with electronic files)		
Approval drawings, final drawings Instruction manual Test report (with electronic files)		

### 2.4 Summary of works

2.4.1 Project title:

2.4.2 Project units:

2.4.3 Scale of the project:

2.4.4 Delivery address:

2.4.5 Traffic, transport:

### 2.5 Training and arrival requirements

Table 3 Summary of training needs

serial number	Bidder's requirement value	Bidder's guaranteed value
1		
2		



serial number	Bidder's requirement value	Bidder's guaranteed value
3		

Table 4 Summary of arrival requirements

serial number	Bidder's requirement value	Bidder's guaranteed value
1	Arrival within <u>90</u> days from the effective date of the contract (including holidays)	

2.6 Other information proposed by the bidder

3 Bidder Response section

3.1 Table of technical deviations of bidders

The technical specifications of the products provided by the bidders shall fully satisfy the stipulations in this bidding document. If there is any deviation, the bidder shall truthfully and carefully fill in the deviation value in the bidder's technical deviation table (Table 10), otherwise it shall be regarded as the same as the requirements stipulated in this bidding document. If there is no technical deviation, it shall fill in "no deviation" in the technical deviation table.

Table 5 Table of technical deviations of bidders

serial number	Item	Corresponding article number	Technical bidding document requirements	Difference	Remarks
1					
2					
3					

3.2 Recommended delivery schedule for spare parts, special tools and instruments

Table 6 Recommended delivery schedule for spare parts, special tools and instrumentation

serial number	Name	Models and specifications	unit (of measure)	quantities
1				
2				

3				
4				
5				
6				

3.3 Sales and operational performance tables

Table 7 Sales and operating performance table

serial number	Model Specification	quantities	user unit	User Contacts	User contact phone number	commissioning time	note
1							
2							
3							
4							

3.4 Proof of use by users or relevant contractual documentation

3.5 Other relevant information and description of the product under tender

火灾报警系统  
(技术规范部分)

## 1 技术规范要求

### 1.1 使用环境条件

#### 1.2.1.1 周围空气温度

最高温度：50℃

最低温度：-10℃

#### 1.2.1.2 环境相对湿度：多年平均相对值：90 %RH

#### 1.2.1.3 地震烈度：7 度

水平加速度：0.2g

垂直加速度：0.1g

#### 1.2.1.4 防护等级：室内 IP40，室外 IP56

1.2.1.5 抗电磁干扰要求：组成火灾自动报警系统的各类组件的抗电磁干扰性能应符合相应标准要求。

### 1.2 设备规范

本火灾自动报警系统设一套火灾报警控制器，布置在控制室，实现对变压器、开关室、电缆夹层等区域的消防报警及控制系统的监控，能够实现全范围内消防报警及控制系统的操作和信息共享。供方提供的火灾自动报警系统应能在变电站特定条件下可靠运行，以确保系统的正确性、稳定性。

控制器应能够实时显示火灾报警、故障、状态信息，并能按时间顺序打印历史资料信息；探测报警区域内，任何一点出现报警，能发出声光报警信号、显示文字信息。

#### 1.2.1 系统组成：

火灾报警控制器（联动型控制器、手动操作系统等）；

探测系统（包括各种模块、探测器、手动报警触发装置等）；

火灾事故声光报警装置；

备用直流电源装置；

消防专用电话；

与其它消防灭火系统相关设备的接口。

#### 1.2.2 消防报警区域划分：

##### 1.2.2.1 消防控制器布置在控制室。

##### 1.2.2.2 消防报警区域

根据变电站的实际情况，系统分为若干个区域进行探测和控制。

#### 1.2.3 系统功能要求：

##### 1.2.3.1 系统组成：火灾报警控制是一套。

1.2.3.2 火灾报警控制器的探测回路采用二总线制，优先选择环形线路结构，所有探测报警设备及其模块采用有极性接线方式。

火灾报警控制器应对雨淋报警阀组、湿式报警组、消防水泵等重要设备采用多线手动控制方式，并在控制器上有直接手动控制功能和指示灯。

对火灾进行探测，发出声光警报并自动、手动及就地手动启动灭火系统，并对消防及灭火设施的运行情况进行监视。

1.2.3.3 报警触发装置的类型及安装位置应符合被保护区域的使用要求，并由需方确认。

1.2.3.4 手动火灾报警按钮在区域内普遍设置，每个防火分区应至少设置一个手动火灾报警按钮，从一个防火分区的任何位置到最近的一个手动火灾报警按钮的步行距离不应大于 30 米。

室内消火栓均设置手动报警按钮，消防报警及控制系统对消火栓系统设有监测。

1.2.3.5 系统中每个报警触发装置的信号，应在控制器上有声、光显示，并均能以简体中文描述报警位置。每台控制器须采用高度集成化的主控制板，每回路报警和联动点无比例混编，不少于 128 点。

1.2.3.6 控制盘应能反映系统中各火灾探测回路的故障，并具有多对联动用输出接点。

1.2.3.7 控制盘应能显示火灾发生的区域、部位及时间。

1.2.3.8 控制盘还应具有故障报警、自检、时钟等功能。故障报警与火灾报警的音响和灯光都应有所区别，并能显示故障发生的区域。当火灾报警与故障报警同时发生时，火灾报警优先。时钟要求显示火灾发生时间；火灾首次报警时间；内部自动连续计时。

1.2.3.9 火灾探测器的选择应根据电站特点（如高频电磁干扰）选择，当设置自动联动装置或启动自动灭火系统时，应采用感烟、感温、线型感温探测器（同类型或不同类型）的组合。对于自动灭火系统，均应设置两路火灾探测系统，当其中任一路报警时，应向控制盘发出报警信号，当两路探测器同时报警时，自动连锁启动灭火系统。对环境较差的区域，如电缆隧道、竖井、桥架等处，应采用线型感温探测器，线型感温探测器敷设在桥架上时线型感温探测器的每个回路长度不宜超过 200 米。

1.2.3.10 需方向供方提供两路 220 AC 50 Hz 电源（一路 UPS 电源、一路保安电源）到火灾报警盘，当供方还需要其它等级的电源时，应自备变压器等转换装置实现。供方供货范围内的各设备供电由供方自行解决。

控制盘应有专用备用电池电源及自动充电器，备用电池应可在最恶劣工况下连续使用 8 小时。

1.2.3.11 消防通讯系统：

手动报警处应设置对讲电话插孔；每个就地区域报警盘及其他重要部位的有人值班室应设置火警电话分机。

1.2.3.12 供方应提供与相关自动灭火系统的联动控制接口。

1.2.3.13 供方所供系统与其它系统的接口形式，根据需方的要求确定接口形式为无源接点或 24V DC 信号。

1.2.4 控制要求

当探测器或监视模块发出火灾报警信号后，系统应能自动识别误报信号，而且对误报信号仅作记录，不发出报警；对于真实报警信号，系统应能打开声光报警器提示工作人员。同时也应能自动 / 手动启动消防泵，自动开启相应区域的专用灭火装置进行自动灭火。

1.2.5 元器件要求

1.2.5.1 在选择火灾探测器时，应根据火灾的特点及探测点的环境来选择。探测器应具备防潮、防渗水功能，电子编码，功耗低，抗干扰能力强。优先选用符合 RoHS 指令的产品。

1.2.5.2 控制系统的容量不应小于报警区域的探测区域总数，应留有 20% 的余量。

1.2.5.3 灯光警报装置和音响警报装置其中一种发生任何故障应不影响另一种装置正常工作。警铃铃声清晰、响亮，音质稳定；敲击柱强度高，安全可靠，外形美观。

1.2.5.4 火灾报警控制器要求具有自动检测、灵敏度可调、故障自动监测、能够准确

判断火灾真伪；具有数据上传功能（RS485/232、TCP/IP 接口），系统具备良好的扩展功能，并提供相应通信规约，实现远程信号传输或控制；具有火灾报警信号无源输出接点；采用可充电电池作为数据存储的后备电源。

1.2.5.5 红外光束感烟探测器由发射器和接收器组成，保护长度在 5~100 米之间，光束之间的距离≤14 米；可对灰尘、温度等环境变化进行自动补偿；易于安装调试，可以在墙壁或顶棚安装，带有必要辅件。

1.2.5.6 手动报警按钮要求外观美观，可以满足各种环境需求；可靠性、稳定性高；采用可恢复式启动零件，专用钥匙复位。

1.2.5.7 短路隔离器可自动隔离故障，并带有故障隔离显示。

1.2.5.8 某一个控制器或模块故障，不影响其它控制器及模块的正常运行。

1.2.5.9 电源故障应属系统的可恢复性故障，一旦重新供电，控制器及模块应能自动恢复正常工作而无需运行人员的任何干预。

1.2.5.10 供方提供的火灾自动报警系统应先行执行我国有关的防火规范及国家标准。

## 2 项目需求部分

供方负责根据需方提供的图纸资料和变电站实际条件，实施火灾报警系统的配合设计、制造、试验、供货，负责落实施工、调试，委托消防检测，确保通过当地消防部门验收。

### 2.1 货物需求一览表

序号	名称	型式、规格	技术参数	单位	数量
1	火灾报警控制器	含备用电源，有上传联动功能，接入最少 128 点；含上传通信模块、通信规约；	额定电压：220VAC；50HZ 功耗：≤55W 备用电源：12V/4AH 蓄电池两块 总线电压：18~24V 线制：二总线 输出回路：1 回路 系统地址数：256 点 输出继电器信号：1 组火警继电器信号，1 组警铃继电器信号 多线联动：可选 2 路启动和停止信号输出总线联动盘 环境条件：温度 0℃~+50℃；湿度 ≤92%  满足标准：GB4717-2005 火灾报警控制器通用技术条件	套	1

序号	名称	型式、规格	技术参数	单位	数量
2	声光报警器		工作电压：24V 静态电流：≤400 μA 报警电流：<40 mA 外部供电：DC24V 闪光强度：32CD 声压等级：80DB 编址范围：1 ~ 254 使用环境：温度 0℃~+50℃； 相对湿度 ≤92 % 结构特征：Φ104mm×40mm 旋转式 连接  外壳材质：红色 ABS	只	
3	光电感烟探测器（智能型）		工作电压：12V 静态电流：≤350 μA 报警电流：<7.4 mA 编址范围：1 ~ 127 使用环境：温度 0℃~+50℃； 相对湿度 ≤92 % 结构特征：薄形 Φ103mm×46mm 旋转式连接  外壳材质：乳白色 ABS	个	
4	光电感烟探测器（防爆型）			个	
5	防爆隔离栅			个	
6	红外光束感烟探测器		工作电压：DC24V 工作电流：≤15mA 报警电流：≤20mA 对射最大距离：100m 对射最小距离：9m 两侧保护距离左右：≤7m 环境温度：-20~55℃ 环境湿度：95%RH(40±2℃) 外形尺寸：Φ130×97mm  安装方式：壁挂式	对	

序号	名称	型式、规格	技术参数	单位	数量
7	智能感温探测器		工作电压：12V 静态电流：≤350 μA 报警电流：<7.4 mA 编址范围：1 ~ 127 使用环境：温度 0℃~+50℃； 相对湿度 ≤92 % 结构特征：薄形 φ103mm×46mm 旋转式连接 外壳材质：乳白色 ABS	个	
8	复合式温感烟感探测器			个	
9	智能编址型手动火灾报警按钮		工作电压：18-24V 静态电流：≤350 μA 报警电流：<3 mA 编址范围：1 ~ 254 使用环境：温度 0℃~+50℃； 相对湿度 ≤92 % 结构特征：86mm×86mm×43mm 与 底座插装式连接 外壳材质：红色 ABS 满足标准：GB19880-2005	只	
10	探测器底座		结构特征：直径 103mm×10mm 安装方式：棚顶安装，固定在 86H50 预埋盒上 体材质：乳白色 ABS	只	
11	感温电缆(138℃)	主变用，户外型，可恢复式	探测器类别：可恢复式缆式线型感 温火灾探测器 工作电压：DC24V 允许范围： DC16V~DC28V 静态电流≤40mA 报警电流≤60mA 报警复位：断电复位 带金属护套	米	
12	感温电缆(105℃)	电缆沟（井）用，屏蔽型，可恢复式	探测方式：温探测 尺寸：外径：3.5mm 4.5mm 使用范围：消防重点场所 类型：线型探测器 工作电源：DC24V 环境湿度：95（%）	米	



序号	名称	型式、规格	技术参数	单位	数量
13	感温电缆夹		安装使用时, 无需打孔、焊接固定架, 是强磁铁固定, 安装方便	个	
14	感温电缆终端盒		工作电压: 24Vdc 电压允许范围: 12V~30Vdc 工作电流: 监视电流≤35mA 报警电流≤50mA 故障电流≤20mA 容量: 1路双芯感温电缆(≤400m) 输出接口: 火警常开(报警闭合) 触点容量 2A/30Vdc 故障常闭(故障状态开路)触点容量 2A/30Vdc	个	
15	输入模块		工作电压: 12V 静态电流: ≤350 μA 报警电流: <7.4 mA 编址范围: 1 ~ 127 使用环境: 温度 0℃~+50℃ ; 相对湿度 ≤92 % 结构特征: 100mm×82mm×34mm 与底座插装式连接 外壳材质: 象牙白 ABS	只	
16	输出模块		工作电压: DC24V 工作电流: <20 mA 触点数量: 一对常开、常闭触点 触点容量: DC24V、7A; AC250、7A 使用环境: 温度 0℃~+50℃ ; 相对湿度 ≤92 % 结构特征: 94mm×74mm×36mm	只	
17	短路隔离器		工作电压: DC12V 负载电流: <200 mA 带载数量: ≤32只编码器件 使用环境: 温度 0℃~+50℃ ; 相对湿度 ≤92 % 结构特征: 100mm×82mm×34mm	只	
18	耐火阻燃信号电缆	2×2.5	火灾自动报警系统的供电线路、消防联动控制线路应采用耐火铜芯电线电缆, 报警总线、消防应急广播和消费专用电话等传输线路应采用耐火电线电缆	米	

序号	名称	型式、规格	技术参数	单位	数量
19	感温电缆信号中继器	根据需要报价			
20	消防-风机联动控制器	满足工程需求		套	
21	切非系统		本站火灾报警系统厂家需提供 25 个相关联动控制接口和相关附件设备：切断火灾区域及相关区域的非消防电源的功能，当需要切断正常照明时，宜在自动喷淋系统或消火栓系统动作期切断。	套	
22	火灾显示盘			只	
23	防火门监控系统		本系统门磁数量需满足现场需求	套	
24	消防广播		其中含广播高音喇叭 2 只	套	
25	消防电话		含消防主机和分机按需配置	套	
26	指导安装费、设备调试费			项	
27	消防电源切换箱	输入：2 路 AC220V； 输出：DC24V，回路数满足工程需求。		套	
28	辅材		模块箱体、消防用埋管需满足现场需求（中标厂家提供安装设备、耗材等具体参数及数量，由甲方采购）	套	
29	屏柜	2260mm×800mm×600mm		面	

注：技术参数表材料数量仅为技术规范参考数量，具体以实际用量为准。

## 2.2 必备的备品备件、专用工具和仪器仪表

表 1 必备的备品备件、专用工具和仪器仪表供货表

序号	名称	单位	项目单位要求		投标人响应		备注
			型号和规格	数量	型号和规格	数量	

序号	名称	单位	项目单位要求		投标人响应		备注
			型号和规格	数量	型号和规格	数量	
1							
2							
3							
4							
5							

### 2.3 图纸资料提交单位

需确认的图纸、资料应由卖方提交到表 2 所列单位。

表 2 卖方提交的需经确认的图纸资料及其接收单位

提交图纸、资料名称	接收图纸单位名称、地址、邮编、电话	提交份数
认可图、最终图 (附电子文档)		
认可图、最终图 说明书 试验报告 (附电子文档)		

### 2.4 工程概况

2.4.1 项目名称:

2.4.2 项目单位:

2.4.3 项目规模:

2.4.4 交货地址:

2.4.5 交通、运输:

### 2.5 培训及到货需求

表 3 培训需求一览表

序号	招标人要求值	投标人保证值
1		
2		
3		

表 4 到货需求一览表

序号	招标人要求值	投标人保证值
1	合同生效之日起_90_日内到货（含节假日）	

2.6 招标人提出的其他资料

3 投标人响应部分

3.1 投标人技术偏差表

投标人提供的产品技术规范应完全满足本招标文件中规定。若有偏差投标人应如实、认真地在投标人技术偏差表（表 10）中填写偏差值，否则视为与本招标文件中规定的要求一致。若无技术偏差则应在技术偏差表中填写“无偏差”。

表 5 投标人技术偏差表

序号	项 目	对应条款编号	技术招标文件要求	差 异	备 注
1					
2					
3					

3.2 推荐的备品备件、专用工具和仪器仪表供货表

表 6 推荐的备品备件、专用工具和仪器仪表供货表

序号	名 称	型号和规格	单位	数量
1				
2				
3				
4				
5				
6				

3.3 销售及运行业绩表

表 7 销售及运行业绩表

序号	型号规格	数量	用户单位	用户联系人	用户联系人电话	投运时间	备注
1							

2							
3							
4							

3.4 用户使用情况证明或有关合同证明材料

3.5 本投标产品其他有关资料及说明

Intelligent Auxiliary Control System  
(technical specifications section)

# Programme

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2 Project requirements section.....	15
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2.2 Supply list of necessary spare parts, special tools and instruments .....	15
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2.5 Conditions of use .....	16
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3.2 Sales and operational performance tables .....	18
3.3 Recommended supply of spare parts, special tools and instrumentation.....	18
3.4 Proof of use by end-users .....	18
3.5 Test and inspection report form provided by the bidder .....	19
3.6 Table of accreditation certificates provided by bidders.....	20

1 Standard Technical Parameter Sheet

Bidders should carefully fill in the standard technical parameter table (see Table 1) item by item, the guaranteed value of the bidder, no space, and can not be replaced by the word "response", and is not allowed to change the value of the bidder's requirements. If there is any difference, please fill in Table 6 Bidder's Technical Deviation Table.

Table 1 List of standard technical parameters

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
"one" radical in Chinese characters (Kangxi radical 1)	Outdoor simulated fastball			
1	signal standard		PAL	
2	transducers		1/4-inch Color Day/Night CCD Sensor	
3	effective pixel		752 (H)× 582 (V)	
4	Horizontal resolution		≥540TVL	
5	camera shot (in a movie etc)	aperture	F1.4-F3.0	
		monitoring range	mm	3.4~ 122.4
6	Optical zoom magnification		Not less than 36 times	
7	Digital zoom magnification		12 times	
8	Horizontal swivel angle		360° continuous rotation	
9	Vertical pitch angle		0 to 90° with auto flip	
10	Day/Night Conversion Mode		Auto/Colour/Black & White	
11	minimum illumination	lux	Colour: 1 Black and white: 0.1	
12	rotation speed		Horizontal max. 300° /s; Vertical max. 240° /s	
13	preset point	point (in space or time)	128	
14	signal-to-noise ratio	dB	≥50	
15	Auto/Manual Aperture		adjutant	
16	Auto/Manual Zoom		adjutant	
17	Auto Gain AGC		adjutant	
18	Automatic backlight compensation		adjutant	
19	Auto White Balance		adjutant	
20	operating temperature	°C	-35 to +55	
21	Automatic temperature control	°C	Heater on: 8± 5 Off: 20 5±	



serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
22	Shield Rating		Not less than IP66	
stupid (Beijing dialect)	Indoor Medium Speed Ball Simulation			
1	signal standard		PAL	
2	transducers		1/4" Colour Day/Night Conversion CCD	
3	effective pixel		752 (H)× 582 (V)	
4	Horizontal resolution		≥540TVL	
5	camera shot (in a movie etc)	aperture	F1.4-F3.0	
		monitoring range	mm	3.4~ 88.4

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
6	Optical zoom magnification		Not less than 26 times	
7	Digital zoom magnification		12 times	
8	Horizontal swivel angle		360° Continuous Rotation	
9	Vertical pitch angle		0~ 90° with auto-reversal	
10	Day/Night Conversion Mode		Auto/Colour/Black & White	
11	minimum illumination	lux	Colour: 1 Black and white: 0.1	
12	rotation speed		Horizontal max. 300° /s; Vertical max. 240° /s	
13	preset point	point (in space or time)	128	
14	signal-to-noise ratio	dB	≥50	
15	Auto/Manual Aperture		adjutant	
16	Auto/Manual Zoom		adjutant	
17	Auto Gain AGC		adjutant	
18	Automatic backlight compensation		adjutant	
19	Auto White Balance		adjutant	
20	operating temperature	°C	-35~ + 55	
21	Automatic temperature control	°C	Heater on: 8± 5 Off: 20±	
22	Shield Rating		Not less than IP65	
3	Analogue Fixed Camera			
1	signal standard		PAL	
2	transducers		Monolithic/tri-chip CCD	
3	Horizontal resolution		≥480TVL	
4	Day/Night Conversion Mode		Auto/Colour/Black & White	

serial number	Item	unit (of measurement)	Standard parameter values	Bidder's guaranteed value
5	minimum illumination	lux	Colour: 0.5 B/W: 0.1	
6	signal-to-noise ratio	dB	≥50	
7	Lens Interface		C/CS	
8	Auto Gain AGC		adjutant	
9	Automatic backlight compensation		adjutant	
10	Auto White Balance		adjutant	
11	operating temperature	°C	-10~ 50; -35 with shield~ + 55	
12	Shield Rating		Not less than IP65	
4	panoramic camera			
1	image sensor		1/2" CMOS, progressive scan	
2	minimum illumination		Colour: 1 lux Monochrome: 0.1 lux	
3	Maximum image resolution		Colour: 2048 x 1536 (3MEGA) B/W: 1280 x 960 (MEGA)	

Table 1 (continued)

serial number	Item	unit (of measurement)	Standard parameter values	Bidder's guaranteed value
4	image format		2048 x 1536, 1280 x 960, 1024 x 768, 800 x 600. 768 x 576 (D1), 704 x 576 (TV-PAL), 640 x 480. 384 x 288, 352 x 288, 320 x 240, 160 x 120. Custom formats (e.g. 1000 x 200 pixel horizontal banner)	
5	Maximum image frame rate (M-JPEG)		VGA: 25 fps, TV-PAL: 18 fps, MEGA: 8 fps, 3MEGA: 4 fps	
6	Maximum video frame rate (MxPEG)		VGA: 30 fps, TV-PAL: 30 fps, MEGA: 30 fps, 3MEGA: 20 fps	
7	image processing		Backlight Compensation, Auto White Balance, Distortion Correction, Intelligent Video Analysis (Intelligent Motion Detection)	
8	Virtual PTZ		Digital pan/tilt/zoom with stepless zoom up to 8x	
9	connector		Ethernet 10/100, USB	
10	security mechanism		User-Group Management, HTTPS/SSL, IP Address Filtering, IEEE 802.1x, Intrusion Detection	
11	electricity supply		Year-round power over the network (IEE 802.3af; Class 0), power adapter, 3 W typical power consumption	
12	operating condition		Protection class IP65 (according to DIN EN 60529), ambient temperature -30° to +60 °C	
5	Outdoor Network Fastball			
1	signal standard		PAL	
2	transducers		1/4" Colour Day/Night Conversion CCD	
3	effective pixel		752 (H)× 582 (V)	

4	Horizontal resolution			≥540TVL	
5	camera shot (in a movie etc)	aperture		F1.4-F3.0	
		monitoring range	mm	3.4~ 122.4	
6	Optical zoom magnification			Not less than 36 times	
7	Digital zoom magnification			12 times	
8	Horizontal swivel angle			360° Continuous Rotation	
9	Vertical pitch angle			0~ 90° with auto-reversal	
10	Day/Night Conversion Mode			Auto/Colour/Black & White	
11	minimum illumination		lux	Colour: 1 Black and white: 0.1	
12	rotation speed			Horizontal max. 300° /s; Vertical max. 240° /s	
13	preset point		point (in space or time)	Not less than 128	
14	signal-to-noise ratio		dB	≥50	
15	Auto/Manual Aperture			adjuvant	
16	Auto/Manual Zoom			adjuvant	
17	Auto Gain AGC			adjuvant	
18	Automatic backlight compensation			adjuvant	

Table 1 (continued)

serial number	Item		unit (of measure)	Standard parameter values	Bidder's guaranteed value
19	Auto White Balance			adjuvant	
20	operating temperature		°C	-35 to +55	
21	Automatic temperature control		°C	Heater on: 8± 5 Off: 20 5±	
22	Shield Rating			Not less than IP66	
23	network interface			10Base-T/100Base-TX, RJ45 header (fibre optic interface optional)	
24	SD card			Manual recording/alarm recording support SDHC standard SD card	
25	security model			Authorised username and password, and MAC address binding	
6	Indoor Network Medium Speed Dome				
1	signal standard			PAL	
2	transducers			1/4" Colour Day/Night Conversion CCD	
3	effective pixel			752 (H)× 582 (V)	
4	Horizontal resolution			≥540TVL	
5	camera shot (in a movie etc)	aperture		F1.4-F3.0	
		monitoring range	mm	3.4~ 88.4	

6	Optical zoom magnification		Not less than 26 times	
7	Digital zoom magnification		12 times	
8	Horizontal swivel angle		360° continuous rotation	
9	Vertical pitch angle		0~ 90° with auto-reversal	
10	Day/Night Conversion Mode		Auto/Colour/Black & White	
11	minimum illumination	lux	Colour: 1 Black and white: 0.1	
12	rotation speed		Horizontal max. 300° /s; Vertical max. 240° /s	
13	preset point	point (in space or time)	Not less than 128 points	
14	signal-to-noise ratio	dB	≥50	
15	Auto/Manual Aperture		adjuvant	
16	Auto/Manual Zoom		adjuvant	
17	Auto Gain AGC		adjuvant	
18	Automatic backlight compensation		adjuvant	
19	Auto White Balance		adjuvant	
20	operating temperature	°C	-35~ + 55	
21	Automatic temperature control	°C	Heater on: 8± 5 Off: 20±	
22	Shield Rating		Not less than IP65	
23	network interface		10Base-T/100Base-TX, RJ45 header (fibre optic interface optional)	
24	SD card		Support SDHC standard SD card	
25	security model		Authorised username and password, and MAC address binding	

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
7	HD Network Fixed Camera			
1	image sensor		DH5: 1/2.5" SONY PROGRESSIVE SCAN CMOS DH2 and XH2: 1/1.8" SONY PROGRESS- IVE SCAN CCD	
2	effective pixel		DH5: 2560(H)×1920(V) DH2 and XH2: 1600(H)×1200(V)	
3	minimum illumination	lux	0.5lux/F1.2 (colour) 0.1lux/F1.2 (B/W)	
4	Day and Night Mode		ICR	
5	Aperture type		Auto Iris DC/Video Drive	
6	Lens Type		External C/CS interface lens	
7	Maximum image size		DH5: 2560× 1920 DH2 and XH2: 1600× 1200	

8	video compression		DH5: H.264/MPEG4/MJPEG DH2 and XH2: H.264	
9	frame rate		DH5: 8fps (2560× 1920) 20fps (2048× 1539) 25fps (1600× 1200) 25fps (1920× 1080) 25fps (1280× 720) DH2 and XH2: 25fps (1600× 1200)	
10	SD card		YES	
11	Alarm Input		4-way	
12	Alarm output		3-way	
13	power supply		DC12V±10%/ AC24DC	
14	operating temperature	°C	-10~50; -35~+55 after equipped with protective cover	
15	electromagnetic compatibility		EMC4	
16	network interface		10Base-T/100Base-TX, RJ45 header (fibre optic interface optional)	
17	SD card		Manual recording/alarm recording Support SDHC standard SD card	
18	security model		Authorised username and password, and MAC address binding	
8	Integrated Three-in-One Lightning Protection System			
1	Maximum continuous operating voltage of the power supply section	V	275	
2	Power supply partial voltage protection level $U_p$	V	40	
3	Maximum continuous operating voltage of the video section	V	6	
4	Video section Rated discharge inrush current $i_{sn}$ (1.2/50 8/20μs) symmetrical/asymmetrical (PE)	A	125A/5kA	
5	Maximum continuous operating voltage of the signalling section	V	15 (DC)	
6	Signal section inrush current $i_{sn}$ (1.2/50 8/20μs) symmetrical/asymmetrical (PE)	A	125A/5kA	

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
9	Station-side video processing unit (analogue input)			
1	video compression standard		H.264/Mpeg4	
2	Real-time monitoring of image resolution		PAL: 704× 576 NTSC: 704× 480	
3	Playback resolution		qcif/cif/2cif/dcif/4cif	
4	Number of video inputs		16	

5	Video Input Interface		BNC (level: 1.0Vp-p, impedance: 75Ω), support PAL, NTSC system	
6	video output		1-way, BNC (level: 1.0Vp-p, impedance: 75Ω)	
7	video frame rate		PAL: 1/16-25 fps, NTSC: 1/16-30 fps	
8	stream type		Video Streaming/Composite Streaming	
9	Compressed output bit rate		32K~ 2M adjustable, also customisable (upper limit 8M in bps)	
10	Number of Audio Inputs		16	
11	Audio Input Connector		BNC (level: 2Vp-p, impedance: 1kΩ)	
12	audio output		1-way, BNC (linear level, impedance: 600Ω)	
13	Audio compression standards		OggVorbis/ITU-T G.711	
14	Audio compression bit rate	kbps	16	
15	Voice Intercom Input		1 way, BNC (level: 2Vp-p, impedance: 1kΩ)	
16	dual playback		adjuvant	
17	dual stream		adjuvant	
18	communications interface	classifier for individual things or people, general, catch-all classifier	Not less than 5 RJ45 10M/100M adaptive Ethernet ports, 1 RS232 port, 1 RS485 port	
19	Keyboard interface	classifier for individual things or people, general, catch-all classifier	2	
20	Hard Drive Interface	classifier for individual things or people, general, catch-all classifier	4 with support for 8 SATA hard drives up to 2TB each	SATA
21	USB port	classifier for individual things or people, general, catch-all classifier	1pc, support USB flash drive, USB hard drive, USB burner, USB mouse	
22	VGA connector	classifier for individual things or people, general, catch-all classifier	1, resolution: 800× 600/60Hz, 800× 600/75Hz, 1024× 768/60Hz	
23	Alarm Input	kind	16	
24	Alarm output	kind	16	
25	power supply	V	220VAC, 50Hz	
26	Power consumption (without hard disc)	W	≤70	
27	operating temperature	°C	-10~ + 55	
28	Operating humidity		10% ~ 90%	

29	case (computer) (lit. machine box)		19-inch standard chassis	
30	Quality (without hard disc)	kg	≤8	

Table 1 (continued)

serial number	Item	unit (of measurement)	Standard parameter values	Bidder's guaranteed value
10	Station-side video processing unit (analogue + network video)			
1	Mixed video input		24 (analogue video+ network video)	
2	audio input		16-way, BNC connector (level: 2.0Vp-p, impedance: 1kΩ)	
3	HDMI output		1 channel, resolution: 1024× 768/60Hz, 1920× 1080/60Hz, 1280× 1024/70Hz	
4	CVBS output		2-way, BNC connector (level: 1.0Vp-p, impedance: 75Ω) Resolution: PAL 704× 576; NTSC 704× 480	
5	VGA output		1 channel, resolution: 1024× 768/60Hz, 1024× 768/70Hz, 1280× 1024/60Hz	
6	audio output		2-way, BNC connector (linear level, impedance: 600Ω)	
7	video compression standard		H.264	
8	Video encoding resolution		UXGA/720P/VGA/4CIF/DCIF/2CIF/ CIF/QCIF	
9	video frame rate		PAL: 1/16-25 fps, NTSC: 1/16-30 fps	
10	video bitrate	kbps	32-2048, customisable, max 6144	
11	stream type		Composite Streaming/Video Streaming	
12	Audio compression standards		OggVorbis/ITU-T G.711	
13	audio bitrate	kbps	16	
14	dual stream		adjuvant	
15	Hard drive type		8 SATA ports	
16	maximum capacity		Supports hard discs with capacities greater than 2TB per interface	
17	Voice Intercom Input		2x, BNC connector (level: 2.0Vp-p, impedance: 1kΩ)	
18	network interface		No less than 5, RJ45 10M/100M/1000M adaptive Ethernet ports	
19	serial interface		1 standard RS-485 serial interface, 1 standard RS-232 serial interface	
20	USB port		3 USB 2.0	
21	Alarm Input		16-way	
22	Alarm output		4-way	
23	power supply		AC220V, 47~ 63Hz	
24	power wastage	W	≤70	
25	operating temperature	°C	-25~ + 70	
26	Operating humidity		10% ~ 90%	
27	case (computer) (lit. machine box)		19-inch standard 2U chassis	

11	Network Storage Unit		
1	processing unit		64-bit dual-core processor (scalable)
2	cache		2GB (expandable)
3	array channel		24

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
4	disk interface		SATA I, SATA II	
5	Hot-swappable disks		adjuvant	
6	RAID level		Support RAID0, 1, 5, 6, 10, 50, JBOD, Hot-Spare	
7	network interface		4 to 8, 10/100/1000M adaptive Ethernet ports	
8	power supply		Redundant power supplies	
9	operating system		Windows, Linux	
10	Protocol Support		iSCSI / NFS / CIFS / FTP / HTTP / AFP	
11	Number of channels of real-time video storage		4CIF:120 channels; CIF:300 channels	
12	power (output)		1150W	
13	operating temperature	°C	10 to 40	
12	Active Infrared Alarm			
1	Number of beams	classifier for bunches, bundles e.g. flowers or straw, and beams of light	four-bunch	
2	stand-off distance		Length of fence 2×	
3	Detection method		Four-beam simultaneous blocking detecting type	
4	light source		infrared LED	
5	Induction speed	ms	50~ 700	
6	Alarm output		Relay contact output 1c, contact capacity AC/DC 30V 0.5A	
7	Supply Voltage	V	DC12-20V or AC10V-15V	
8	Current consumption	mA	65~ 85	
9	Temperature range	°C	-35~ + 55	
10	Tamper Evident Output		Contact output 1b	
11	Optical axis adjustment angle		Level: 180° (± 90° )	
12	Optical axis adjustment angle		Vertical: 10° (± 5° )	
13	Other additional functions		Receive Indication, Optical Axis Test Point	
14	material (that sth is made of)		ABS resin	
13	Infrared dual-alarm detector			



1	Detection type		Infrared + Microwave	
2	Pulse count adjustment		automation	
3	housings		Metal anti-electromagnetic interference	
4	temperature compensation		automation	
5	Detection range		90° , 14m× 14m	
6	power supply	V	DC12	
fourteen	electric fence			
1	peak pulse value (physics)	V	5000~ 10 000	
2	pulse period	s	1~ 1.5	

Table 1 (continued)

serial number	Item	unit (of measurement)	Standard parameter values	Bidder's guaranteed value
3	Pulse duration	s	≤0.1	
4	Pulse Maximum Power	mC	≤2.5	
5	Low Voltage Mode Pulse Peak		Around 700V	
6	Duration of pulse current over 300mA	ms	<1.5	
7	Peak pulse current	A	≤10	
8	Maximum pulse energy	J	≤5	
9	Number of fence lines installed		4	
15	guarded entrance			
1	Card reading method		inductive	
2	Maximum number of controlled doors/controller		Not less than 4	
3	communications protocol		DL/T 860 Protocol, RJ45	
4	MTBF		Not less than 44,000h	
5	Maximum system capacity		Not less than 40,000	
sixteen	Lighting Intelligent Control Unit			
1	Switching output	kind	AC220V/20A× 8-way	
2	communications interface		RJ45 (DL/T860 protocol)	
3	Power Input		AC220V	
4	sizes		19" 1U (Rack Mount)/Wall Mount	
seventeen	Temperature and humidity sensors			
1	Temperature measurement	°C	-20~+ 100	
2	Temperature measurement	°C	0.5	
	Humidity measurement range		0%~ 100%RH	
	Humidity measurement accuracy		±1 per cent RH (25°C )	
3	response	s	≤15	
4	Data transmission	m	≥800	

5	environmental temperature	°C	-35~+ 55	
6	Environmental		10%~ 95%RH	
7	output	mA	4~ 20	
18	Wind Speed Sensor			
1	Measurement range	m/s	0~ 100	
2	Measurement accuracy		±0.5 per cent of measured value	
3	response	s	≤1	
4	Data transmission	m	≥800	
5	environmental temperature	°C	-35~+ 55	
6	Environmental		10%~ 95%RH	
7	output	mA	4~ 20	

Table 1 (continued)

serial number	Item	unit (of measurement)	Standard parameter values	Bidder's guaranteed value
19	Flood probe			
1	(level of) sensitivity	mm	3 l±	
2	response time	s	≤1	
3	false positive rate		≤0.01 per cent	
4	output method		Normally closed/normally open passive output	
20	Environmental data processing unit			
1	Standard current loop signal access	kind	16	
2	Standard current loop signal	mA	4~ 20	
3	Hard contact input	kind	8	
4	Power Input	V	AC220	
5	communications interface		2 RS232, 2 RJ45	
6	remote switch		4-way (AC220V/20A)	
7	Installation		Wall or screen cabinet (standard 19") mounting	
21st	SF <sub>6</sub> detector			
1	Detectable range		0~ 3000ppm	
2	accurate		Plus or minus 1% of full scale	
3	Operating Temperature Range	°C	-10~ 50	
4	Pressure range		800hPa-1000hPa	
5	Humidity range		0%~ 95% relative humidity	
6	preheating time	min	Less than 2min	
7	response time (technology)	s	Diffusion time less than 25s, flow rate less than 5s	
8	starting current	mA	70	
9	output signal	mA	4~ 20 current signal	
twenty-two	Integrated power supply			

1	Power Input	V	AC220V, 50Hz	
2	power output (of an electrical device etc)	V	AC24V8A×6, DC24V8A×3, DC12V8A 3×	
3	overpower		Output short circuit, overload or overload automatically cut off the power supply, de-loading after 2s automatic	
4	sizes		19-inch 2U	
5	overcurrent protection		DC output circuits are protected by TVS.	
6	Withstanding Voltage and Safety $I_{Leakage}=15mA$ ,		No voltage withstand for straight-through outputs; input to ground (chassis): 2000VAC; input to output: 2000VAC; output to ground (chassis):	
twenty-three	network switch			
1	application level		two-ply	
2	transmission rate	Mbps	10/100/1000	

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
3	port structure		non-modular	
4	Number of ports		26	
5	interface medium		10/100/1000Base-T, 1000Base-X SFP	
6	transfer mode		Full/Half-Duplex Adaptive	
7	Configuration form		stackable	
8	exchange method		Store-and-forward	
9	Backplane Bandwidth	Gbps	19.2	
10	VLAN Support		adjuvant	
11	QOS Support		adjuvant	
12	Network Management Support		adjuvant	
13	network management		Support Command Line Interface (CLI), Telnet, Console port configuration; support SNMP; support iMC network management system; support WEB network management	
14	MAC address table	K	8	
15	Number of modular slots		2	
16	power supply		Rated voltage range: 100V~240V AC, 50/60Hz, Maximum voltage range: 90V~264V AC, 47Hz~63Hz	
17	environmental standard		Operating temperature: 0°C ~ 45°C , working humidity: 10% ~ 90% (non-condensing)	
24	(network) bridge			
1	Ethernet interface	classifier for individual things or people, general, catch-all classifier	Interface: 10/100Base-T Interface protocol: IEEE 802.3 compliant Interface rate: 10/100M adaptive Interface type: RJ45	

2	E1 interface	classifier for individual things or people, general, catch-all classifier	Code speed: 2.048Mbps Tolerance:± 50ppm Code: HDB3 Interface electrical characteristics: ITU-T G.703 recommendation compliant Jitter transfer characteristics: compliant with ITU-T G.823 recommendations Input jitter tolerance: ITU-T G.823 recommendation compliant Interface impedance: 75Ω unbalanced/120Ω balanced	
3	Clock mode		Internal clock/line clock (default setting: internal clock)	
4	Power Supply Selection		Voltage: AC220V/DC-48V/AC110V/ DC+24V Power consumption: ≤5W	
5	Environmental requirements		Working Temperature: -30°C~ +50°C Relative humidity: 5% to 95% non-condensing	
25	Video Optical Transmitter			
1	video input		1 channel 1.0Vp-p/75Ω	

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
2	video interface		BNC	
3	differential gain		<0.1 per cent (typical)	
4	differential phase		<0.4° (typical)	
5	Video signal-to-noise ratio (weighted)	dB	$S/N \geq 70$ (at maximum optical link loss)	
6	Field Tilt		<0.5 per cent (maximum)	
7	data format		RS-232, RS-485	
8	correspond (by letter etc)	kbps	0~ 300	
9	BER		<10 <sup>-9</sup>	
10	environmental temperature	°C	-35~ + 70	
11	Environmental humidity		10% ~ 95% RH, non-condensing	
26	Optical network forwarding equipment			
1	Ethernet physical interface		1 shielded RJ45 connector	
2	Ethernet interface rate		10M/100M/1000M Adaptive	
3	optical physical interface		1 FC interface	
4	Fibre type		Single mode (9/125um) single or dual fibre	
5	indicator light		Network connection status and data sending/receiving indication	
6	operating temperature	°C	-30~ + 70	
7	Environmental humidity		10% ~ 95% RH, non-condensing	
8	Power supply method		220V AC/DC	

twenty-seven	Graphics workstations			
1	CPU		Intel Core 2 2330MHz	
2	random access memory (RAM)		ECC REG DDR2 2G	
3	Discrete graphics card memory	M	256	
4	hard drive		SATA 250GB	
5	CD or DVD Drive		DVD-ROM	
6	monitor (computer)		22"	
7	network card		10M/100M/1000M Adaptive NIC 2 pieces	
8	operating system		Genuine Windows XP Professional	
twenty-eight	connection cable			
1	Armoured flame retardant 3-in-1 video combination cable	km	zr-(y)-syv75-5-41+rvp2*0.75+rv1.5*2	
2	Armoured flame retardant power cables	km	zr-rvvp22-2*2.5	
3	Armoured flame retardant shielded cable	km	ZR-RVVP22-4*1.0	
4	Armoured flame retardant shielded cable	km	zr-rvvp22-12*0.5	
5	fibre	km	GYFTZY53-4B1	

Table 1 (continued)

serial number	Item	unit (of measure)	Standard parameter values	Bidder's guaranteed value
6	Shielded network cable	chest	FTP-31-5E-4P	
7	Flame retardant materials		Cross-linked polyethylene (XLPE)	

Note When the project unit has discrepancies in the parameters in the standard technical parameter table, they may be given in the technical discrepancy table of the project unit in the project requirement section, and the bidder shall respond to the discrepancy table. When the discrepancy table differs from the parameters in the standard technical parameter table, the parameters given in the discrepancy table shall prevail.

## 2 Project requirements component

### 2.1 List of Goods Required and Scope of Supply

Table 2 List of Goods Required and Scope of Supply

serial number	Item	Bidder requirements		Bidder Response	
		Component specifications and main parameters	Quantity (to be filled in by the bidder)	Component specifications and main parameters	quantities

serial number	Item	Bidder requirements		Bidder Response	
		Component specifications and main parameters	Quantity (to be filled in by the bidder)	Component specifications and main parameters	quantities
"one" radical in Chinese characters (Kangxi radical 1)	Video subsystem				
1	Outdoor Fastball	CCD, 540TVL, 36x optical zoom, 128 presets			
2	Indoor Fastball	CCD, 540TVL, 36x optical zoom, 128 presets			
3	Indoor Medium Speed Ball	CCD, 540TVL, 26x optical zoom, 64 presets			
4	fixed camera	CCD, 480TVL, colour to black			
5	protective cover	Outdoor, IP66			
6	Integrated Three-in-One Lightning Protection System	Video, data and power in one			
7	Armoured flame retardant 3-in-1 video combination cable	ZR-(Y)-SYV75-5-41+RVP2*0.75+RV1.5*2			
8	Network Panoramic Camera	Outdoor, IP66, 360° panoramic view			
9	Outdoor Network Fastball	CCD, 540TVL, 36x optical zoom, 128 presets, with PTZ mount, IR night vision, 10M/100M adaptive network interface			
10	Indoor Network Medium Speed Dome	CCD, 540TVL, 36x optical zoom, 128 presets, with PTZ mount, IR night vision, 10M/100M adaptive network interface			
11	Network HD Camera	Maximum definition 2560× 1920, support SD card storage			
12	Network Lightning Protector	Discharge current 10kA, high speed response (10~12s), 10/100M adaptive, two-stage lightning discharge circuit to ground			
13	Outdoor poles	Stainless steel; diameter 100mm; height 6000mm; wall thickness not less than 3mm			
14	Station-side video processing unit	16-Channel Embedded			
15	Station-side video processing unit	24 mixed inputs (analogue + network video)			
16	Video Dedicated Hard Drives	SATA, 4T, 7200rpm			
17	Network Storage Unit	24 HDD channels, 4+ network ports			
18	Armoured flame retardant power cables	ZR-(Y)-RVV1.5*2			

serial number	Item	Bidder requirements		Bidder Response	
		Component specifications and main parameters	Quantity (to be filled in by the bidder)	Component specifications and main parameters	quantities
19	Single-phase power supply lightning protector				
20	fibre	GYFTZY53-4B1			
21	Shielded network cable	FTP-31-5E-4P			
stupid (Beijing dialect)	Security subsystem				
1	Active Infrared Alarm	100m			
2	Infrared dual-alarm detector	15m× 15m			
3	electric fence	2 Zone Controller, 4-Wire Installation			
4	Armoured flame retardant shielded cable	ZR-RVVP22-4*1.0			
3	Access control subsystem				
1	guarded entrance	4-door controller			
2	reader				
3	door opener button				
4	solenoid lock				
5	Armoured flame retardant shielded cable	zr-rvvp22-12*0.5			
4	Environmental monitoring subsystem				
1	Environmental Data Acquisition Unit				
2	Temperature and humidity sensors	Temperature measurement range: -20°C~ +100°C ; ± 0.5°C Humidity measurement range: 0% to 100% RH;± 1% RH (25°C)			
3	Wind Speed Sensor	0 to 100m/s;± 0.5% of measured value			
4	Flood detector	3mm± 1mm; False alarm rate≤ 0.01 per cent			
5	Air Conditioning Controller	With RS485 communication interface and hard node control function			
6	Fan control box	Each with 1 fan controller, accessor, thermal relay and other accessories			
7	Water Pump Controller				
8	Electric gate controller				
9	SF <sub>6</sub> monitoring subsystems				
9.1	SF <sub>6</sub> Leakage Alarm Monitoring Mainframe	Built-in 1 set of voice alarm system			
9.2	craft	SF <sub>6</sub> detector			

serial number	Item	Bidder requirements		Bidder Response	
		Component specifications and main parameters	Quantity (to be filled in by the bidder)	Component specifications and main parameters	quantities
9.3	Sampling and Analysis Module	9 channels of sampling and 1 channel of calibration			
9.4	audible and visual alarm				
9.5	External Voice Alarm System				
9.6	Accessories				
10	Armoured flame retardant shielded cable	ZR-RVVP22-4*1.0			
5	Intelligent Lighting Control Subsystem				
1	Lighting Intelligent Control Unit	AC220V/20A× 8-way intelligent switch, RJ45 interface (DL/T860 protocol)			
2	auxiliary lighting	400W (with power module controller)			
3	Armoured flame retardant power cables	zr-rvvp22-2*2.5			
6	the rest				
1	Integrated power supply	Outputs: AV24V8A× 6; DC24V5A× 3;DC12V5A 3×			
2	liquid crystal display	17", rack-mounted, panel-mounted; 22" in security room			
3	radiator	2260× 800× 600			
4	(network) bridge	10M			
5	network switch	10M/100M/1000M adaptive switch, not less than 24 electrical ports, not less than 2 FC-type optical ports, rack mountable			
6	Video Optical Transmitter	1 video; 1 bi-directional data			
7	Optical network forwarding equipment	Single mode fibre optic interface, 100M network interface			
8	Large screen display (optional for substations of 330kV and above)	52"			
9	Graphic workstation (optional for substations of 330kV and above)	CPU: Intel Core 2 2.33MHz Memory: 2G Discrete Graphics 256M 22" LCD			
10	Video matrix (330kV and above grade substation selection)	Video Input: Video Output:			
11	Mounting accessories	Hot galvanised pipes, PVC pipes, etc.			
12	Auxiliary control system mainframe				

Note:1. Night remote viewing should be matched with camera lights.

2. The winning manufacturer needs to connect the remote-vision sub-station to the remote-vision master station of the power grid monitoring centre and be responsible for the related costs.



3. The substation is constructed in accordance with intelligent substation, and the whole station network is established on the basis of IEC61850 communication technology specification, and the whole station is intelligent according to hierarchical distribution. The equipment of the winning manufacturer shall meet the requirements of intelligent substation.

4. This station integrates the image surveillance, security system, fire alarm system, water supply and drainage system, lighting system, environmental monitoring system and heating and ventilation system into the auxiliary control management system. Each sub-system is connected to the intelligent auxiliary control system host (integrated workstation), which transmits the operation status information of each sub-system. The auxiliary control system host communicates with the station control layer of the substation through the Ethernet interface in accordance with the IEC61850 protocol. The winning manufacturer shall meet this requirement and be responsible for system integration, commissioning and installation.

5. The system is installed on site by the equipment supplier.

6. The quantity of materials in the technical parameter table is only the reference quantity for technical specification, and the actual quantity shall prevail.

## 2.2 Supply list of necessary spare parts, special tools and instruments

Table 3 Necessary spare parts, special tools and instrumentation supply table

serial number	Name	unit	Bidder requirements		Bidder Response	
			Models and specifications	quantities	Models and specifications	quantities
1						
2						
3						
4						

## 2.3 Drawing submission units

Confirmed drawing information shall be submitted by the seller to the units listed in table 4.

Table 4 Drawings submitted by the seller subject to validation and the recipient thereof

Name of drawing submission	Name, address, postcode and telephone number of the unit receiving the drawings	Number of copies submitted	Submission time
Approval drawings, final drawings Instruction manual Test report (with electronic files)			(1) The supplier shall provide approved drawings within 2 weeks after the signing of the technical agreement.
Approval drawings, final drawings Instruction manual Test report (with electronic files)			(2) The Engineer shall send 1 copy of the confirmed drawings to the Supplier within 2 weeks of receipt of the approved drawings.
			(3) The supplier receives the confirmed drawings within 2 weeks to submit the final drawings

2.4 Summary of works

2.4 Summary of works

**2.4.1 Project title:**

**2.4.2 Project units:**

**2.4.3 Scale of work:**

**2.4.4 Address of Work:**

2.4.5 Traffic, transport: roads, railways

2.5 Conditions of use

Table 5 Conditions of use

serial number	Name	Title	unit (of measure)	Bidder's requirement value
1	Frequency of the power supply		Hz	50
2	environmental temperature	maximum daily temperature	°C	55
		minimum daily temperature		-35
		Maximum daily temperature difference		25
3	humidity level	Average daily relative humidity	%	≤95
		Monthly average relative humidity		≤90
4	altitude		m	≤3000
5	seismic capacity	horizontal acceleration	m/s <sup>2</sup>	0.3g
		vertical acceleration	m/s <sup>2</sup>	0.15g
6	use	Group screen/single unit	(provided by the project unit)	
7	Installation	Centralised/decentralised	(provided by the project unit)	

Note In the table, "the value required by the bidder" is the normal use condition, and when it exceeds this value, it is the special use condition, which can be modified by the project unit according to the actual use condition of the project.

2.6 Table of technical differences in project units

In principle, the project unit cannot change the parameters solidified in the provisions of the general technical specifications and special technical specifications. According to the conditions of project use, when there are differences in filth level, altitude, etc. with the standard technical parameter table or differences in the provisions of the general technical specification, they shall be listed in "Table 6 Technical difference table of project unit", and the parameters given in the difference table shall prevail. The bidder shall confirm the technical parameters in Table 6.

This table supplements and modifies the technical specifications and shall prevail in case of conflict.

Table 6 Table of technical differences in project units

serial number	Item	Standard parameter values	Project unit requirement value	Bidder's guaranteed value
1				
2				
	.....			
serial number	Item	Change clause page number, paragraph number	original expression	Expression after change
1				
2				
	.....			

3 Bidder's response section

Bidders are required to fill in the corresponding tables in parts 1 and 2 of the special part. If the required values in the standard technical parameter table and the technical difference table of the project unit are different, the technical difference table of the project unit shall prevail. The guaranteed value of the bidder cannot be blanked out or replaced by the word "response", and no change in the bidder's required value is allowed. If there is any discrepancy, the Bidder's Technical Difference Table shall be completed. The "bidder's guaranteed value" shall be consistent with the type test report and other performance test reports.

3.1 Table of technical deviations of bidders

The technical specification of the product provided by the bidder shall be consistent with the requirements stipulated in this technical specification. If there is any deviation, the bidder shall fill in the deviation value truthfully and carefully; if there is no technical deviation, it is regarded as fully meeting the requirements of this technical specification, and "no deviation" shall be filled in the bidder's technical deviation table.

Table 7 Table of technical deviations of bidders

serial number	Item	Corresponding article number	Technical bidding document requirements	bias	Note
1					
2					
3					

3.2 Sales and operational performance tables

Table 8 Sales and operational performance table

serial number	Product Model	operating unit	Number of units commissioned	commissioning time	Contact person and phone number	Remarks

serial number	Product Model	operating unit	Number of units commissioned	commissioning time	Contact person and phone number	Remarks

### 3.3 Recommended supply of spare parts, special tools and instrumentation

Table 9 Recommended delivery schedule for spare parts, special tools and instrumentation

serial number	Name	Models and specifications	unit	Quantity
1				
2				
4				
5				

### 3.4 Proof of use by end-users

Table 10 Sales and operating performance table

serial number	Product Model	operating unit	Number of units commissioned	commissioning time	Contact person and phone number	note
1						
2						
3						
4						
5						
6						
7						
8						

### 3.5 Test and inspection report form provided by the bidder

Table 11 Table of test and inspection reports provided by bidders

serial number	Model Name	Type and content of test reports	Based on criteria	Test time	test unit

### 3.6 Table of accreditation certificates provided by bidders

Table 12 List of accreditation certificates provided by bidders

serial number	Identification of product model name	Organisation identification unit	Based on criteria	Date of appraisal


智能辅助控制系统  
(技术规范部分)

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## 1 标准技术参数表

投标人应认真逐项填写标准技术参数表（见表 1）中投标人保证值，不能空格，也不能以“响应”两字代替，不允许改动招标人要求值。如有差异，请填写表 6 投标人技术偏差表。

表 1 标准技术参数表

序号	项 目		单位	标准参数值	投标人保证值
一	室外模拟快球				
1	信号制式			PAL	
2	传感器			1/4"彩色日夜转换型 CCD	
3	有效像素			752 (H) × 582 (V)	
4	水平解析度			≥540TVL	
5	镜头	光圈		F1.4—F3.0	
		焦距	mm	3.4~122.4	
6	光学变焦倍数			不低于 36 倍	
7	数字变焦倍数			12 倍	
8	水平回转角度			360°连续旋转	
9	垂直俯仰角度			0~90°带自动翻转	
10	日夜型转换模式			自动/彩色/黑白	
11	最低照度		lux	彩色：1 黑白：0.1	
12	旋转速度			水平最大 300°/s；垂直最大 240°/s	
13	预置点		点	128	
14	信噪比		dB	≥50	
15	自动/手动光圈			支持	
16	自动/手动变焦			支持	
17	自动增益 AGC			支持	
18	自动背光补偿			支持	
19	自动白平衡			支持	
20	工作温度		℃	-35~+55	
21	自动温控范围		℃	加热器开：8±5 关：20±5	
22	防护罩等级			不低于 IP66	
二	室内模拟中速球				
1	信号制式			PAL	
2	传感器			1/4"彩色日夜转换型 CCD	
3	有效像素			752 (H) × 582 (V)	
4	水平解析度			≥540TVL	
5	镜头	光圈		F1.4—F3.0	
		焦距	mm	3.4~88.4	



表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
6	光学变焦倍数		不低于 26 倍	
7	数字变焦倍数		12 倍	
8	水平回转角度		360°连续旋转	
9	垂直俯仰角度		0~90°带自动翻转	
10	日夜型转换模式		自动/彩色/黑白	
11	最低照度	lux	彩色：1 黑白：0.1	
12	旋转速度		水平最大 300°/s；垂直最大 240°/s	
13	预置点	点	128	
14	信噪比	dB	≥50	
15	自动/手动光圈		支持	
16	自动/手动变焦		支持	
17	自动增益 AGC		支持	
18	自动背光补偿		支持	
19	自动白平衡		支持	
20	工作温度	℃	-35~+55	
21	自动温控范围	℃	加热器开：8±5 关：20±5	
22	防护罩等级		不低于 IP65	
三	模拟固定摄像机			
1	信号制式		PAL	
2	传感器		单片/三片 CCD	
3	水平解析度		≥480TVL	
4	日夜型转换模式		自动/彩色/黑白	
5	最低照度	lux	彩色：0.5 黑白：0.1	
6	信噪比	dB	≥50	
7	镜头接口		C/CS	
8	自动增益 AGC		支持	
9	自动背光补偿		支持	
10	自动白平衡		支持	
11	工作温度	℃	-10~50；配装防护罩后达到-35~+55	
12	防护罩等级		不低于 IP65	
四	全景摄像机			
1	图像传感器		1/2" CMOS，逐行扫描	
2	最低照度		彩色：1 lux 黑白：0.1 lux	
3	图像最大分辨率		彩色：2048 x 1536 (3MEGA) 黑白：1280 x 960 (MEGA)	

表 1 (续)

序号	项 目		单位	标准参数值	投标人保证值
4	图像格式			2048 x 1536, 1280 x 960, 1024 x 768, 800 x 600, 768 x 576 (D1), 704 x 576 (TV-PAL), 640 x 480, 384 x 288, 352 x 288, 320 x 240, 160 x 120; 自定义格式 (例如 1000 x 200 像素的横形条幅)	
5	最大图像帧频 (M-JPEG)			VGA: 25 fps, TV-PAL: 18 fps, MEGA: 8 fps, 3MEGA: 4 fps	
6	最大视频帧频 (MxPEG)			VGA: 30 fps, TV-PAL: 30 fps, MEGA: 30 fps, 3MEGA: 20 fps	
7	图像处理			背光补偿, 自动白平衡, 失真校正, 智能视频分析(智能动态侦测)	
8	虚拟 PTZ			数字俯仰/转动/缩放, 无级放大至 8 倍	
9	接口			Ethernet 10/100, USB	
10	安全机制			用户-/组管理, HTTPS/SSL, IP 地址过滤, IEEE 802.1x, 非法入侵检测	
11	供电			全年通过网络供电 (IEE 802.3af; Class 0), 供电适配器, 典型耗电量 3 W	
12	运行条件			防护等级 IP65 (按 DIN EN 60529), 环境温度 -30° 至 +60 °C	
五	室外网络快球				
1	信号制式			PAL	
2	传感器			1/4"彩色日夜转换型 CCD	
3	有效像素			752 (H) × 582 (V)	
4	水平解析度			≥540TVL	
5	镜头	光圈		F1.4—F3.0	
		焦距	mm	3.4~122.4	
6	光学变焦倍数			不低于 36 倍	
7	数字变焦倍数			12 倍	
8	水平回转角度			360°连续旋转	
9	垂直俯仰角度			0~90°带自动翻转	
10	日夜型转换模式			自动/彩色/黑白	
11	最低照度		lux	彩色: 1 黑白: 0.1	
12	旋转速度			水平最大 300°/s; 垂直最大 240°/s	
13	预置点		点	不少于 128	
14	信噪比		dB	≥50	
15	自动/手动光圈			支持	
16	自动/手动变焦			支持	
17	自动增益 AGC			支持	
18	自动背光补偿			支持	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
19	自动白平衡		支持	
20	工作温度	°C	-35~+55	
21	自动温控范围	°C	加热器开: 8±5 关: 20±5	
22	防护罩等级		不低于 IP66	
23	网络接口		10Base-T/100Base-TX, RJ45 头 (光纤接口可选)	
24	SD 卡		手动录像/报警录像支持 SDHC 标准的 SD 卡	
25	安全模式		授权的用户名和密码, 以及 MAC 地址绑定	
六	室内网络中速球			
1	信号制式		PAL	
2	传感器		1/4"彩色日夜转换型 CCD	
3	有效像素		752 (H) × 582 (V)	
4	水平解析度		≥540TVL	
5	镜头			
	光圈		F1.4—F3.0	
	焦距	mm	3.4~88.4	
6	光学变焦倍数		不低于 26 倍	
7	数字变焦倍数		12 倍	
8	水平回转角度		360° 连续旋转	
9	垂直俯仰角度		0~90°带自动翻转	
10	日夜型转换模式		自动/彩色/黑白	
11	最低照度	lux	彩色: 1 黑白: 0.1	
12	旋转速度		水平最大 300°/s; 垂直最大 240°/s	
13	预置点	点	不少于 128 点	
14	信噪比	dB	≥50	
15	自动/手动光圈		支持	
16	自动/手动变焦		支持	
17	自动增益 AGC		支持	
18	自动背光补偿		支持	
19	自动白平衡		支持	
20	工作温度	°C	-35~+55	
21	自动温控范围	°C	加热器开: 8±5 关: 20±5	
22	防护罩等级		不低于 IP65	
23	网络接口		10Base-T/100Base-TX, RJ45 头 (光纤接口可选)	
24	SD 卡		支持 SDHC 标准的 SD 卡	
25	安全模式		授权的用户名和密码, 以及 MAC 地址绑定	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
七	高清网络固定摄像机			
1	图像传感器		DH5: 1/2.5" SONY PROGRESSIVE SCAN CMOS DH2 和 XH2: 1/1.8" SONY PROGRESS- IVE SCAN CCD	
2	有效像素		DH5: 2560(H)×1920(V) DH2 和 XH2: 1600(H)×1200(V)	
3	最低照度	lux	0.5lux/F1.2 (彩色) 0.1lux/F1.2 (黑白)	
4	日夜模式		ICR	
5	光圈类型		自动光圈 DC/Video 驱动	
6	镜头类型		外接 C/CS 接口镜头	
7	最大图像尺寸		DH5: 2560×1920 DH2 和 XH2: 1600×1200	
8	视频压缩		DH5: H.264/MPEG4/MJPEG DH2 和 XH2: H.264	
9	帧率		DH5: 8fps(2560×1920) 20fps(2048×1539) 25fps(1600×1200) 25fps(1920×1080) 25fps(1280×720) DH2 和 XH2: 25fps(1600× 1200)	
10	SD 卡		YES	
11	报警输入		4 路	
12	报警输出		3 路	
13	电源		DC12V±10%/ AC24DC	
14	工作温度	℃	-10~50; 配装防护罩后达到-35~+55	
15	电磁兼容		EMC4	
16	网络接口		10Base-T/100Base-TX, RJ45 头(光纤接口可选)	
17	SD 卡		手动录像/报警录像 支持 SDHC 标准的 SD 卡	
18	安全模式		授权的用户名和密码, 以及 MAC 地址绑定	
八	三合一防雷器			
1	电源部分最大持续运行电压	V	275	
2	电源部分电压保护水平 $U_p$	V	40	
3	视频部分最大持续运行电压	V	6	
4	视频部分 额定放电冲击电流 $i_{sn}$ (1.2/50 8/20 $\mu$ s) 对称/非对称 (PE)	A	125A/5kA	
5	信号部分最大持续运行电压	V	15 (DC)	
6	信号部分冲击电流 $i_{sn}$ (1.2/50 8/20 $\mu$ s) 对 称/非对称 (PE)	A	125A/5kA	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
九	站端视频处理单元（模拟输入）			
1	视频压缩标准		H.264/Mpeg4	
2	实时监视图像分辨率		PAL: 704×576 NTSC: 704×480	
3	回放分辨率		QCIF/CIF/2CIF/DCIF/4CIF	
4	视频输入路数		16	
5	视频输入接口		BNC（电平：1.0Vp-p，阻抗：75Ω），支持 PAL、NTSC 制	
6	视频输出		1 路，BNC（电平：1.0Vp-p，阻抗：75Ω）	
7	视频帧率		PAL: 1/16—25 帧/s，NTSC: 1/16—30 帧/s	
8	码流类型		视频流/复合流	
9	压缩输出码率		32K~2M 可调，也可自定义（上限 8M，单位：bps）	
10	音频输入路数		16	
11	音频输入接口		BNC（电平：2Vp-p，阻抗：1kΩ）	
12	音频输出		1 路，BNC（线性电平，阻抗：600Ω）	
13	音频压缩标准		OggVorbis/ITU-T G.711	
14	音频压缩码率	kbps	16	
15	语音对讲输入		1 路，BNC(电平：2Vp-p，阻抗：1kΩ)	
16	双路回放		支持	
17	双码流		支持	
18	通信接口	个	不少于 5 个 RJ45 10M/100M 自适应以太网口，1 个 RS232 口，1 个 RS485 口	
19	键盘接口	个	2 个	
20	硬盘接口	个	4 个，支持 8 个 SATA 硬盘，支持每个硬盘容量达 2TB	SATA
21	USB 接口	个	1 个，支持 U 盘，USB 硬盘，USB 刻录机，USB 鼠标	
22	VGA 接口	个	1 个，分辨率：800×600/60Hz，800×600/75Hz，1024×768/60Hz	
23	报警输入	路	16	
24	报警输出	路	16	
25	电源	V	220VAC，50Hz	
26	功耗（不含硬盘）	W	≤70	
27	工作温度	℃	-10~+55	
28	工作湿度		10%~90%	
29	机箱		19 英寸标准机箱	
30	质量（不含硬盘）	kg	≤8	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
十	站端视频处理单元 (模拟+网络视频)			
1	混合视频输入		24 路 (模拟视频+网络视频)	
2	音频输入		16 路, BNC 接口 (电平: 2.0Vp-p, 阻抗: 1k $\Omega$ )	
3	HDMI 输出		1 路, 分辨率: 1024 $\times$ 768/60Hz, 1920 $\times$ 1080/60Hz, 1280 $\times$ 1024/70Hz	
4	CVBS 输出		2 路, BNC 接口 (电平: 1.0Vp-p, 阻抗: 75 $\Omega$ ) 分辨率: PAL 制式 704 $\times$ 576; NTSC 制式 704 $\times$ 480	
5	VGA 输出		1 路, 分辨率: 1024 $\times$ 768/60Hz, 1024 $\times$ 768/70Hz, 1280 $\times$ 1024/60Hz	
6	音频输出		2 路, BNC 接口 (线性电平, 阻抗: 600 $\Omega$ )	
7	视频压缩标准		H.264	
8	视频编码分辨率		UXGA/720P/VGA/4CIF/DCIF/2CIF/CIF/QCIF	
9	视频帧率		PAL: 1/16—25 帧/s, NTSC: 1/16—30 帧/s	
10	视频码率	kbps	32—2048, 可自定义, 最大 6144	
11	码流类型		复合流/视频流	
12	音频压缩标准		OggVorbis/ITU-T G.711	
13	音频码率	kbps	16	
14	双码流		支持	
15	硬盘类型		8 个 SATA 接口	
16	最大容量		每个接口支持容量大于 2TB 的硬盘	
17	语音对讲输入		2 个, BNC 接口 (电平: 2.0Vp-p, 阻抗: 1k $\Omega$ )	
18	网络接口		不少于 5 个, RJ45 10M/100M/ 1000M 自适应以太网口	
19	串行接口		1 个标准 RS-485 串行接口, 1 个标准 RS-232 串行接口	
20	USB 接口		3 个 USB 2.0	
21	报警输入		16 路	
22	报警输出		4 路	
23	电源		AC220V, 47~63Hz	
24	功耗	W	$\leq 70$	
25	工作温度	$^{\circ}\text{C}$	-25~+70	
26	工作湿度		10%~90%	
27	机箱		19 英寸标准 2U 机箱	
十一	网络存储单元			
1	处理器		64 位双核处理器 (可扩展)	
2	高速缓存		2GB (可扩展)	
3	阵列通道		24	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
4	磁盘接口		SATA I, SATA II	
5	热插拔磁盘		支持	
6	RAID 级别		支持 RAID0、1、5、6、10、50, JBOD, Hot-Spare	
7	网络接口		4~8 个, 10/100/1000M 自适应以太网口	
8	电源		冗余电源	
9	操作系统		Windows, Linux	
10	协议支持		iSCSI / NFS / CIFS / FTP / HTTP / AFP	
11	实时录像存储路数		4CIF:120 路; CIF:300 路	
12	功率		1150W	
13	工作温度	℃	10~40	
十二	主动红外对射报警器			
1	光束数	束	四束	
2	警戒距离		围墙长度×2	
3	探测方式		四光束同时遮断检知式	
4	光源		红外 LED	
5	感应速度	ms	50~700	
6	警报输出		继电器接点输出 1c, 接点电容量 AC/DC 30V 0.5A	
7	电源电压	V	DC12-20V 或 AC10V-15V	
8	消耗电流	mA	65~85	
9	使用温度范围	℃	-35~+55	
10	防拆输出		接点输出 1b	
11	光轴调整角度		水平: 180° (±90°)	
12	光轴调整角度		垂直: 10° (±5°)	
13	其他附加机能		接收指示, 光轴测试点	
14	材质		ABS 树脂	
十三	红外双鉴探测器			
1	探测类型		红外+微波	
2	脉冲数调节		自动	
3	外壳		金属抗电磁干扰	
4	温度补偿		自动	
5	探测范围		90°、14m×14m	
6	电源	V	DC12	
十四	电子围栏			
1	脉冲峰值	V	5000~10 000	
2	脉冲周期	s	1~1.5	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
3	脉冲持续时间	s	$\leq 0.1$	
4	脉冲最大电量	mC	$\leq 2.5$	
5	低压模式脉冲峰值		700V 左右	
6	脉冲电流超过 300mA 的持续时间	ms	$< 1.5$	
7	脉冲电流峰值	A	$\leq 10$	
8	脉冲最大能量	J	$\leq 5$	
9	围墙安装栏线数		4	
十五	门禁			
1	读卡方式		感应式	
2	最大控制门数/控制器		不低于 4	
3	通信协议		DL/T 860 协议, RJ45	
4	MTBF		不低于 44 000h	
5	最大系统容量		不低于 40 000 人	
十六	灯光智能控制单元			
1	开关量输出	路	AC220V/20A $\times$ 8 路	
2	通信接口		RJ45 (DL/T860 协议)	
3	电源输入		AC220V	
4	尺寸		19 英寸 1U (机柜安装)/壁挂	
十七	温湿度传感器			
1	温度测量范围	$^{\circ}\text{C}$	$-20 \sim +100$	
2	温度测量精度	$^{\circ}\text{C}$	0.5	
	湿度测量范围		0%~100%RH	
	湿度测量精度		$\pm 1\% \text{RH} (25^{\circ}\text{C})$	
3	响应时间	s	$\leq 15$	
4	数据传输距离	m	$\geq 800$	
5	环境温度	$^{\circ}\text{C}$	$-35 \sim +55$	
6	环境湿度		10%~95%RH	
7	输出方式	mA	4~20	
十八	风速传感器			
1	测量范围	m/s	0~100	
2	测量精度		$\pm 0.5\%$ 测量值	
3	响应时间	s	$\leq 1$	
4	数据传输距离	m	$\geq 800$	
5	环境温度	$^{\circ}\text{C}$	$-35 \sim +55$	
6	环境湿度		10%~95%RH	
7	输出方式	mA	4~20	



表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
十九	水浸探头			
1	灵敏度	mm	3±1	
2	响应时间	s	≤1	
3	误报率		≤0.01%	
4	输出方式		常闭/常开型无源输出	
二十	环境数据处理单元			
1	标准电流环信号接入	路	16	
2	标准电流环信号	mA	4~20	
3	硬接点输入	路	8	
4	电源输入	V	AC220	
5	通信接口		2 个 RS232, 2 个 RJ45	
6	遥控开关		4 路 (AC220V/20A)	
7	安装方式		壁挂或屏柜 (标准 19 英寸) 安装	
二十一	SF <sub>6</sub> 探测器			
1	可检测范围		0~3000ppm	
2	精度		满量程的正负 1%	
3	工作温度范围	℃	-10~50	
4	压力范围		800hPa-1000hPa	
5	湿度范围		0%~95%相对湿度	
6	预热时间	min	小于 2min	
7	反应时间	s	扩散时间小于 25s, 流速小于 5s	
8	启动电流	mA	70	
9	输出信号	mA	4~20 的电流信号	
二十二	综合电源			
1	电源输入	V	AC220V, 50Hz	
2	电源输出	V	AC24V8A×6、DC24V8A×3、DC12V8A×3	
3	过功率保护		输出短路、过载或超载后自动切断电源, 去载后 2s 自动恢复	
4	尺寸		19 英寸 2U	
5	过流保护		直流输出回路都采用 TVS 做保护	
6	耐压及安规 I <sub>漏</sub> =15mA, 1min		直通输出不做耐压; 输入对地 (机壳): 2000VAC; 输入对输出: 2000VAC; 输出对地 (机壳):	
二十三	网络交换机			
1	应用层级		两层	
2	传输速率	Mbps	10/100/1000	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
3	端口结构		非模块化	
4	端口数量		26	
5	接口介质		10/100/1000Base-T、1000Base-X SFP	
6	传输模式		全双工/半双工自适应	
7	配置形式		可堆叠	
8	交换方式		存储-转发	
9	背板带宽	Gbps	19.2	
10	VLAN 支持		支持	
11	QOS 支持		支持	
12	网管支持		支持	
13	网管功能		支持命令行接口 (CLI), Telnet, Console 口配置; 支持 SNMP; 支持 iMC 网管系统; 支持 WEB 网管	
14	MAC 地址表	K	8	
15	模块化插槽数		2	
16	电源		额定电压范围: 100V~240V AC, 50/60Hz, 最大 电压范围: 90V~264V AC, 47Hz~63Hz	
17	环境标准		工作温度: 0℃~45℃、工作湿度: 10%~90% (非 凝露)	
二十四	网桥			
1	以太网接口	个	接口: 10/100Base-T 接口规程: 符合 IEEE 802.3 标准 接口速率: 10/100M 自适应 接口类型: RJ45	
2	E1 接口	个	码速: 2.048Mbps 容差: ±50ppm 码型: HDB3 接口电气特性: 符合 ITU-T G.703 建议 抖动转移特性: 符合 ITU-T G.823 建议 输入抖动容限: 符合 ITU-T G.823 建议 接口阻抗: 75Ω 非平衡/120Ω 平衡	
3	时钟模式		内部时钟/线路时钟 (默认设置: 内部时钟)	
4	电源选择		电压: AC220V/DC-48V/AC110V/ DC+24V 功耗: ≤5W	
5	环境要求		工作温度: -30℃~+50℃ 相对湿度: 5%~95%无冷凝	
二十五	视频光端机			
1	视频输入		1 路 1.0Vp-p/75Ω	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
2	视频接口		BNC	
3	微分增益		<0.1% (典型值)	
4	微分相位		<0.4° (典型值)	
5	视频信噪比(加权)	dB	$S/N \geq 70$ (最大光学链路损耗时)	
6	场 倾 斜		<0.5% (最大值)	
7	数据格式		RS-232、RS-485	
8	通信	kbps	0~300	
9	误 码 率		<10~9	
10	环境温度	°C	-35~+70	
11	环境湿度		10%~95%RH, 无冷凝	
二十六	光网转发设备			
1	以太网物理接口		1 个屏蔽 RJ45 接口	
2	以太网接口速率		10M/100M/1000M 自适应	
3	光纤物理接口		1 个 FC 接口	
4	光纤类别		单模 (9/125um) 单纤或双纤	
5	指示灯		网络连接状态和数据收发指示	
6	工作温度	°C	-30~+70	
7	环境湿度		10%~95%RH, 无冷凝	
8	供电方式		交直流 220V	
二十七	图形工作站			
1	CPU		Intel 酷睿 2 2330MHz	
2	内存		ECC REG DDR2 2G	
3	独立显卡显存	M	256	
4	硬盘		SATA 250GB	
5	光驱		DVD-ROM	
6	显示器		22"	
7	网卡		10M/100M/1000M 自适应网卡 2 块	
8	操作系统		正版 Windows XP Professional	
二十八	连接电缆			
1	铠装阻燃三合一视频组合电缆	km	ZR-(Y)-SYV75-5-41+RVP2*0.75+RV1.5*2	
2	铠装阻燃电源电缆	km	ZR-RVVP22-2*2.5	
3	铠装阻燃屏蔽电缆	km	ZR-RVVP22-4*1.0	
4	铠装阻燃屏蔽电缆	km	ZR-RVVP22-12*0.5	
5	光纤	km	GYFTZY53-4B1	

表 1 (续)

序号	项 目	单位	标准参数值	投标人保证值
6	屏蔽网络线	箱	FTP-31-5E-4P	
7	阻燃材料		交联聚乙烯 (XLPE)	

注 项目单位对标准技术参数表中参数有差异时，可在项目需求部分的项目单位技术差异表中给出，投标人应对该差异表响应。差异表与标准技术参数表中参数不同时，以差异表给出的参数为准。

## 2 项目需求部分

### 2.1 货物需求及供货范围一览表

表 2 货物需求及供货范围一览表

序号	项 目	招标人要求		投标人响应	
		元件规格和主要参数	数量 (投 标 人 填 写)	元件规格和主要参数	数量
一	视频子系统				
1	室外快球	CCD、540TVL、36 倍光学变焦、128 预置位			
2	室内快球	CCD、540TVL、36 倍光学变焦、128 预置位			
3	室内中速球	CCD、540TVL、26 倍光学变焦、64 预置位			
4	固定摄像机	CCD、480TVL、彩转黑			
5	防护罩	室外、IP66			
6	三合一防雷器	视频、数据、电源三合一			
7	铠装阻燃三合一视频组合 电缆	ZR-(Y)-SYV75-5-41+RVP2*0.75+RV1.5*2			
8	网络全景摄像机	室外、IP66、360° 全景视角			
9	室外网络快球	CCD、540TVL、36 倍光学变焦、128 预置位， 带云台安装、红外夜视功能，10M/100M 自适应网 络接口			
10	室内网络中速球	CCD、540TVL、36 倍光学变焦、128 预置位， 带云台安装、红外夜视功能，10M/100M 自适应网 络接口			
11	网络高清摄像机	最高清晰度 2560×1920，支持 SD 卡存储			
12	网络防雷器	放电电流 10kA，高速反应 (10~12s)，10/100M 自 适应，两级对地雷电泄放电路			
13	室外立杆	不锈钢；直径 100mm；高 6000mm；壁厚不小于 3mm			
14	站端视频处理单元	16 路嵌入式			
15	站端视频处理单元	24 路混合输入 (模拟+网络视频)			
16	视频专用硬盘	SATA、4T、7200 转			
17	网络存储单元	24 个硬盘通道，4 个以上网络口			
18	铠装阻燃电源电缆	ZR-(Y)-RVV1.5*2			

序号	项 目	招标人要求		投标人响应	
		元件规格和主要参数	数量 (投标人填写)	元件规格和主要参数	数量
19	单相电源防雷器				
20	光纤	GYFTZY53-4B1			
21	屏蔽网络线	FTP-31-5E-4P			
二	安全警卫子系统				
1	主动红外对射报警器	100m			
2	红外双鉴探测器	15m×15m			
3	电子围栏	2 区域控制器，4 线安装			
4	铠装阻燃屏蔽电缆	ZR-RVVP22-4*1.0			
三	门禁子系统				
1	门禁	4 门控制器			
2	读卡器				
3	开门按钮				
4	电磁锁				
5	铠装阻燃屏蔽电缆	ZR-RVVP22-12*0.5			
四	环境监测子系统				
1	环境数据采集单元				
2	温湿度传感器	温度测量范围：-20℃~+100℃；±0.5℃ 湿度测量范围：0%~100%RH；±1%RH（25℃）			
3	风速传感器	0~100m/s；±0.5%测量值			
4	水浸探测器	3mm±1mm；误报率≤0.01%			
5	空调控制器	具有 RS485 通信接口和硬节点控制功能			
6	风机控制箱	每个含风机控制器 1 台、接入器、热继电器等附件			
7	水泵控制器				
8	电动大门控制器				
9	SF <sub>6</sub> 监测子系统				
9.1	SF <sub>6</sub> 泄露报警监控主机	内置 1 套语音报警系统			
9.2	探测器	SF <sub>6</sub> 探测器			
9.3	采样分析模块	9 路采样 1 路校准			
9.4	声光报警器				
9.5	外置语音报警系统				
9.6	安装辅材				
10	铠装阻燃屏蔽电缆	ZR-RVVP22-4*1.0			
五	智能灯光控制子系统				
1	灯光智能控制单元	AC220V/20A×8 路智能开关，RJ45 接口（DL/T860 协议）			

序号	项 目	招标人要求		投标人响应	
		元件规格和主要参数	数量 (投标人填写)	元件规格和主要参数	数量
2	辅助灯光	400W(含电源模块控制器)			
3	铠装阻燃电源电缆	ZR-RVVP22-2*2.5			
六	其他				
1	综合电源	输出：AV24V8A×6; DC24V5A×3; DC12V5A×3			
2	液晶显示器	17”、机架式，组屏安装；22”放置在警卫室			
3	屏柜	2260×800×600			
4	网桥	10M			
5	网络交换机	10M/100M/1000M 自适应交换机，不少于 24 电口，不少于 2 路 FC 型光口，机架式安装			
6	视频光端机	1 路视频；1 路双向数据			
7	光网转发设备	单模光纤接口，100M 网络接口			
8	大屏幕显示器（330kV 及以上等级变电站选用）	52”			
9	图形工作站（330kV 及以上等级变电站选用）	CPU: Intel 酷睿 2 2.33MHz 内存：2G 独立显卡 256M 22”液晶			
10	视频矩阵（330kV 及以上等级变电站选用）	视频输入： 视频输出：			
11	安装辅料	热镀锌管、PVC 管等			
12	辅助控制系统主机				

注:1. 夜间遥视应与摄像机灯光配套。

2. 中标厂家需将遥视子站接入电网监控中心的遥视主站，并负责相关费用。

3. 本变电站按照智能化变电站建设，整站网络建立在 IEC61850 通信技术规范基础上，按分层分布式来实现整站智能化。中标厂家设备应满足智能化变电站的各项要求。

4. 本站将图像监视、安全警卫系统、火灾报警系统、给排水系统、照明系统、环境监测系统以及采暖通风系统统一纳入辅助控制管理体系。各子系统连接到智能化辅控系统主机（综合工作站），传送各子系统的运行状态信息。辅助控制系统主机通过以太网接口按照 IEC61850 规约与变电站站控层通信。中标厂家应满足此要求，并负责系统集成，调试，安装等。

5. 本系统由设备供货商进行现场安装。

6. 技术参数表材料数量仅为技术规范参考数量，具体以实际用量为准。

## 2.2 必备的备品备件、专用工具和仪器仪表供货表

表 3 必备的备品备件、专用工具和仪器仪表供货表

序号	名 称	单 位	招标人要求	投标人响应
----	-----	-----	-------	-------

			型号和规格	数量	型号和规格	数量
1						
2						
3						
4						

### 2.3 图纸资料提交单位

经确认的图纸资料应由卖方提交表 4 所列单位。

表 4 卖方提交的须经确认的图纸资料及其接收单位

提交图纸资料名称	接收图纸单位名称、地址、邮编、电话	提交份数	提交时间
认可图、最终图 说明书 试验报告 (附电子文档)			1) 技术协议签订后 2 周内, 供货商应提供认可图纸。 2) 工程师在收到认可图纸后 2 周内, 应将经确认的 1 份图纸寄送给供货商。 3) 供货商收到经确认的图纸 2 周内提出最终图
认可图、最终图 说明书 试验报告 (附电子文档)			

### 2.4 工程概况

#### 2.4 工程概况

##### 2.4.1 项目名称:

##### 2.4.2 项目单位:

##### 2.4.3 工程规模:

##### 2.4.4 工程地址:

##### 2.4.5 交通、运输: 公路、铁路

### 2.5 使用条件

表 5 使用条件表

序号	名称	单位	招标人要求值	
1	电源的频率	Hz	50	
2	环境温度	℃	日最高温度	55
			日最低温度	-35
			日最大温差	25
3	湿度	%	日相对湿度平均值	≤95
			月相对湿度平均值	≤90
4	海拔高度	m	≤3000	

5	耐受地震能力	水平加速度	m/s <sup>2</sup>	0.3g
		垂直加速度	m/s <sup>2</sup>	0.15g
6	用途	组屏/单装置	(项目单位提供)	
7	安装方式	集中/分散	(项目单位提供)	

注 表中“招标人要求值”为正常使用条件，超出此值时为特殊使用条件，项目单位可根据工程实际使用条件进行修改。

### 2.6 项目单位技术差异表

项目单位原则上不能改动通用技术规范条款及专用技术规范固化的参数。根据工程使用条件，当污秽等级、海拔高度等与标准技术参数表有差异或对通用技术规范条款有差异时，应逐项在“表6 项目单位技术差异表”中列出，并以差异表给出的参数为准。投标人应对表6的技术参数进行确认。

本表是对技术规范的补充和修改，如有冲突，应以本表为准。

表6 项目单位技术差异表

序号	项 目	标准参数值	项目单位要求值	投标人保证值
1				
2				
	.....			
序号	项 目	变更条款页码、款号	原表达	变更后表达
1				
2				
	.....			

## 3 投标人响应部分

投标人需填写专用部分的第1和第2部分的相应表格。标准技术参数表和项目单位技术差异表中要求值不同时，以项目单位技术差异表为准。投标人保证值，不能空格，也不能以“响应”两字代替，不允许改动招标人要求值。如有差异，应填写投标人技术差异表。“投标人保证值”应与型式试验报告及其他性能试验报告相符。

### 3.1 投标人技术偏差表

投标人提供的产品技术规范应与本技术规范中规定的要求一致。若有偏差投标人应如实、认真地填写偏差值；若无技术偏差则视为完全满足本技术规范的要求，且在投标人技术偏差表中填写“无偏差”。

表7 投标人技术偏差表

序号	项 目	对应条款编号	技术招标文件要求	偏 差	备 注
1					
2					
3					

### 3.2 销售及运行业绩表



表 8 销售及运行业绩表

序号	产品型号	运行单位	投运数量	投运时间	联系人及电话	备注

3.3 推荐的备品备件、专用工具和仪器仪表供货

表 9 推荐的备品备件、专用工具和仪器仪表供货表

序号	名称	型号和规格	单位	数量
1				
2				
4				
5				

3.4 最终用户的使用情况证明

表 10 销售及运行业绩表

序号	产品型号	运行单位	投运数量	投运时间	联系人及电话	备注
1						
2						
3						
4						
5						
6						
7						
8						

3.5 投标人提供的试验检测报告表

表 11 投标人提供的试验检测报告表

序号	产品型号名称	试验报告类别和内容	依据标准	试验时间	试验单位

3.6 投标人提供的鉴定证书表

表 12 投标人提供的鉴定证书表

序号	鉴定产品型号名称	组织鉴定单位	依据标准	鉴定时间

**Technical Specifications for 115kV**

**Transformer Neutral Point Assembly**

# Programme

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2 Structural and other requirements	8
2.1 Disconnecting switches	8
2.2 Pillar insulators (if any)	10
2.3 Surge arrester insulation performance (if any)	10
2.4 Steel supports	11
2.5 Nameplates	11
2.6 Galvanised parts	11
3 Tests	11
3.1 Type test	11
3.2 Factory test	12
3.3 Field handover tests	12
4 Technical services, factory inspection	12
4.1 Technical services	12
4.2 Factory inspection	13
5 Primary, secondary and civil interface requirements	13
5.1 Electrical primary interface	13
5.2 Electrical secondary interface	13
5.3 Civil interfaces	13

## 0 Scope of supply and delivery date

Serial number	Equipment Specifications	Name of substation	Quantity	Installation Location
1	See clause 6	115KV substation	1 set	Inside the home. main transformer room

The specific delivery date is determined according to Party A's notification.

## 1 General Provisions

### 1.1 General provisions

1.1.1 Bidders shall have the qualifications required by the solicitation notice, which are set out in the commercial section of the solicitation documents.

1.1.2 The Bidder shall carefully read all the clauses stated in the Tender Documents including this Technical Specification (General and Special Part of the Technical Specification). The Neutral Point Package to be supplied by the Bidder shall comply with the requirements specified in the tender documents .

1.1.3 This bidding document specifies the minimum technical requirements but does not cover all technical details or fully reference all relevant standards and regulations, the bidder shall provide brand-new products that comply with the latest version of the standards cited in this technical specification and the technical requirements of this bidding document, if there is any inconsistency between the cited standards or if the standards used in this bidding document are inconsistent with the standards implemented by the bidder, the higher standard shall be implemented. If there is any inconsistency between the standards quoted or the standards used in this bidding document are inconsistent with the standards implemented by the bidder, the standard with higher requirements shall be implemented.

1.1.4 If a bidder does not submit in writing a discrepancy to the provisions of the technical specifications of these bidding documents, it means that the equipment supplied by the bidder fully complies with the requirements of these bidding documents. If there is any inconsistency with the requirements of this tender document, it must be listed item by item in the "Bidder's Technical Difference Table". If there is no inconsistency, it must be stated as "no discrepancy" in the "Bidder's Technical Difference Table".

1.1.5 These technical specifications will be attached to the ordering contract and have the same legal effect as the contract. Matters not covered in the technical specifications of the bidding document shall be determined by the contracting parties during the contract negotiations.

1.1.6 If there is any contradiction between the commercial aspects of these technical specifications and the commercial parts of the solicitation documents, the commercial parts shall prevail.

1.1.7 In the event of a conflict between the provisions of the general part of these technical specifications and the special part of the technical specifications, the special part shall prevail.

### 1.2 Qualification documents to be provided by bidders

The Bidder shall provide the following qualifying documents in the Bidding Documents,

failing which the Bid will be considered non-responsive.

1.2.1 The sales records of the equipment of corresponding voltage level in recent years and the corresponding end-user's proof of use that meet the qualification requirements of the bidder.

1.2.2 There is an authoritative authority issued by the ISO 9000 series of certificates or equivalent quality management system certification.

1.2.3 Relevant information on production technology and production capacity required to fulfil the contract (provide a list of production and inspection equipment).

1.2.4 The bidder must provide the type test report of the bidding product or similar products within 5 years, the recent sampling test report of the product and the test report and appraisal certificate of the supplied products one by one, in order to prove that the supplied products can fully meet the requirements of the bid. If there is a user or third-party sampling test reports are provided together.

1.2.5 Declaration documents

The bidder shall provide a declaration document on whether the product meets the requirements of the bidding document (Note: the signature of the bidder's authorised representative is required).

The bidder shall provide a quality undertaking that the product life is not less than 30 years when it is normally operated in accordance with the environmental conditions specified in this specification and the product instruction manual (Note: Signature of an authorised representative of the bidder is required).

1.2.6 Other information as required.

1.3 Scope of application

1.3.1 The scope of application of this specification is limited to the 115kV neutral point sets for substations listed in the List of Requirements for Goods and Scope of Delivery of the Special Part of the Technical Specification (Table 2).

1.3.2 The workmanship and manufacture of insulators included in these technical conditions and drawings shall be state-of-the-art. The products supplied shall be technically reliable, of good workmanship and with advanced equipment. Their design and manufacture shall be in accordance with the drawings, design data and relevant documents approved by the Purchaser.

No omission, negligence and ambiguity in the drawings and in this Technical Condition shall relieve the bidder of the responsibility of providing first class quality of insulators and services; in case of any omission or ambiguity found, the bidder shall promptly inform the buyer and any initiative taken before the issue is clarified shall be the responsibility of the bidder.

1.4 Requirements for design drawings, test reports and specifications

1.4.1 Approval and delivery of drawings and plans

1) Dispatch of technical documents.

a) All drawings and illustrative documents to be confirmed by the buyer shall be submitted by the seller for the buyer's approval within 4 weeks of the conclusion of the technical agreement. The following technical documents shall be provided by the supplier after the conclusion of the contract and sent directly to the parties concerned.

(b) The name of the document to be sent, the number of copies to be submitted, the receiving organisation, the time of submission and the postal address are shown in the "special technical specifications".

- c) The technical documents submitted mainly include: drawings, manuals and test reports of three categories.
- Drawing categories: general assembly drawings, installation drawings, nameplate drawings, structural drawings.
- Instruction manual category: installation and use instructions, other applicable complete information and instructions.
- Type of test report: type test report, sample test report, test report by test report, test report of major components and other test reports required by the tender.
- d) Detailed packing list.
- 2) The bidder shall provide the bidder with all the final version of drawings, information and instructions free of charge. The drawings shall include general assembly drawings and precise layout drawings of the location of the equipment at the time of installation, and shall ensure that the buyer can carry out maintenance and facilitate the replacement of parts of the supplied equipment in accordance with the final version of the drawings and information.
- (3) The buyer's engineer (in short, the Engineer) shall be entitled to make corrections to the supplier's drawings of the equipment supplied at no additional cost to the buyer. The supplier shall revise the drawings in accordance with the buyer's comments and make the final approval.
- 4) Any risks and losses incurred by the supplier as a result of advance procurement of materials or processing and manufacturing before receipt of the buyer's final approval of the drawings shall be borne by the supplier.
- 5) The fact that the drawings have been approved by the Purchaser does not exclude the Supplier's responsibility for the completeness and correctness of his drawings.

#### 1.4.2 Contents to be included in drawing information

- 1) General assembly drawing: this drawing shall indicate all the required number of accessories, catalogue number, rating and model number and other technical data, shall indicate the total assembly of the equipment, including the external dimensions (tolerance), the total mass of the equipment; creepage distance, dry arc distance, the size of the umbrella skirt, the wind area, the intrinsic frequency; the size of the bottom and the top of the mounting holes; the size of the transport dimensions and quality, etc.; shall also indicate the neutral point equipment connection terminals to the earth's height,. With electrical and mechanical characteristics data.
- Drawings shall indicate the location of all parts and accessories by size.
- Drawings shall indicate neutral kit mounting strut base and foundation bolt dimensions.
- 2) Nameplate diagrams: shall comply with the relevant national standards for the classification of the corresponding various types of equipment.
- 3) Other drawings and information required for the installation, operation, maintenance and design of related facilities such as current transformers, disconnect switches, pillar insulators discharge gaps and other equipment.
- 4) Structural drawing: sectional view of the structure of the neutral set.
- 5) Installation specifications.

#### 1.4.3 Requirements for test reports

The test of the product should be in accordance with the requirements of the state and the

former Ministry of Machinery and Ministry of Electric Power relevant norms and standards.

The seller shall provide the following test reports:

- 1) Type test report.
- 2) Factory test reports.
- 3) Test reports on major components, including disconnecting switches, current transformers, pillar insulators, fittings, galvanised parts, etc.
- 4) If the product has been locally improved or changed should be supplemented with the corresponding validation test report.

#### 1.4.4 Requirements for instructions

The instruction manual shall include complete instructions and data for installation, operation, maintenance, and all accessories, but shall include at least the following:

- 1) Explanation of the meaning of neutral point set.
- 2) Product performance indicators.
- 3) Description of major components.
- 4) Instructions for storage, maintenance, storage and transport, and installation instructions.

#### 1.5 Standards and norms

1.5.1 All equipment provided must comply with the latest versions of Chinese National Standards (GB) and the International System of Units (SI), in addition to the technical parameters and performance requirements specified in this specification. If the bidder has its own standard or specification, it shall be adopted only after the buyer's consent, but it cannot be lower than the relevant provisions of the Chinese national standard; special circumstances shall be agreed separately by the supply and demand sides.

1.5.2 This technical specification is formulated with reference to the standards in Table 1, and the bidding equipment shall comply with the requirements of this technical specification, and the requirements not stipulated in this technical specification shall be implemented in accordance with the following standards.

Table 1 Main criteria to be met by equipment and accessories supplied by the seller

Standard No.	Name of standard
GB 156	standard voltage
GB 1985	AC high voltage disconnecting and earthing switches
GB 4585.2	Test Method for Artificial Obscurity of High Voltage Insulators for AC Systems, Solid Layer Method
DL/T 486	Technical Conditions of Order for AC High Voltage Disconnectors and Earthing Switches
DL/T 593	Technical guidelines for common ordering of high-voltage switchgear
DL/T 620	Overvoltage protection and insulation coordination of AC electrical installations
GB 1208	current transformer
GB 311.1	Insulation fit of high-voltage transmission and substation equipment
GB/T 775.3	Insulator test methods
GB 5582	High-voltage power equipment external insulation filth level
GB/T 7354	Partial Discharge Measurement
GB/T 11604	Radio Interference Test Methods for High Voltage Electrical Equipment
GB/T 16927	High Voltage Test Technology



GB 11032	AC Metal Oxide Surge Arresters without Gap
GB 50150	Electrical installation engineering electrical equipment handover test standard
GB 763	Heat generation of AC high-voltage appliances during long-term operation
GB 191	Packaging, storage and transport graphic symbols

All equipments and their spare parts in the tender shall follow the latest version of national standards (GB), power industry standards (DL) and the international system of units (SI), which are the minimum requirements for the equipments, except for the technical parameters and requirements stipulated in this tender. If the supplier has its own standards or specifications, it should provide the standard code and its relevant content, and must be agreed by the demand side before adopting them, but in principle, the higher requirement standard is adopted, and it will be automatically replaced if there is a new version after the tender is issued.

1.5.3 All bolts, double-headed bolts, screws, pipe threads, bolt heads and nuts, etc. shall conform to the standards of the national standard (GB) and the international system of units (SI).

1.6 Technical data and information that must be submitted

1.6.1 The bidder shall provide all technical data listed in the technical specifications.

1.6.2 Manufacturer's product characteristic parameters and other required information.

1.6.3 The manufacturer's performance records should include: brief parameters of the equipment, the name of the project used, the installation location, the time of commissioning, operation (need to have test data), operation evaluation, the use of unit contacts and telephone and so on.

1.6.4 Other information as required.

1.7 Spare parts

1.7.1 The bidder shall provide spare parts necessary for the installation, the price of which shall be included in the total bid price.

1.7.2 All spare parts shall be brand-new products, interchangeable with the corresponding parts of the installed equipment, with the same technical specifications and the same specifications, materials and manufacturing processes.

1.7.3 All spare parts shall be protected against dust, moisture and damage, and shall be shipped together with the main equipment and labelled "spare parts" to distinguish them from the main body.

1.8 Specialised tools and instrumentation

1.8.1 The bidder shall provide special tools and instrumentation necessary for installation, operation and maintenance, the price of which shall be included in the total bid price.

1.8.2 All specialised tools and instruments shall be new and state-of-the-art and shall be accompanied by complete and detailed information on their use.

1.8.3 Special tools and instruments should be packed in special boxes, indicating "special tools", "instruments", "instrument", and labelled with "moisture", "dust", "fragile", "up", "do not Inverted", etc., and shipped together with the main equipment.

1.9 Installation, commissioning, performance testing, commissioning and acceptance

1.9.1 The buyer will be responsible for installation and commissioning under the supervision of the supplier's technical personnel in accordance with the provisions of the technical documents and instructions provided by the bidder.

1.9.2 Performance tests, commissioning and acceptance of contract equipment shall be carried out in accordance with the standards, procedures and specifications specified in this tender.

1.9.3 Upon completion of the installation of the contract equipment, the buyer and the bidder inspect and confirm the installation work and sign a certificate of installation work in two copies, one for each party.

1.9.4 For installation, commissioning, performance test, trial operation and warranty period of technical indicators one or more can not meet the contract requirements, the buyer, the bidder and the two sides jointly analyse the reasons, to distinguish the responsibility, such as manufacturing reasons, involving claims in accordance with the business part of the relevant provisions of the implementation.

## 2 Structural and other requirements

The technical parameters of the neutral point set are shown in the technical parameters response table in the special part of the technical specifications.

The cross-sectional area and type of conductor connected to the neutral point of the transformer are determined by the user.

When products are supplied, inspection reports and quality certificates and other factory information should be provided.

### 2.1 Disconnect switches

2.1.1 The isolating switch shall be simple in structure, reliable in performance, easy to install and adjust, safe and convenient in maintenance and repair; the metal parts shall be rust-proof and corrosion-resistant; the steel parts shall be hot-dip galvanised; and the threaded connection parts shall be rust-proof, loosening-proof and galvanic corrosion-resistant. The bolts are made of stainless steel.

2.1.2 The disconnectors shall be capable of withstanding the electrical and mechanical stresses arising during operation and operation without damage, misalignment or refusal to operate under the specified conditions of use. The metal parts (including the latching elements) shall be able to withstand oxidation without corrosion and shall be able to withstand galvanic corrosion between different materials as well as additional stresses caused by thermal expansion and contraction of the materials, and the threaded connections shall be prevented from loosening and, if necessary, compensatory measures shall be taken in the structure.

2.1.3 The installation dimensions of products of the same type and specification should be the same, and the parts should be interchangeable.

2.1.4 The maintenance manual of the product provided by the manufacturer shall specify the overhaul and maintenance cycle and content. The product and its components shall be guaranteed to operate reliably during the service and maintenance intervals.

2.1.5 The manufacturer shall give the forces acting on the foundation of the disconnecting switch and the stiffness, strength and structural requirements.

2.1.6 The disconnecting switch shall be capable of reliably breaking and closing at the specified thickness of ice cover.

2.1.7 The electrically live parts of the disconnecting switch and its rotating parts shall be constructed in such a way as to prevent birds from making nests, and the drive and rotating parts shall be lubricated and sealed, and in cold areas an anti-freeze lubricant shall be used.

### 2.1.8 Requirements for mechanical drive systems and conductive circuits

- 1) Connection of the output shaft of the actuator mechanism with the body. The output shaft of the actuator of the disconnecting switch and the drive shaft of its body shall be

connected by stepless adjustment, and the mechanical connection shall be firm and reliable, and a fixed connection without adjustment shall be adopted. A set of overload protection devices that can reliably cut off the power supply of the motor should be installed in the actuator.

- 2) Requirements for rotating connections. The rotating connection bearing seat must adopt a fully sealed structure, at least two seals should be provided, and it is not permitted to set up "oiling holes". Bearing lubrication should be in line with the humidity of the air around the equipment, high-quality molybdenum disulphide lithium grease, and should be specified in the factory test report of its quality control indicators, such as components, composition and viscosity.
- 3) Requirements for transmission bearings, bushings and shaft pins. The transmission connection should be connected by universal bearings and bushings with self-lubricating function, the shaft pins should be made of stainless steel or aluminium bronze and other rust-proof materials, and the universal bearings should have dust-proof structure.
- 4) Requirements for transmission links. The drive linkage shall be of an assembled connecting structure and shall be made of polygonal steel, stainless steel or hot-dip galvanised steel tubing that meets the requirements for mechanical strength and stiffness.
- 5) Requirements for conductive circuits. The conductive circuit of the disconnectors shall withstand 1.1 times the rated current without exceeding the permissible temperature rise. The conductive rods and contacts shall have a silver plating thickness of  $\geq 20\mu\text{m}$  and a hardness of  $\geq 120\text{HV}$ . The contact springs shall be treated against corrosion and rust, and external pressure contacts shall be used. For internal pressure type contacts, the contact springs shall be insulated with reliable measures to prevent spring shunt to ensure the elasticity of the springs.

2.1.9 The grounding bolts shall comply with the following provisions: The base of the disconnecting switch shall be fitted with grounding bolts of not less than M12.

2.1.10 The disconnecting switch shall be capable of preventing tripping from the closed position or closing from the open position in the event of wind pressure, gravity, earthquakes or accidental impact on the connecting rods between the actuator and the disconnecting switch.

2.1.11 Terminal blocks shall be of the flat type.

2.1.12 The pressure-relief ring must be smooth and of good workmanship.

2.1.13 The porcelain body and flange of the isolating switch shall be cast in such a way as to prevent expansion cracking and shall have a good fit.

2.1.14 Radio interference: Radio interference is not greater than  $500\mu\text{V}$  at 1.1 times the maximum operating phase voltage, and there is no visible corona on a clear night. The net distance between the electrified parts on both sides of the break is not less than 1m.

2.1.15 Operating mechanism:

- 1) The electric actuator mechanism is motor voltage: 220V AC, control voltage: 110V DC, heating power supply: 220V AC.
- 2) Nodal requirements: the grounding knife gate is 6 normally open contacts with 6 normally closed contacts. The opening capacity of auxiliary contacts is AC 250V, 5A, and the auxiliary contacts should be of positioning type. All contacts should be led to the terminal row of the mechanism box.

- 3) Terminal requirements: flame retardant and dustproof type copper terminals, leaving 15% spare terminal block, terminal block is suitable for connecting 1.5~ 4mm<sup>2</sup> wires. The motor power supply, operating power supply and heating power supply circuits have their own air switches and auxiliary contacts for power failure alarm. All auxiliary contacts shall be numbered on the electrical wiring diagram and connected to the terminal strip. The electrical wiring of each auxiliary switch and all auxiliary contacts shall be numbered.
- 4) The electric actuator shall be fitted with local closing and closing buttons and a local remote transfer switch, which shall have a pair of lead-in spare contacts indicating the local operating position. The voltage at the motor terminals of the electric actuator shall be such as to ensure reliable closing and opening of the disconnecting switch within 80%~ 110% of its rated voltage.
- 5) The case of the operating mechanism should be able to resist cold, corrosion and moisture, and adopt stainless steel shell, and the protection level meets the requirements of IP54. The end position of the operating mechanism should have a solid positioning and limiting device, and the operating handle can be locked in the opening and closing position.
- 6) When the electric actuator is in any position, it shall be possible to remove or open the box door of the actuator for checking and repairing auxiliary switches and terminals. The motor and instrumentation used in the electric actuator shall comply with the appropriate standards.
- 7) The actuator shall have an indicator reflecting the position of the disconnecting switch, which shall be marked with the words "divided" and "closed".
- 8) The direction of movement of the operating tools of the operating mechanism should be clearly marked.
- 9) The mechanism box is made of stainless steel.

## 2.2 Pillar insulators

### 2.2.1 Insulator dimensions

Insulator dimensional deviations shall comply with the following:

Structural height deviation: permitted deviation $\pm$  1mm;

Roundness tolerance: when  $D \leq 300 \pm (0.04d + 1.5)$  mm ( $D$  is the diameter of the ceramic part).

When  $D > 300 \pm (0.025d + 6)$  mm ( $D$  is the diameter of the porcelain);

Creepage distance deviation: $\pm$  (0.04d+ 1.5) mm ( $d$  is the nominal creepage distance);

Parallelism deviation of end face: 0.5mm;

Maximum deviation between the circular axes of the centre of the upper and lower attachment mounting holes:  $2(1+h)$ ,  $h$  in metres;

Mounting hole angle deviation: 1°(clockwise or counterclockwise).

### 2.2.2 Fouling resistance

The minimum nominal creepage ratio distance (according to the highest voltage of the system) of the pillar insulator jacket is not less than 25mm/kV for Grade III polluted area, and 31mm/kV for Grade IV polluted area. According to the provisions of GB/T 5582-1993, when the grey density is 1.0mg/cm<sup>2</sup>, the equivalent salt density of the solid layer method of the artificial filtration tolerance value is ( $>0.036$ )~0.080mg/cm(2) for Grade III polluted area, and ( $>$

0.08)~0.16mg/cm<sup>2</sup>) for Grade VI polluted area. 0.036)~0.080mg/cm<sup>2</sup>, VI grade dirty area is (>0.08)~0.16mg/cm<sup>2</sup>).

When the equivalent diameter  $D$  of the porcelain parts is greater than or equal to 300 mm, the creepage distance shall be corrected as follows:

300mm  $D \leq 500$ mm, the creepage distance shall be increased by 10% from the above;

$D > 500$ mm, the creepage distance shall be increased by 20% from the above.

### 2.2.3 Flanges

Pillar insulator flange is required to be hot-dip galvanised, and the galvanised parts should be in accordance with the provisions of JB/T 8177. Silicon waterproof adhesive should be applied at the flange and porcelain parts gluing. The casting colour is sea grey (B05).

### 2.2.4 Porcelain

The products provided are standard products that have been supplied, and the porcelain parts must have the permanent mark of the manufacturer. Porcelain appearance according to the relevant provisions of GB 772 requirements. Porcelain umbrella skirt structure and parameters should be in line with the provisions of IEC 60815. The colour of the porcelain sleeve is brown.

## 2.3 Surge arrester insulation

The insulating property of the internal structure of the arrester shall be the insulating property of the combination of the arc isolating cylinder, insulating tie rods, metal parts and corresponding fasteners. The test piece should be consistent with the actual product installation method. Test reports of insulating parts (components) shall be provided. If the product consists of multiple components, it is allowed to test on the components, and the applied test voltage shall be considered according to the component with the most severe voltage distribution, but the equivalence of the overall structure shall be verified.

### 2.3.1 Fouling resistance

The minimum nominal creepage distance of the surge arrester jacket is not less than 25mm/kV for Class III contaminated areas and 31mm/kV for Class IV contaminated areas.

When the jacket equivalent diameter  $D$  of a porcelain jacket arrester is greater than or equal to 300 mm, the creepage distance shall be corrected as follows:

300mm  $D \leq 500$ mm, the creepage distance shall be increased by 10% from the above;

When  $D > 500$ mm, the creepage distance shall be increased by 20% on the above basis.

Bidders should provide the bidding products using porcelain sets of test reports and supply lists, the products provided for the standard products have been supply performance.

The protruding length of the umbrella skirt and the spacing of the umbrellas shall be in accordance with IEC 60815.

The lightning arrester umbrella skirt should be reasonably shaped and no flashover should occur during operation of the arrester.

Class III and above filth level area with lightning arrester should do artificial filth test.

The artificial filth test method for composite jacket surge arrester used in Class III and above filth level area shall be negotiated between the supplier and the demander.

### 2.3.2 Seal structure

The arrester should have a reliable sealing structure, and its operational performance should not be affected by poor sealing during its lifetime, and the specific sealing test should be carried out using an effective test method.

### 2.3.3 Composite jackets

The composite jacket arrester shall pass the specified procedure of starting trace and electric erosion loss test, and the composite insulating material shall be tested for material properties and meet the requirements of the relevant properties.

### 2.3.4 Ground screw

The lightning arrester shall be equipped with a grounding electrode plate that meets the requirements of the grounding thermal stability current and is equipped with grounding bolts for connecting the grounding wire, and the diameter of the bolts shall not be less than 8mm.

### 2.3.5 Insulated base

Lightning arrester bottom insulation base, the creepage distance should not be counted and the length of the insulation base, but verification of the mechanical strength of the lightning arrester must be assessed together with the insulation base.

### 2.3.6 Counters

Gapless surge arrester should be equipped with counter, counter performance should meet the requirements of JB/T 10492 standard. Counter and surge arrester connection line should facilitate the operation of the surge arrester continuous current measurement.

## 2.4 Steel supports

2.4.1 The steel bracket is supplied complete with the neutral set.

2.4.2 Steel supports shall be capable of meeting the mechanical strength and stiffness requirements of the neutral set under local seismic conditions.

2.4.3 Steel supports are made of stainless steel or hot-dip galvanised steel.

2.4.4 The height of the steel supports shall be confirmed by the Design Institute at the time of confirmation of the drawings.

## 2.5 Nameplates

Neutral point of the complete set of devices nameplate should be in line with the requirements of national standards, the nameplate made of corrosion-resistant materials, words, symbols should be clear and durable, the nameplate should be clearly visible in the normal operation and installation position.

## 2.6 Galvanised parts

All galvanised parts of the neutral point set shall conform to JB/T 8177.

## 3 Tests

### 3.1 Type test

The purpose of the type test is to verify that the various properties of the neutral set comply with the design requirements.

Due to the diversity of types, ratings and combinations of components used, it is not possible to type test all programmes. Type tests can only be carried out on typical functional units. The performance of any specific programme can be quoted from test data of similar programmes.

The type test consists of:

- 1) Short-time current test.
- 2) Lightning Impact Test.
- 3) Insulation test, partial discharge test and auxiliary circuit insulation test.
- 4) Temperature rise test and main circuit resistance measurement.
- 5) Mechanical operation test at room temperature (including mechanical property test and

mechanical life test).

- 6) Mechanical interlocking test.
- 7) Protection level test.
- 8) Operate the vibration test.
- 9) Components such as disconnecting switches, current transformers, pillar insulators, etc. in neutral point complete sets shall be subjected to the appropriate type tests in accordance with the standards for their various types of equipment.
- 10) The bidder shall provide valid type test reports and periodic test reports. The report shall include all type test items required by national standards. The unit providing the test report must be a testing unit with corresponding qualification and authorisation certificate.

### 3.2 Factory test

Each neutral point complete set shall be assembled in the factory as a whole and tested at the factory, and the technical data of the factory test shall be delivered to the buyer together with the product. Critical connection parts and components shall be marked before dismantling the product.

3.2.1 Insulation test of the main circuit.

3.2.2 Insulation test of auxiliary and control circuits.

3.2.3 Main circuit resistance measurement.

3.2.4 Rainproofing test.

3.2.5 Operational tests at extreme temperatures.

3.2.6 Design and appearance checks.

3.2.7 Operational tests under severe freezing conditions.

3.2.8 Seismic test: can be provided by the seller of the product seismic performance calculations, the calculations must be completed by the nationally recognised institutions. Support insulator bending and torsion test.

3.2.9 Mechanical operation and mechanical property tests.

3.2.10 Local Discharge Measurements.

### 3.3 Field handover tests

Neutral point set of devices should be installed after the site handover test, the test should be in line with the requirements of DL/T 404 and GB 50150 "Electrical Installation Engineering Electrical Equipment Handover Test Standard". The seller shall send a representative to participate in the test, and all test results shall comply with the technical requirements of the products.

The test items are listed below:

3.3.1 Main circuit insulation test.

3.3.2 Auxiliary circuit insulation test.

3.3.3 Main circuit resistance test.

3.3.4 Inspection and verification. This includes: visual inspection, drawings and instructions; tightness of all bolts and wiring.

3.3.5 Mechanical operation tests.

3.3.6 Other field tests to be carried out in accordance with relevant equipment standards for components such as disconnecting switches, current transformers, pillar insulators, etc. in neutral point complete sets.

## 4 Technical services, factory inspections

#### 4.1 Technical services

##### 4.1.1 General

The Seller shall, at the Buyer's request, appoint after-sales service personnel to provide relevant business guidance to the installation contractor.

The Seller shall provide timely technical services based on the actual work progress of the site construction.

##### 4.1.2 Tasks and responsibilities

- 1) The seller's appointed after-sales service personnel shall fully co-operate and consult with the buyer's representatives fully within the scope of the contract in order to solve technical and working problems related to the contract. Representatives of both parties, without authorisation from both parties, shall not have the right to change and amend the contract.
- 2) On behalf of the seller, the seller's after-sales service personnel shall complete the technical services relating to the equipment specified in the contract.
- 3) The seller's after-sales service personnel shall be obliged to assist the buyer in carrying out the necessary training of personnel for operation and maintenance on site.
- 4) The technical instructions of the seller's after-sales service personnel shall be correct, and the seller shall be responsible for repairing, replacing and/or replenishing the equipment and materials caused by incorrect instructions at the seller's expense, which shall also include service charges incurred during the period in which the repairs are carried out. The buyer's technicians concerned shall respect the technical instructions of the seller's after-sales service personnel.

4.1.3 During the period of validity of this contract, the seller and the buyer shall promptly respond to questions from the other party concerning design and technology within the scope of the technical documentation, and all amendments or modifications to the design of the contract equipment proposed by either party shall be discussed and agreed to by the other party.

#### 4.2 Factory inspection

4.2.1 The buyer has the right to select a certain number of products that are being manufactured or have been manufactured to carry out random tests to detect product quality or to verify the authenticity of the supplier's tests, and the seller shall co-operate with the buyer in carrying out the random tests, and the costs shall be borne by the buyer.

4.2.2 If any of the contracted equipment fails to meet the requirements of the technical specifications upon inspection and sampling, the buyer may refuse to accept it at no cost.

#### 5 Primary, secondary and civil interface requirements

##### 5.1 Electrical primary interface

A high level arrangement is used, mounted on a stand, and the manufacturer is responsible for installation.

##### 5.2 Electrical secondary interface

Electrical interfaces are not available at this time.

##### 5.3 Civil engineering interfaces

Neutral point complete set of device bracket using galvanised steel or stainless steel pipe rod, installation of the centre of the base plate hole distance and the size of the screw hole with the electrical primary installation requirements.



## 6 Main Technical Parameters of 115kV Neutral Point Sets for Substation (with Surge Arrester)

<b>name (of a thing)</b>	<b>standard value</b>
1 Parameter table of technical characteristics	
1.1 Shared parameters	
1.1.2 Standard parameter values Transformer voltage level (kV)	110
1.1.3 Transformer neutral withstand voltage	
1.1.3.1 Standard parameter value 20 $\mu$ S lightning strike (peak) (kV)	325
1.1.3.2 Standard parameter values 1 min working frequency (kV)	140
1.1.6 Creepage distance/dry arc distance (dry arc distance should take into account the altitude correction factor KH) ( $\leq$ )	4
1.1.7 Maximum radio interference voltage ( $\mu$ V)	500
1.1.8 Life expectancy in years for standard parameter values	30
1.2 Disconnecting switch parameters	GW13-72.5/630A
1.2.3 Motorised or manual	Motorised and manually operated
1.2.6 Rated voltage (kV)	72.5
1.2.7 Rated frequency (Hz)	50
1.2.8 Rated current (A)	630
1.2.10 Temperature rise test current	1.1Ir
1.2.11 Rated frequency 1min withstand voltage	
1.2.11.1 Fracture (kV)	200
1.2.11.2 To earth (kV)	160
1.2.12 Rated peak lightning impulse withstand voltage (1.2/50 $\mu$ s)	
1.2.12.1 Fracture (kV)	410
1.2.12.2 To earth (kV)	350
1.2.13 Rated short-time withstand current and duration (kA/s)	31.5/4
1.2.14 Rated peak withstand current (kA)	80
1.2.19 Auxiliary and control circuits short-time frequency withstand voltage (kV)	2
1.2.20 Mechanical stability (times) ( $\geq$ )	3000
1.2.21 Static mechanical loading of terminal blocks	
1.2.21.1 Horizontal vertical (N)	1500
1.2.21.2 Horizontal transverse (N)	1000
1.2.21.3 Vertical (N)	1000
1.2.21.4 Factor of safety	Static 2.75, dynamic 1.7
1.3 Current transformers	

<b>name (of a thing)</b>	<b>standard value</b>
1.3.2 Rated voltage (kV)	10
1.3.3 Maximum equipment voltage Um (kV)	12
1.3.4 Rated frequency (Hz)	50
1.3.5 Rated primary current I1n (A)	100-200-400-600
1.3.9 Number of cores (pcs)	2
1.3.10 Rated thermal stability current (kA)	31.5
1.3.11 Thermal stability duration (4S)	4
1.3.13 Creepage distance/dry arc distance (≤ )	4
1.3.14 Polarity	depolarisation
1.3.16 Umbrella skirt construction	umbrellas
1.4 Lightning arrester	Y1.5W-60/144
1.4.4 Nominal discharge current (kA)	1.5
1.4.60.75 Leakage current at 1 mA DC reference voltage (≤ μA)	50
1.4.9 Rated frequency (Hz)	50
1.5 Discharge gap	not have
1.6 Bracket	
1.6.2 Height	Confirmation after providing drawings
1.7 Table of technical parameters required by the project unit	
1.7.1 Current transformer parameters	not have
1.7.2 Discharge gap	not have
1.7.3 Brackets	Confirmation after providing drawings
2 Component Material Configuration Sheet	
2.1 Configuration table of components of a single unit (set) of equipment group	
2.1.1 Configuration table of components of a single unit (set) of equipment group	
2.1.1.1 Neutral point kits	1
2.1.1.2 Disconnecting switches	1
2.1.1.3 Lightning arresters	1
2.1.1.4 Current transformers	0
2.1.1.5 Discharge gap	0
2.2 Recommended supply form for spare parts, special tools and instruments (to be completed by the bidder)	Bidders provide
2.3 Material list of main group components	Bidders provide
2.4 Necessary spare parts, special tools and instruments supply table	Bidders provide
3 Table of environmental conditions for use	
3.6 Ambient temperature	-25~45°C
4 Sales and operating performance table	Bidders provide

<b>name (of a thing)</b>	<b>standard value</b>
5 Proof of use by end-users	Bidders provide
6 Test and inspection report form provided by the bidder	Bidders provide
7 Table of accreditation certificates provided by the bidder	Bidders provide

**变压器 115kV 中性点成套装置  
技术规范书**

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## 0 供货范围及交货日期

序号	设备参数	变电站名称	数量	安装位置
1	见条款 6	115KV 变电站	1 套	户内， 主变室

具体交货日期根据甲方通知确定。

### 1 总则

#### 1.1 一般规定

- 1.1.1 投标人应具备招标公告所要求的资质，具体资质要求详见招标文件的商务部分。
- 1.1.2 投标人须仔细阅读包括本技术规范（技术规范通用和专用部分）在内的招标文件阐述的全部条款。投标人提供的中性点成套装置应符合招标文件所规定的要求。
- 1.1.3 本招标文件提出的是最低限度的技术要求，并未对一切技术细节作出规定，也未充分引述有关标准和规范的条文，投标人应提供符合本技术规范引用标准的最新版本标准和本招标文件技术要求的全新产品，如果所引用的标准之间不一致或本招标文件所使用的标准如与投标人所执行的标准不一致时，按要求较高的标准执行。
- 1.1.4 如果投标人没有以书面形式对本招标文件技术规范的条文提出差异，则意味着投标人提供的设备完全符合本招标文件的要求。如有与本招标文件要求不一致的地方，必须逐项在“投标人技术差异表”中列出。如果没有不一致的地方，必须在“投标人技术差异表”中写明为“无差异”。
- 1.1.5 本技术规范将作为订货合同的附件，与合同具有同等的法律效力。本招标文件技术规范未尽事宜，由合同签约双方在合同谈判时协商确定。
- 1.1.6 本技术规范中涉及有关商务方面的内容，如与招标文件的商务部分有矛盾时，以商务部分为准。
- 1.1.7 本技术规范中通用部分各条款如与技术规范专用部分有冲突，以专用部分为准。

#### 1.2 投标人应提供的资格文件

投标人在投标文件中应提供下列合格的资格文件，否则视为非响应性投标。

- 1.2.1 满足对投标人的资质要求的近年内相对应电压等级设备的销售记录及相应的最终用户的使用情况证明。
- 1.2.2 有权威机关颁发的 ISO 9000 系列的认证书或等同的质量管理体系认证证书。
- 1.2.3 具有履行合同所需的生产技术和生产能力的有关资料（提供生产、检验设备一览表）。
- 1.2.4 投标人必须提供 5 年内投标产品或类似产品的型式试验报告、产品的近期抽样试验报告及供货产品的逐个试验报告和鉴定证书，以证明所提供的产品能完全满足标书的要求。如有用户或第三方抽样试验报告一并提供。
- 1.2.5 声明文件  
投标人应提供产品是否符合招标文件要求的声明文件（注：需要投标人授权代表签字）。  
投标人应提供按照本规范书规定的环境条件和产品使用说明书正常运行时，产品寿命不少于 30 年的质量承诺书（注：需要投标人授权代表签字）。
- 1.2.6 其他需要的资料。

#### 1.3 适用范围

- 1.3.1 本规范书的适用范围仅限于技术规范专用部分货物需求及供货范围一览表（表 2）中所列的变电站用 115kV 中性点成套装置。

1.3.2 本技术条件和图样所包含的绝缘子的工艺和制造应是最先进的。提供的产品应是技术可靠、工艺优良、设备先进的。其设计和制造应根据买方认可的图样、设计数据和有关文件。

不能因图样和本技术条件书的遗漏、疏忽和不明确而解脱投标人提供一流绝缘子质量及服务责任；倘若发现有任何疏漏和不明确之处，投标人方应及时通知买方，在问题未澄清之前的任何举措，应由投标人负责。

#### 1.4 对设计图样、试验报告和说明书的要求

##### 1.4.1 图样及图样的认可和交付

###### 1) 技术文件的发送。

a) 所有需经买方确认的图样和说明文件，均应由卖方在技术协议签订后的4周内提交给买方认可。供货商在合同签订后须提供下列技术文件，并直接寄送有关各方。

b) 寄送文件名称、提交份数、接收单位、提交时间及邮寄地址见“专用技术规范”。

c) 提交的技术文件主要包括：图样类、说明书类、试验报告类三大类。

图样类：总装图、安装图、铭牌图、结构图。

说明书类：安装使用说明书、其他适用的完整资料和说明书。

试验报告类：型式试验报告、抽样试验报告、逐个试验报告、主要部件的试验报告和标书要求的其他试验报告。

d) 详细的装箱清单。

2) 投标人免费提供给招标方全部最终版的图样、资料及说明书。其中图样应包括总装配图及安装时设备位置的精确布置图，并且应保证买方可按最终版的图样资料对所供设备进行维护和方便更换零部件等工作。

3) 买方的工程师（简称工程师）有权对供货商的供货设备图样的不妥之处提出修改意见，对此买方不承担附加费用。供货商应根据买方的意见，对图样进行修改并作最终审定认可。

4) 在收到买方对图样的最终认可之前，供货商提前采购材料或加工制造而发生的任何风险和损失由供货商自行承担。

5) 图样经买方认可后，并不能排除供货商对其图样的完整性及正确性应负的责任。

##### 1.4.2 图样资料应包括的内容

1) 总装图：本图应标明全部所需要的附件数量、目录号、额定值和型号等技术数据，应表示设备总的装配情况，包括外形尺寸（公差）、设备的总质量；爬电距离、干弧距离、伞裙尺寸、受风面积、固有频率；底部和顶部安装孔尺寸；运输尺寸和质量等；还应表示出中性点设备连接端子对地高度，并附电气和机械特性数据。

图纸应标明所有部件和附件的尺寸位置。

图纸应标明中性点成套装置安装支柱底座和基础螺栓尺寸。

2) 铭牌图：应符合国家相应各种设备分类的相关标准。

3) 电流互感器、隔离开关、支柱绝缘子放电间隙等设备安装、运行、维修和有关设施设计所需的其他图纸和资料。

4) 结构图：中性点成套装置结构的剖视图。

5) 安装规范。

##### 1.4.3 对试验报告的要求

产品的试验应符合国家及原机械部、电力部有关规范标准的要求。

卖方应提供下列试验报告：

1) 型式试验报告。

- 2) 出厂试验报告。
- 3) 主要部件试验报告，包括隔离开关、电流互感器、支柱绝缘子、金具、镀锌件等的试验报告。
- 4) 如果产品进行了局部改进或改变应补充提供相应的验证性试验报告。

#### 1.4.4 对说明书的要求

说明书应包括安装、运行、维护和全部附件完整的说明和数据，但须至少包括以下内容：

- 1) 中性点成套装置的含义说明。
- 2) 产品性能指标。
- 3) 主要零部件的说明。
- 4) 保管、维护、储运及安装指导的说明。

#### 1.5 标准和规范

1.5.1 所有投标设备，除本技术规范书中规定的技术参数、性能要求和标准外，其余均应遵照最新版本的中国国家标准（GB）及国际单位制（SI），这是对设备的最低要求。如果投标人有自己的标准或规范，须经买方同意后方可采用，但不能低于中国国家标准的相关规定；特殊情况由供需双方另行约定。

1.5.2 本技术规范是参照表 1 标准制定的，投标设备应符合本技术规范的要求，本技术规范未作规定的要求按照下列标准执行。

表 1 卖方提供的设备和附件需要满足的主要标准

标准号	标准名称
GB 156	标准电压
GB 1985	交流高压隔离开关和接地开关
GB 4585.2	交流系统用高压绝缘子人工污秽试验方法固体层法
DL/T 486	交流高压隔离开关和接地开关订货技术条件
DL/T 593	高压开关设备的共用订货技术导则
DL/T 620	交流电气装置的过电压保护和绝缘配合
GB 1208	电流互感器
GB 311.1	高压输变电设备的绝缘配合
GB/T 775.3	绝缘子试验方法
GB 5582	高压电力设备外绝缘污秽等级
GB/T 7354	局部放电测量
GB/T 11604	高压电器设备无线电干扰测试方法
GB/T 16927	高电压试验技术
GB 11032	交流无间隙金属氧化物避雷器
GB 50150	电气装置安装工程电气设备交接试验标准
GB 763	交流高压电器在长期工作时的发热
GB 191	包装储运图示标志

标书中所有设备及其备品备件，除本标书中规定的技术参数和要求外，其余均应遵循最新版本的国家标准（GB）、电力行业标准（DL）和国际单位制（SI），这是对设备的最低要求。如果供方有自己的标准或规范，应提供标准代号及其有关内容，并须经需方同意后方可采用，但原则上采用更高要求的标准，标书发出后如有新版本，自动替换。



1.5.3 所有螺栓、双头螺栓、螺丝、管螺纹、螺栓头及螺帽等均应符合国家标准（GB）及国际单位制（SI）的标准。

#### 1.6 必须提交的技术数据和信息

1.6.1 投标人应提供技术规范中列举的所有技术数据。

1.6.2 制造商产品特性参数和其他需要提供的信息。

1.6.3 制造商业绩记录应包括：设备简要参数、所使用的工程名称、安装地点、投运时间、运行情况（需有检测数据）、运行评价、使用单位联系人及电话等。

1.6.4 其他需要的资料。

#### 1.7 备品备件

1.7.1 投标人应提供安装时必需的备品备件，价款应包括在投标总价中。

1.7.2 所有备品备件应为全新产品，与已经安装设备的相应部件能够互换，具有相同的技术规范和相同的规格、材质、制造工艺。

1.7.3 所有备品备件应采取防尘、防潮、防止损坏等措施，并应与主设备一并发运，同时标注“备品备件”，以区别于本体。

#### 1.8 专用工具与仪器仪表

1.8.1 投标人应提供安装、运行及维修所必需的专用工具和仪器仪表，价款应包括在投标总价中。

1.8.2 所有专用工具和仪器仪表应是全新的、先进的，且须附完整、详细的使用说明资料。

1.8.3 专用工具和仪器仪表应装于专用的包装箱内，注明“专用工具”、“仪器”、“仪表”，并标明“防潮”、“防尘”、“易碎”、“向上”、“勿倒置”等字样，同主设备一并发运。

#### 1.9 安装、调试、性能试验、试运行和验收

1.9.1 合同设备的安装、调试将由买方根据投标人提供的技术文件和说明书的规定，在投标方技术人员指导下进行。

1.9.2 合同设备的性能试验、试运行和验收须根据本投标书规定的标准、规程、规范进行。

1.9.3 完成合同设备安装后，买方和投标人检查和确认安装工作，并签署安装工作证明书，该证明书一式两份，双方各执一份。

1.9.4 对于安装、调试、性能试验、试运行及质保期内技术指标一项或多项不能满足合同要求时，买方、投标人双方共同分析原因，分清责任，如属制造方面的原因，涉及索赔部分按商务部分有关条款执行。

## 2 结构及其他要求

中性点成套装置技术参数见技术规范专用部分的技术参数响应表。

连接到变压器中性点的导线截面积和型式由用户决定。

产品供货时，应提供检验报告及质量合格证等出厂资料。

#### 2.1 隔离开关

2.1.1 隔离开关应结构简单、性能可靠、易于安装调整、维护检修安全方便，金属零部件应防锈、防腐蚀，钢制件应热镀锌处理，螺纹连接部分应防锈、防松动和电腐蚀。螺栓采用不锈钢材质。

2.1.2 隔离开关在规定的使用条件下，应能承受运行和操作时出现的电气及机械应力而不损坏、不误动和拒动。其金属制件（包括闭锁元件）应能耐受氧化而不腐蚀、并能耐受不同材料间的电蚀及材料热胀冷缩造成的附加应力的作用，各螺纹连接部分应防止松动，必要时在结构上采取补偿措施。

2.1.3 同型号同规格产品的安装尺寸应一致，零部件应具有互换性。

2.1.4 制造厂提供的产品维护手册中，应明确检修维护周期和内容。产品及其元部件应保

证在检修维护周期内可靠运行。

2.1.5 制造商应给出隔离开关对基础的作用力及刚度、强度和结构要求。

2.1.6 在规定的覆冰厚度下，隔离开关应能可靠地分闸和合闸。

2.1.7 隔离开关的带电部分及其转动部分的结构应能防止鸟类作窝，传动和转动部分应采取润滑措施和密封措施，在寒冷地区应采用防冻润滑剂。

2.1.8 对机械传动系统和导电回路的要求

1) 操动机构输出轴与本体的连接。隔离开关操动机构的输出轴与其本体传动轴应采用无级调节的连接方式，机械连接应牢固、可靠，应采用无需调节的固定连接。操动机构内应装设一套能可靠切断电动机电源的过载保护装置。

2) 对转动连接的要求。转动连接轴承座必须采用全密封结构，至少应有两道密封，不允许设“注油孔”。轴承润滑应采用符合设备周围空气湿度的优质二硫化钼锂基润滑脂，并应在出厂试验报告中注明其质量控制指标，如组分、成分和黏度等。

3) 对传动轴承、轴套、轴销的要求。传动连接应采用万向轴承和具有自润滑功能的轴套连接，轴销应采用不锈钢或铝青铜等防锈材料，万向轴承带有防尘结构。

4) 对传动连杆的要求。传动连杆应采用装配式连接结构，其材质应是满足机械强度和刚度要求的多棱形钢、不锈钢或热镀锌钢管。

5) 对导电回路的要求。隔离开关导电回路应能耐受 1.1 倍额定电流而不超过允许温升。导电杆和触头的镀银层厚度 $\geq 20\mu\text{m}$ 、硬度 $\geq 120\text{HV}$ 。触头弹簧应进行防腐防锈处理，应采用外压式触头。对内压式触头，其触头弹簧必须采取可靠的防止弹簧分流的绝缘措施，以保证弹簧的弹性。

2.1.9 接地螺栓应符合如下规定：隔离开关的底座上应装设不小于 M12 的接地螺栓。

2.1.10 隔离开关在风压、重力、地震或操动机构与隔离开关之间的连杆被偶然撞击时隔离开关应能防止从合闸位置分闸或从分闸位置合闸。

2.1.11 接线端子板应为平板式。

2.1.12 均压环必须光滑，工艺优良。

2.1.13 隔离开关瓷体和法兰的浇注应能防止胀裂，并应有良好的配合。

2.1.14 无线电干扰：无线电干扰在 1.1 倍最高工作相电压下，不大于  $500\mu\text{V}$ ，在晴天夜晚无可见电晕。断口两侧带电部分之间净距不小于 1m。

2.1.15 操动机构：

1) 电动操动机构为电动机电压：交流 220V，控制电压：直流 110V，加热电源：交流 220V。

2) 节点要求：接地刀闸为常开触点 6 个与常闭触点 6 个。辅助触点的开断能力为交流 250V、5A，辅助触点应为定位式的。所有触点均需引至机构箱端子排上。

3) 端子要求：采用阻燃防尘型铜质端子，留有 15% 备用端子排，端子排适用于接  $1.5\sim 4\text{mm}^2$  导线。电机电源、操动电源和加热电源回路有各自的空气开关，并有失电报警辅助接点。所有辅助接点应在电气接线图上表明编号并且连接至端子排。每只辅助开关及所有辅助接点的电气接线必须编号。

4) 电动操动机构应装设就地分、合按钮及就地远方转换开关，该开关应有引出的表示就地操作位置的备用接点一对。电动操动机构的电动机端子的电压在其额定电压值 80%~110% 范围时保证隔离开关可靠地合闸和分闸。

5) 操动机构箱应能防寒、防腐、防潮，采用不锈钢外壳，防护等级满足 IP54 的要求。操动机构的终点位置应有坚固的定位和限位装置，且在分、合闸位置时能将操动柄锁住。

6) 电动操动机构在处于任何位置时，均应能取下或打开操动机构的箱门，以便检查、

修理辅助开关和接线端子。电动操动机构中采用的电动机及仪表，应符合相应的标准。

- 7) 操动机构上应有反映隔离开关分、合闸位置的指示器，指示器上应标明“分”、“合”字样。
- 8) 操动机构的操作工具的运动方向应有明显的标志。
- 9) 机构箱采用不锈钢材料。

## 2.2 支柱绝缘子

### 2.2.1 绝缘子尺寸

绝缘子尺寸偏差应符合以下规定：

结构高度偏差：允许偏差 $\pm 1\text{mm}$ ；

圆度公差：当 $D \leq 300 \pm (0.04d + 1.5)$  mm ( $D$ 为瓷件直径)，

当 $D > 300 \pm (0.025d + 6)$  mm ( $D$ 为瓷件直径)；

爬电距离偏差： $\pm (0.04d + 1.5)$  mm ( $d$ 为爬电距离公称值)；

端面平行度偏差：0.5mm；

上下附件安装孔中心圆轴线间最大偏差： $2(1+h)$ ， $h$ 以米计；

安装孔角度偏差： $1^\circ$ （顺时针或逆时针方向）。

### 2.2.2 耐污秽性能

支柱绝缘子外套的最小公称爬电比距（按系统最高电压计）三级污区不小于 25mm/kV、四级污区不小于 31mm/kV。根据 GB/T 5582—1993 规定，在灰密为 1.0mg/cm<sup>2</sup>时，固体层法人工污秽耐受值的等值盐密在 III 级污区为 ( $>0.036$ ) ~ 0.080mg/cm<sup>2</sup>，VI 级污区为 ( $>0.08$ ) ~ 0.16mg/cm<sup>2</sup>。

当瓷件等效直径  $D$  大于等于 300mm 时，爬电距离应作以下校正：

300mm  $\leq D \leq$  500mm 时，爬电距离在以上基础上应增大 10%；

$D > 500\text{mm}$  时，爬电距离在以上基础上应增大 20%。

### 2.2.3 法兰盘

支柱绝缘子法兰盘要求热镀锌，镀锌件应符合 JB/T 8177 的规定。法兰盘与瓷件胶装处应涂硅类防水胶。铸件颜色采用海灰色 (B05)。

### 2.2.4 瓷件

所提供产品为已有供货业绩的标准产品，瓷件上必须具有制造厂家的永久性标志。瓷件外观按 GB 772 有关规定要求。瓷件伞裙结构和参数应符合 IEC 60815 规定。瓷套颜色采用棕色。

## 2.3 避雷器绝缘性能

避雷器的内部结构绝缘性能应为隔弧筒、绝缘拉杆、金属件及相应的紧固件等组合后的绝缘性能。被试件应与实际产品安装方法相一致。应提供绝缘件（组件）的试验报告。如产品由多元件组成，允许在元件上进行试验，施加的试验电压应按电压分布最严重的元件考虑，但须验证整体结构的等价性。

### 2.3.1 耐污秽性能

避雷器外套的最小公称爬电比距三级污区不小于 25mm/kV、四级污区不小于 31mm/kV。

瓷外套避雷器的外套等效直径  $D$  大于等于 300mm 时，其爬电距离应作以下校正：

300mm  $\leq D \leq$  500mm 时，爬电距离在以上基础上应增大 10%；

$D > 500\text{mm}$  时，爬电距离在以上基础上应增大 20%。

投标人应提供投标产品使用瓷套的试验报告和供货清单，所提供产品为已有供货业绩的标准产品。

伞裙的伸出长度、伞间距应符合 IEC 60815 规定。

避雷器伞裙造型应合理，避雷器运行中不应发生闪络。

Ⅲ级及以上污秽等级地区用避雷器应做人工污秽试验。

用于Ⅲ级及以上污秽等级地区的复合外套避雷器的人工污秽试验方法由供需双方协商。

### 2.3.2 密封结构

避雷器应有可靠的密封结构，在其寿命期内不应因为密封不良而影响运行性能，具体密封试验应采用有效的试验方法进行。

### 2.3.3 复合外套

复合外套避雷器应通过规定程序的起痕和电蚀损试验，复合绝缘材料应进行材料性能试验并满足相关性能的要求。

### 2.3.4 接地螺栓

避雷器应装设满足接地热稳定电流要求的接地极板，并配有连接接地线用的接地螺栓，螺栓的直径不小于 8mm。

### 2.3.5 绝缘底座

避雷器底部绝缘底座，其爬电距离不应计及绝缘底座的长度，但验证避雷器的机械强度时，必须连同绝缘底座一并考核。

### 2.3.6 计数器

无间隙避雷器应配备计数器，计数器性能应满足 JB/T 10492 标准要求。计数器和避雷器的连接线应便于运行中避雷器持续电流的测量。

## 2.4 钢支架

2.4.1 钢支架与中性点成套装置成套供货。

2.4.2 钢支架应在当地地震条件下满足中性点成套装置机械强度和刚度要求。

2.4.3 钢支架采用不锈钢或热镀锌钢材质。

2.4.4 钢支架高度在图纸确认时由设计院确认。

## 2.5 铭牌

中性点成套装置铭牌应符合国家标准的要求，铭牌用耐腐蚀材料制成，字样、符号应清晰耐久，铭牌应在正常运行和安装位置明显可见。

## 2.6 镀锌件

中性点成套装置所有镀锌件，应符合 JB/T 8177 的规定。

## 3 试验

### 3.1 型式试验

型式试验的目的在于验证中性点成套装置的各种性能是否符合设计的要求。

由于所用元件的类型、额定参数和组合的多样性，所以不可能对所有方案都进行型式试验。型式试验只能在典型的功能单元上进行试验。任一种具体方案的性能可以引用类似方案的试验数据。

型式试验的内容包括：

- 1) 短时电流试验。
- 2) 雷电冲击试验。
- 3) 绝缘试验、局部放电试验及辅助回路绝缘试验。
- 4) 温升试验和主回路电阻测量。
- 5) 常温下的机械操作试验（包括机械特性试验、机械寿命试验）。
- 6) 机械联锁试验。
- 7) 防护等级试验。
- 8) 操作振动试验。

- 9) 中性点成套装置中隔离开关、电流互感器、支柱绝缘子等元件应按其各类设备标准进行相应的型式试验。
- 10) 投标人须提供有效的型式试验报告和定期试验报告。报告应包括国家标准所要求进行的所有型式试验项目。提供试验报告的单位必须是有相应资质授权证明的检测单位。

### 3.2 出厂试验

每台中性点成套装置均应在工厂内进行整台组装并进行出厂试验,出厂试验的技术数据应随产品一起交付买方。产品在拆前应对关键的连接部位和部件做好标记。

- 3.2.1 主回路的绝缘试验。
- 3.2.2 辅助和控制回路的绝缘试验。
- 3.2.3 主回路电阻测量。
- 3.2.4 防雨试验。
- 3.2.5 极限温度下的操作试验。
- 3.2.6 设计和外观检查。
- 3.2.7 严重冰冻条件下的操作试验。
- 3.2.8 地震试验:可由卖方提供产品抗震性能计算书,该计算书必须由国家认可的机构完成。支持绝缘子的抗弯、抗扭试验。
- 3.2.9 机械操作和机械特性试验。
- 3.2.10 局部放电测量。

### 3.3 现场交接试验

中性点成套装置安装完毕后应进行现场交接试验,试验应符合 DL/T 404 和 GB 50150《电气装置安装工程电气设备交接试验标准》的要求。试验时卖方应派代表参加,所有试验结果均应符合产品的技术要求。

试验项目如下:

- 3.3.1 主回路绝缘试验。
- 3.3.2 辅助回路绝缘试验。
- 3.3.3 主回路电阻试验。
- 3.3.4 检查与核实。内容包括:外观检查、图纸与说明书;所有螺栓及接线的紧固情况。
- 3.3.5 机械操作试验。
- 3.3.6 中性点成套装置中隔离开关、电流互感器、支柱绝缘子等元件按相关设备标准应进行的其他现场试验。

## 4 技术服务、工厂检验

### 4.1 技术服务

#### 4.1.1 概述

卖方应根据买方要求,指定售后服务人员,对安装承包商进行相关业务指导。

卖方应该根据工地施工的实际工作进展,及时提供技术服务。

#### 4.1.2 任务和责任

- 1) 卖方指定的售后服务人员,应在合同范围内全面与买方代表充分合作与协商,以解决合同有关的技术和工作问题。双方的代表,未经双方授权,无权变更和修改合同。
- 2) 卖方售后服务人员代表卖方,完成合同规定有关设备的技术服务。
- 3) 卖方售后服务人员有义务协助买方在现场对运行和维护的人员进行必要的培训。
- 4) 卖方售后服务人员的技术指导应是正确的,如因错误指导而引起设备和材料的损坏,卖方应负责修复、更换和/或补充,其费用由卖方承担,该费用中还包括进行

修复期间所发生的服务费。买方的有关技术人员应尊重卖方售后服务人员的技术指导。

4.1.3 在本合同有效期内，买卖双方应及时回答对方提出的技术文件范围内有关设计和技术的问题，由任一方提出的所有有关合同设备设计的修正或修改都应由对方参与讨论并同意。

#### 4.2 工厂检验

4.2.1 买方有权对正在制造或制造完毕的产品，选择一定数量，进行抽查测试，检测产品质量或验证供应商试验的真实性，卖方应配合买方做好抽查测试，费用由买方承担。

4.2.2 若有合同设备经检验和抽检不符合技术规范的要求，买方可以拒收，并不承担费用。

### 5 一、二次及土建接口要求

#### 5.1 电气一次接口

采用高位布置，安装在支架上，厂家负责安装。

#### 5.2 电气二次接口

电气接口暂无。

#### 5.3 土建接口

中性点成套装置支架采用镀锌钢或不锈钢管杆，安装底板孔中心距离及螺孔大小同电气一次安装要求。

### 6 变电站用 115kV 中性点成套装置（带避雷器）主要技术参数

名称	标准值
1 技术特性参数表	
1.1 共用参数	
1.1.2 标准参数值变压器电压等级 (kV)	110
1.1.3 变压器中性点耐受电压	
1.1.3.1 标准参数值 20 μS 雷电冲击 (峰值) (kV)	325
1.1.3.2 标准参数值 1min 工频 (kV)	140
1.1.6 爬电距离/干弧距离 (干弧距离应计及海拔修正系数 KH) (≤)	4
1.1.7 最大无线电干扰电压 (μV)	500
1.1.8 标准参数值预期寿命 (年)	30
1.2 隔离开关参数	GW13-72.5/630A
1.2.3 电动或手动	电动并可手动
1.2.6 额定电压 (kV)	72.5
1.2.7 额定频率 (Hz)	50
1.2.8 额定电流 (A)	630
1.2.10 温升试验电流	1.1Ir
1.2.11 额定工频 1min 耐受电压	
1.2.11.1 断口 (kV)	200
1.2.11.2 对地 (kV)	160
1.2.12 额定雷电冲击耐受电压峰值 (1.2 / 50 μs)	
1.2.12.1 断口 (kV)	410
1.2.12.2 对地 (kV)	350

名称	标准值
1.2.13 额定短时耐受电流及持续时间 (kA/s)	31.5/4
1.2.14 额定峰值耐受电流 (kA)	80
1.2.19 辅助和控制回路短时工频耐受电压 (kV)	2
1.2.20 机械稳定性(次) ( $\geq$ )	3000
1.2.21 接线端子静态机械负荷	
1.2.21.1 水平纵向 (N)	1500
1.2.21.2 水平横向(N)	1000
1.2.21.3 垂直(N)	1000
1.2.21.4 安全系数	静态 2.75, 动态 1.7
1.3 电流互感器	
1.3.2 额定电压 (kV)	10
1.3.3 设备最高电压 $U_m$ (kV)	12
1.3.4 额定频率(Hz)	50
1.3.5 额定一次电流 $I_{1n}$ (A)	100-200-400-600
1.3.9 铁心数(个)	2
1.3.10 额定热稳定电流(kA)	31.5
1.3.11 热稳定持续时间(4S)	4
1.3.13 爬电距离/干弧距离 ( $\leq$ )	4
1.3.14 极性	减极性
1.3.16 伞裙结构	大小伞
1.4 避雷器	Y1.5W-60/144
1.4.4 标称放电电流(kA)	1.5
1.4.60.75 倍直流 1mA 参考电压下漏电流 ( $\leq \mu A$ )	50
1.4.9 额定频率 (Hz)	50
1.5 放电间隙	无
1.6 支架	
1.6.2 高度	提供图纸后确认
1.7 项目单位要求的技术参数表	
1.7.1 电流互感器参数	无
1.7.2 放电间隙	无
1.7.3 支架	提供图纸后确认
2 组件材料配置表	
2.1 单台(套)设备组部件配置表	
2.1.1 单台(套)设备组部件配置表	
2.1.1.1 中性点成套装置	1
2.1.1.2 隔离开关	1
2.1.1.3 避雷器	1
2.1.1.4 电流互感器	0
2.1.1.5 放电间隙	0
2.2 推荐的备品备件、专用工具和仪器仪表供货表(投标人填写)	投标人提供
2.3 主要组部件材料表	投标人提供

名称	标准值
2.4 必备的备品备件、专用工具和仪器仪表供货表	投标人提供
3 使用环境条件表	
3.6 环境温度	-25~45℃
4 销售及运行业绩表	投标人提供
5 最终用户的使用情况证明	投标人提供
6 投标人提供的试验检测报告表	投标人提供
7 投标人提供的鉴定证书表	投标人提供



# **Technical Specification for 22kV Station Service Transformer Cabinet**

## 1、 Order Scope

Indoor station service transformer cabinet system

station name	quantitative (science)	fig. a series of tricks	delivery period
115KV substation	Contractor accounting	1	

### 1.1 Dispatch of technical documents

The seller shall provide the following number of copies of the technical documentation at the time specified and send them directly to the parties concerned.

### 1.3 Endorsement chart

1.1.1.1 The seller shall provide the buyer with the basic dimensions of the equipment, weight, external dimension drawings, transport dimension drawings, nameplate drawings, the weight of each part of the equipment and the location of the inlet and outlet cables within one week after the award of the tender, and the accurate terminal dimensions and other information within one month, the schematic wiring diagrams, and the wiring diagrams of the electrical control and signalling circuits, and the terminal row diagrams.

The buyer has the right to propose modifications to the seller's drawings of the equipment to be supplied at no additional cost to the buyer. The seller shall make changes to the drawings in accordance with the buyer's changes.

Any risks and damages incurred by the Seller as a result of advance procurement of materials or fabrication shall be borne by the Seller until receipt of the Buyer's final acceptance of the drawings.

The fact that the drawings have been approved by the Buyer does not relieve the Seller of its responsibility for the completeness and correctness of its drawings.

### 1.4 Final diagram

Within 2 weeks of receipt of the Buyer's approved drawings, the Seller shall send all final approved drawings and a removable hard drive containing the CAD files of the final drawings to the appropriate unit, the CAD version used shall be Auto-CAD R14 or 2000.

Products shall be manufactured in accordance with the confirmed final drawings.

### **1.5 Installation, operation and maintenance instructions and test reports**

At least 4 weeks before shipment of the equipment, the seller shall send installation, operation and maintenance instructions and test reports.

### **1.6 Requirements for technical documentation**

All technical documents are written in Chinese and use SI metric units.

## **2、 Standards to be implemented**

All equipment and auxiliary components comply with the provisions of the nearest available IEC, except for the technical conditions specified by us.

GB6450 Dry-type Power Transformer

GB1094.2 Power Transformer Temperature Rise

GB1094.3 Insulation level and insulation test for power transformers

GB1094.5 Power transformer short-circuit carrying capacity

GB/T10228 Technical Parameters and Requirements for Dry-type Power Transformers

GB7328 Determination of Sound Levels of Transformers and Reactors

GB7354 Partial Discharge Measurement

GB10237 Air Gap for Insulation Level and Insulation Test of External Insulation of Power Transformer

GB311 Insulation Fit of High Voltage Power Transmission and Distribution Equipment

GB7449 Guidelines for Lightning Shock and Operational Shock Tests of Power Transformers and Reactors

JB/T 501 Guidelines for Power Transformer Testing

DL/T 572 Transformer Operation Regulations

GB 50148 Code for Construction and Acceptance of Power Transformers, Oil-immersed Reactors and Transformers for Electrical Installation Works

## **3、 Technical parameter requirements**

The 22kV station service transformer (shared with a grounding transformer) uses an SCB14-160kVA dry-type transformer housed within a fully integrated cabinet system.

### **3.1 Dry-type transformers**

1) Name: Dry-type, three-phase, dual-winding, copper-wound, epoxy resin-cast distribution transformer

(2) Product model: SCB14-160 (capacity tentative), with protective shell, fan and

temperature controller, to GB20052-2020 "10kV dry-type three-phase double-winding non-excited voltage-regulating distribution transformer energy efficiency level" level 2

- 3) Rated frequency: 50Hz
- 4) Voltage Rating: 22kV ±5%, Secondary Voltage: 0.4kV~0.23kV
- 5) Vector Group: D yn11
- (6) Form of voltage regulation: no-load voltage regulation
- 7) Tap capacity: ± 2\*2.5%
- 8) Impedance voltage: 4± 5%
- 9) Local Discharge Level: <5PC
- 10) Temperature rise: winding ≤ 125K (average temperature rise measured by resistance method)
- 11) Insulation grade: Class H
- 12) Cooling Method: Natural Air Cooling (AN) / Forced Air Cooling (AF)
- 13) Industrial frequency withstand voltage: 22kV (35kV), 0.4kV (5kV)  
Lightning surge withstand voltage: 75kV
- 14) Service Life: At least 20 years under normal operating conditions.
- (15) Partial discharge amount: 1.1 times the rated voltage, discharge amount ≤ 5PC
- \*16) Loss, no-load current and noise level (75°C load loss = 120°C load loss/1.145; noise is tested in accordance with the requirements and methods of GB7328, i.e., measured at 1M away from the shell and 1.5M in height).

Transformer capacity (kVA)	No-load loss (W)	Load Loss (120°C , W)	No-load current (per cent)	noise level (Sound pressure level dB)	note
1250	1420	8720	0.4	55	
1600	1665	10555	0.4	55	
2000	2075	13005	0.3	55	
2500	2450	15445	0.3	55	

(17) Withstand short-circuit capability: transformer high and low voltage windings and its auxiliary equipment such as support insulators, etc., in the transformer low-voltage side of the winding outlet occurs three-phase metallic short-circuit, the transformer does not appear to be harmful to the mechanical and thermal stresses or electrical performance damage.

① Thermal stability of the transformer to withstand short-circuit: the transformer can continuously withstand external short-circuit current for 3S time, and its winding temperature

does not exceed 350°C .

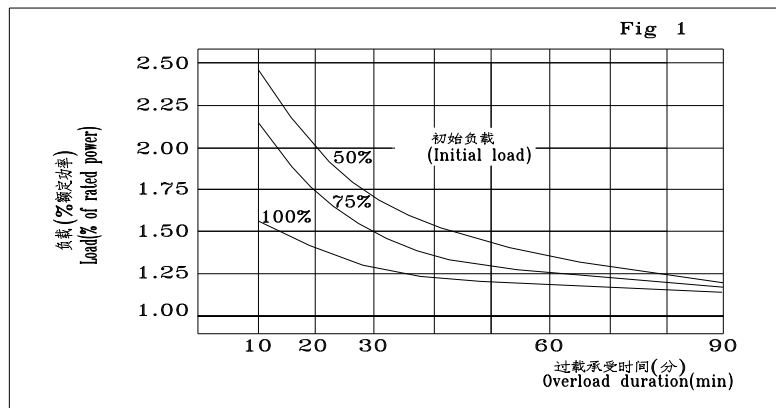
② transformer withstand short-circuit dynamic stability: transformer can withstand the national standard GB1094.5-2008 short-circuit test current value without damage or displacement.

(18) Overload capacity: transformer overload capacity should be in accordance with IEC 60905 "dry-type transformer load guidelines". Transformer allow short time overload capacity in the air natural cooling condition to meet or higher than the following table (normal life, overload before full load). 20°C , 40°C overload characteristics curve, temperature rise with the load curve (attached).

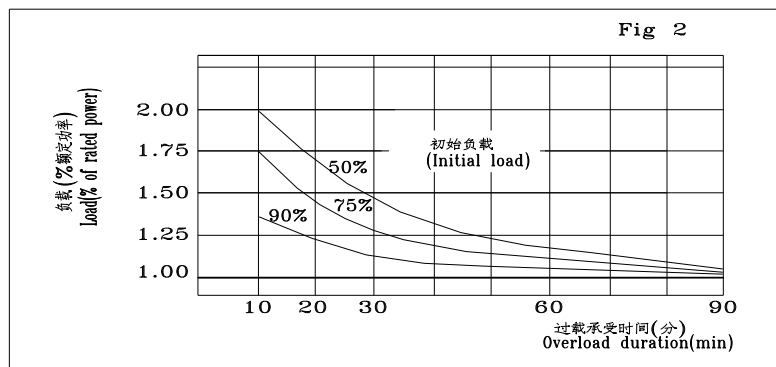
**Load capacity (without fan cooling)**

Overload per cent	Allowable time (min)
20	60
30	45
40	32
50	18
60	5

\* 不同环境温度和初始负载条件下,计算出我厂干式变压器过载曲线如下 :



环境温度:20°C  
(Ambient temperature)



环境温度:40°C  
(Ambient temperature)

### Overload characteristic curve at 20°C , 40 °C

(10) The cabinet enclosure has an IP41 protection rating, in compliance with GB 4208 standards. Features are described as follows:

① Land and weld to ground embedded parts.

② Cabinet Structure: Modular frame with bolted connections, allowing for on-site assembly and disassembly

③ The protective enclosure has sufficient mechanical and electrical strength to withstand the mechanical and electrical stresses of transport, installation and accidents without damage.

④ Shell material: high-quality steel plate

⑤ The equipment provided by the bidder shall comply with the standards in this specification and shall not be lower than the requirements of the relevant national standards and industry standards. The ancillary equipment should also comply with the corresponding industry standards, and should have test reports and product certification.

Unspecified technical parameters are in accordance with national standards.

### 3.2 Low voltage side outlet switch

~~Install one SGR5-250 and one SGR5-63 knife fuse switch on the low voltage side of the transformer cabinet (SGR5-250 rated current 250A, fuse rated current: 250A; SGR5-63 rated current 63A, fuse rated current: 63A). All of the above are tentative, subject to the final construction drawings. The busbar on the inlet side of the knife fused switch is fitted with heat shrinkable sleeving and a protective cover.~~

#### **4、 Cable termination requirements**

The high-voltage input cable must be terminated with a 22kV 3×70mm<sup>2</sup> cable terminal.

#### **5、 Secondary wiring diagram**

The secondary wiring diagram in the cabinet shall be submitted to Party A for confirmation.

#### **6、 Product testing and services**

1、 Products in the factory test, Party B should immediately notify Party A to the factory to participate in the acceptance, Party B in accordance with the standards and the agreed technical agreement acceptance, qualified before packing and shipping.

2、 After the equipment arrives at the site, the unpacking shall be attended by A and B together for unpacking and acceptance.

3. Party B shall send relevant personnel to the installation site to assist installation and commissioning.

4. Party B shall provide one set of commissioning manual, one set of operation manual and one set of installation manual for indoor station into a set of cabinet equipment, and submit the factory report of the product and relevant information to Party A.

Party B shall provide a set of operating tools.

5. Party B shall do a good job in after-sales service to help Party A to put into operation smoothly and safely.

Note: The bidding programme must take into account the space required for installation, maintenance, testing and overhauling, and be indicated in detail in the diagram; failure to meet the requirements will be treated as a waste bid.

# 技术要求



## 1、订货范围

户内站用变成套柜式设备

站名	容量	套数	交货期
115KV 变电站	承包人核算	1	

### 1.1 技术文件的发送

卖方须按规定时间提供下列份数的技术文件，并直接寄送给有关各方。

### 1.3 认可图

1.1.1.1 卖方在中标后一周内向买方提供设备基础尺寸、重量、外形尺寸图、运输尺寸图、铭牌图、设备各部分重量及进出电缆位置，一个月内提供准确的端子尺寸等资料，原理接线图及电气控制和信号回路的接线图及端子排图。

买方有权对供货设备的卖方图纸提出修改意见，对此买方不承担任何附加费用。卖方应根据买方的修改意见，在图纸上进行修改。

在收到买方对图纸的最终认可之前，卖方因提前采购材料或加工制造而发生的任何风险和损失由卖方自行承担。

图纸经买方认可，并不能解除卖方对其图纸的完整性和正确性应负的责任。

### 1.4 最终图

卖方在收到买方的认可图纸的 2 周内，应将全部最终认可图纸和含有最终图 CAD 文件的移动硬盘发送有关单位，所用的 CAD 版本应为 Auto-CAD R14 或 2000。

产品应按照经确认的最终图纸制造。

### 1.5 安装、运行、维修说明书及试验报告

至少在设备装运前 4 周，卖方应发送安装、运行、维修说明书及试验报告。

### 1.6 对技术文件的要求

所有技术文件均用中文编写，并采用 SI 公制单位。

## 2、应执行的标准

除了按甲方规定的技术条件以外，所有设备和辅助元件均符合最近可用的 IEC 的规定。

GB6450	《干式电力变压器》
GB1094.2	《电力变压器 温升》
GB1094.3	《电力变压器 绝缘水平和绝缘试验》
GB1094.5	《电力变压器 承受短路的能力》
GB/T10228	《干式电力变压器技术参数和要求》
GB7328	《变压器和电抗器的声级测定》
GB7354	《局部放电测量》
GB10237	《电力变压器绝缘水平和绝缘试验外绝缘的空气间隙》
GB311	《高压输配电设备的绝缘配合》
GB7449	《电力变压器和电抗器的雷电冲击和操作冲击试验导则》
JB/T 501	《电力变压器试验导则》
DL/T 572	《变压器运行规程》
GB 50148	《电气装置安装工程电力变压器、油浸电抗器、互感器施工及验收规范》

### 3、技术参数要求

22kV 站用变（与接地变共用）采用 SCB14-160kVA 干式变压器，采用成套柜式设备。

#### 3.1 干式变压器

1) 名称：干式三相双线圈铜绕组环氧树脂浇注配电变压器

2) 产品型号：SCB14-160(容量暂定)，带保护外壳、风机及温控器，达到 GB20052-2020

“10kV 干式三相双绕组无励磁调压配电变压器能效等级” 2 级

3) 额定频率：50Hz

4) 电压组合：22+5-5%/0.4~0.23kV

5) 联结组别：D yn11

6) 调压形式：无载调压

7) 分接容量：±2\*2.5%

8) 阻抗电压：4±5%

9) 局放水平：<5PC

10) 温升：绕组 $\leq 125K$ （用电阻法测量的平均温升）

11) 绝缘等级：**H**级

12) 冷却方式：AN/AF

13) 工频耐受电压：**22kV**（35kV），0.4kV（5kV）

雷电冲击耐受电压：75kV

14) 在正常工作条件下，运行寿命 $\geq 20$ 年。

15) 局部放电：1.1倍额定电压下，放电量 $\leq 5PC$

\*16) 损耗、空载电流及噪声水平（75℃负载损耗=120℃负载损耗/1.145；噪声按 GB7328 的要求和方法进行测试，即在离外壳 1M、高度 1.5M 处测量）

变压器容量 (kVA)	空载损耗 (W)	负载损耗 (120℃, W)	空载电流 (%)	噪声水平 (声压级 dB)	备注
1250	1420	8720	0.4	55	
1600	1665	10555	0.4	55	
2000	2075	13005	0.3	55	
2500	2450	15445	0.3	55	

17) 耐受短路能力：变压器高、低压绕组及其辅助设备如支持绝缘子等，在变压器低压侧绕组出口发生三相金属性短路时，变压器不致出现有害的机械、热应力或电气性能损伤。

① 变压器承受短路的热稳定能力：变压器能持续承受 3S 时间的外部短路电流，其绕组温度不超过 350℃。

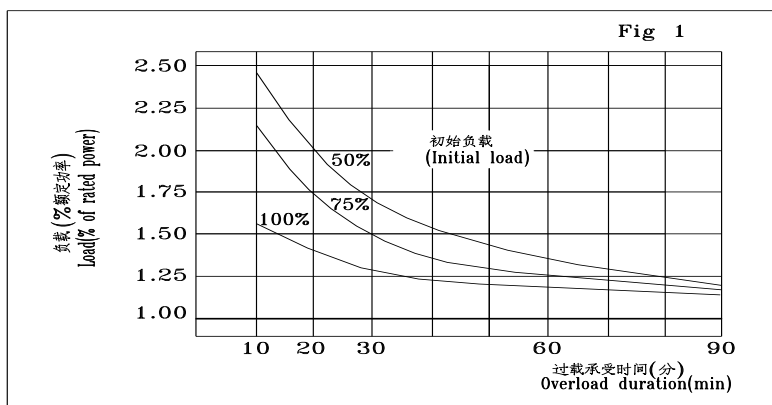
② 变压器承受短路时动稳定性能：变压器能承受国标 GB1094.5-2008 所规定的短路试验电流值而不损坏或位移。

18) 过负荷能力：变压器过负荷能力应符合 IEC 60905《干式变压器负载导则》。变压器允许短时间过载能力在空气自然冷却情况下满足或高于下表的要求（正常寿命，过载前已带满负荷）。20℃、40℃时过载特性曲线图、温升随负载变化曲线图（附后）。

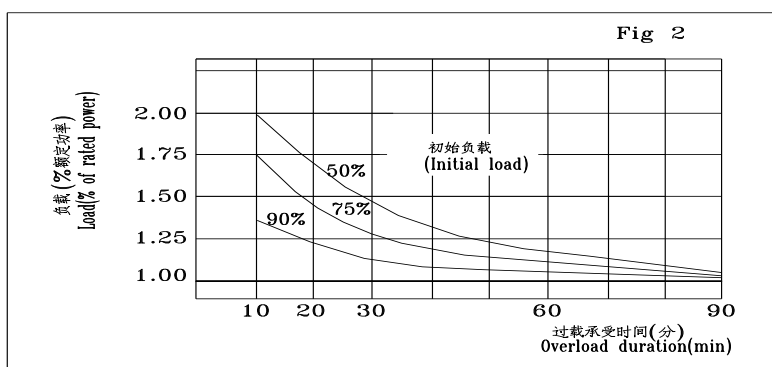
负载能力（无风机散热的状态下）

过载%	允许时间 (min)
20	60
30	45
40	32
50	18
60	5

\* 不同环境温度和初始负载条件下,计算出我厂干式变压器过载曲线如下 :



环境温度:20°C  
(Ambient temperature)



环境温度:40°C  
(Ambient temperature)

### 20℃、40℃时过载特性曲线图

(10) 外壳的防护等级为 IP41, 符合 GB 4208 (外壳防护等级) 标准的要求。特点说明如下:

- ① 落地并与地面埋件焊接固定。
- ② 结构形式: 型材固定螺栓连接, 可现场拆卸和组装。
- ③ 防护外壳具有足够的机械和电气强度, 能承受运输、安装和事故时的机械和电气应力而不损坏。
- ④ 外壳材质: 优质钢板
- ⑤ 投标方提供的设备应符合本规范书中的各项标准, 并不低于有关国家标准和行业标准要求。对配套的附属设备也应符合相应的行业标准, 并应有试验报告和产品合格证。

未注明技术参数按国家标准执行。

### 3.2 低压侧出线开关

变压器柜内低压侧安装 SGR5-250 和 SGR5-63 刀熔开关各一把 (SGR5-250 额定电流 250A, 熔断器额定电流: 250A; SGR5-63 额定电流 63A, 熔断器额定电流: 63A)。以上均

为暂定，以最终施工图为准。刀熔开关进线侧母排加装热缩套管，并装防护罩。

#### 4、电缆终端要求

高压进线电缆接 22kV  $3\times 70\text{mm}^2$  的电缆终端头。

#### 5、二次接线图

柜内二次接线图需交甲方确认。

#### 6、产品试验与服务

1、产品在出厂试验前，乙方应即通知甲方到厂参加验收，乙方按标准及商定的技术协议书验收，合格后方可装箱发运。

2、设备到达现场后，开箱时应由甲乙双方共同参加开箱验收。

3、乙方应派有关人员到安装现场协助安装调试。

4、乙方应提供户内站用变成套柜式设备调试手册一套、操作手册一套、安装手册一套，提交产品出厂报告及有关资料给甲方。

乙方应提供操作工具一套。

5、乙方应做好售后服务工作，帮助甲方顺利投运和安全运行。

说明：投标方案必须考虑安装、维护、试验、检修所需空间，并在图中详细表示，不足要求将作废标处理。

**Technical Requirements for  
Microcomputer Protection,  
Integrated Automation, AC/DC  
Panels, and Fault Recording Panels**

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## I Substation overview

See description of project content

## II. General provisions

### 1 Implementation standards

All supplied equipment must comply with the latest applicable national standards as of the delivery date.

GB191 Packaging, storage and transport graphic symbols

GB/T1360 Printed circuit network

GB/T2423.1 Basic environmental test procedures for electrical and electronic products Test A: Low temperature test method

GB/T2423.2 Basic environmental test procedures for electrical and electronic products Test A: High temperature test method

GB/T2423.9 Basic environmental test specification for electrical and electronic products Test Cb: Constant damp heat test method for equipment

GB/T2681 Colour of conductors in electrical sets

GB/T2887 General Specification for Computer Sites

GB/T2900.1 Electrotechnical terminology Basic terminology

GB/T2900.17 Electrotechnical terminology Electrical relays

GB/T2900.49 Electrotechnical terminology Power system protection

GB4208 Shell protection grade (IP code)

GB/T4798.2 Environmental conditions for the application of electric and electronic products

Transport

GB/T7261 Basic test methods for relays and relay protection devices

GB/T9361 Safety Requirements for Computing Station Sites

GB/T11287 Electrical relays Part 21: Vibration, shock, impact and seismic tests for metering relays and protective devices Part 1: Vibration test (sine)

GB/T13384 General technical conditions for packaging of electromechanical products

GB/T14537 Shock and impact test for measuring relays and protective devices

GB/T14598.9 Electrical relays Part 22: Electrical interference test for metering relays and protective devices Part 3: Radiated electromagnetic field interference test

GB/T14598.13 Electrical interference test for measurement relays and protective devices Part 1: 1MHz pulse group interference test

GB/T14598.14 Electrical interference test for measurement relays and protective devices Part 2: Electrostatic discharge test

GB16836 General requirements for the safe design of measurement relays and protective devices

GB14285 Technical regulations for relay protection and safety automatic devices

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DL/T667            Telecontrol equipment and system Part 5: Transmission protocol Part 103 Relay protection equipment information interface supporting standards

DL/T478            General technical conditions for static relay protection and safety automation devices

DL/T769            Technical guidelines for microcomputer relay protection of power systems

GB/6162            Electrical interference test for static relays and protective devices

JB5777.2            General technical conditions for control and relay protection panels (cabinets and stations) for secondary circuits of power systems

DL/T 724            Technical regulations for the operation and maintenance of direct-current devices with storage batteries for power systems

DL/T 637            Technical Conditions for Ordering Valve-Regulated Sealed Lead-Acid Batteries

DL/T 459            Technical conditions for ordering DC power supply cabinets for power systems

GB3859.1            Semiconductor power converter

GB4942.2            Low-voltage Electrical Appliance Shell Protection Grade

GB/T 17626.2        Electromagnetic compatibility Test and measurement techniques Electrostatic discharge

GB1984            AC High Voltage Circuit Breakers

DL402            AC High Voltage Circuit Breakers

## **2 Environmental conditions**

### 1.1.2 General working conditions

Height (altitude):            1000 metres;

Maximum Monthly Average Relative Humidity:  $\leq 90\%$  RH;

Maximum ambient temperature:     $55^{\circ}\text{C}$  ;

Minimum ambient temperature:  $-10^{\circ}\text{C}$  ;

Maximum change in daily temperature:     $25^{\circ}\text{C}$  ;

Earthquake resistance:            Seventh degree of intensity.

## **3 Ratings**

CT AC current:            5A;

PT AC voltage:            100V,  $100/\sqrt{3}$ ;

Frequency:            50HZ;

DC power supply:            110V DC.

## **4 Duties of Party B**

(1) Provide drawings, a list of manufacturing and quality assurance processes, standards for testing and inspection, including test data for test commissioning reports, and other information as specified in the

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tender.

(2) If there is an obvious conflict between the standards and specifications and this Technical Agreement, Party B shall inform Party A in writing of the conflict and the solution before manufacturing the equipment, and shall proceed with the manufacturing of the equipment only after Party A confirms the conflict.

(3) Technical services for the design, manufacture, factory testing, packaging and transport, ancillary equipment, factory and site acceptance, commissioning and operation of complete substation automation systems and ancillary equipment (including optical fibres or cables).

(4) Responsible for parameter design, database and screen generation of substation automation system, and preparation of information table in accordance with Party A's requirements.

(5) Within 15 days of the signing of the contract, Party B appoints a project leader who is responsible for liaison, organisation and coordination.

(6) Provide instructions for the design, manufacture, installation and use of all equipment.

(7) Provide type test and routine test data to confirm that the supplied equipment meets all performance requirements.

(8) Undertake the design, construction and user units with Party A to cooperate with the guidance and is responsible for the entire supply of equipment system coordination.

(9) Modify and adjust the system user interface according to Party A's requirements during on-site commissioning.

(10) Party B shall provide perishable spare parts (kept by Party B) and original backup of the system.

(11) Training of our personnel and maintenance services during the warranty period.

(12) Party B is responsible for providing free software upgrades.

## **5 Responsibilities of Party A**

(1) Party A is responsible for acceptance of the automation system project for the 115KV substation project in Golden Heron Industrial Park, Thailand.

(2) Party A is responsible for providing Party B with the textual information on the communication from the automation system to the relevant dispatching master system, including: the text of the communication statute from the dispatching master station to the plant station, channel parameters, telemetry and telecommunication transmission table, remote control table and so on;

(3) Party A is responsible for providing Party B with the interface parameters between intelligent devices such as protection relays and automation systems.

(4) Party A, with the cooperation of Party B, is responsible for the installation of automation equipment, and is responsible for the provision of signalling and control cables connecting the on-site equipment with the automation equipment (except for specific contractual agreements to be provided by Party B); Party A shall give active cooperation during the commissioning period of Party B, and Party A

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shall be responsible for the operation related to the primary equipment.

(5) Within 15 days after the contract is signed, Party A will designate one or two project leaders to be responsible for liaison, organisation and coordination. And designate a person to cooperate with Party B personnel on-site commissioning and future maintenance.

(6) Party A and Party B jointly formulate an engineering implementation programme, and Party A shall try to follow the requirements of the engineering programme and cooperate with the implementation of the commissioning plan.

(7) Party A is responsible for providing Party B with the primary wiring diagram of the substation, the type and format of the screen and report.

(8) Since the signing of the agreement on the specific substation, the content of information in Articles 2 and 3 shall be provided by Party A to Party B within half a month and Article 7 within one month, so as to avoid delays in the construction period and to ensure that the works are carried out smoothly.

(9) When involving the products of third party manufacturers, Party A is responsible for providing the interface information of their hardware and software and communication protocols, and coordinating the specific work between Party B and the third party when there are things difficult to coordinate between Party B and the third party manufacturers.

(10) In order to protect the intellectual property rights of Party A and Party B, both Party A and Party B shall keep the contents of this Agreement and Party B's products confidential.

## **6 Drawing information and submission progress**

(1) Party B shall provide Party A with all the drawings and explanatory materials to be approved (drawings include system structure schematic, cabinet screen diagram, communication link diagram, information access schematic), and provide equipment manuals one week before FAT. The communication link diagram refers to the position of the communication interface equipment and the composition of the communication link (the communication string of the relevant protection equipment) in conjunction with the switchgear cabinet layout provided by Party A. The information access diagram refers to the physical interface terminal schematic for the information related to the system such as telemetry, telecommunication, remote control, power degree, intelligent equipment, etc. in conjunction with the information quantity table provided by Party A.

(2) Design liaison meetings are held between Party A and Party B in order to expedite the design and construction of the project.

In the design liaison meeting, the following was accomplished:

(a) Party A introduces the detailed layout of the substation and the external conditions for the installation of the equipment of the integrated automation system of the substation.

b) Party B describes in detail the functions of the integrated automation system product.

c) Discussion of issues to be confirmed. You will detail the areas where the specification cannot be met

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and discuss these with us. The software to be provided by the integrated automation system and the list of information sheets, HMI screens and reports to be provided by Party A shall be determined at the design liaison meeting.

(d) You shall explain any ambiguities in the drawings provided.

(e) Signatures of both parties on the information requested for confirmation.

(3) Factory training and FAT (Factory Acceptance Test)

Party B provides training plan and FAT acceptance outline for Party A's confirmation, Party A organises factory training and FAT acceptance.

(4) Site commissioning and SAT (site acceptance)

Party B provides on-site commissioning, training, guidance and service plans and projects for Party A's confirmation.

(5) Warranty period

Party B shall provide a warranty period of 24 months from the date of commissioning. Party B shall provide a lifetime guarantee that it will respond to service within 24 hours and complete troubleshooting within 48 hours, and the system will be restored to normal.

### **III Technical requirements for substation supply equipment**

#### **1 Substation microcomputer protection device technical requirements**

The technical requirements of this section apply to 115kV total drop stations.

##### **1.1 General technical requirements for protection**

1.1.1 The requirements set out in this section apply to the requirements for each set of devices and their interfaces. At the same time, each device shall fulfil its specific requirements separately.

1.1.2 Temperature characteristics of the unit

The device should be able to meet the specified accuracy when the device is operated in an ambient temperature of -10°C to +45°C .

The device must function properly within an ambient temperature range of -20°C to +55°C.

1.1.3 Under the action of lightning overvoltage, primary circuit operation, switching field failure and other strong interference; under the interference of secondary circuit operation, the device, including the measuring element, shall not be inadvertently activated or refused to be activated. The device high frequency interference test, radiated electromagnetic field interference test and impulse voltage test and insulation test shall meet the standard requirements.

1.1.4 Protective devices shall be capable of being applied to P-type or composite current transformers.

1.1.5 Protection device outlet circuit, the main circuit, device abnormalities and DC power supply disappearance should be frequently monitored and self-diagnostic functions, such as characteristics of abnormalities should be able to start alarm signals, remote signals, etc..

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1.1.6 The logic circuits of each device should be powered by an independent DC converter, and the device should not be inadvertently activated when the DC voltage disappears, and at the same time, there should be an output contact to activate the warning signal; the device should be able to be correctly activated when the DC voltage slowly rises to 80 per cent of the rated value.

The unit shall operate correctly when the supply voltage varies within 80 to 115% of the rated value.

The device shall operate correctly at a ripple factor of  $\leq 5$  per cent.

The device should not be inadvertently operated when the power supply as well as the plugging and unplugging fuses are repeatedly struck through the spark, and the device should not be inadvertently operated when various abnormalities (such as short-circuiting, disconnecting, grounding, etc.) occur in the DC power supply circuit. There should be a DC fast mini-switch, which is installed in the same cabinet with the device.

1.1.7 The device shall not malfunction if any element of the device is damaged.

1.1.8 The use of contact relays for the trip outlet circuit shall ensure reliable tripping of the circuit breaker. The tripping outlet contact of the device shall meet the operational requirements.

1.1.9 The minimum operating voltage of the protected main exit trip relay and the device switching input optocoupler shall be between 50% and 70% of the DC supply voltage.

1.1.10 The error of the time element in each device shall be  $<3\%$  of the set value under these technical conditions.

1.1.11 Inserts in protective cabinets should have reliable contact and be interchangeable so that they can be quickly replaced during maintenance.

1.1.12 Special accessories, if any, shall be provided for each set of protection. Connecting circuits such as tripping and starting and blocking reclosures shall have test parts or connecting tabs for separate disconnection during operation.

1.1.13 The device shall have independent contacts with sufficient output for central signalling, station monitoring, event logging, etc.

1.1.14 Protection devices, protection cabinets, protection cabinets and communication cabinets or other equipment should be connected by photoelectric coupling or relay contact, there should be no direct electrical connection, the photoelectric coupling circuit that affects the behaviour of the protection action needs to be paralleled with anti-interference resistance.

1.1.15 Functional and configuration requirements of the protection system: When metallic and non-metallic faults (including single-phase grounding, two-phase grounding, two-phase ungrounded short-circuit, three-phase short-circuit and composite faults, conversion faults, etc.) occur within the protection range of the line protection device, the protection should be able to act correctly. When metallic and non-metallic faults occur outside the scope of protection, the device should not operate incorrectly; in addition, the protection should not operate incorrectly in the case of external fault removal, fault conversion and system operation. Under the influence of steady state and transient harmonic and DC components generated by

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HVDC transmission equipment and transformers (excitation inrush), etc., the protective device, including the measuring elements, shall not malfunction or refuse to operate.

1.1.16 The adjustment values of the device shall be capable of being changed safely and conveniently.

1.1.17 Protective devices shall have a fault recording function.

1.1.18 The protective device shall be provided with a standard communication port that can be connected to a PC, so that the user can commission and monitor the protective device through the PC. The contractor shall provide connectors and commissioning software for the PC to be connected to the protective device.

1.1.19 This station adopts comprehensive automation, and its protection device should be able to receive the unified GPS satellite timing signal in the station, and the synchronous timing method can adopt STNP, second pulse, minute pulse and serial port timing. The time synchronisation accuracy of the protection device is  $\leq 10\text{ms}$ .

1.1.20 The protection device should provide a standard communication interface (1 RS-485 port) to provide access to work with.

1.1.21 Substations with integrated automation use protection devices that combine measurement and control. Analogue measurement accuracy requirements:  $\text{error} \leq 0.5\%$ .

1.1.22 Each protective function in a protective device shall be capable of being individually switched on and off by means of an external circuit or software.

## **1.2 Technical specification for the configuration of relay protection devices**

The protection system of 115kV and main transformer should conform to the principle of separate configuration of protection and measurement and control, and the protection system and measurement and control system of each interval are electrically independent of each other to ensure that the protection system and the control system will not affect each other in the event of a fault. 115kV and main transformer's protection system and measurement and control system should be installed in centralised panels respectively. 22kV protection and control system should conform to the configuration of integration of protection and measurement and control. The protection and control system of 22KV should be in line with the integrated configuration of protection and measurement and control, and all the protection and control systems of 22KV should be installed in the local switchgear in a decentralised manner.

### **1.2.1 Main transformer protection configuration**

The 115kV transformer protection sets the following protection functions:

- ◇ Transformer differential protection 87T;
- ◇ Overcurrent protection on the high voltage side 50/51;
- ◇ High voltage side compound voltage blocking overcurrent protection 51V;
- ◇ Low voltage side compound voltage blocking overcurrent protection 51V;



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- ◇ Transformer overload protection 49;
- ◇ Low voltage protection 27;
- ◇ Overvoltage protection 59;
- ◇ Zero sequence current, voltage protection 50/51N,59N
- ◇ Gap zero sequence current, voltage protection 50/51N,59N
- ◇ Non-electricity protection: the body weight gas protection, regulator heavy gas protection, pressure relief valve, the above can be selected to act on the main transformer two side switch tripping or signalling (alarm volume)
- ◇ Non-electricity protection: light gas in the main body, light gas in the regulator, overload, high oil temperature in the main transformer and abnormal oil level are sent as alarms after a delay.

In addition to the realisation of the above protection functions, other technical parameters required for this protection device are:

- ◇ Differential protection action is fast, and the action time of differential protection with braking should be no more than 25ms;
- ◇ It can automatically adapt to different ratios and vector group compensation;
- ◇ Automatic adjustment of the transformer on-load voltage regulator can be realised;
- ◇ Transformer protection shall be able to collect real-time transformer tap stall information by BCD code input, and can adopt corresponding algorithms to track the change of transformer model CT ratio, adaptively adjust the differential protection function, and improve the sensitivity of differential protection.
- ◇ Inrush braking utilises the second harmonic and waveform discrimination principles;
- ◇ Excitation inrush braking during over-excitation utilises the fifth harmonic principle;
- ◇ The adaptive blocking function shall reliably block the differential protection in the event of system restorative inrush and external fault CT saturation;
- ◇ It should be very sensitive to reflect turn-to-turn faults within the winding;
- ◇ The device should have a powerful continuous online self-test function;
- ◇ The secondary system monitoring function shall include CT circuit monitoring and PT fuse breakage monitoring;
- ◇ The unit shall be equipped with an LCD display that shows events, other measurement data, etc;
- ◇ The device shall have not less than 8 LED indicators to show different action information or alarm information of the device;
- ◇ The device should have an event recording function, which can record not less than 100 events, and the precision of event time scale can reach 1ms;

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- ✧ The unit is required to have a minimum of 40 input and 20 output relay signals. The input signals must be jitter-discriminating;
- ✧ The fault recording function shall be able to cover all analogue input and switching input/output signals and shall be able to record at least 50 fault recording reports;

### **1.2.2 Technical specifications for the configuration of measuring and control devices**

The 115kV part shall be equipped with a separate measurement and control device, and the protection measurement and control device used for 22KV shall meet the requirements of the following measurement and control functions:

#### 1) Remote control section:

- ✧ Main substation 115kV side circuit breaker, disconnecting switch, neutral disconnecting switch, motorised earthing switch and 22KV side circuit breaker opening and closing;
  - ✧ 115kV line circuit breakers, disconnect switches, and motorised earth switches on and off;
  - ✧ 115kV sectional circuit breakers, disconnecting switches, motorised earthing switches on and off;
  - ✧ 22kV switchgear circuit breaker opening and closing;

#### 2) Telemetry section :

- ✧ Main transformer: current on each side, active power, reactive power, coil temperature, oil temperature
- ✧ Line: current, active power, reactive power
- ✧ Busbar: voltage, frequency
- ✧ Sections/busbars: current
- ✧ Static compensation devices: current, reactive power
- ✧ DC system: positive and negative battery current, battery voltage, charger inlet current and voltage, DC bus voltage, DC system positive-to-ground voltage, DC system negative-to-ground voltage.

#### 3) Telecommunication component

- ✧ All high voltage circuit breaker positions (double position)
- ✧ Position of all disconnecting switches (double position), position of earthing knife gate (double position)
- ✧ DC main circuit switch position
- ✧ Total protective action signal
- ✧ Accident signals

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- ◇ Local/remote changeover switch position
- ◇ Circuit breaker operating mechanism abnormal signal
- ◇ Control circuit disconnection signal
- ◇ Protection Alarm Signal
- ◇ Protective device fault signalling
- ◇ Signal of equipment body abnormality
- ◇ Abnormal signals from automatic devices
- ◇ Abnormal DC system signals

### 1.2.2.1 115kV and main transformer measurement and control device

115kV and main transformer measurement and control devices are configured separately according to intervals, including 115kV line, internal bridge and main transformer measurement and control devices, etc. The basic requirements are as follows:

- ◇ Adopting strict interval unitisation and integral device mode to improve the anti-interference performance of the device and the concise arrangement within the screen, it collects the full three-phase power of each interval of 115kV, and realises the functions of telemetry, telecontrol, telecommunication and remote pulse;
- ◇ Display function: with a large screen LCD, displaying the real-time operating parameters of the protected object, including analogue and switching information, displaying the single-interval circuit-breaker operating status diagram, and displaying the current interlocking status of the device (blocked) with special symbols;
- ◇ The device shall have not less than 8 LED indicators that can display different action information or alarm information of the device;
- ◇ Each monitoring device shall, in addition to the remote control function dependent on the communication network, telemetry, telecommunication, accident alarm and recording functions can be completely independent of the communication network and computer;
- ◇ The measurement and control device shall have the function of detecting the same period to ensure that the circuit breaker only closes safely under the precondition that the voltages on both sides are the same or at least one side of the line is voltage-free;
- ◇ The device shall be logically programmable for interlocking between this interval by means of a programming tool in accordance with IEC 61131;
- ◇ The front panel of the unit shall have a switching button for local/remote control and an on/off button for local control;
- ◇ The monitoring device is required to have the function of monitoring and displaying electrical parameters such as three-phase current, voltage, power factor, frequency, and degree;
- ◇ The device should have an event recording function, which can record not less than

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100 events, and the precision of event time scale can reach 1ms;

#### 1.2.2.2 22 kV measurement and control devices

No independent measurement and control device is provided for 22kV, and the measurement and control function shall be realised in the protection device.

### 1.2.3 22kV line protection configuration

The following protection functions are set for the 22kV outgoing line:

- ✧ Three-phase current flow protection 50;
- ✧ Three-phase overcurrent protection 51;
- ✧ Zero sequence overcurrent protection 51N;
- ✧ Low voltage protection 27;

In addition to the realisation of the above protection functions, other technical parameters required for this protection device are:

- ✧ The device shall have a continuous online self-test function;
- ✧ It shall have both Ethernet IEC 61850-8-1 interface and RS485 interface;
- ✧ The fault recording function shall be able to cover all analogue input and switching input/output signals and shall be able to record at least 50 fault recording reports;
- ✧ The unit shall be equipped with an LCD display that shows events, other measurement data, etc;
- ✧ The front panel of the unit shall have a switching button for local/remote control and an on/off button for local control;
- ✧ The unit shall have not less than 11 LED indicators for different action messages or alarm messages of the unit;
- ✧ The device should have an event recording function, which can record not less than 100 events, and the precision of event time scale can reach 1ms;
- ✧ The unit is required to have a minimum of 12 input and 10 output relay signals. The input signals must have contact jitter discrimination;
- ✧ The device shall have a hardware IRIG-B timing interface.

### 1.2.4 22KV capacitor protection configuration

The following protection is set for 22KV capacitors:

- ✧ Three-phase current flow protection 50;
- ✧ Three-phase overcurrent protection 51;
- ✧ Zero sequence overcurrent protection 51N;
- ✧ Low voltage protection 27;
- ✧ Voltage unbalance protection 59N;

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In addition to the realisation of the above protection functions, other technical parameters required for this protection device are:

- ✧ The device shall have a continuous online self-test function;
- ✧ It shall have both Ethernet IEC 61850-8-1 interface and RS485 interface;
- ✧ The fault recording function shall be able to cover all analogue input and switching input/output signals and shall be able to record at least 50 fault recording reports;
- ✧ The unit shall be equipped with an LCD display that shows events, other measurement data, etc;
- ✧ The front panel of the unit shall have a switching button for local/remote control and an on/off button for local control;
- ✧ The unit shall have not less than 11 LED indicators for different action messages or alarm messages of the unit;
- ✧ The device should have an event recording function, which can record not less than 100 events, and the precision of event time scale can reach 1ms;
- ✧ The unit is required to have a minimum of 12 input and 10 output relay signals. The input signals must have contact jitter discrimination;
- ✧ The device shall have a hardware IRIG-B timing interface.

### 1.2.5 Configuration of 22kV female sub-protection

The following protection functions are set for the 22KV subsection:

- ✧ Three-phase overcurrent protection 51;
- ✧ Charge Protection 51;

In addition to the realisation of the above protection functions, other technical parameters required for this protection device are:

- ✧ The device shall have a continuous online self-test function;
- ✧ It shall have both Ethernet IEC 61850-8-1 interface and RS485 interface;
- ✧ The fault recording function shall be able to cover all analogue input and switching input/output signals and shall be able to record at least 50 fault recording reports;
- ✧ The unit shall be equipped with an LCD display that shows events, other measurement data, etc;
- ✧ The front panel of the unit shall have a switching button for local/remote control and an on/off button for local control;
- ✧ The unit shall have not less than 11 LED indicators for different action messages or alarm messages of the unit;
- ✧ The device should have an event recording function, which can record not less than

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100 events, and the precision of event time scale can reach 1ms;

✧ The unit is required to have a minimum of 12 input and 10 output relay signals. The input signals must have contact jitter discrimination;

✧ The device shall have a hardware IRIG-B timing interface.

### **1.3 Testing, acceptance and servicing of protective devices**

#### 1.3.1 Tests

Protective cabinets and protective devices shall be subjected to factory performance tests before leaving the factory.

The required tests are at least:

(1) All internal components are tested for correct performance and all wiring is tested for correctness.

(2) Simulate actual conditions for continuous long-term energisation, including AC current, voltage, and DC power supply tests.

(3) Industrial frequency withstand voltage test shall be carried out in accordance with relevant standards.

And provide a report.

(4) Perform tests on protective devices with different currents and voltages, simulating various faults, and provide reports.

(5) The device shall be subjected to rapid transient interference, high-frequency interference, radiated electromagnetic field interference, impulse voltage test. (Provide type test report)

(6) Motion characteristic test of the device, mutual motion test conforming to the logical design, and provide a report.

1.3.2 The factory acceptance test must be attended by Party A. Party B shall notify Party A two weeks in advance and provide relevant quality inspection documents for Party A's approval.

#### 1.3.3 On-site services

Party B provides free on-site commissioning and commissioning services of the device; Party A provides necessary assistance.

#### 1.3.4 Drawings and information

(1) The delivered product shall conform to the final approved drawings (including wiring diagrams, logic diagrams, etc.). Our approval does not relieve us of our responsibility for the completeness and accuracy of our drawings.

(2) 5 sets of accurate product drawings should be provided randomly when the product is shipped with AUTOCAD disc or USB flash drive for Party A's installation, maintenance and operation.

(3) All titles, notes and part names of all drawings should be written in Chinese, with a text height of more than 3 mm.

(4) Descriptive information

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(a) The explanatory information should be in Chinese.

(b) Seven copies of the explanatory material shall be sent to us two weeks before the equipment is dispatched.

(c) The descriptive information should include the items listed below:

1) Product Manuals

2) Technical descriptions and instructions for use

(3) Commissioning and maintenance manuals for protective devices

4) Full instructions and data for installation, operation, maintenance and commissioning.

5) All information required for all spares and all accessories.

(5) Commissioning and calibration software and accessories.

## **1.4 Main transformer protection screen setup requirements**

1.4.1 The product complies with the following standards

1.4.1.1 GB4942.2 Low-voltage electrical enclosure protection level

1.4.1.2 GB/T 2681 Colour of conductors in electrotechnical complete installations

1.4.1.3 GB/T2887 General Specification for Electronic Computer Sites

1.4.1.4 JB5777.2 General technical conditions for control and relay protection panels (cabinets and stations) for secondary circuits of electric power systems

1.4.1.5 GB14285 Technical regulations for relay protection and safety automation equipment

1.4.1.6 GB/T7261 Basic test methods for relays and relay protection devices

1.4.1.7 GB4208 Enclosure protection class (IP code)

1.4.3 Technical requirements for screen assembly

1.4.3.1 The open end of the protective trip connecting lug or each function connecting lug shall be mounted above, with the head of the upper stake connected to the tripping coil circuit of the circuit-breaker or to the protective open-entry circuit.

1.4.3.2 Test terminals and wiring are equivalent to those of Nanjing Phoenix.

1.4.3.3 Terminal blocks shall be provided with an adequate level of insulation. Generally, only one wire can be connected to each terminal. The DC positive power supply and the tripping and closing circuits of the circuit breaker cannot be connected to adjacent terminals, nor can the positive and negative poles of the DC power supply be connected to adjacent terminals. Use current-type terminal blocks for current circuits, 6 mm<sup>2</sup> terminals for DC trip circuits, and 4 mm<sup>2</sup> terminals for DC signal circuits.

1.4.3.4 Miniature circuit breakers are to be the equivalent of ABB or Siemens and shall be wired in accordance with the technical requirements of that product.

1.4.3.5 If it is necessary to install a stall plate behind the cabinet, it should not affect the maintenance work behind the cabinet. The terminal row is at least 50cm from the ground to facilitate cable discharge, and the installation of any components in the cabinet should be considered without affecting the maintenance work

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of tightening wires on the inside of the terminal row.

1.4.3.6 The internal wiring in the cabinet shall be made of heat-resistant, moisture-resistant and flame-retardant (non-flame retardant) insulated copper wires, and the cross-section of the wires for the current circuit shall be not less than 2.5 square millimetres, and that of the general wires shall be not less than 1.5 square millimetres.

1.4.3.7 Conductors shall be free from damage and shall be terminated with compression type couplings.

1.4.3.8 All electrical connections shall be made of copper.

1.4.3.9 The type and number of signalling and intermediate relays in the protection screen are based on the design institute drawings.

1.4.4 Technical requirements for cabinets

Protection cabinet should be closed structure plus glass door (GK type), the thickness of steel plate is not less than 2.5mm, using cold-rolled steel plate, cabinet without transverse support through the frame, the cabinet surface coating should be uniform, firm, not easy to fall off.

Cabinet external dimensions (H× W× D): 2360× 800× 600mm. Cabinet colour: RAL7035.

1.4.5 Tests

The protection cabinet shall be subjected to a factory performance test before leaving the factory and the required test shall be at least:

All internal components performance correctness test and all wiring correctness test (the protection device through different current, voltage, simulation of a variety of fault test, to verify the correctness of the wiring).

1.4.6 After-sales service and drawing information:

1.4.6.1 Five sets of wiring diagrams and terminal block diagrams behind each protection and control cabinet with AUTOCAD CD-ROM or USB flash drive shall be provided for installation, maintenance and operation.

1.4.6.2 Original information shall be provided for all equipment in the cabinet.

1.4.6.3 All headings, notes and part names on all drawings shall be written in Chinese with a text height greater than 4 mm.

1.4.6.4 The Supplier shall provide the user with personnel training free of charge, and go to the site for installation and maintenance guidance.

## **2 Integrated automation technology requirements**

The technical requirements of this section apply to this substation (main drop station).

### **2.1 Integrated automation hardware and software components of the general landing station**

The integrated automation system of 115kV total drop station adopts a layered distributed



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system. The system is based on the main control layer, network layer and interval layer.

### **2.1.1 Master Control Layer**

One DELL server collects and stores monitoring data from the main drop station and six substations, including information on the main transformer protection screen protection measurement and control devices, main transformer temperature control devices, high-voltage cabinet protection measurement and control devices, TEV multifunctional PT synthesis devices, small-current grounding devices, DC panels, and temperature and humidity measurement devices, and so on. Data redundancy is achieved by RAID1 disk data mirroring, which generates mutual backup data on pairs of independent disks. When the original data is busy, the data can be read directly from the mirrored copy.

2 DELL monitoring workstations to display and handle general drop station and substation monitoring duties. DELL commercial computers are used.

1 set of server power monitoring system software, 1 set of Windows Server 2012 R2 genuine server operating system.

2 sets of monitoring workstation power monitoring system software, 2 sets of Windows 7 genuine flagship version operating system.

2 large 60-inch LCDs, 1 displaying the screen of the power monitoring system, and 1 used as a video surveillance system rotating display. 1 set each of needle and laser printer. 1 set of 6-station operation desk, steel and wood structure, including 6 chairs.

### **2.1.2 Network layer**

Communication manager, acquiring 115kV and 22kV protection and intelligent devices, capable of statute processing and statute conversion.

Network switch, connecting the management machine and the main control layer computer equipment, and at the same time connecting and collecting the monitoring data of each substation.

Ethernet interface GPS satellite synchronous clock, as the total drop station and substation synchronous clock source, to the protection and each intelligent device clock synchronisation.

### **2.1.3 Spacers**

The spacing layer contains all the captured devices, protection and intelligent devices directly connected to the communication manager via RS485 bus or Ethernet, exchanging information in real time with SPA, IEC61850, Modbus, CDT and other conventional power communication protocols.

The equipment in each interval layer is independent of each other and does not affect each other. The data server collects and processes the raw data from the site, transmits them to the monitoring workstation, receives the control and operation commands from the monitoring

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workstation, and finally carries out the operation and control of the equipment and data collection after the validity judgement, blocking detection, synchronous detection, and so on. In case of communication layer and network failure, the spacing layer device can complete its own function independently and is not affected by the network.

#### **2.1.4 Configuration of 1 communication control panel**

2 measurement and control units to collect and control auxiliary information in the station other than the main transformer. Each measurement and control unit has no less than 72 switching inputs, 20 switching outputs and 12 analogue inputs.

One 16-port communication manager to collect and process the communication information of the general landing station, and support the statute processing and statute conversion.

One 24-port Ethernet switch as communication manager and data channel between the substation system and the monitoring server of the main landing station.

1 Ethernet GPS synchronous clock as a clock synchronisation source for monitoring servers, communication managers and protection devices.

1 set of single-mode fibre-optic auxiliary equipment for communication with substations.

One 2200\*800\*600 screen and related accessories.

#### **2.1.5 Configuration of 1 remote communication screen**

1 remote management machine, which collects and gathers data from this general landing station and sub-station and transmits them to the Region 1 monitoring system and the centralised control system, as well as carries and meets the remote control functions of Region 1 and the centralised control for this general landing station and sub-station.

1 remote management machine to collect and gather data from this total drop station and reserve the communication interface with power dispatch.

One 4-optical, 24-power high-performance gigabit fibre-optic ring switch. The ring switch serves as an extension of the coverage of area 1 of the centralized control centre, forming a ring-type network with the other two general drop stations in area 1 to improve network reliability.

#### **2.1.6 Configuration of 1 inverter power supply panel**

Two 5kVA inverter units supply power to the station's monitoring system mainframe, monitors, 60-inch large LCD screens, video system mainframe, hard disc recorders, cameras, temperature and humidity devices, voice over IP equipment, network switches, communication managers and other equipment. Its DC power supply comes from the DC screen of the main landing station.

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### **2.1.7 Configuration of two 115kV main transformer protection panels , one 22kV main transformer protection panel**

Each screen is equipped with one main transformer differential protection, one high backup protection, one low backup protection, and one measurement and control device.

### **2.1.8 Configuration of 1 set of direct current panels, 3 panels, DC110V 200Ah**

### **2.1.9 Configuration of 1 set of AC screens, counting 2 screens**

### **2.1.10 Configuration of 1 set of fault recording screens**

Acquisition and processing of recorded real-time and fault recording data from the general landing station.

### **2.1.11 Equipped with converters and communication isolation modules for communication with protection and intelligent devices.**

### **2.1.12 Configuration of 1 video and paging system equipment at the main drop station**

1 video surveillance host, high-performance DELL workstation, acquisition and display of new energy terminus and substation cameras and video images, 1 HDMI graphics card, can output video images to the large LCD screen system. Installation of two-way IP network paging system software, operation can use IP network paging microphone and new energy terminus and substation equipment room calls.

1 TV DVR, 256 inputs for network, 27 6T hard discs for monitoring. Convert the new energy camera screen and dock it with the 60-inch large LCD screen.

1 high-performance 10 Gigabit fibre-optic ring switch, 4 10 Gigabit and 24 Gigabit, as the main switch of the video network, to undertake the data flow of the video ring network, and to provide video streaming information to the video surveillance host, decoder, centralised control and so on.

1 set of 3 million digital HD infrared all-in-one gun camera, 3 million digital HD infrared dome, using Ethernet structure to transmit video data stream. Monitor 115kV main transformer room, GIS room, 22kV distribution room, capacitor room.

2 Gigabit Ethernet switches as transmission channel between cameras and DVRs.

1 set of IP pager to microphone, 1 set of two-way IP network system software (including PC sub-control software).

1 set of Ethernet temperature and humidity detection device, 1 set of dedicated Ethernet switch, 1 set of dedicated communication manager, isolated from the power monitoring system, and at the same time as the temperature and humidity detection device and the monitoring system of this station and remote communication media, transmission of temperature and humidity information.

1 video surveillance screen, installation of equipment such as hard disc recorders, ring

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switches, network switches for communication with substations.

1 set of video, paging system equipment, temperature and humidity subsidiary installation power cabinet equipment, etc.

## **2.2 Composition of integrated automation software and hardware for substations**

This phase contains a total of six substations. Its comprehensive automation system also adopts a layered distributed system. The system has a three-layer topology with main control layer, network layer and interval layer. The hardware and software components of each substation are as follows:

### **2.2.1 Master Control Layer**

1 DELL monitoring workstation, collecting, storing, displaying and processing the monitoring data of this substation, including the information of high-voltage cabinet protection measurement and control device, TEV multifunctional PT integrated device, small current grounding device, DC screen, temperature and humidity measurement device, and so on. It adopts mainstream brand commercial computer with mainstream configuration.

1 set of monitoring workstation power monitoring system software, 1 set of Windows 7 genuine flagship version operating system.

### **2.2.2 Network layer**

1 communication manager, collects the protection and intelligent equipment of the substation, and is able to perform statute processing and statute conversion. 1 network switch, connects the manager and the computer equipment of the main control layer, and at the same time transmits the data of the substation to the server of the general descent station.

### **2.2.3 Spacers**

The spacing layer contains all the captured devices, protection and intelligent devices directly connected to the communication manager via RS485 bus or Ethernet, exchanging information in real time with SPA, IEC61850, Modbus, CDT and other conventional power communication protocols.

### **2.2.4 Configuration of 1 communication screen**

Installation of communication equipment such as main control layer computer mainframes and network layer communication managers and network switches.

One 2kVA inverter as power supply for monitoring hardware, video hardware, temperature and humidity equipment, and IP dialogue equipment. Its DC power supply comes from the substation DC screen, which is required to be no less than DC110V 65Ah.

### **2.2.5 Configuration of 1 set of video and paging system equipment**

One 24-port Ethernet switch, as a video network switch, provides substation video streams to

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the total drop station video network.

1 set of 3 million digital HD infrared all-in-one gun camera, 3 million digital HD infrared dome, using Ethernet structure to transmit video data stream. Monitor 22KV power distribution room.

1 set of IP digital intercom panels.

1 set of Ethernet temperature and humidity detection device, 1 set of dedicated Ethernet switch, 1 set of dedicated communication manager, isolated from the power monitoring system, and at the same time as the temperature and humidity detection device and the monitoring system of this station and remote communication media, transmission of temperature and humidity information.

1 set of video, paging system equipment, temperature and humidity ancillary installation power cabinet equipment, etc.

## **2.3 Supporting equipment for the CPA2 centralised control centre**

CPA2 centralised control centre and communications equipment for this phase, which is supported by this phase, is installed in the centralised control centre.

### **2.3.1 Configuration of a new energy monitoring and communication screen**

1 DELL server to collect and store monitoring data from the new energy 115kV main drop station and 6 substations. Data redundancy is achieved by using RAID1 disk data mirroring, which generates mutual backup data on pairs of independent disks.

1 DELL monitoring workstation to display and handle general drop station and substation monitoring duties. DELL commercial computers are used.

1 set of server power monitoring system software, 1 set of Windows Server 2012 R2 genuine server operating system.

1 set of monitoring workstation power monitoring system software, 1 set of Windows 7 genuine flagship version operating system.

One communication manager receives and processes the information transmitted by the new energy remote manager and forwards the information to the area one monitoring system and the centralised control system.

1 high-performance gigabit fibre-optic ring switch. The ring switch will enable the new energy terminal to form a ring network with the other two terminals in region 1.

1 DVI graphics card, output new energy monitoring screen to the centralised control system large screen display.

### **2.3.2 Configuration of 1 new energy video and paging system screen**

1 video surveillance host, high-performance DELL workstation, acquisition and display of

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new energy terminus and substation cameras and video images, 1 HDMI graphics card, can output video images to the large LCD screen system. Installation of two-way IP network paging system software, operation can use IP network paging microphone and new energy terminus and substation equipment room calls.

1 video HD decoder to convert new energy camera footage to interface with the splice screen HD matrix.

1 set of video manager software to complete the screen settings and optimise the display, as well as the configuration of the screen docking.

Development and commissioning of 1 set of centralised control with new energy video linkage.

1 high-performance 10 Gigabit fibre-optic ring switch, 4 10 Gigabit and 24 Gigabit, as the main switch of the video network, to undertake the data flow of the video ring network, and to provide video streaming information to the video surveillance host, decoder, centralised control and so on.

One 5KVA uninterruptible power supply for video equipment.

## **2.4 General technical requirements for integrated automation**

### **2.4.1 Data acquisition and processing functions**

#### 1) Analogue data acquisition and processing

The system is capable of continuously collecting the required analogue quantities according to the information sheet.

Main transformer protection, high-voltage cabinet protection, main transformer temperature, three-phase current and three-phase voltage on the low-voltage side of the station transformer are collected through transmitters, and DC system bus voltage is collected through the communication port of the DC screen in the station. Transformer stalls are input by telemetry, displayed and transmitted to dispatching in telemetry mode.

Analogue data is recorded at fixed 5-minute intervals with valid values, and important data is retained for more than 2 years.

#### 2) Acquisition and processing of digital quantities

The system collects digital quantities as detailed in the information sheet.

The system is equipped with variable alarm and SOE functions, and all alarm information is stored. In addition, the system should be able to accumulate the number of switching operations.

The background can handle the function of dual-position telecommunication, when dual-position abnormality occurs, the displayed switch should change colour, and the system can synthesize a total "switch position abnormality" signal to report to the dispatching.

The system shall have the function of receiving GPS clock signals, receiving them via Ethernet and

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timing them with the protection measurement and control unit by means of time broadcast commands;

The system is capable of combining the signals in question.

### (3) Collection and processing of electrical metering

The system is equipped with the function of collecting 22KV line metering, as detailed in the information sheet.

The 22kV line power is metered and the protocol is the meter communication protocol.

## **2.4.2 Control logic and execution**

There are three levels of substation equipment control:

The first level of control, with the highest priority, is local to the equipment. When the operator places the single remote input/deactivation toggle switch in the equipment local position in the "disengaged" position, all remote control functions are blocked and only local operation is possible.

The second level of control, i.e. the next highest priority, is in the main station control unit (i.e. the local function). There is a general remote control remote/local toggle switch mounted on the station control panel. When the local input/disconnect switch is placed in the "input" position and the general remote control remote/local switch is placed in the "local" position, equipment such as the station circuit breakers can be remotely controlled from the operator's telephone unit and the operation commands from the dispatch are blocked at the same time. Operation commands from dispatching are blocked at the same time. During execution, the remote control operator and the guardian are set up with corresponding passwords and different rights (the operator only has operating rights; the guardian has operating and guardianship rights), and the operation can only be carried out if the passwords are correctly entered and the corresponding rights are correctly verified. Before executing the operation, the system will prompt and lock the operation command and its error message according to the relevant analogue and digital quantities through the control logic locking check, and will lock the command if it may be wrong.

The control function is put out of service and does not affect the normal monitoring of this station by the dispatching side.

The control of the main unit of station control (i.e., the local function) is divided into main screen and sub-screen control, which can be conveniently selected in the primary wiring diagram or user menu.

## **2.4.3 VQC control**

The system can carry out A and B group auto start/cut operations for capacitors according to remote control commands, blocking the auto start/cut function when the capacitor protection action is tripped, and blocking the auto start/cut of the relevant capacitor bank when the switch on the LV side of the main transformer is disconnected. The VQC control mode can be conveniently switched on and off through the background remote control mode.

Limitations include voltage, upper and lower stall limits, time period division, frequent switching in critical state, power factor, protection action blocking, main transformer opening and associated tripping,

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capacitor switching, main transformer current, and faults of the on-load mechanism.

#### **2.4.4 Communication functions with smart devices**

The system should have the function of communicating with intelligent devices such as electricity meters and DC control devices, and be able to upload relevant information.

#### **2.4.5 Operational records**

The system should have the ability to save a variety of users required by the system and the power system normal records, abnormal records, event records, operation records and other operating records.

#### **2.4.6 Opportunities for people to talk**

1) Display the real-time operation status of the power grid

It has the function of displaying primary main wiring diagram, voltage curve diagram and bar graph, load curve diagram and bar graph, time-adjustable load trend diagram, circumferential curve diagram, report, various event displays, integrated automation system status diagram and commonly used data table, alarm, SOE, and operation information under Chinese environment. Functions to display various forms of Chinese characters and dynamic Chinese characters.

(2) The screen and database are equipped with editing and modification functions.

Accident total signal test function. Simulates the total accident signal in the background so that the total accident signal can be tested during substation inspections.

Accident total signal confirmation function. The total accident signal is a synthetic signal, when there is an accident or abnormal alarm, after manual confirmation, the total accident signal should be resumed, the accident or abnormal signal still shows the real-time status, and when there is other alarm signals, the total accident signal will act again.

(3) Work condition monitoring and sound alarm (equipped with active speakers) function

(4) Real-time operation data recording, printing and tabulating functions

(5) Self-diagnostic function of substation integrated automation system

(6) Display function: the requirements and types of screen display are in accordance with the "screen requirements of the comprehensive automation system of the Southern Power Supply Company".

#### **2.4.7 Reports and Printouts**

The type and format of the report is defined by the user and can be exported and saved in Excel format.

Random, summoned and timed printing function and screen copy function are available.

#### **2.4.8 Alarm management**

With analogue overrun and accidental tripping alarm function, the alarm mode has various ways such as push screen, sound and prompt window.

The system has an alarm synthesis function, which allows you to define a virtual point that can be synthesised by integrating a number of related alarm points.



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It has the function of trial alarm test and resumption, i.e. it can simulate the total signal forwarding dispatching of the accident in the background and resumption manually.

#### **2.4.9 Database management**

The database is well protected against misuse of the database.

Meet real-time requirements for fast access to long-standing memory data and hard disc data

Allows concurrent access to the same dataset within the database by different programmes, ensuring the integrity and consistency of the database in a concurrent manner.

Good scalability and adaptability to meet the needs of system expansion

Multiple data tables can be defined and generated using the same database.

#### **2.4.10 Historical data**

Historical databases can be written to the hard disk at regular intervals or saved on a CD-ROM. If archived historical data is loaded back into the system for data analysis, the loaded data should not overwrite the existing historical data save contents.

#### **2.4.11 Interfaces and remote functions**

Protection equipment for system access, communication protocols to be determined.

The system communicates with the district and/or local regulator through the main and backup channels with the statutes such as CDT and GB/T 870-5-101 respectively, transmits the data such as analogue, digital, command and serial information of the protection device and accepts the control commands, and the communication mode is duplex four-wire system.

Party B coordinates and cooperates with the completion of the station and the dispatching end of the intermodulation work.

#### **2.4.12 System monitoring, maintenance functions**

It has the functions that data will not be lost before power loss, no malfunction will occur when power loss occurs, and it can automatically start and resume operation after power is restored.

The system has both manual and automatic backup functions. Through simple push-button and menu selections, database definitions and various parameters of the system can be manually backed up to a specified directory for easy system reinstallation.

#### **2.4.13 Remote data transmission to CPA2 centralised control centre function**

The data from the main landing station and all substations need to be transmitted to the CPA2 centralised control centre, including telecommunication, telemetry, telepulse and remote control. This enables the regional control system and the centralised control system at the CPA2 centralised control centre to monitor and control any controllable equipment at the terminals and substations.

The main scope includes main transformer protection screen protection measurement and control devices, main transformer temperature control devices, high-voltage cabinet protection measurement and control devices, TEV multifunctional PT integrated devices, small-current grounding devices, DC panels

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and other intelligent equipment.

#### **2.4.14 Video surveillance function**

The total landing station and all sub-stations are equipped with video surveillance system. The camera adopts 3 million HD infrared integrated gun camera and 3 million HD infrared dome. Gun camera distributed fixed installation, monitoring the main transformer room, GIS room, 22kV distribution room, capacitors and other high-voltage electrical equipment; dome for the 22kV distribution room, monitoring the operation of personnel and high-voltage cabinet operation, normal rotational speed rotation of the lens to cover the scope of surveillance. At the same time, each gun and ball machine is used in the centralised control centre for the centralised monitoring system and video system linkage of the total drop station and sub-station, when there is a fault signal generated by the equipment, the camera interface can be automatically popped up on the centralised control centre monitor.

#### **2.4.15 Temperature and humidity acquisition function**

The total drop station and all sub-stations are equipped with temperature and humidity measuring equipment with Ethernet interface, which can collect the ambient temperature and humidity in the main transformer room, GIS room, 22kV distribution room, capacitor room, etc., and transmit the data to the local total drop station or switching station after summarising them through the switchboards and the communication manager, which can be reflected in the interface of the local monitoring system and can set the temperature and humidity alarm limit values. At the same time, it can be remotely transmitted to the regional control system and centralised control system in the centralised control centre.

#### **2.4.16 IP dialogue function between the duty room and the distribution room**

The total landing station and all substations are equipped with IP dialogue equipment, which can realize the voice call function between the duty room of the total landing station and the total landing station and each substation. Each room and the corresponding IP voice interface in the operation selection can be used to make voice calls and prompts with the personnel in the monitoring range in conjunction with the video monitoring system screen. At the same time, the centralised control centre also needs to implement this function.

### **3 Technical Requirements for AC and DC Panels at General Landing Stations**

#### **3.1 Technical parameters of the DC power supply unit**

AC input voltage:	Three-phase 380V $\pm$ 15 per cent;
AC power frequency:	50 $\pm$ 5Hz;
DC rated voltage:	110V;
DC output voltage:	90 to 130V (continuously adjustable);
Current stabilisation accuracy:	< $\pm$ 0.5% (at 10% to 100% I <sub>e</sub> );
Voltage regulation accuracy:	< $\pm$ 0.5% (at 10% to 100% I <sub>e</sub> );

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Module overheating protection: Shuts down and alarms when heat sink temperature exceeds  $75.5 \pm 0.5^\circ\text{C}$  ;

Module operating voltage: Three-phase  $380\text{V} \pm 20\%$ ;

Efficiency:  $>90$  per cent;

Noise:  $\leq 50\text{dB}$ ;

Communication interface: Meet automation system requirements (e.g. RS-232, RS-485);

Battery capacity: 200Ah.

### **3.2 DC System Composition**

The main wiring of the DC system is in the form of single busbar wiring, with one group of chargers and one group of batteries.

Contains four high-frequency switching charging modules, two on the combining mother and two on the controlling mother.

### **3.3 Technical requirements for DC power supplies**

#### **3.3.1 DC output voltage**

90-130V DC, components work properly at low output voltages.

#### **3.3.2 AC power distribution units**

Two channels of 380V power input, each other as a standby, can be manually and automatically switching. A certain road over-voltage, under-voltage, phase loss, should be able to automatically switch to another AC power supply. And it is required that the AC power supply switching voltage corresponds to the working voltage of the module, i.e. when the AC power supply voltage exceeds the rated voltage $\pm$  by 15%, the AC power supply switching should be acted, and when the AC power supply voltage exceeds the rated voltage $\pm$  by 20%, an alarm signal will be sent.

AC input with lightning protection and alarm function (nominal discharge current greater than 40kA, residual voltage less than 1kV), anti-surge function.

#### **3.3.3 Charging module**

The module has an output current and voltage display window.

Each module's autonomous output voltage is factory calibrated at 2.23  $6 \times 9$  (V) (DC110V systems). Modules can be plugged and unplugged for replacement without affecting system operation. If any module fails during operation, the system will issue a fault signal and the faulty module will automatically exit. The module output is connected to the DC bus via the busbar.

The module shall be capable of autonomous equalisation and reliable operation when the monitor is withdrawn from operation.

With over-voltage, over-current protection and automatic current limiting, alarm and other functions.

Module paralleling equalisation imbalance: $\leq 5\%$

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Ripple value:  $\leq 0.1\%$  (resistive load)

### **3.3.4 Digital display**

There are six digital meters on each charging screen: AC input voltage (can be switched between phases), DC output voltmeter, DC output ammeter, battery voltage, battery charging and discharging ammeter, and ripple meter. The digital table work power supply from the respective DC bus, and there are protection elements. The battery charge/discharge meter adopts five and a half digit meter, which can display two digits after the decimal point. Other meters can display one digit after the decimal point. The meter should be certified by the qualification unit recognised by the local electric power company.

### **3.3.5 Contact alarm function**

In addition to the monitoring device RS485 telemetry and telecommunication alarms, the following relay node alarm functions shall be available:

There are bus over-voltage and under-voltage relay alarm devices independent of the monitoring device (for DC110V system: over-voltage 125V, under-voltage 110V;), which do not affect the voltage abnormality alarm when the monitoring device is out of voltage or malfunctioning, and there is a pre-test function.

There are relay alarms for monitoring device failures.

Telemetry: control bus voltage, float charge current, battery voltage, each battery voltage, charge current, input AC three-phase voltage, DC screen battery temperature, feeder switch fault trip and other RS485 serial signals.

Signals: high-frequency switching power supply working status, battery fuse melting, charger and each subsidiary device (including module, monitoring unit, DC insulation detection, battery detection) failure, DC bus voltage abnormality, each section of the AC power supply failure (AC phase loss, AC undervoltage) delay 10 seconds alarm, lightning arrester breakdown, DC system insulation degradation and selection of wires, battery voltage abnormality (including single battery), feeder circuit breaker tripping (each feeder circuit breaker combined with a pay contact), etc. (including single battery overrun), feeder circuit breaker tripping (each feeder circuit breaker is combined into one pay contact), and so on. The above signals can be put into/out of operation through the monitor interface soft pressure plate. When a certain fault occurs, the soft pressure plate can be manually withdrawn from the monitor, and should not be sent to the telecommunication, but it does not affect the other fault signals sent to the telecommunication, and when the fault is recovered, the soft pressure plate will be put into operation automatically.

### **3.3.6 Monitoring systems**

#### **3.3.6.1 Real-time display, alarm; parameter setting and control functions.**

The monitoring system shall be able to start the whole DC system back to normal working condition after the station power is lost.

The monitor, regardless of the nature of the fault, shall not have the result of misadjustment of the module, false shutdown, refusal to alarm, etc., which affects the safe operation of the DC system.

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It can display the current and voltage of each module and the current and voltage of each meter.

3.3.6.2 The monitor pair has two communication ports and a USB port:

Communicate with the local backend machine via RS485/RS232 port, and the backend machine provides only one communication port;

Another communication port through 10/100BaseT (RJ-45), support TCP/IP protocol, can be convenient for on-site address setting, and at the same time, remote data transmission.

Party B provides the protocol and completes the communication with the upper computer. Ensure the implementation of the three remote (telecommunication, telemetry, remote control) function, factory shielding remote control function.

Transmission of telemetry see 5.5 monitor pair down with not less than 3 input interfaces and 3 alarm input empty contact, accept insulation monitoring device, battery monitor, inverter, etc. telecommunication and data transmission. The communication protocol is provided by the downstream equipment plant, and the upstream equipment completes the forwarding. (Specific transmission volume to be negotiated separately)

And have spare telecommunication, telemetry input interface.

The historical data of the monitor (including the voltage value of each single unit of the battery) can be downloaded through the USB interface.

3.3.6.3 Ability to collect DC insulation monitor ground resistance data at regular intervals

Record the daily positive and negative grounding resistance values, take a point every hour, plot the daily change of grounding resistance graph or curve, save 10 days of recording volume;

Record the lowest ground resistance value for each day, a little each day, and plot it on a graph or curve that can be used to see how the ground resistance has changed over the last month.

The received information can be output through the communication port.

3.3.6.4 It has the function of automatic battery charging management: it can automatically carry out the conversion of both floating and charging according to the test results, and it has the functions of charging procedure, long-term operation procedure, AC interruption recovery procedure, current limitation of battery charging, temperature compensation of floating charging voltage (the temperature probe must be installed in the same installation space of the battery), and equal charging in a regular time. And there are test (adjustment) means or records reflecting the existence of the above performance. And can set, modify and display the above parameters.

Normal charging procedure of valve-regulated sealed lead-acid battery pack (3 months a cycle): Charge with 0.1C10A constant current, the voltage reaches the set value of  $2.35V \times n$ , the charger automatically switches to constant voltage charging, when the charging current is gradually reduced to 0.01C10A, the microcomputer starts to time the charging of the battery, after charging 0.01C10A for 3h, the microcomputer controls the charging of the float charging device and automatically switches to the float charging state. operation with a voltage of  $2.25V \times n$ .

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Another condition for switching to equalisation: switching to equalisation capacity ratio, i.e. the monitoring module controls the system to equalise the battery when the battery capacity drops to a certain level. Capacity ratio = (existing capacity ÷ nominal capacity) × 100%, this value reflects the depth of battery discharge. The setting range is from 1 to 100%, usually set at 50 to 80%, and the setting is 80%.

Delayed alarm when charging current is greater than 0.01 C10A current during float charging state.

After 10 minutes of AC blackout, AC comes back to power, and the charger floats to even charging.

When the temperature of the battery picked up by the monitor > 45 degrees, turn to float charging. When the battery charging current in the range of 0.01C10A < I < 0.05C10A continue to maintain a certain value for 3 hours unchanged (change < 0.02C10A), turn to float charging.

When overvoltage occurs in a single cell, switch to float charging.

Temperature compensation shall be set to 0.003V/section (adjustable) for a total of 9 sections (adjustable), and the total compensation voltage shall be calculated automatically.

Current limiting function: The output current is limited by 105% of  $I_e$ , which is the rated output current of a single module. When a short-circuit occurs at the output terminal, the output current will be output according to the maximum current-limiting value, the output voltage will drop, and the voltage will return to normal automatically after the short-circuit disappears.

The input voltage of the HF module should be:

(1) Input over-voltage protection, with a shutdown alarm function when the input voltage is 1.2 $U_e$ , and should be automatically restored when the power grid is normal;

(2) Input undervoltage alarm, the monitoring device has an alarm function when the input voltage is 0.8 $U_e$ ;

(3) Output over-voltage protection, can be arbitrarily set by the monitoring system, the output over-voltage value is required to be set to 135V, after the output over-voltage, the shutdown alarm will be issued, and the module needs to be restarted and recovered;

(4) Output under-voltage protection, can be set arbitrarily by the monitoring system, the output under-voltage voltage value is required to be set at 100V, and the monitoring device shall alarm after the output is under-voltage.

3.3.6.5 Automatic and manual switching of equalisation/floatation can be achieved and can be put into/out of operation as required.

3.3.6.6 There are not less than 100 historical alarm messages that do not disappear after power down.

3.3.6.7 All parameter settings and clearing of fault logs must be confirmed by password.

3.3.6.8 Cancellation of the in-monitor discharge procedure.

### **3.3.7 Control busbar output continuous current**

The control busbar outputs a continuous current value of 40A.

### **3.3.8 Busbar voltage**

DC screen AC power loss, the battery gapless to the bus power supply, the implementation of automatic

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voltage regulation, the DC (control) bus voltage instantaneous fluctuations shall not be less than 90% of the nominal DC voltage.

### **3.3.9 Control of busbar voltage fluctuations during inrush current**

The control bus voltage shall fluctuate by no more than 10 per cent when the inrush current is supplied to the load, which is mainly supplied by the battery bank.

### **3.3.10 Feeder units**

The DC screen feeder has a total of 25 returns, including:

63A, 7-way;

40A, 1 way;

32A, 12-way;

16A, 3-way;

10A, 2-way.

Actual quantities will be determined by the design and construction drawings.

All circuits use circuit breakers with closing light indication, and the circuit breakers shall be equipped with fault alarm contacts.

DC switch type test report is provided with the screen.

### **3.3.11 Batteries and battery testing**

3.3.11.1 This DC system will be mated to a 200Ah (2V/cell) battery.

3.3.11.2 Battery fuses must be selected as DC fuses. For battery packs with capacity of 200Ah or below, the rated current of DC fuses shall be selected according to the one-hour rate discharge current of the battery.

The 200Ah battery fuse current rating is limited to 200A.

3.3.11.3 Battery requirements

Sealed lead-acid batteries are used, and the batteries should be able to be used normally under the condition of ambient temperature  $-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$ . Battery life: 10 years and above ( $25^{\circ}\text{C}$ ), provide type test report.

Battery voltage equalisation: the open circuit voltage difference between any two batteries in a group of batteries should be no more than 60mV. The operating voltage deviation of the float-charged battery pack should be  $\pm 50\text{mV}$ .

For imported batteries, the agent's certificate and the original imported product documents should be provided.

The manufacturer shall provide the product factory 10 hours rate full capacity test including (each section of the single voltage value).

The parameter values, characteristic curves and test reports to be provided for the storage batteries shall be implemented according to the requirements of the relevant documents of State Grid Power Corporation.

3.3.11.4 The DC screen is provided with a battery 80%  $U_e$  set of outgoing circuits, with the positive terminal coming from a set of battery 80% taps and connected to the output terminals via a DC air switch.

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80% DC air switches with a capacity of 25 A are positioned at the rear of the screen and the outputs are connected to the terminals.

3.3.11.5 A battery discharge switch 40A (200Ah) is provided at each charging panel.

3.3.11.6 Battery tester: it can measure the voltage and current of each battery at regular intervals, and the measured values shall be shown on the DC monitor display in serial number order and transmitted remotely.

Each battery screen has temperature sampling point.

### **3.3.12 Insulation monitoring**

With DC grounding line selection function, online detection of DC power system insulation. When the DC power system grounding or insulation level is lower than the specified value (can be adjusted), the insulation detection device should be reliable action, DC line selection device can be automatically selected which one road insulation defects, try to pull open the grounding line insulation alarm to return to normal judgement time should be less than 2 seconds, and displayed on the monitoring screen, record the event related parameters and timely remote transmission and alarm.

Insulation monitoring devices for testing the insulation of DC system branch circuits shall have the following functions:

Install detection sensors in all DC branch circuits and battery circuits, the sensors should be of the same batch, and the sensor signal wires must be accessed in sequential order.

The insulation monitoring branch number shall be marked at the same time in the centre below the corresponding switch (battery symbol) on the face of the DC screen.

All the factory technical data of insulation monitor (should have the inspection data of insulation monitor, sensor, etc. of the manufacturing factory) shall be shipped to Party A with the screen, with Party B's test conclusion reflecting the working condition of the component.

Display and record the grounding branch number, polarity, insulation resistance value (measurement error not greater than 10% of the set value) and time of occurrence.

Detect the insulation condition of DC bus positive pole and negative pole separately or simultaneously, display and record the polarity, resistance value and occurrence time of the grounding bus.

### **3.3.13 Monitor power supply, voltage sampling, etc., busbar lead units**

The monitor power supply, voltage sampling and other bus lead units should have protection units.

### **3.3.14 Pressure regulators**

Buck selection requirements for the silicon chain of the valve-controlled battery pack: 2.35V (2V/cell)×n-110.

The voltage regulator shall have both manual and automatic voltage regulation functions and shall maintain continuous power supply to the control bus.



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### 3.4 Technical requirements for AC station electrical panels

- (1) Input three-phase four-wire 380V/50Hz AC power supply two ways, automatic switching.
- (2) Outlet circuit as per drawing. All switches are Siemens 5SJ series products.
- (3) Electricity meter is installed in the cabinet, and a visual hole is opened on the door of the cabinet to view the reading of the electricity meter, and the junction box is installed in the cabinet door.
- (4) Latching power supply (WYKD-110/5A) is installed on the upper door panel.
- (5) Three-phase AC current, voltage and loss of voltage signals are uploaded to the comprehensive automation system through the DC screen, and the DC screen fault and AC loss of voltage signals should have hard contact outputs.
- (6) Configuration: as per the attached drawings and annexes.
- (7) For an AC system with two panels, the cabinet size of each panel (height× width× depth): 2360× 800× 600mm. Cabinet colour: RAL7035.

### 3.5 Process and reliability requirements

- (1) Expected indicators of system reliability: MTBF greater than 10 years
- (2) Shunt, battery fuse, busbar, etc. must take into account the load capacity of one hour discharge rate current of the matching battery to ensure that the system works reliably.
- (3) AC phases, DC positive and negative conductors shall be marked with different colours.
- (4) The DC output terminals are Weidmüller or Phoenix, mounted upright on the second side of the DC screen, with the terminal ports of the external cables connected to the inside of the screen, and taking into account the space required for mounting and fixing the cables against the side of the screen. Between each circuit with more visible isolation sheet isolation, in order to distinguish each circuit.

High-current output terminals should be considered for cable connection and fixing needs, with a height of >300mm above the ground.

Weidmüller or Phoenix terminals are used for the null contact output. Line troughs are provided on both sides of the DC screen.

- (5) Protective fuses for in-unit devices are centrally located for easy access.
- (6) The battery main fuse and the same terminal of the battery 80% tap shall be set adjacent to each other. +Distance between + and - (>30mm). Battery warning fuse with connector.

If the battery screen is provided, the maximum number of batteries in each layer of the screen is 2 batteries in front and back, the height of the layer according to the height of the battery to consider the need for battery measurement space, and to meet the battery group on the floor loading is not more than 8000N per square metre.

- (7) The requirements for on-line switching of DC air switches during operation can be met. The wiring of the air switches shall meet the principle of top-in/bottom-out and the polarity requirements.
- (8) Busbars and busbars are fitted with colour-coded insulating heat-shrinkable tubing, and there are no

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exposed copper rows.

(9) The location numbering of the components in the screen and the numbering of the components are consistent with the drawings, and the functions of all operable components are labelled in Chinese.

(10) The structure of the cabinet is safe and reliable; components, especially wearing parts, are installed for easy maintenance and dismantling; each component board should have a dustproof device; the insulation monitor and the lower part of the screen have isolation security measures; and the front glass door is followed by a heat dissipation door.

(11) Ventilation and heat dissipation shall be considered for screen equipment. The amount of ventilation should be ensured to dissipate the heat of the equipment under maximum load conditions.

The screen is made of grounded copper rows with a cross-section of not less than 100mm<sup>2</sup>. The equipment should have protective earthing.

(12) The power supply monitoring lamp shall be a low heat-generating LED indicator with a long-term operating voltage of 127V, arranged above the corresponding switch and not obviously offset from the corresponding switch, with the nameplate arranged below the switch.

(13) Screen drawing DC analogue diagram.

(14) The DC system has three panels, the cabinet size of each panel (height× width× depth): 2360× 800× 600mm. Cabinet colour: RAL7035.

#### **4 Technical Requirements for Inverter Power Supplies**

The capacity is 5kVA\*2. It adopts common AC and DC standby mode, AC can also be used as bypass, and has maintenance bypass and switch, maintenance bypass is used for the power supply when the inverter power module is moved out as a whole, the schematic drawing shall be confirmed by Party A.

Technical parameters:

DC input:	90-150V
AC Output:	220± 1% (V)
Output frequency:	50± 0.5% (HZ)
Output waveform distortion:	<1% (resistive load)
Overload capacity:	10 minutes at 120 per cent load
Switching time:	4 seconds

Other requirements such as voltage resistance and anti-interference must meet the requirements of the ministry regarding AC and DC power supply systems.

The operation of the control module must not be interfered with during and after switching the power gap.

Can provide alarm functions through hard contacts, alarm signals include DC input too high, too low, output overload, high temperature, switching status.

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Inputs include 4 switches (16A) and 2 service switches, outputs include 2 main switches and multiple sub-switches,, and the sub-switch should be automatically jumped on its own sub-switch in case of a short-circuit in the sub-circuit loads, and should not affect other outgoing wires.

## **5 Fault Recording Screen Technical Requirements**

(1) The fault recorder shall be digitally embedded, have a separate start-up element, and have the capability of outputting the information it records locally and transmitting it to a remote location.

(2) The fault recorder shall be reliably activated and start recording in the event of a system fault or oscillation.

(3) The fault recorder shall have an access circuit for an external starting contact.

(4) The fault recorder shall be capable of continuously recording multiple fault waveforms.

(5) The fault recorder shall have a ranging function with an error of less than 3 per cent.

(6) The fault recorder shall be able to record and save the electrical waveforms from at least 80ms before the fault to the end of the fault when the recording is stopped, with an optional sampling frequency of up to 10kHz for each analogue channel when 96 analogue channels are operating simultaneously.

(7) The fault recorder shall be able to provide a brief report of fault information after start-up, including: faulty component, fault type, start-up volume and fault ranging results.

(8) The resolution of the event volume recording element  $\leq 1\text{ms}$ , and the time of action shall be printable when recording.

(9) The memory of the local fault recorder system is not less than 256M, the hard disc is not less than 80GB, and the printer is equipped locally.

(10) The Party shall provide relevant software for analysing current and voltage waveforms to obtain data such as fault ranging, active power, reactive power and harmonics. The master software shall be able to run on WINDOW2000 platform and achieve multi-task operation, and can apply WINDOW2000's print management and dial-up network functions, with complete fault information remote transmission, analysis, archiving and processing functions, and the record format of the fault file shall be able to be converted into COMTRADE format.

(11) The fault recorder shall have sufficient signal indicators, alarm signals and event record output contacts.

(12) Fault recorders shall have timed detection and local and remote test functions.

(13) The terminals on the fault recorder cabinet shall be flame retardant, and the terminals shall be phoenix terminals with 2.5 mm<sup>2</sup> for current circuit wiring and 2.5 mm<sup>2</sup> for voltage circuit wiring. All electrical components, assemblies and the whole machine shall have high reliability and interchangeability.

(14) Fault recorder device adopts plug-in structure, each plug-in should be in good contact, reliable and durable, and have measures to prevent vibration off.

(15) The cabinet is illuminated.

(16) Main technical parameters and performance of the device:

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Analogue:	96 channels
Switching volume:	128 channels
Input Voltage:	110V DC, 220V AC.

(17) The voltage quantity is connected to the fault recorder through an air mini-switch. The power consumption of AC current circuit is not more than 0.5VA per phase, the rated value of AC current is 5A, and the overload multiplier is 20 times. The thermal stability of the input circuit meets the requirements of the line standard.

(18) The power consumption of the AC voltage circuit is not more than 0.5VA per phase and the AC voltage is rated at 100V.

(19) The power consumption of the DC power circuit is not more than 100VA, and the DC switch is a small DC air switch.

(20) In the event of large system disturbances such as short-circuit faults, system oscillations, frequency breakdowns and voltage breakdowns, the fault recorder device shall be capable of automatically recording the changes in electrical quantities during the whole process of the disturbance and the action behaviour of the protective devices. When the system dynamic process is terminated, the recording is automatically stopped.

(21) Analogue accuracy: 16-bit AD accuracy.

(22) Receive GPS satellite timing signals, including minute pulses, second pulses, IRIG-B format.

(23) Upon the Party's request, the Party shall use and be able to provide the 103 protocol for the remote transmission of data from the fault recorder.

(24) A communication box (TX-01) is installed in the cabinet, which has the function of interfacing with the remote transmission system.

(25) Cabinet external dimensions (H×W×D): 2360×800×600mm. Cabinet colour: RAL7035.

## 6 Substation Large LCD Technical Requirements

### 6.1 General technical requirements

(1) Real-time display of the electrical main wiring diagram of this substation, interface with the automation system, real-time display of the switching station operation status.

(2) Real-time display of year, month, day, hour, minute and wonderful.

(3) Real-time display of reactive power on incoming and outgoing lines.

(4) Real-time display of the number of days of safe operation.

(5) Real-time polling displays the video monitoring screen of the main landing station and substations.

### 6.2 Large LCD Types and Sizes

Large LCD display, tentatively 60".

## 7 Video Surveillance Technical Requirements

### 7.1 General

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This terminus and substations need to install high-definition infrared video cameras. 24-hour uninterrupted video surveillance, with video playback function. The key locations for installation are as follows:

115kV main drop station monitors 115kV main transformer room, GIS room, 22KV distribution room, capacitor room. Sub-station distribution station.

This video surveillance system needs to have the following features:

1) Real-time monitoring

All high-definition camera image quality can reach 1080P, the use of H.264 efficient coding technology, the use of high-speed monitoring and transmission network access system, high-definition images can be real-time display in the room, and can be motion high-speed ball camera control.

2) Remote Monitoring

For all high-definition images, internal network remote monitoring and operation control can be realised, and all computers accessing the network can monitor the images and operate and control the high-speed dome camera;

3) Data storage function

24-hour full HD video recording of all monitoring images and full recording of the system's work log, with all records kept for no less than 30 days;

4) Retrieval and backup of data information

The system is equipped with a data storage function for high video streams. Authorised users can retrieve the stored information and save a backup of the retrieved files.

5) Delegation of authority management

All users can be authorised, and different users can be given different permissions.

## 7.2 Compliance with standards

Code for Electrical Design of Civil Buildings JCJ/T 16-92

Public Security Industry Standard of the People's Republic of China GA38-92

Technical Specification for Civilian Closed-Circuit Monitoring System Engineering GB 50395-2007

Procedures and Requirements for Security Preventive Works GA/T 75-94

General Technical Conditions for Burglar Alarm Controllers GB12663-90

Technical Specification for Security and Safety Monitoring Engineering GA/T 76-96

Methods of Budgeting for Costs of Security Preventive Works GA/T 70-94

General Graphics and Symbols for Security Systems GA/T 74-1994

Alarm image signal wired transmission device GB/T16677-1996

Design Code for Industrial Television System Engineering GBJ115-87

Computer Software Development Code GB8566-88

General rules for communication fibre-optic cable series GB/T13993.1-92

Code for Acceptance of Security Systems GA308-2001

Technical Requirements for Video Security Monitoring Systems GA/T367-2001

Technical Specification for Security Engineering GB50348-2004

Series of Standards for Urban Monitoring and Alarm Networking System GA/T669-2008

General Security Technical Requirements for Information Security Technology Information Systems GB/T20271-2006

## 7.3 System Composition and Main Technical Index Design Planning

7.3.1 Main system components: monitoring front-end (infrared cameras), network layer and monitoring centre

1) Monitoring front-end

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Installation of infrared video cameras with Ethernet interface and 3 megapixels with night vision at the main landing station and sub-stations. 24-hour uninterrupted real-time monitoring of important equipment and monitoring of the operating status of equipment on the site and in the high-voltage power distribution room.

The use of pure digital monitoring system, the main trunk line using optical fibre transmission, in each monitoring centralised area in the placement of network switches, nearby monitoring equipment near access. Specific distribution points see each plant plan on the logo.

## 2) Network Layer

This total drop station and the substation to establish optical fibre cable communication between the high-performance Gigabit Ethernet switch communication. It establishes optical fibre ring network communication with the region one video network, and is relatively independent from the optical fibre network of the power system, without interfering with each other.

Choose a suitable location to place the local cabinet, the communication between the cabinet and the fibre optic ring switch uses optical cable, and the communication between the cabinet and the camera uses Category 6 Ethernet cable.

## 3) Monitoring Centre

The new energy 115kV total drop station is equipped with video monitoring main equipment (network DVR, video server, etc.). The video recording is not less than 30 days. By special graphic tools, real-time monitoring of front-end all substation images, data and alarms to complete the analysis, processing and segmentation of video images, these images can be uploaded to the 60-inch large LCD screen, but also through the network video playback.

The video streams of all camera images from the terminals and substations in this phase need to be transmitted and fed into the centralised control centre video system in CPA2.

### 7.3.2. Main technical indicators of the system

1) Video surveillance system model and video compression standards: video surveillance system needs to use digital network video surveillance technology model, video compression standards using H.264, independent network transmission system, video capture point using network cameras or network video servers combined with high-quality analog cameras, to achieve the whole process from monitoring the front-end, the monitoring centre, monitoring workstations, digital processing technology.

2) Front-end equipment features: front-end equipment using digital capture technology (network cameras) or digital-to-analogue conversion technology (network video servers)

Support H.264 compression standard, real-time image transmission, transmission in QCIF/CIF/4CIF/720P format can be up to 25fps (frame rate adjustable, adjustable range of 2 ~ 30 frames per second);

Support TCP/IP network protocol with 10/100 Base-T RJ45 network interface;

Network video transmission rate is maintained at 200kbps to 2048kbps (image compression rate is adjustable);

With VMD brake detection technology;

Supports remote control of the head and automatic focus adjustment;

Supports inputs and outputs of additional alarm sensors with alarm functions.

3) High-resolution video images: The system supports image resolution up to megapixels,

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high clarity, realistic colours, and image compression formats supporting MJPEG, MPEG4, MXPEG and H.264, in line with international standards, and frame rates up to 25fps or higher at high video resolutions. Real-time viewing and storage images are 1080P resolution (1920\*1080), and the image quality is rated according to the 5-level damage system or 4 or more points according to the 5-level quality system.

4) Support C/S and B/S two kinds of video surveillance mode: the system can support C/S and B/S two kinds of application mode, in order to improve the flexibility of the system application. B/S mode, the client can use the standard Web browser to access the various functions of the system, to achieve the maximum simplicity of the system installation, but also makes it easy for the user to access the system through the network, and at the same time to achieve the system's smooth and scalable. C/S mode is mainly for the use of duty personnel, with all the functions of B/S mode, based on the implementation of digital matrix and other advanced functions. C/S mode is mainly for duty personnel to use, with all the functions of B/S mode, on the basis of the realisation of digital matrix and other advanced functions.

5) Integrated video centralised management

Screen Recall: Select a camera from the Camera List or the Event List to view the screen of any camera from anywhere.

Quick View: You can quickly view the status of the camera at any moment of the day, and you can browse the pictures of a certain time period. The system can distinguish the time status of recording, warning and alarm by different colours.

Dual Stream: The system platform provides dual streams: one for real-time video viewing and one for recording, both of which do not affect each other.

Video Tags: Users can add a tag to important events for later access at any time during video playback. There is no limit to the number of tags that can be added.

6) Video image recording, video retrieval and video playback: Provide a variety of video recording mechanisms such as scheduled video, manual video and alarm video, users can develop different video recording strategies according to the actual needs of specific monitoring areas and locations. The system can record multiple cameras at the same time, the system automatically updates the video storage information on a regular basis, more than a certain capacity of data storage can provide additional data backup mechanism. Video records can be called at any time, and according to the user needs to fast-forward, slow playback or normal speed playback, you can drag the progress bar to select the playback. Video records can be edited, stored and deleted as needed.

7) Event Log: Support users to manage and query video information, alarm information and system information online. At the same time, the system automatically records actions such as alarm logs and video events into the database, and administrators are able to query and print user login information, alarm information and video data information in the management tool.

8) Monitoring information storage: all video information is managed and maintained by the general monitoring centre, and the video information is kept for at least 30 days.

### 7.3.3 Camera technical requirements

1) Full HD infrared all-in-one camera, providing HD picture quality with various coding. Adopt 3 million and above HD camera, can provide CIF,2CIF,4CIF,1080P and other kinds of picture quality of HD encoding ability, the highest can provide 1920\*1080 picture quality.

2) High-definition lenses. All selected cameras all use high-definition lenses, and ordinary lenses are different, high-definition lenses can reach 3 million physical resolution, to ensure that the camera to obtain the optical signal when clean, clean, no dispersion, no interference.

3) Single board design. Unlike ordinary IP cameras, it adopts direct communication between the image processing chip and the image encoding chip, getting rid of the traditional CVBS transmission method, so as to provide full HD images without crosstalk.

4) Efficient encoding method. The use of a unique video stream encoding method, in order to greatly reduce the bandwidth pressure of video transmission.

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5) Low power consumption fill light design. Adopt high brightness and low power consumption fill light to achieve high definition monitoring at night.

#### 7.4 Back-end systems Technical requirements

The back-end system mainly provides data decoding, display, storage and forwarding services. The whole system relies on the centralised control system network as the basis, and a large number of video streams from the front-end are transmitted to the back-end monitoring centre via LAN. The structure of the back-end monitoring centre is as follows:



The back-end monitoring centre, which can be simplified or extended for different needs, can meet the following functions:

- 1) Real-time preview function, providing real-time monitoring function for monitoring points and convenient screen division switching.
- 2) Operation control function, can be convenient to use the keyboard on the high-speed dome camera rotation zoom and other operations control.
- 3) Storage function, NVR host can achieve manual recording, scheduled recording and alarm recording function.
- 4) Search function that provides multiple ways to search, e.g., by time, by channel, by file, by type, etc.
- 5) Playback function, support pause, play, fast forward, precise positioning, hue adjustment and other playback functions.
- 6) Backup function, can specify the channel, file, time period, backup, provide local backup, mobile storage backup, network backup and other backup methods.
- 7) Through the network transmission to the back-end can be linked to the back-end alarm equipment for remote linkage alarm.

#### 7.5 System performance

- 1) System stability

Selection of stable and reliable NVR, long-term trouble-free operation time of more than 20,000 hours, embedded structure, there should be no power outages, viruses, worms, Trojan



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horses, misuse of the system failure.

2) System operation and control

Intelligent design facilitates the implementation of relevant operations, and the system monitoring centre facilitates all operations flexibly through the Ethernet network.

3) Network Streaming Technology

- Remote network real-time monitoring and video file download, query, playback, backup.
- Remote network PTZ lens control
- Remote alarm information reception and processing and system log viewing
- Multi-level password management, each computer on the network can only view the

corresponding image and video files according to the permissions

4) Multiple recording modes

- Video compression using H.264 fixed code stream, variable code stream and frame rate, support for 16-way video signal independent synchronous real-time compression, video, video synchronisation, absolutely no lag
- Manual video, timed video, alarm linkage video, dynamic detection video and other video modes, and has a pre-recorded function.

5) Playback and retrieval

- 96-channel video full real-time recording at the same time, can achieve single-channel playback
- Time-streaming design for fast retrieval
- Video search by channel, date and time, and alarm events
- Surveillance footage can be photographed and used as evidentiary material
- Multiple video playback modes: fast playback, slow playback, forward, backward, pause and frame-by-frame playback.

6) Security Management Function

- Multi-level user management, you can set different users with different permissions, for example, general users can only watch authorised cameras and videos, while administrative users can achieve more setup functions.
- Multi-password security control
- watermarking technology, which prevents images from being deleted and tampered with.
- Perfect log management, all the operations of the system are recorded, preventing and controlling the destructive operation of human beings.

## 7.6 User training

### 7.6.1 Purpose of training

It enables the owner to have a comprehensive understanding of the whole system, be familiar

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with the routine maintenance work, be capable of dealing with general problems, and eliminate failures caused by improper use or operation of the system and reduce the occurrence of sudden failures.

#### 7.6.2 Training content

The content of the training can be divided into two categories: operator-oriented and manager-oriented. The former focuses on practical operations, while the latter favours the overall system structure, functions and management.

#### 7.6.3 Training for operators includes, inter alia:

- Theoretically based principle structure of each subsystem;
- The role of the main equipment and devices installation location;
- Maintenance procedures and simple troubleshooting;
- As-built drawing access and modifications.

#### 7.6.4 The content of the training for managers includes, inter alia:

- The overall structure of the system and the relationship of the subsystems to each other;
- Setting and modification of important system parameters;
- Access to as-built drawings.

#### 7.6.5 Organisational management of the training process

- Develop training content and plans for each subsystem;
- Review and validate the training content and programme;
- Make necessary adjustments during implementation as required by the Owner.

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#### **IV Attachment**

**See annex.**

## V. Scale of information

Information volume statistics (by final capacity)

### 1 115kV total drop station statistics (to final)

#### 1.1 Analogue:

Three-phase current on 115kV side of main transformer	(3×2)
Three-phase current on 22kV side of main transformer	(3×2)
Three-phase current, active power, reactive power of 22kV side of main transformer	(5×2)
22KV busbar I and II section voltage (including line voltage, $3U_0$ , calculated phase voltage)	(4×2+3×2)
Main transformer oil temperature	(1 x 2)
22KV segmented three-phase current, active power, reactive power	(5×1)
22KV outgoing three-phase current, active power, reactive power	(5× 28)
22KV capacitor current, reactive power (total three-phase current, total reactive power, three-phase single-phase current)	(7×2)
22KV station transformer three-phase current	(3×2)
DC 110V bus voltage (data port communication to obtain charging current, battery pack voltage)	(3×1)
System frequency	(1 x 1)
Three-phase current, three-phase voltage (380V) on the low-voltage side of station transformer	(6×2)

#### 1.2 Digital quantities

##### 1.2.1 Amount of interruptions:

Total accident signal	(1 x 1)
Main transformer differential protection action	(1 x 2)
Main transformer heavy gas	(1 x 2)
Main transformer loaded with heavy gas	(1 x 2)
Main transformer overcurrent	(1 x 2)
Main transformer 115kV charging protection	(1×2)
Main transformer 115kV zero current	(1×2)
Main transformer protective relay failure	(1 x 2)
Main transformer 22KVI, II section zero current	(2×2)
22KV outgoing line protection action	(4×28)
22KV Outgoing Relay Failure	(1×2)
22KV busbar grounding	(1×2)
Capacitor protection action	(6× 2)
Main transformer high and low voltage side circuit breaker position signal (open and close)	(2×4)
22KV outgoing circuit breaker position signal (open and close)	(2×28)
Capacitor bank circuit breaker and capacitor group circuit breaker position signal (open and close)	(2×8)

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22KV sectionalised circuit breaker position signal (open and close) (2×1)

1.2.2 Non-interruptible quantities:

Circuit breaker, on-load remote control/local position signalling (1 x 39)

Main transformer overload signal (1 x 2)

Main transformer light gas (1×2)

High main transformer temperature (1 x 2)

Main transformer on-load light gas (1 x 2)

High main variable air pressure (1 x 2)

Main transformer low voltage side switchgear trolley position (1×2)

22KV outgoing line, capacitor, station transformer, sectional and sectional leads, pressure transformer trolley position (1×36)

Earthing knife position (22KV outgoing line, capacitor, station transformer, capacitor bank, 115kV side earthing switch, main transformer neutral point disconnecting switch) (1×48)

Main transformer tap position (17×2)

115kV switch sulphur hexafluoride gas pressure low alarm (1×2)

115kV switch sulphur hexafluoride gas pressure low blocking (1×2)

115kV other gas chamber sulphur hexafluoride gas pressure low alarm (1×2)

Temperature and humidity controller failure (1 x 38)

Voltage circuit disconnection (loss of voltage) (1×2)

Switch not stored energy (1 x 37)

MCB air switch trip (1×2)

Station power loss (1 x 1)

DC System Failure (1 x 1)

Fault Recording Recording Start (1 x 1)

Fault recording device failure (1 x 1)

Fault recording power-down alarm (1×1)

Station smoke and fire alarm and backup (10×1)

1.2.3 Switching outputs

Main transformer high-voltage side disconnecting switch (2×4)

Main transformer high and low voltage side circuit breaker (2×4)

22KV Outlet Circuit Breaker (2×28)

22KV sectional circuit breaker (2×1)

22KV capacitor and group circuit breaker (2×8)

Station Transformer Circuit Breaker (2×2)

Main transformer on-load voltage regulator tap (rising, falling) (2×2)

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Main transformer neutral point disconnecting switch (2×2)

1.2.4 Reset signalling

**2 substation statistics (provisional)**

**2.1 Analogue:**

22KV bus section I, II, III voltage (including line voltage, 3U<sub>0</sub>, calculated phase voltage) (4×2×6+3×2×6)

22KV high-voltage cabinet (including inlet, outlet and sectional) three-phase current, active power, reactive power (5× 80)

DC bus voltage (data port communication to obtain charging current, battery pack voltage (3×1)

System frequency (1 x 12)

**2.2 Digital quantities**

2.2.1 Amount of interruptions:

Total Accident Signal (1 x 12)

22KV high-voltage cabinets (including inlet, outlet, section) protection action (4×80)

22KV high-voltage cabinet (including inlet, outlet, section) relay failure (1×80)

22KV busbar grounding (1×12)

22KV high-voltage cabinet (including inlet, outlet, segment) circuit breaker position signal (open and close) (2×80)

2.2.2 Non-interruptible quantities:

Circuit breakers, trolleys, earth knives, spring unloaded energy storage, remote control, transformer gas, transformer high temperature (11× 80)

Voltage circuit disconnection (loss of voltage) (1×80)

MCB air switch trip (1 x 80)

DC System Failure (1 x 6)

2.2.3 Switching outputs

22KV Circuit Breaker (2×80)

2.2.4 Reset signalling

**VI Scope of supply**

serial number	Equipment name	Model Specification	quantities	unit (of measure)
<b>1</b>	<b>Comprehensive protection</b>			
<b>1.1</b>	<b>Main transformer protection screen</b>			
	RET541B	Main transformer differential protection		classifier for heavy objects, such as machines, TVs, computers; theater

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				performances
	REF541M	High Voltage Side High Backup Protection Measurement and Control		classifier for heavy objects, such as machines, TVs, computers; theater performances
	REF541M	High Voltage Low Backup Protection Measurement and Control		classifier for heavy objects, such as machines, TVs, computers; theater performances
	WXD2361	Measurement and control devices		classifier for heavy objects, such as machines, TVs, computers; theater performances
	WXD-8	Protective screen 2260*800*600		top
<b>1.2</b>	<b>22KV protection decentralised installation</b>			
	RE_615	High voltage cabinet protection		classifier for heavy objects, such as machines, TVs, computers; theater performances
<b>1.3</b>	<b>Decentralised installation of substation protection</b>			
	RE_615	High voltage cabinet protection		classifier for heavy objects, such as machines, TVs, computers; theater performances
<b>2</b>	<b>Fault Recording Screen</b>			
	DRL-600	Guodian Nanshi Fault Recorder		classifier for heavy objects, such as machines, TVs, computers; theater performances
	LQ-300K	EPSON Needle Printer		classifier for heavy objects, such as machines, TVs, computers; theater performances
	WXD-8	Protective screen 2260*800*600		classifier for heavy objects, such as machines, TVs, computers; theater

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				performances
3	DC screen	Set of 3 screens		interleave
4	AC screen	Set of 2 screens		interleave
5	<b>Integrated automated communications equipment list</b>			
5.1	<b>Equipment in centralised control stations</b>			
5.1.1	<b>Monitoring equipment (mounted in communication screens)</b>			
	monitoring server	RAID1 server		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Monitoring Workstation	DELL Surveillance Workstation Monitor		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Monitoring system PSA+	PSA+ system		interleave
	Monitoring server operating systems	windows server 2012 R2		interleave
	Monitor workstation operating systems	Windows 7 Flagship		interleave
	communications manager	Communication with new energy back-office systems		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Gigabit fibre optic ring switches	4Light 24 Electricity (Roger Kang)		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Fibre optic terminal box	Fibre optic terminal box 24 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	fibre optic pigtail	Single mode ST		roots
	fibre optic patch cord	Single mode ST		roots



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5.1.2	ST Coupler	ST-ST		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic cable splicing	By number of fibre cores		lamp pith
	Graphic cards for video display	DVI Graphics Card		lump (of earth)
	DVI/HDMI Adapter Cable	New energy in the centralised control of the monitoring screen output to the big screen		interleave
	Screens and Accessories	WXD100 (2200*800*600)		interleave
	<b>Configuration and commissioning services</b>			
	Statute processing	Development of communication protocols with new energy back-office		interleave
	<b>Centralised control incremental configuration debugging</b>			
	Incremental docking services	Docking service between centralised control and new energy system. Debugging with new energy master drop, DS1, DS2, DS3, DS4, DS5, DS6 configuration.		interleave
	Centralised control incremental configuration debugging	Centralised control incremental configuration debugging. Configuration debugging with new energy total drop, DS1, DS2, DS3, DS4, DS5, DS6		interleave
	<b>Area 1 incremental configuration debugging</b>			
	Incremental docking services	Region I and new energy system docking services. Debugging with new energy general drop, DS1, DS2, DS3, DS4, DS5, DS6 configuration		interleave

Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

<b>5.1.3</b>	Centralised control incremental configuration debugging	Region 1 incremental configuration debugging. Configuration commissioning with new energy total drop, DS1, DS2, DS3, DS4, DS5, DS6		interleave
	<b>Newsletter Annexes</b>			
	fibre-optic cable	8-pole single-mode, connection to new energy master drop station		surname Mi
	Ethernet cable	Ethernet cable 300m		interleave
<b>5.2</b>	<b>Terminal equipment</b>			
<b>5.2.1</b>	<b>monitoring computer</b>			
	monitoring server	RAID1 server		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Monitoring Workstation	L Monitor Workstation Monitor		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Monitoring system PSA+	PSA+ system		interleave
	Monitoring server operating systems	windows server 2012 R2		interleave
	Monitor workstation operating systems	Windows 7 Flagship		interleave
	pinprinter	EPSON Needle Printer		classifier for heavy objects, such as machines, TVs, computers; theater performances
	laser colour printer	HP Laser Colour A4		classifier for heavy objects, such as machines, TVs, computers; theater performances
	large display	60 large LCD display		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Operating desk (with 6 chairs)	Steel and wood construction (3+3)		interleave

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5.2.2		workstations		
	<b>Communication Control Panel</b>			
	GPS Satellite Clock	GPS satellite synchronised clock with SNTP support		classifier for heavy objects, such as machines, TVs, computers; theater performances
	measurement and control unit	Not less than 72DI,20DO,12AI per unit		classifier for heavy objects, such as machines, TVs, computers; theater performances
	16-port communication manager	16-port communications manager with support for protocol handling and protocol conversion		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Ethernet switch	24-port Ethernet switch		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Photoelectric converter	Single Mode Fibre Converter		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic terminal box	Fibre optic terminal box 24 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	fibre optic pigtail	Single mode ST		roots
	fibre optic patch cord	Single mode ST		roots
	ST Coupler	ST-ST		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic cable splicing	By number of fibre cores		lamp pith
	Screens and Accessories	WXD100 (2200*800*600)		interleave
	5.2.3	<b>telecontrol screen</b>		
	telecontrol unit	Communication with the Area I system and the centralised control system		classifier for heavy objects, such as machines, TVs, computers; theater performances

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5.2.4	telecontrol unit	Reserve the interface with the power dispatching communication network		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Gigabit fibre optic ring switches	4Light 24 Electricity (Roger Kang)		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Fibre optic terminal box	Fibre optic terminal box 24 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	fibre optic pigtail	Single mode ST		roots
	fibre optic patch cord	Single mode ST		radical (chemistry)
	ST Coupler	ST-ST		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic cable splicing	By number of fibre cores		lamp pith
	Screens and Accessories	WXD100 (2200*800*600)		interleave
	<b>Inverter power panels</b>			
	inverter	5kVA		classifier for heavy objects, such as machines, TVs, computers; theater performances
Screens and Accessories	WXD100 (2200*800*600)		interleave	
5.2.5	<b>Newsletter Annexes</b>			
	fibre-optic cable	8-pole single-mode, connection to centralised control station		surname Mi
	bridge	Hot-dip galvanised channel bridge (with cover), 150*100mm		surname Mi
	Station communication cables	RVVP2*0.75		surname Mi
	multimode fibre			surname Mi
	ABB RER103	ABB Optical Converters Communication Isolation Modules		classifier for birds and certain animals,

Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

5.2.6				one of a pair, some utensils, vessels etc
	RS422 Optical Converter	Backend 115kV end photoconverter		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Ethernet cable	Category 6 Ethernet cable		surname Mi
	<b>Configuration and commissioning services</b>			
	Local configuration and commissioning	Local back-office communication and configuration debugging		vice-
	Remote configuration and commissioning	Remote communication and configuration debugging		vice-
	Statute processing referrals	Statute development with region I and centralised back office		vice-
	Statute Development Commissioning	Reserve for debugging of statute development with power dispatching		vice-
	Docking services with region I	In situ back-office interfacing services with the Region One system		vice-
	Docking services with centralised control	In situ back-office and centralised control system interface services		vice-
<b>6</b>	<b>List of video system equipment</b>			
6.1	<b>Video pooling equipment (installed at the central control station)</b>			
	Video surveillance host	Surveillance mainframe and monitor (high end)		classifier for heavy objects, such as machines, TVs, computers; theater performances
	HDMI Graphics Card	Output to the screen system		lump (of earth)
	Video HD Decoder	Docking with splicing screen HD matrix (high end)		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Video management software	Video platform management software (high end)		classifier for heavy objects, such as machines, TVs, computers; theater performances

Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

	Centralised control with video linkage	Centralised control system and video screen video debugging and development		interleave
	10 Gigabit Fibre Ring Switches	40 Gigabit optical 24 Gigabit		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Fibre optic terminal box	Fibre optic terminal box 24 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	fibre optic pigtail	Single mode ST		roots
	fibre optic patch cord	Single mode ST		roots
	ST Coupler	ST-ST		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic cable splicing	By number of fibre cores		lamp pith
	Ethernet cable	Category 6 Ethernet cable		surname Mi
	Video Communication Cable	8-pole single-mode, connection to new energy master drop station		surname Mi
	switching mode power supply	DC12V 30A		classifier for individual things or people, general, catch-all classifier
	Bidirectional IP network system software package	Bi-directional IP network system software package (with PC sub-control software)		interleave
	IP network paging microphone	IP network paging microphone		classifier for heavy objects, such as machines, TVs, computers; theater performances
	uninterruptible power supply	Uninterruptible power supply 5kVA		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Video screens and accessories	WXD100 (2200*800*800)		interleave

Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

	Video communication debugging	Field communication debugging		interleave
<b>6.2</b>	<b>Terminal station equipment</b>			
<b>6.2.1</b>	<b>Mainframe and network equipment</b>			
	Video surveillance host	Video surveillance mainframe and monitor		classifier for heavy objects, such as machines, TVs, computers; theater performances
	hard disc recorder (DVR)	Network DVR 256 inputs		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Dedicated Hard Drives for Surveillance	Seagate Surveillance Grade 6T		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	10 Gigabit Fibre Ring Switches	40 Gigabit optical 24 Gigabit		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Photoelectric converter	Single Mode Optical Converters		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic terminal box	Fibre optic terminal box 24 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	fibre optic pigtail	Single mode ST		roots
	fibre optic patch cord	Single mode ST		roots
	ST Coupler	ST-ST		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Fibre optic cable splicing	By number of fibre cores		lamp pith
	Ethernet cable	Category 6 Ethernet cable		surname Mi
	switching mode power supply	DC12V 30A		classifier for individual things or people, general, catch-all classifier

Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

	Video Communication Cable	8-pole single-mode, connection to centralised control station		surname Mi
	Bidirectional IP network system software package	Bi-directional IP network system software package (with PC sub-control software)		interleave
	IP network paging microphone	IP network paging microphone		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Video screens and accessories	WXD100 (2200*800*800)		interleave
<b>6.2.2</b>	<b>Camera Body</b>			
	115kV GIS room camera	Digital HD Infrared All-in-One Gun Camera		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	22KV Switchgear Room Camera	Digital HD Infrared All-in-One Gun Camera		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Dominant Variable Camera	Digital HD Infrared All-in-One Gun Camera		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Capacitor Camera	Digital HD Infrared All-in-One Gun Camera		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	video dome	Digital HD Infrared Dome		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Camera bracket	All-in-one stand		classifier for individual things or people, general, catch-all classifier
	Wall mounted cabinet for video screen equipment	Camera local power and communication cabinets		interleave
	Photoelectric converter	Single Mode Optical Converters		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	Ethernet switch	Gigabit Ethernet switch 24 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc



Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

	fibre optic pigtail	Single mode ST		roots
	fibre optic patch cord	Single mode ST		roots
	Fibre optic terminal box	Fibre optic terminal box 8 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	ST Coupler	ST Coupler		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	switching mode power supply	DC12V 30A		classifier for individual things or people, general, catch-all classifier
	Video Communication Cable	4-pole single mode		surname Mi
	Fibre optic cable splicing	By number of fibre cores		lamp pith
	Cabinet Power Cord	RVVP3*2.0		surname Mi
	Camera Power Cord	RVVP2*1.0		surname Mi
	Camera communication cable	Category 6 Ethernet cable		surname Mi
	<b>IP intercom and temperature and humidity equipment</b>			
	IP Digital Intercom Wall Panel	IP Digital Intercom Wall Panel		classifier for individual things or people, general, catch-all classifier
	power cable (of an appliance etc)	RVVP3*2.0		surname Mi
	Network Temperature and Humidity Meter	Network Temperature and Humidity Meter		classifier for individual things or people, general, catch-all classifier
	Ethernet switch	High performance Ethernet switch 16 ports		classifier for birds and certain animals, one of a pair, some utensils, vessels etc
	communications manager	Communication manager (temperature and humidity meter communication)		classifier for heavy objects, such as machines, TVs, computers; theater performances
	Wall mounted cabinets	Local power and communication cabinets		interleave

Microcomputer protection, integrated automation, AC and DC panels and fault recording panels technical requirements

	<b>Mounting accessories</b>			
	Mounting accessories	PVC pipe and grounding accessories (including video, IP intercom and temperature and humidity accessories)		interleave
	Installation and commissioning	On-site installation and commissioning		interleave

# 微机保护、综合自动化、交直流屏及故障 录波屏技术要求

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## 一 变电站概况

见工程内容说明

## 二 总则

### 1 执行标准

所提供的装置必须符合到货日期止有效的下列国家标准：

GB191	包装储运图示标志
GB/T1360	印刷电路网络
GB/T2423.1	电工电子产品基本环境试验规程 试验 A：低温试验方法
GB/T2423.2	电工电子产品基本环境试验规程 试验 A：高温试验方法
GB/T2423.9	电工电子产品基本环境试验规程 试验 Cb：设备用恒定湿热试验方法
GB/T2681	电工成套装置中的导线颜色
GB/T2887	电子计算机场地通用规范
GB/T2900.1	电工术语 基本术语
GB/T2900.17	电工术语 电气继电器
GB/T2900.49	电工术语 电力系统保护
GB4208	外壳防护等级（IP 代码）
GB/T4798.2	电工电子产品应用环境条件 运输
GB/T7261	继电器及继电保护装置的基本试验方法
GB/T9361	计算站场地安全要求
GB/T11287	电气继电器 第 21 部分：量度继电器和保护装置的振动、冲击、碰撞和地震试验

#### 第 1 篇：振动试验（正弦）

GB/T13384	机电产品包装通用技术条件
GB/T14537	量度继电器和保护装置的冲击与碰撞试验
GB/T14598.9	电气继电器 第 22 部分：量度继电器和保护装置的电气干扰试验 第 3 篇：辐射 电磁场干扰试验
GB/T14598.13	量度继电器和保护装置的电气干扰试验 第 1 部分：1MHz 脉冲群干扰试验
GB/T14598.14	量度继电器和保护装置的电气干扰试验 第 2 部分：静电放电试验

GB16836	量度继电器和保护装置安全设计的一般要求
GB14285	继电保护和安全自动装置技术规程
DL/T667	远动设备及系统 第 5 部分：传输规约 第 103 篇 继电保护设备信息接口配套标准
DL/T478	静态继电保护及安全自动装置通用技术条件
DL/T769	电力系统微机继电保护技术导则
GB/6162	静态继电器及保护装置的电气干扰试验
JB5777.2	电力系统二次电路用控制及继电保护屏（柜、台）通用技术条件
DL/T 724	《电力系统用蓄电池直流装置运行与维护技术规程》
DL/T 637	《阀控式密封铅酸蓄电池订货技术条件》
DL/T 459	《电力系统直流电源柜订货技术条件》
GB3859.1	《半导体电力变流器》
GB4942.2	《低压电器外壳防护等级》
GB/T 17626.2	《电磁兼容 试验和测试技术 静电》
GB1984	《交流高压断路器》
DL402	《交流高压断路器》

## 2 环境条件

### 1.1.2 一般工况

高度（海拔）：	1000 米；
最大月平均相对湿度：	90%；
最高环境温度：	55℃；
最低环境温度：	-10℃；
日气温最大变化：	25℃；
抗地震能力：	七级烈度。

## 3 额定值

CT 交流电流：	5A；
PT 交流电压：	100V、100/√3；
频率：	50HZ；



直流电源：                    110V。

#### 4 乙方职责

- (1) 提供图纸，制造和质量保证过程的一览表，试验和检验的标准，包括试验调试报告的试验数据，以及标书规定的其他资料。
- (2) 如标准、规范与本技术协议有明显的冲突，则乙方应在制造设备前，用书面形式将冲突和解决办法告知甲方，并经甲方确认后，才能进行设备制造。
- (3) 整套变电站自动化系统及配套设施（包括光纤或电缆）的设计、制造、工厂试验、包装运输、铺设、工厂及现场验收、调试和运行的技术服务。
- (4) 负责变电站自动化系统的参数设计、数据库和画面生成、编制符合甲方要求的信息表。
- (5) 在合同签订 15 天内，乙方指定一名项目负责人，负责联络、组织、协调。
- (6) 提供所有设备的设计、制造、安装及使用方面的说明书。
- (7) 提供型式试验和常规试验数据，以便确认供货设备能否满足所有的性能要求。
- (8) 承担与甲方设计、施工及用户单位的配合指导和负责整个供货设备的系统联调。
- (9) 在现场调试过程中根据甲方要求对系统用户界面进行修改调整。
- (10) 乙方应提供易损的备品备件（乙方保存）及系统原始备份。
- (11) 对甲方人员的培训和保证期内的维修服务。
- (12) 乙方负责提供软件的免费升级。

#### 5 甲方职责

- (1) 甲方负责对泰国金鹭工业园区 115KV 变电站工程自动化系统工程进行验收。
- (2) 甲方负责向乙方提供本期自动化系统向有关调度主站系统通信的文本资料，包括：调度主站到厂站端的通信规约文本、通道参数、遥测遥信发送表、遥控表等；
- (3) 甲方负责向乙方提供保护继电器等智能设备与自动化系统的接口参数。
- (4) 甲方在乙方的配合下，负责自动化设备的安装，并负责提供现场设备与自动化设备之间连接的信号与控制电缆（特定的合同约定由乙方提供的除外）；乙方调试期间，甲方应给予积极配合，涉及到与一次设备相关的操作由甲方负责。
- (5) 在合同签订 15 天内，甲方指定一至二名项目负责人，负责 联络、组织、协调。并指定专人配合乙方人员现场调试和以后的维护。
- (6) 甲方与乙方共同制订工程实施方案，甲方应尽量按照工程方案的要求，配合调试计划的

实施。

(7) 甲方负责向乙方提供变电站一次接线图，画面和报表的种类、格式等。

(8) 自签定具体变电站协议起，第 2、3 条资料内容在半个月内，第 7 条在一个月由甲方向乙方提供，以免造成工期的延误，确保工程顺利进行。

(9) 在涉及第三方厂家产品时，甲方负责提供其硬件和软件及通信规约的接口资料，在乙方与第三方厂家出现难以协调的事情时，负责协调乙方与第三方的具体工作。

(10) 为了保护甲方、乙方的知识产权，甲乙双方都应对本协议内容及乙方的产品保密。

## 6 图纸资料及提交进度

(1) 乙方向甲方提供要认可的全部图纸和解释材料（图纸包括系统结构示意图、机柜组屏图、通讯链路图、信息量接入示意图），并在 FAT 一周前提供设备说明书。通讯链路图是指结合甲方提供的开关柜布置图明确通讯接口设备的安放位置及通讯链路（相关保护设备的通讯串）构成，信息量接入图指结合甲方提供的信息量表画出系统相关的遥测、遥信、遥控、电度、智能设备等信息的物理接口端子示意。

(2) 为了加快项目的设计和建设进度，在甲方和乙方之间举行设计联络会议。

在设计联络会议中，完成以下几项工作：

- a) 甲方介绍变电站详细布置情况，变电站综合自动化系统设备安装外部条件。
- b) 乙方详细介绍综合自动化系统产品的功能。
- c) 讨论需确认的问题。乙方详细说明不能满足技术规范书之处，并与甲方加以讨论。综合自动化系统提供的软件及甲方提供的信息表、人机界面内画面及报表清单在设计联络会时确定。
- d) 乙方对提供图纸中不明确之处加以说明。
- e) 在要求确认的资料上双方签名认可。

(3) 工厂培训及 FAT（工厂验收）

乙方提供培训计划及 FAT 验收大纲供甲方确认，甲方组织工厂培训及 FAT 验收。

(4) 现场调试及 SAT（现场验收）

乙方提供现场调试、培训、指导及服务计划及项目，供甲方确认。

(5) 质保期

乙方应提供质保期为投运之日起 24 个月。乙方需终身保证 24 小时内响应服务及 48 小时内完成故障处理，系统恢复正常。

### 三 变电站供货设备技术要求

#### 1 变电站微机保护装置技术要求

本节技术要求适用于 115kV 总降站。

##### 1.1 保护总的技术要求

1.1.1 本节中所提的要求，适用于每一套装置及其间配合的要求。同时，每一装置还应分别满足其具体要求。

##### 1.1.2 装置温度特性

装置工作环境温度在 $-10^{\circ}\text{C}\sim+45^{\circ}\text{C}$ 时，装置应能满足规定的精度。

装置工作环境温度在 $-20^{\circ}\text{C}\sim+55^{\circ}\text{C}$ 时，装置应能正常工作。

1.1.3 在雷击过电压，一次回路操作、开关场故障及其它强干扰作用下；在二次回路操作干扰下，装置包括测量元件，不应误动和拒动。装置高频干扰试验，辐射电磁场干扰试验和冲击电压试验和绝缘试验应符合标准要求。

1.1.4 保护装置应能适用于 P 型或复合型电流互感器。

1.1.5 保护装置出口回路、主要电路、装置异常及直流电源消失等应有经常监视及自诊断功能，如特性不正常时应能起动作告警信号、远动信号等。

1.1.6 各装置的逻辑回路应由独立的直流变换器供电，直流电压消失时，装置不应误动，同时应有输出接点以起动作告警信号；直流电压缓慢上升至 80% 额定值时，装置应能正确动作。

电源电压在 80~115% 额定值范围内变化时，装置应正确工作。

纹波系数 $\leq 5\%$ 时，装置应正确工作。

电源以及插拔熔丝发生重复击穿火花时，装置不应误动作，直流电源回路出现各种异常情况（如短路、断线、接地等）时装置不应误动作。应具有直流快速小开关，与装置安装在同一柜上。

1.1.7 装置中任一元件损坏时，装置不应误动作。

1.1.8 跳闸出口回路采用有接点继电器，应保证断路器可靠跳闸。装置的跳闸出口接点应满足运行要求。

1.1.9 保护的总出口跳闸继电器和装置开关量输入光耦最低动作电压应在 50%~70% 直流电源电压之间。

1.1.10 各装置中的时间元件的误差，在本技术条件下应 $<3\%$ 整定值。

- 1.1.11 保护柜中的插件应接触可靠，并且有良好的互换性，以便检修时能迅速更换。
- 1.1.12 每套保护如有特殊附件应予提供。跳闸及起动和闭锁重合闸等连接回路应有试验部件或连接片，以便在运行中分别断开。
- 1.1.13 装置应有足够输出的独立接点供中央信号、站内监控、事件记录等需要。
- 1.1.14 保护装置、保护柜之间，保护柜与通信机柜或其它设备之间应采用光电耦合或继电器接点进行连接，不应有电的直接联系，影响保护动作行为的光电耦合回路需并联抗干扰电阻。
- 1.1.15 保护系统功能和配置要求：线路保护装置在保护范围内发生金属性和非金属性的各种故障（包括单相接地、两相接地、两相不接地短路、三相短路及复合故障、转换性故障等）时，保护应能正确动作。保护范围外发生金属性和非金属性故障时，装置不应误动；此外，在外部故障切除、故障转换及系统操作等情况下，保护也不应误动作。在由高压直流输电设备和变压器（励磁涌流）等所产生的稳态和暂态的谐波分量和直流分量的影响下，保护装置包括测量元件不应误动作或拒动。
- 1.1.16 装置各整定值应能安全，方便地更改。
- 1.1.17 保护装置应有故障录波功能。
- 1.1.18 保护装置应提供可同 PC 机连接的标准通信端口，使用户可以通过 PC 机调试、监控保护装置。己方应提供 PC 机同保护装置相连的联接件和调试软件。
- 1.1.19 本站采用综合自动化，其保护装置应能接收站内统一的 GPS 卫星对时信号，同步对时方式可采用 STNP、秒脉冲、分脉冲及串行口对时。保护装置的时间同步准确度 $\leq 10\text{ms}$ 。
- 1.1.20 保护装置应提供标准的通信接口（RS-485 口 1 个），提供接入配合工作。
- 1.1.21 综合自动化的变电站采用测控合一的保护装置。模拟量测量精度要求：误差 $\leq 0.5\%$ 。
- 1.1.22 保护装置中的各保护功能应能通过外回路或软件单独投退。

## 1.2 继电保护装置配置技术规范

115kV及主变压器的保护系统应符合保护和测控分开配置的原则，各间隔的保护系统和测控系统在电气上相互独立，确保故障时保护系统与控制系统之间不会相互影响。115kV及主变的保护系统和测控系统应分别集中组屏安装。22KV的保护控制系统应符合保护和测控一体化的配置方案，所有22KV的保护控制都分散安装于就地开关柜上。

### 1.2.1 主变保护配置

115kV变压器保护设置以下保护功能：

- ◇ 变压器差动保护 87T；

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- ◇ 高压侧过电流保护 50/51;
- ◇ 高压侧复合电压闭锁过电流保护 51V;
- ◇ 低压侧复合电压闭锁过电流保护 51V;
- ◇ 变压器过负荷保护 49;
- ◇ 低电压保护 27;
- ◇ 过电压保护 59;
- ◇ 零序电流、电压保护 50/51N, 59N
- ◇ 间隙零序电流、电压保护 50/51N, 59N
- ◇ 非电量保护: 本体重瓦斯保护、调压重瓦斯保护、压力释放阀, 上述可选择分别作用于主变二侧开关跳闸或发信号(告警量)
- ◇ 非电量保护: 本体轻瓦斯、调压箱轻瓦斯、过负荷、主变油温过高、油位异常经延时作为告警量发信

该保护装置除实现以上保护功能外, 其他的技术参数要求有:

- ◇ 差动保护动作快速, 带制动的差动保护动作时间应不大于 25ms;
- ◇ 能自动适应不同变比及矢量组补偿;
- ◇ 能实现变压器有载调压开关的自动调节;
- ◇ 变压器保护应可通过 BCD 码输入方式实时采集变压器分接头档位信息, 并可采取相应算法跟踪变压器模型 CT 变比变化, 自适应调整差动保护功能, 提高差动保护的灵敏性。
- ◇ 涌流制动利用二次谐波和波形判别原理;
- ◇ 过励磁时的励磁涌流制动利用五次谐波原理;
- ◇ 自适应的闭锁功能, 在系统恢复性涌流和外部故障 CT 饱和时应可靠闭锁差动保护;
- ◇ 应能非常灵敏地反映绕组内部匝间故障;
- ◇ 装置应具有强大的连续在线自检功能;
- ◇ 二次系统监视功能应包含 CT 回路监视和 PT 熔丝断线监视;

- ◇ 装置应配置 LCD 显示屏，可显示事件和其他测量数据等；
- ◇ 装置应具有不少于 8 个 LED 指示灯，可显示装置不同动作信息或报警信息；
- ◇ 装置应具有事件记录功能，可记录不少于 100 条事件，且事件时标精度可达到 1ms；
- ◇ 装置要求至少带 40 个输入和 20 个输出继电器信号。输入信号需带接点抖动鉴别功能；
  
- ◇ 故障录波功能应能涵盖所有的模拟量输入和开关量输入/输出信号，应可记录至少 50 个故障录波报告；

### 1.2.2 测控装置配置技术规范

115kV 部分应配置单独的测控装置、22KV 所采用的保护测控装置应满足下列测控功能的要求：

#### 1) 遥控部分：

- ◇ 主变 115kV 侧断路器、隔离开关、中性点隔离开关、电动接地开关及 22KV 侧断路器分合闸；

  - ◇ 115kV 线路断路器、隔离开关、电动接地开关分合闸；
  - ◇ 115kV 分段断路器、隔离开关、电动接地开关分合闸；
  - ◇ 22kV 开关柜断路器分合闸；

#### 2) 遥测部分：

- ◇ 主变压器：各侧电流、有功功率、无功功率、线圈温度、油温
- ◇ 线路：电流、有功功率、无功功率
- ◇ 母线：电压、频率
- ◇ 分段 / 母联：电流
- ◇ 静态补偿装置：电流、无功功率
- ◇ 直流系统：蓄电池正反向电流、蓄电池电压、充电器进线电流和电压、直流母线电压、直流系统正对地电压、直流系统负对地电压。

#### 3) 遥信部分

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- ◇ 所有高压断路器位置（双位）
- ◇ 所有隔离开关位置（双位）、接地刀闸位置（双位）
- ◇ 直流主回路开关位置
- ◇ 保护动作总信号
- ◇ 事故信号
- ◇ 就地 / 远方转换开关位置
- ◇ 断路器操作机构异常信号
- ◇ 控制回路断线信号
- ◇ 保护报警信号
- ◇ 保护装置故障信号
- ◇ 设备本体异常信号
- ◇ 自动装置异常信号
- ◇ 直流系统异常信号

#### 1.2.2.1 115kV 及主变测控装置

115kV及主变测控装置按照间隔分别配置，包括115kV线路、内桥及主变测控装置等，基本要求如下：

- ◇ 采取严格的间隔单元化、整体化装置方式，以提高装置抗干扰性能和屏体内简洁布置，采集 115kV 每个间隔三相全电量，实现遥测、遥控、遥信、遥脉功能；
- ◇ 显示功能：具有大屏幕液晶显示器，显示被保护对象的实时运行参数，包括模拟量及开关量信息，显示单间隔断路器运行状态图，并可以特殊符号显示当前装置联锁状态（被闭锁）；
- ◇ 装置应具有不少于 8 个 LED 指示灯，可显示装置的不同动作信息或报警信息；
- ◇ 每个监控装置应除遥控功能依赖通讯网外，遥测、遥信、事故报警、记录功能可完全不依赖通讯网络和计算机；

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◇ 测控装置应具有同期检测功能，确保断路器仅在两侧电压同期或至少有一侧线路无压的前提下安全合闸；

◇ 装置应可通过符合 IEC61131 标准的编程工具进行逻辑编程，实现本间隔联锁功能；

◇ 装置前面板应具有就地/远方控制的切换按钮，且具有就地控制的分/合闸按钮；

◇ 监控装置要求具有监测和显示三相电流、电压、功率因数、频率、电度等电气参数的功能；

◇ 装置应具有事件记录功能，可记录不少于 100 条事件，且事件时标精度可达到 1ms；

#### 1.2.2.2 22kV 测控装置

22kV不设置独立的测控装置，测控功能应在保护装置中实现。

#### 1.2.3 22kV线路保护配置

22kV出线设置以下保护功能：

◇ 三相电流速断保护 50；

◇ 三相过电流保护 51；

◇ 零序过电流保护 51N；

◇ 低电压保护 27；

该保护装置除实现以上保护功能外，其他的技术参数要求有：

◇ 装置应具有连续在线自检功能；

◇ 应同时具有以太网 IEC61850-8-1 接口和 RS485 接口；

◇ 故障录波功能应能涵盖所有的模拟量输入和开关量输入/输出信号，应可记录至少 50 个故障录波报告；

◇ 装置应配置 LCD 显示屏，可显示事件和其他测量数据等；



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◇ 装置前面板应具有就地/远方控制的切换按钮，且具有就地控制的分/合闸按钮；

◇ 装置应具有不少于 11 个 LED 指示灯，可显示装置的不同动作信息或报警信息；

◇ 装置应具有事件记录功能，可记录不少于 100 条事件，且事件时标精度可达到

1ms；

◇ 装置要求至少带 12 个输入和 10 个输出继电器信号。输入信号需带接点抖动鉴别功能；

◇ 装置应具有硬件 IRIG-B 对时接口。

#### 1.2.4 22KV 电容器保护配置

22KV 电容器设置以下保护功能：

◇ 三相电流速断保护 50；

◇ 三相过电流保护 51；

◇ 零序过电流保护 51N；

◇ 低电压保护 27；

◇ 电压不平衡保护 59N；

该保护装置除实现以上保护功能外，其他的技术参数要求有：

◇ 装置应具有连续在线自检功能；

◇ 应同时具有以太网 IEC61850-8-1 接口和 RS485 接口；

◇ 故障录波功能应能涵盖所有的模拟量输入和开关量输入/输出信号，应可记录至少 50 个故障录波报告；

◇ 装置应配置 LCD 显示屏，可显示事件和其他测量数据等；

◇ 装置前面板应具有就地/远方控制的切换按钮，且具有就地控制的分/合闸按钮；

◇ 装置应具有不少于 11 个 LED 指示灯，可显示装置的不同动作信息或报警信息；

◇ 装置应具有事件记录功能，可记录不少于 100 条事件，且事件时标精度可达到

1ms；

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◇ 装置要求至少带 12 个输入和 10 个输出继电器信号。输入信号需带接点抖动鉴别功能；

◇ 装置应具有硬件 IRIG-B 对时接口。

### 1.2.5 22kV 母分保护配置

22KV分段设置以下保护功能：

◇ 三相过电流保护 51；

◇ 充电保护 51；

该保护装置除实现以上保护功能外，其他的技术参数要求有：

◇ 装置应具有连续在线自检功能；

◇ 应同时具有以太网 IEC61850-8-1 接口和 RS485 接口；

◇ 故障录波功能应能涵盖所有的模拟量输入和开关量输入/输出信号，应可记录至少 50 个故障录波报告；

◇ 装置应配置 LCD 显示屏，可显示事件和其他测量数据等；

◇ 装置前面板应具有就地/远方控制的切换按钮，且具有就地控制的分/合闸按钮；

◇ 装置应具有不少于 11 个 LED 指示灯，可显示装置的不同动作信息或报警信息；

◇ 装置应具有事件记录功能，可记录不少于 100 条事件，且事件时标精度可达到 1ms；

◇ 装置要求至少带 12 个输入和 10 个输出继电器信号。输入信号需带接点抖动鉴别功能；

◇ 装置应具有硬件 IRIG-B 对时接口。

## 1.3 保护装置的试验、验收、服务

### 1.3.1 试验

保护柜及保护装置在出厂前应进行出厂性能试验。

所需的试验内容至少为：

- (1) 内部所有元件性能正确性试验及所有接线正确性试验。
- (2) 模拟实际情况进行连续长期通电，包括交流电流、电压、直流电源试验。
- (3) 应按有关标准进行工频耐压试验。并提供报告。
- (4) 对保护装置通不同电流、电压、进行模拟各种故障的试验，并提供报告。
- (5) 装置应进行快速瞬变干扰、高频干扰，辐射电磁场干扰、冲击电压试验等。（提供型式试验报告）
- (6) 装置的动作特性试验，符合逻辑设计的相互动作试验，并提供报告。

1.3.2 产品出厂验收试验必须由甲方人员参加，乙方应提前二周通知甲方，并提供有关质量检验文件供甲方认可。

### 1.3.3 现场服务

乙方免费提供装置现场调试、投运服务；甲方提供必要的帮助。

### 1.3.4 图纸与资料

(1) 出厂产品应符合最后认可的图纸（包括接线图和逻辑图等）。甲方的认可并不减轻己方对其图纸完整性和精确性所负的责任。

(2) 产品出厂时应随机提供准确产品图纸 5 套，并附 AUTOCAD 光盘或优盘，供甲方安装、维护、运行使用。

(3) 全部图纸所有标题、注释及部件名称，都应有中文书写，文字高度大于 3 毫米。

(4) 说明资料

(a) 说明资料应为中文。

(b) 己方应在设备发货之前 2 个星期将说明资料 7 份发给甲方。

(c) 说明资料应包括下述项目：

- 1) 产品说明书
- 2) 技术说明和使用说明书
- 3) 保护装置的调试、维护手册
- 4) 安装、运行、维护和调试的全部说明和数据。
- 5) 所有备品和所有附件所需的全部资料。

(5) 调试及整定软件和附件。

## 1.4 主变保护屏组屏要求

### 1.4.1 产品符合以下标准

1.4.1.1 GB4942.2 低压电器外壳防护等级

1.4.1.2 GB/T 2681 电工成套装置中的导线颜色

1.4.1.3 GB/T2887 电子计算机场地通用规范

1.4.1.4 JB5777.2 电力系统二次电路用控制及继电保护屏（柜、台）通用技术条件

1.4.1.5 GB14285 继电保护和安全自动装置技术规程

1.4.1.6 GB/T7261 继电器及继电保护装置的基本试验方法

1.4.1.7 GB4208 外壳防护等级（IP 代码）

### 1.4.3 组屏技术要求

1.4.3.1 保护跳闸连接片或各功能连接片的开口端应装在上方，上桩头接到断路器的跳、合闸线圈回路或保护开入回路。

1.4.3.2 试验端子及接线采用等同于南京 Phoenix 的产品。

1.4.3.3 端子排应保证足够的绝缘水平。每个端子上一般只能接一根导线。直流正电源与断路器的跳闸及合闸回路不能接在相邻的端子上、直流电源正负极也不能接在相邻的端子上。电流回路用电流型端子排，直流跳闸回路用 6 平方毫米端子，直流信号回路用 4 平方毫米端子。

1.4.3.4 微型断路器采用等同于 ABB 或西门子的产品，并应根据该产品的技术要求进行接线。

1.4.3.5 柜后若需加装档板，应不影响柜后检修工作。端子排离地至少 50 厘米，以利于电缆排放，柜中任何元件安装时，均要考虑不影响端子排内侧紧线维护工作。

1.4.3.6 柜中内部接线应采用耐热、耐潮和阻（不延）燃的绝缘铜线，电流回路的导线的截面应不小于 2.5 平方毫米，一般导线的截面应不小于 1.5 平方毫米。

1.4.3.7 导线应无损伤，导线的端头应采用压紧型联接件。

1.4.3.8 所有电气连接件均应采用铜材料。

1.4.3.9 保护屏中信号及中间继电器型号和数量根据设计院图纸。

### 1.4.4 柜体技术要求

保护柜应采用封闭的结构加玻璃门（GK 型），钢板厚度不小于 2.5mm，采用冷轧钢板，柜内无横向撑经架，柜面涂层应均匀、牢固，不易脱落。

柜体外形尺寸（高×宽×深）：2360×800×600mm。柜体颜色：RAL7035。

#### 1.4.5 试验

保护柜在出厂前应进行出厂性能试验，所需的试验内容至少为：

内部所有元件性能正确性试验及所有接线正确性试验（对保护装置通不同电流、电压、进行模拟各种故障的试验，验证接线的正确性）。

#### 1.4.6 售后服务及图纸资料：

1.4.6.1 应提供各保护控制柜背后接线图、端子排图五套、并附 AUTOCAD 光盘或优盘，供安装、维护、运行使用。

1.4.6.2 应提供柜内所有设备的原始资料。

1.4.6.3 全部图纸所有标题、注释及部件名称，都应有中文书写，文字高度大于 4 毫米。

1.4.6.4 供方应向用户免费提供人员培训，并到现场作安装维护指导。

## 2 综合自动化技术要求

本节技术要求适用于本变电站（总降站）。

### 2.1 总降站综合自动化软硬件组成

115kV 总降站综合自动化系统采用分层分布式系统。系统为主控层、网络层和间隔层。

#### 2.1.1 主控层

1 台 DELL 服务器，采集和存储该总降站及 6 个分站监控数据，包含主变保护屏保护测控装置、主变温控装置、高压柜保护测控装置、TEV 多功能 PT 综合装置、小电流接地装置、直流屏、温湿度测量装置等信息。采用 RAID1 磁盘数据镜像实现数据冗余，在成对的独立磁盘上产生互为备份的数据。当原始数据繁忙时，可直接从镜像拷贝中读取数据。

2 台 DELL 监控工作站，显示和处理总降站及分站监控职责。采用 DELL 商用电脑。

1 套服务器电力监控系统软件，1 套 Windows Server 2012 R2 正版服务器操作系统。

2 套监控工作站电力监控系统软件，2 套 Windows7 正版旗舰版操作系统。

2 面 60 寸大液晶显示屏，1 面显示电力监控系统画面，1 面作为视频监视系统轮显使用。针式和激光打印机各 1 台。1 套 6 工位操作台，钢木结构，含 6 张椅子。

### 2.1.2 网络层

通讯管理机，采集 115kV 和 22kV 保护和智能设备，能够进行规约处理和规约转换。

网络交换机，连接管理机和主控层电脑设备，同时连接和采集各分站监控数据。

以太网接口 GPS 卫星同步时钟，作为该总降站及分站同步时钟源，给保护及各智能装置时钟同步。

### 2.1.3 间隔层

间隔层包含所有被采集设备，保护和智能装置直接通过 RS485 总线或以太网接入通讯管理机，以 SPA, IEC61850, Modbus, CDT 等常规电力通讯协议实时交换信息。

各间隔层的设备互相独立，互不影响。数据服务器采集处理现场的原始数据，传送给监控工作站，同时接收监控工作站发来的控制操作命令，经过有效性判断、闭锁检测、同步检测等，最后对设备进行操作控制、数据采集等。在通讯层及网络失效的情况下，间隔层装置能够独立完成自身功能，不受网络影响。

### 2.1.4 配置 1 面通讯测控屏

2 台测控单元，采集和控制站内除主变外其他辅助信息。每台测控单元不少于 72 路开关量输入，20 路开关量输出，12 路模拟量输入。

1 台 16 口通讯管理机，采集处理总降站通讯信息，支持规约处理和规约转换。

1 台 24 口以太网交换机，作为通讯管理机及分站系统与总降站监控服务器数据通道。

1 台以太网 GPS 同步时钟，作为监控服务器、通讯管理机及保护装置的时钟同步源。

1 套与分站通讯单模光纤辅助设备。

1 面 2200\*800\*600 屏体及相关附件。

### 2.1.5 配置 1 面远动通讯屏

1 台远动管理机，采集和收集本总降站和分站数据，并传输给区域一监控系统和集

中控制系统，并承载和满足区域一和集控对本总降站和分站的遥控功能。

1 台远动管理机，采集和收集本总降站数据，预留与电力调度通讯接口。

1 台 4 光 24 电高性能千兆光纤环网交换机。该环网交换机作为集控中心区域一的扩展覆盖范围，与区域一其他两个总降站形成环型网络，提高网络可靠性。

#### **2.1.6 配置 1 面逆变电源屏**

2 台 5kVA 逆变器装置，给站用监控系统主机、显示器、60 寸大液晶显示屏、视频系统主机、硬盘录像机、摄像机、温湿度装置、IP 语音设备、网络交换机、通讯管理机等设备提供电源。其直流电源来自总降站直流屏。

#### **2.1.7 配置 2 面 115kV 主变保护屏、1 面 22KV 主变保护屏**

每面屏配置 1 台主变差动保护、1 台高后备保护、1 台低后备保护、1 台测控装置。

#### **2.1.8 配置 1 套直流屏，计 3 面屏，DC110V 200Ah**

#### **2.1.9 配置 1 套交流屏，计 2 面屏**

#### **2.1.10 配置 1 套故障录波屏**

采集和处理记录总降站实时和故障录波数据。

#### **2.1.11 配备与保护及智能装置通讯的各种转换器和通讯隔离模块**

#### **2.1.12 总降站配置 1 套视频及寻呼系统设备**

1 台视频监视主机，高性能 DELL 工作站，采集和显示新能源总降站和分站摄像机及视频画面，1 块 HDMI 显卡，可输出视频画面到大液晶拼屏系统。安装双向 IP 网络寻呼系统软件，运行能使用 IP 网络寻呼对话筒与新能源总降及分站各设备房间通话。

1 台视硬盘录像机，网络 256 路输入，27 只 6T 监控专用硬盘。转化新能源摄像机画面，与 60 寸大液晶显示屏对接。

1 台高性能万兆光纤环网交换机，4 万兆 24 千兆，作为视频网络主交换机，承担视频环网数据流，及提供视频流信息给视频监视主机、解码器、集控等。

1 套 300 万数字高清红外一体式枪式摄像机，300 万数字高清红外球机，采用以太网结

构传输视频数据流。监视 115kV 主变压器室、GIS 室、22kV 配电室、电容器室。

2 台千兆以太网交换机，作为摄像机与硬盘录像机的传输通道。

1 套 IP 寻呼机对话筒，1 套双向 IP 网络系统软件（含 PC 分控软件）。

1 套以太网温湿度检测装置，1 台专用以太网交换机，1 台专用通讯管理机，与电力监视系统隔离，同时作为温湿度检测装置与本站监控系统及远动通讯介质，传输温湿度信息。

1 面视频监视屏体，安装硬盘录像机、环网交换机、与分站通讯的网络交换机等设备。

1 套视频、寻呼系统设备、温湿度附属安装电源机柜设备等。

## 2.2 分站综合自动化软硬件组成

本期共计包含 6 个分站。其综合自动化系统同样采用分层分布式系统。系统为主控层、网络层和间隔层三层拓扑结构。每个分站软硬件组成如下：

### 2.2.1 主控层

1 台 DELL 监控工作站，采集存储和显示处理该分站监控数据，包含高压柜保护测控装置、TEV 多功能 PT 综合装置、小电流接地装置、直流屏、温湿度测量装置等信息。采用主流品牌商用电脑，主流配置。

1 套监控工作站电力监控系统软件，1 套 Windows7 正版旗舰版操作系统。

### 2.2.2 网络层

1 台通讯管理机，采集该分站保护和智能设备，能够进行规约处理和规约转换。1 台网络交换机，连接管理机和主控层电脑设备，同时将该分站数据传送给总降站服务器。

### 2.2.3 间隔层

间隔层包含所有被采集设备，保护和智能装置直接通过 RS485 总线或以太网接入通讯管理机，以 SPA，IEC61850，Modbus，CDT 等常规电力通讯协议实时交换信息。

### 2.2.4 配置 1 面通讯屏

安装主控层电脑主机和网络层通讯管理机、网络交换机等通讯设备。



1 台 2kVA 逆变器，作为监控硬件、视频硬件、温湿度设备、IP 对话设备电源。其直流电源来自分站直流屏，要求分站直流屏不低于 DC110V 65Ah。

### 2.2.5 配置 1 套视频及寻呼系统设备

1 台 24 口以太网交换机，作为视频网络交换机，提供分站视频流给总降站视频网络。

1 套 300 万数字高清红外一体式枪式摄像机，300 万数字高清红外球机，采用以太网结构传输视频数据流。监视 22KV 配电室。

1 套 IP 数字对讲面板。

1 套以太网温湿度检测装置，1 台专用以太网交换机，1 台专用通讯管理机，与电力监视系统隔离，同时作为温湿度检测装置与本站监控系统及远动通讯介质，传输温湿度信息。

1 套视频、寻呼系统设备、温湿度附属安装电源机柜设备等。

## 2.3 与 CPA2 集控中心配套设备

CPA2 集控中心与本期通讯设备，由本期配套，安装到集控中心。

### 2.3.1 配置 1 面新能源监控通讯屏

1 台 DELL 服务器，采集和存储新能源 115kV 总降站及 6 个分站监控数据。采用 RAID1 磁盘数据镜像实现数据冗余，在成对的独立磁盘上产生互为备份的数据。

1 台 DELL 监控工作站，显示和处理总降站及分站监控职责。采用 DELL 商用电脑。

1 套服务器电力监控系统软件，1 套 Windows Server 2012 R2 正版服务器操作系统。

1 套监控工作站电力监控系统软件，1 套 Windows7 正版旗舰版操作系统。

1 台通讯管理机，接收和处理新能源远动管理机传送过来的信息，并将这些信息转发给区域一监控系统和集控系统。

1 套高性能千兆光纤环网交换机。该环网交换机使新能源总降站与区域一其他两个总降站形成环型网络。

1 块 DVI 显卡，输出新能源监控画面到集控系统大屏幕拼屏。

## 2.3.2 配置 1 面新能源视频及寻呼系统屏

1 台视频监视主机，高性能 DELL 工作站，采集和显示新能源总降站和分站摄像机及视频画面，1 块 HDMI 显卡，可输出视频画面到大液晶拼屏系统。安装双向 IP 网络寻呼系统软件，运行能使用 IP 网络寻呼对话筒与新能源总降及分站各设备房间通话。

1 台视频高清解码器，转化新能源摄像机画面，与拼接屏高清矩阵对接。

1 套视频管理机软件，完成画面设置及优化显示，及拼屏对接的各项组态。

1 套集控与新能源视频联动的开发和调试。

1 台高性能万兆光纤环网交换机，4 万兆 24 千兆，作为视频网络主交换机，承担视频环网数据流，及提供视频流信息给视频监视主机、解码器、集控等。

1 台 5KVA 不间断电源，作为视频设备电源。

## 2.4 综合自动化通用技术要求

### 2.4.1 数据采集和处理功能

#### 1) 模拟量数据采集和处理

系统能按照信息表连续采集所需模拟量。

主变保护、高压柜保护、主变温度、站用变低压侧三相电流、三相电压通过变送器采集，直流系统母线电压通过站内直流屏通讯口采集。变压器档位采用遥信量输入，以遥测方式显示和往调度传送。

模拟量数据按 5 分钟固定时间间隔记录有效值，重要数据保留 2 年以上。

#### 2) 数字量的采集和处理

系统采集数字量详见信息表。

系统具备变位报警、SOE 功能，报警信息全部存贮。此外，系统还应能累计开关分合动作的次数。

后台能处理双位置遥信功能，当双位置出现异常时，显示的开关应变色，系统能合成一个总的“开关位置异常”信号，报调度。

系统应具有接收 GPS 时钟信号的功能，通过以太网接收并通过对时广播命令与保护测控单元对时；

系统能对有关信号进行合并，

### 3) 电度量的采集和处理

系统具备采集 22KV 线路电度量的功能，详见信息表。

22kV 线路电度采用电度表，规约为电表通信规约。

## 2.4.2 控制逻辑和执行

变电站设备控制分三级：

第一级控制，具有最高优先级的控制权在设备就地。当操作人员将设备就地的单个的遥控投入/解除切换开关放在“解除”位置时，将闭锁所有远方遥控功能，只能进行就地操作。

第二级控制，即次高优先级的控制权在站控主单元（即当地功能）。在站控屏上安装有一个总的遥控远方/就地切换开关。当设备就地的投入/解除切换开关放在“投入”位置同时将总的遥控远方/就地切换开关放在“就地”时，可以在人机会话单元上进行遥控站内断路器等设备，并同时闭锁来自调度的操作命令。执行时，对遥控操作人和监护人设置相应密码和不同权限（其中操作人只有操作权限；监护人具有操作权和监护权），只有密码输入正确和相应权限验证正确后，才能进行操作。在执行操作前，系统根据相关的模拟量、数字量通过控制逻辑闭锁校核，对可能有误的操作命令及其错误信息进行提示，并闭锁该命令。

控制功能的投退并不影响调度端对本站的正常监视。

站控主单元（即当地功能）的控制分为主画面和分画面控制，可以在一次接线图或用户菜单中方便选择。

## 2.4.3 VQC 控制

系统可以根据遥控命令对电容器进行甲乙组分组自动投/切操作，当电容器保护动作跳闸后闭锁自动投切功能，当主变低压侧开关断开时也同时闭锁相关的电容器组的自动投切。VQC 控制方式可通过后台遥控方式方便切换或退出。

限制条件包括电压、档位上下限、时段划分、在临界状态的频繁投切、功率因数、保护动作闭锁、主变开关联跳、电容器开关、主变电流、有载机构故障等。

## 2.4.4 与智能设备的通信功能

系统应具有与电度表、直流控制装置等智能设备的通信功能，并能将有关信息上传。

## 2.4.5 运行记录

系统应具备能够保存各种用户所需的本系统和电力系统正常记录、异常记录、事件记录、操作记录等运行记录。

## 2.4.6 人机会话

### 1) 显示电网实时运行状态

具有在中文环境下显示一次主接线图，电压曲线图及棒形图，负荷曲线图及棒形图，时间可调的负荷趋势图，周波曲线图，报表，各种事件显示，综合自动化系统状态图和常用数据表，告警、SOE、操作信息的功能。显示多种形态的汉字，以及动态汉字的功能。

### 2) 画面、数据库等具备编辑、修改功能。

事故总信号试验功能。在后台模拟事故总信号，以便变电站巡视的时候对事故总信号进行试验。

事故总信号确认功能。事故总信号为合成信号，当有事故或异常告警，经人工确认后，事故总信号应复归，事故或异常信号仍显示实时状态，当有其它告警信号发生时，事故总信号再次动作。

### 3) 工况监督和音响报警（配置有源音箱）功能

### 4) 实时运行数据的记录、打印制表功能

### 5) 变电站综合自动化系统自诊断功能

### 6) 显示功能：画面显示的要求和种类按照“市南供电公司综合自动化系统的画面要求”执行。

## 2.4.7 报表及打印输出

报表种类和格式由用户定，并可以 EXCEL 格式导出和保存。

具备随机、召唤、定时打印功能和画面拷贝功能。

## 2.4.8 报警管理

具备模拟量越限、事故跳闸告警功能，告警方式有推画面、音响、提示窗等多种方式。

系统具有报警合成功能，即可定义虚拟点，而该虚拟点可由一些相关报警点集成合成。

具有试警试验和复归功能，即能够在后台模拟事故总信号转发调度并人工复归。

## 2.4.9 数据库管理

数据库具有完善的保护功能，以防止对数据库的误操作

满足快速访问长驻内存数据和硬盘数据实时要求

允许不同程序对数据库内的同一数据集进行并发访问，保证在并发方式下数据库的完整性和一致性。

具有良好的可护性和适应性，满足系统扩容需要

可以用同一数据库定义、生成多种数据表格。

#### **2.4.10 历史数据**

历史数据库可定时写入硬盘，也可以保存在光盘上，若把已存档的历史数据装回系统数据分析时，装回的数据不应覆盖现有的历史数据保存内容

#### **2.4.11 接口及远传功能**

系统接入的保护设备、通讯规约待定。

系统分别以 CDT 和 GB/T 870-5-101 等规约通过主备通道与区调和/或地调通信，传送模拟量、数字量、命令量及保护装置串口信息等数据，并接受控制命令，通信方式为双工四线制。

乙方协调配合完成本站与调度端的联调工作。

#### **2.4.12 系统监测、维护功能**

具有失电前的数据不会丢失、失电时不会发生误动作的功能，在电源恢复后能自动启动并恢复运行。

系统有人工和自动备份功能，通过简洁的按钮和菜单选择，可手工将数据库定义和系统的各类参数备份到指定目录，便于系统重装。

#### **2.4.13 远传数据到 CPA2 集控中心功能**

总降站及所有分站数据需要远传给 CPA2 集控中心，包含遥信、遥测、遥脉和遥控。使在 CPA2 集控中心的区域控制系统和集控系统可以监视和控制总降站及分站的任何可控设备。

主要范围包含主变保护屏保护测控装置、主变温控装置、高压柜保护测控装置、TEV 多功能 PT 综合装置、小电流接地装置、直流屏等智能设备。

#### **2.4.14 视频监视功能**

总降站及所有分站配置视频监视系统。摄像机采用 300 万高清红外一体式枪式摄像机和 300 万高清红外球机。枪式摄像机分布式固定安装，监视主变压器室、GIS 室、22kV 配电室、电容器等高压电气设备；球机用于 22kV 配电室，监视人员操作及高压柜运行情况，正常按转速旋转镜头覆盖监视范围。同时各枪机和球机应用于集控中心的对该总降站及分站的集中监控系统与视频系统联动，当设备有故障信号产生，摄像机界面能自动在集控中心监视器上弹出。

#### **2.4.15 温湿度采集功能**

总降站及所有分站配置以太网接口的温湿度测量设备，能够收集主变压器室、GIS 室、22kV 配电室、电容器室等环境温湿度，并通过交换机及通讯管理机将数据汇总后，传输给就地总降站或开关站，在就地监控系统中界面能够反映出来，并能够设置温湿度报警限值。同时能够远传给集控中心的区域控制系统和集控系统。

#### 2.4.16 值班室和配电间 IP 对话功能

总降站及所有分站配置 IP 对话设备，能够实现总降站值班室与总降站及各分站站内的语音通话功能。运行选中各房间及对应 IP 语音接口，可以配合视频监控系统画面与该监视范围内人员进行语音通话和提示。同时集控中心也需实现该功能。

### 3 总降站交直流屏技术要求

#### 3.1 直流电源装置技术参数

交流输入电压：	三相 380V $\pm$ 15%；
交流电源频率：	50 $\pm$ 5Hz；
直流额定电压：	110V；
直流输出电压：	90~130V（连续可调）；
稳流精度：	$<\pm 0.5\%$ （在 10%~100% $I_e$ 时）；
稳压精度：	$<\pm 0.5\%$ （在 10%~100% $I_e$ 时）；
模块过热保护：	散热器温度超过 75 $\pm$ 5 $^{\circ}$ C 时关机并报警；
模块工作电压：	三相 380V $\pm$ 20%；
效率：	$>90\%$ ；
噪声：	$\leq 50$ dB；
通信接口：	满足自动化系统要求（如 RS-232、RS-485）；
蓄电池容量：	200Ah。

#### 3.2 直流系统构成

直流系统主接线采用单母线接线形式，一组充电器、一组蓄电池。  
含四个高频开关充电模块，合母上二个，控母上二个。

### 3.3 直流电源技术要求

#### 3.3.1 直流输出电压

90-130V DC，在低输出电压时各部件工作正常。

#### 3.3.2 交流配电单元

两路 380V 电源输入，互为备用，可手动、自动投切。某路过压，欠压，缺相，应能自动瞬时切换至另一路交流电源。且要求交流电源切换电压与模块工作电压相对应，即交流电源电压超出额定电压 $\pm 15\%$ 时，交流电源切换就应动作，交流电源电压超出额定电压 $\pm 20\%$ 时，发报警信号。

交流输入具备雷击防护及告警功能（标称放电电流大于 40kA，残压小于 1kV），防浪涌功能。

#### 3.3.3 充电模块

模块有输出电流电压显示窗口。

每个模块自主输出电压出厂整定值为  $2.23 \times 6 \times 9$  (V) (DC110V 系统)。模块可带电插拔更换，不影响系统运行。运行中任一模块故障，系统发出故障信号，故障模块自动退出。模块输出后经汇流排接向直流母线。

监控器退出工作时，模块应能自主均流、可靠运行。

具有过电压、过电流保护和自动限流、报警等功能。

模块并机均流不平衡度： $\leq 5\%$

纹波值： $\leq 0.1\%$ （阻性负载）

#### 3.3.4 数显表

每充电屏上有六块数显表：交流输入电压（可各相切换）、直流输出电压表、直流输出电流表、蓄电池电压、蓄电池充放电电流表，纹波表。数字表工作电源取自各自的直流母线，且有保护元件。蓄电池充放电表采用五位半数表，能显示小数点后两位数。其它表能显示小数点后一位数。表计需经当地电力公司认可的资质单位检定。

#### 3.3.5 接点告警功能

除监控装置 RS485 遥测、遥信报警外，应具有以下继电器节点报警功能：

有独立于监控装置的母线过、欠压继电器报警装置（对 DC110V 系统：过压 125V、欠压 110V；），当监控装置失压、故障时不影响电压异常报警，且有预试功能。

有监控装置故障的继电器报警。

遥测：控制母线电压、浮充电流、电池电压、每节电池电压、充电电流、输入交流三相电压、直流屏电池温度，馈线开关故障跳闸等 RS485 串口信号。

信号：高频开关电源工作状态、蓄电池熔断器熔断、充电器及各附属装置（包括模块、监控单元、直流绝缘检测、蓄电池检测）故障、直流母线电压异常、每段交流电源故障（交流缺相、交流欠压）延时 10 秒报警、避雷器击穿、直流系统绝缘降低及选线情况、蓄电池电压异常（包括单体电池越限）、馈线断路器跳闸（各馈线断路器合并成一付接点）等。以上信号可通过监控器界面软压板进行投入/退出运行，当某个故障发生时，可通过监控器手动把软压板退出，不应发遥信，但不影响其它故障信号发遥信，当故障恢复时，软压板自动投入。

### 3.3.6 监控系统

#### 3.3.6.1 有实时显示、报警；参数设置及控制功能。

站用电失却后来电，监控系统应能启动整个直流系统恢复正常工作状态。

监控器无论发生何种性质的故障，均不得发生对模块误调整、误关机、拒报警等影响直流系统安全运行的结果。

能显示各模块电流电压及各表计的电流电压。

#### 3.3.6.2 监控器对上有二个通讯口和一个 USB 接口：

通过 RS485/RS232 口与本地后台机通讯，且后台机仅提供一个通讯端口；

另一通讯口通过 10/100BaseT（RJ-45），支持 TCP/IP 协议，可方便现场设置地址，同时进行远方数据传输。

乙方提供规约并完成与上位机通信。确能实施三遥（遥信、遥测、遥控）功能，出厂时屏蔽遥控功能。

传送的遥测量见 5.5 监控器对下有不少于 3 个输入接口及 3 个告警输入空接点，接受绝缘监测装置、蓄电池监测仪、逆变等的遥信及数据传输。由下行设备厂提供通信规约，上行设备完成转发。（具体传递量另行协商）

并有备用遥信，遥测输入接口。

通过 USB 接口可以下载监控器的历史数据（包括蓄电池的每只单体电压值）。

#### 3.3.6.3 能定时采集直流绝缘监测仪对地电阻数据

将每天的正负接地电阻值记录下来，每小时采一点，绘制成每天的接地电阻的变化图表或曲线，保存 10 天的记录量；



将每天的最低接地电阻值记录下来，每天记录一点，绘制成可供调看最近一个月接地电阻变化的图表或曲线。

接收的信息可通过通讯口输出。

3.3.6.4 具有蓄电池自动充电管理功能：可自动根据检测结果进行均浮充转换，具有充电程序、长期运行程序、交流中断恢复程序，有蓄电池充电限流、浮充电压温度补偿（温探必须装于蓄电池的同一安装空间内）、定时均充等功能。并有反映上述性能存在的测（调）试手段或记录。并能对上述参数设定、修改及显示。

阀控式密封铅酸蓄电池组正常充电程序（3个月一循环）：用  $0.1C_{10A}$  恒流充电，电压达到整定值  $2.35V \times n$  时，充电机自动转为恒压充电，当充电电流逐渐减少，达到  $0.01C_{10A}$  时，微机开始计时，以  $0.01C_{10A}$  充电 3h 后，微机控制充电浮充电装置自动转为浮充电状态运行，电压为  $2.25V \times n$ 。

转均充的另一个条件：转均充容量比，即电池容量下降到一定程度时，监控模块控制系统对电池进行均充。容量比 =  $(\text{现有容量} \div \text{标称容量}) \times 100\%$ ，此值反应了电池放电的深浅程度。设置范围为 1~100%，一般设置在 50~80%，设置为 80%。

浮充状态时充电电流大于  $0.01C_{10A}$  电流时延时告警。

交流停电 10 分钟后，交流再来电，充电机浮充转均充。

当监控器采到的电池温度  $>45$  度，转浮充。当蓄电池充电电流在  $0.01C_{10A} < I < 0.05C_{10A}$  范围内持续保持某个值 3 个小时不变（变化  $< 0.02C_{10A}$ ），转浮充。

单节电池出现过压时，转浮充。

温度补偿应设置成  $0.003V/\text{节}$ （可整定），共 9 节（可整定），总补偿电压自动计算。

限流功能：输出电流按  $105\%I_e$  定值进行限流， $I_e$  为单一模块额定输出电流。当输出端发生短路时按最大限流定值输出电流，输出端电压随之下降，短路消失后电压自动恢复正常。

高频模块的输入电压应有：

- (1) 输入过压保护，在输入电压  $1.2U_e$  时具备关机报警功能，当电网正常时应自动恢复；
- (2) 输入欠压报警，在输入电压  $0.8U_e$  时，监控装置具有报警功能；
- (3) 输出过压保护，可由监控系统任意设定，要求输出过压电压值设定为 135V，输出过压后，关机报警，需模块重新启动后恢复；
- (4) 输出欠压保护，可由监控系统任意设定，要求输出欠压电压值设定为 100V，输出欠压后，监控装置应报警。

3.3.6.5 能实现均充/浮充的自动和手动转换，可根据需要投入/退出运行。

3.3.6.6 有不少于 100 条历史告警信息，掉电后不会消失。

3.3.6.7 所有参数设置及故障记录的清除均须通过密码确认方可执行。

3.3.6.8 取消监控器内放电程序。

### 3.3.7 控制母线输出持续电流

控制母线输出持续电流值 40A。

### 3.3.8 母线电压

直流屏交流失电时，电池无间隙向母线供电，实行自动调压，其直流（控制）母线电压瞬间波动不得低于直流标称电压的 90%。

### 3.3.9 冲击电流时控制母线电压的波动

在向负载提供冲击电流时，其控制母线电压的波动应不大于 10%，冲击电流主要由蓄电池组提供。

### 3.3.10 馈线单元

直流屏馈线一共 25 回，其中包括：

63A，7 路；

40A，1 路；

32A，12 路；

16A，3 路；

10A，2 路。

实际数量由设计施工图确定。

所有回路均采用断路器，并有合闸灯光指示，断路器应配有故障报警接点。

随屏提供直流开关型式试验报告。

### 3.3.11 蓄电池及电池检测

3.3.11.1 本直流系统将 与 200Ah（2V/节）蓄电池相配。

3.3.11.2 蓄电池熔丝必须选用直流熔丝，200Ah 及以下容量的蓄电池组，其直流熔丝额定电流按照蓄电池一小时率放电电流选择。

200Ah 蓄电池熔丝额定电流限定为 200A。

### 3.3.11.3 蓄电池要求

采用密封铅酸蓄电池，蓄电池在环境温度  $-10^{\circ}\text{C}\sim+45^{\circ}\text{C}$  条件下应能正常使用。蓄电池使用寿命：10 年及以上（ $25^{\circ}\text{C}$ ），提供型式试验报告。

电池电压均衡性：应满足一组蓄电池中任意二个电池的开路电压差不超过 60mV。浮充蓄电池组运行电压偏差值 $\pm 50\text{mV}$ 。

对进口蓄电池，应提供代理证书及原装进口的产品证明文件。

厂家应提供产品出厂 10 小时率全容量试验包括（每节单体电压值）。

有关蓄电池需提供的参数值、特性曲线及试验报告按国网电力公司有关文件要求执行。

3.3.11.4 直流屏上设有蓄电池  $80\%U_e$  一组出线回路，正极来自一组蓄电池  $80\%$  抽头，并经直流空气开关接到输出端子。80%直流空气开关容量为 25A，位置安放在屏后，输出接至端子。

3.3.11.5 各充电屏设电池放电开关 40A（200Ah）一只。

3.3.11.6 蓄电池检测仪：能定时测量蓄电池每瓶的电压、电流，测量数值均应能在直流监控器显示屏上按序号顺序显示和远传。每面蓄电池屏有温度采样点。

### 3.3.12 绝缘监测

具有直流接地选线功能，在线检测直流电源系统绝缘情况。当直流电源系统接地或绝缘水平低于规定值（可整定）后，绝缘检测装置应可靠动作，直流选线装置能自动选出哪一支路绝缘存在缺陷，试拉开接地选线绝缘报警恢复正常判断时间应小于 2 秒，并显示于监测屏上，记录该事件相关参数并及时远传和报警。

检测直流系统支路绝缘的绝缘监测装置应具有以下功能：

在所有直流支路及蓄电池回路安装检测传感器，传感器应同一批次，传感器信号连线必须按顺序依次接入。

绝缘监测支路编号应同时标志在直流屏屏面相应的开关（电池标志）下方正中。

绝缘监视仪所有出厂技术资料（应有制造厂绝缘监视仪、传感器等检查数据），随屏发运至甲方，并附有反映该部件工作状况的乙方试验结论。

显示并记录接地支路编号、极性、绝缘电阻值（测量误差不大于整定值的 10%）及发生时间。

分别或同时检测直流母线正极、负极绝缘状况，显示并记录接地母线的极性、电阻值及发生时间。

### 3.3.13 监控器电源、电压采样等母线引下单元

监控器电源、电压采样等母线引下单元应有保护单元。

### 3.3.14 调压装置

阀控电池组硅链的降压选择要求： $2.35V(2V/节) \times n - 110$ 。

调压装置应具有手动及自动调压功能，且应保持控制母线连续供电。

## 3.4 交流站用电屏的技术要求

- (1) 输入三相四线 380V/50Hz 交流电源二路，自动切换。
- (2) 出线回路按图纸。所有开关采用西门子 5SJ 系列产品。
- (3) 柜内安装电度表，柜门上开可视孔可查看电度表读数，接线盒安装于柜门内。
- (4) 上门板安装闭锁电源（WYKD-110/5A）。
- (5) 三相交流电流、电压及失压信号通过直流屏上传至综合自动化系统，直流屏故障、交流失压信号应具备硬接点输出。
- (6) 备配置：按附图与附件。
- (7) 一套交流系统共两面屏，每面屏的柜体尺寸（高×宽×深）：2360×800×600mm。柜体颜色：RAL7035。

## 3.5 工艺及可靠性要求

- (1) 系统可靠性预计指标：MTBF 大于 10 年
- (2) 分流器、蓄电池熔丝、母排等必须考虑相配电池一小时放电率电流的负荷容量，保证系统工作可靠。
- (3) 交流各相、直流正负导线应有不同色标。
- (4) 直流输出端子采用魏德米勒或凤凰，直立安装在直流屏二侧，连接外部电缆的端子口靠屏内侧并考虑电缆靠屏侧安装固定所需空间。在每一回路之间用较醒目隔离片隔离，以分清每一回路。

大电流输出端子要考虑电缆连接和固定需要，离地高度>300mm。

空接点输出采用魏德米勒或凤凰端子。直流屏两侧设置行线槽。



交流输出:	220±1% (V)
输出频率:	50±0.5% (HZ)
输出波形失真度:	<1% (阻性负载)
过载能力:	120% 负荷情况下 10 分钟
切换时间:	4 秒

耐压、抗干扰等其他要求必须满足部颁有关交直流电源系统的要求。

在切换电源间隙和之后，不能影响控制模块的工作。

能通过硬接点提供报警功能，报警信号包括直流输入过高、过低、输出过载、温度高、切换状态。

输入包括 4 个开关 (16A) 和 2 个检修开关，输出包括 2 个总开关和多路分开关，分路负载短路时应自动跳开本身的分开关，不能影响其它出线。

## 5 故障录波屏技术要求

(1) 故障录波器应采用数字嵌入式，有独立的启动元件，并具有将其记录的信息就地输出并向远方传送的功能。

(2) 故障录波器应在系统发生故障或振荡时可靠启动并开始录波。

(3) 故障录波器应具有外部启动接点的接入回路。

(4) 故障录波器应能连续记录多次故障波形。

(5) 故障录波器应具有测距功能，其误差应小于 3%。

(6) 故障录波器应能记录和保存从故障前至少 80ms 到故障结束停止记录时的电气波形，采样频率可选，96 路模拟量同时工作时，每个模拟通道最高采样频率 10kHz。

(7) 故障录波器启动后应能提供简要的故障信息报告，包括：故障元件、故障类型、启动量和故障测距结果等。

(8) 事件量记录元件的分辨率≤1ms，记录时应可打印出动作时间。

(9) 就地故障录波器系统存储器不低于 256M，硬盘不低于 80GB，就地配打印机。

(10) 己方应提供有关软件用于分析电流电压波形，以得到故障测距、有功、无功、谐波等数据。主站软件应能在 WINDOW2000 平台上运行，并能实现多任务操作，可应用 WINDOW2000 的打印管理和拨号网络等功能，具有完备的故障信息远传、分析、存档处理功能，故障文件的记录格式应能转化为 COMTRADE 格式。

- (11) 故障录波器应有足够的信号指示灯、告警信号及事件记录输出接点。
- (12) 故障录波器应具有定时检测及就地和远方试验功能。
- (13) 故障录波器柜上的接线端子应具有阻燃性能，接线端子采用凤凰端子，电流回路接线为 2.5 平方毫米，电压回路接线为 2.5 平方毫米。所有电气元器件、组件及整机应具有高度的可靠性和可换性。
- (14) 故障录波器装置采用插件式结构，各插件应接触良好，可靠耐用，并具有防止震脱措施。
- (15) 柜内装有照明。
- (16) 装置主要技术参数和性能：

模拟量：	96 路
开关量：	128 路
输入电压：	直流 110V，交流 220V。
- (17) 电压量经过空气小开关接入故障录波仪。交流电流回路功耗每相不大于 0.5VA，交流电流额定值为 5A，过载倍数为 20 倍。输入回路热稳定满足行标要求。
- (18) 交流电压回路功耗每相不大于 0.5VA，交流电压额定值为 100V。
- (19) 直流电源回路功耗不大于 100VA，直流开关采用直流空气小开关。
- (20) 当系统发生大扰动如短路故障、系统振荡、频率崩溃及电压崩溃时，故障录波器装置应能自动地记录扰动全过程的电气量变化及保护装置的动作行为。当系统动态过程终止后，自动停止记录。
- (21) 模拟量精度：16 位 AD 精度。
- (22) 接收 GPS 卫星对时信号，包括分脉冲，秒脉冲，IRIG-B 格式。
- (23) 根据己方需要，己方应使用并能提供用于该故障录波仪数据远传的 103 规约。
- (24) 柜内装设通讯箱 (TX—01)，具备与远方传输系统接口功能。
- (25) 柜体外形尺寸 (高×宽×深)：2360×800×600mm。柜体颜色：RAL7035。

## 6 变电站大液晶显示屏技术要求

### 6.1 总的技术要求

- (1) 实时显示本变电站电气主接线图，与自动化系统接口，实时显示开关站运行状态。
- (2) 实时显示年、月、日、时、分、秒。
- (3) 实时显示进出线有无功率。
- (4) 实时显示安全运行天数。
- (5) 实时轮询显示总降站及分站视频监视画面。

## 6.2 大液晶显示屏类型及尺寸

大液晶显示屏，暂定为 60 寸。

## 7 视频监控技术要求

### 7.1 总述

本期总降站及分站需安装高清红外视频摄像机。24小时不间断视频监控，具备录像回放功能。安装重点位置如下：

115kV总降站监视115kV主变压器室、GIS室、22KV配电室、电容器室。分站配电站。

该视频监控系统需具备如下功能：

#### 1) 实时监控

所有高清摄像机画质均可达到 1080P，采用 H.264 高效的编码技术，利用高速的监控传输网络接入系统，高清画面均可实时在机房的显示，并对可运动高速球摄像机进行控制。

#### 2) 远程监控

对于所有的高清画面，可以实现内部网络远程监控和操作控制，所有接入网络的电脑均能对画面进行监视，并能对高速球摄像机进行操作控制；

#### 3) 数据存储功能

对所有监控画面进行 24 小时全高清录像，并对系统的工作日志进行全程记录，所有记录保存时间不低于 30 天；

#### 4) 数据资料的检索和备份

系统具备高视频流的数据存储功能，授权用户可以对存储的资料进行检索，并对检索文件进行备份保存。

#### 5) 授权管理

对于所有的用户可以进行授权管理，对于不同的用户分别赋予不同的权限。

### 7.2 符合标准

《民用建筑电气设计规范》JCJ/T 16-92

《中华人民共和国公共安全行业标准》GA38-92

《民用闭路监控系统工程技术规范》GB 50395-2007

《安全防范工程程序与要求》GA/T 75-94

《防盗报警控制器通用技术条件》GB12663-90



《保安安保监控工程技术规范》GA/T 76-96

《安全防范工程费用预算编制方法》GA/T 70-94

《安全防范系统通用图形与符号》GA/T 74-1994

《报警图像信号有线传输装置》GB/T16677-1996

《工业电视系统工程设计规范》GBJ115-87

《计算机软件开发规范》GB8566-88

《通信光缆系列总则》GB/T13993.1-92

《安全防范系统验收规范》GA308-2001

《视频安防监控系统技术要求》GA/T367-2001

《安全防范工程技术规范》GB50348—2004

《城市监控报警联网系统系列标准》GA/T669—2008

《信息安全技术信息系统通用安全技术要求》GB/T20271-2006

### 7.3 系统组成及主要技术指标设计规划

#### 7.3.1 系统主要组成：监控前端（红外摄像机）、网络层和监控中心

##### 1) 监控前端

总降站及分站安装红外视频摄像机，具有以太网接口，300万像素具有夜视功能。24小时不间断实时监视重要设备，监视场地和高压配电间设备的运行状态。

采用纯数字监控系统，主要线路干线采用光纤传输，在各个监控集中区在安置网络交换机，附近监控设备就近接入。具体分布点见各厂区平面图上的标识。

##### 2) 网络层

本总降站与分站之间建立光缆通讯，采用高性能千兆以太网交换机通讯。与区域一视频网络建立光纤环网通讯，与电力系统光纤网络相对独立，互不干扰。

选择合适位置放置就地机柜，机柜与光纤环网交换机之间通讯采用光缆，机柜与摄像机之间的通讯采用六类以太网线。

##### 3) 监控中心

新能源115kV总降站配置视频监控主要设备（网络硬盘录像机、视频服务器等）。视频录像不低于30天。由专用图形工具，实时监控前端所有变电站的图像、数据及报警完成视

频图像的分析、处理及分割，这些图像可上传到60寸大液晶显示屏，也可通过网络对视频进行回放。

本期总降站及分站所有摄像机图像视频流需传送汇入CPA2的集控中心视频系统。

### 7.3.2. 系统主要技术指标

1) 视频监控系统模式和视频压缩标准：视频监控系统需采用数字化网络视频监控技术模式，视频压缩标准采用 H.264，独立的网络传输系统，视频采集点采用网络摄像机或者网络视频服务器结合高质量模拟摄像机，实现从监控前端、监控中心、监控工作站的全过程数字化处理技术。

2) 前端设备功能：前端设备采用数字采集技术（网络摄像机）或者数模转换技术（网络视频服务器）

- 支持 H.264 压缩标准，实时图像传输，以 QCIF/CIF/4CIF/720P 格式的传输可达 25fps（帧速率可调，可调范围 2~30 帧/秒）；

- 支持 TCP/IP 网络协议，具有 10/100 Base-T RJ45 网络接口；

- 网络视频传输速率保持在 200kbps~2048kbps（图像压缩率可调节）；

- 具备 VMD 制动侦测技术；

- 支持远程控制云台及焦距自动调节；

- 支持额外警报传感器的输入输出，具备警报功能。

3) 高分辨率视频图像：系统支持图像分辨率能够达到百万像素，清晰度高，色彩逼真，图像压缩格式支持 MJPEG、MPEG4、MXPEG 和 H.264，符合国际标准，在高视频分辨率下帧速能够达到 25fps 或更高。实时观看图像和存储图像均为 1080P 分辨率（1920\*1080），图像质量按 5 级损伤制评分标准或按 5 级质量制评分标准达到 4 分以上。

4) 支持 C/S 和 B/S 两种视频监控模式：系统能够支持 C/S 和 B/S 两种应用模式，以提高系统应用的灵活性。B/S 模式下，客户端可以采用标准的 Web 浏览器来访问系统的各项功能，实现系统安装的最大简化，也使得用户能够方便的通过网络访问系统，同时实现系统的平滑可扩展。C/S 模式主要供值班人员使用，具备 B/S 模式所有功能的基础上，实现数字矩阵等高级功能。

5) 综合视频集中管理

- 画面调用：从摄像机列表或者事件列表中选择摄像机，便可在任何地方查看任何摄像机的画面。

- 快速查看：可以快速的查看当天该摄像机的任一瞬间的状态，可以浏览某个时间

段的图片。系统可以通过不同颜色来区分录制、预警、报警等时间状态。

- 双码流：系统平台提供双码流：一个用于实时视频观看，一个用于记录，二者之间不互相影响。

- 视频标签：用户可以在回放视频的任何时候对重要的事件添加一个标签以便于以后访问。添加标签的数量没有限制。

6) 视频图像录制、录像检索和录像回放：提供计划录像、手动录像和报警录像等多种录像机制，用户可根据具体的监控区域和地点的实际需求制订不同的录像策略。系统可对多路镜头同时录像，系统自动定时更新录像存储资料，超过一定容量的资料存储能提供额外数据备份机制。录像记录可以随时调用，并按用户需要进行快进、慢放或者正常的速度播放，可以拖动进度条选择播放。对于录像记录用户可以根据需要进行编辑、存储、删除。

7) 事件日志：支持用户在线管理和查询录像信息、报警信息和系统信息。同时，系统对报警记录和录像事件等动作，自动记录到数据库中，管理员能够在管理工具中查询、打印用户登录信息、报警信息和录像资料信息。

8) 监控信息存储：所有录像资料由总监控中心统一进行管理维护，录像资料保存至少 30 天。

### 7.3.3 摄像机技术要求

1) 全高清红外一体摄像机，提供多种编码的高清画质。采用 300 万及以上高清摄像机，可提供 CIF, 2CIF, 4CIF, 1080P 等各种画质的高清编码能力，最高可提供 1920\*1080 的画质。

2) 高清镜头。所有选择的摄像机全部采用高清镜头，和普通镜头不同，高清镜头可达到 300 万的物理解析力，确保摄像获取的光信号时干净，清洁，无色散，无干扰的。

3) 单板设计。与普通的 IP 摄像机不同，采用了图像处理芯片和图像编码芯片直接通讯，摆脱了传统的 CVBS 传输方式，这样才能提供全高清无串扰的图像。

4) 高效的编码方式。采用了独特的视频流编码方式，为大大降低视频传输的带宽压力。

5) 低功耗补光灯设计。采用高亮低功耗补光灯，实现夜间的高清监控。

### 7.4 后端系统技术要求

后端系统主要提供数据的解码、显示、存储及转发服务。整个系统依托集控系统网络为基础，前端大量的视频流通过局域网传输到后端监控中心。后端监控中心的结构如下：



后端监控中心，可以不同需求进行简化或者扩展，能满足以下功能：

- 1) 实时预览功能，提供对监控点实时监视功能，并可方便的进行画面分割切换。
- 2) 操作控制功能，可方便利用键盘对高速球摄像机进行转动变焦等操作控制。
- 3) 存储功能，NVR主机可以实现手动录像、计划录像及报警录像功能。
- 4) 检索功能，提供多种方式检索，例如：按时间，按通道，按文件，按类型等。
- 5) 回放功能，支持暂停、播放、快进、精确定位、色调调节等回放功能。
- 6) 备份功能，可对指定通道，文件，时间段，进行备份，提供本地备份，移动存储备份，网络备份等多种备份方式。
- 7) 通过网络传输到后端可以联动后端的报警设备进行远程联动报警。

## 7.5 系统性能

### 1) 系统稳定性

选用稳定性可靠的NVR，长时间无故障运行时间大于2万小时，嵌入式结构，不应存在因为停电、病毒、蠕虫、木马、误操作导致的系统故障。

### 2) 系统操作和控制

智能化设计方便实现相关操作，系统监控中心通过以太网方便灵活的实现一切操作。

### 3) 网络流媒体技术

- 远程网络实时监视及录像文件下载、查询、回放、备份。
- 远程网络云台镜头控制
- 远程报警信息接收处理及系统日志查看
- 多级密码管理，网络上各计算机只能按权限查看相应图像及录像文件

#### 4) 多种录像模式

· 视频压缩采用H. 264固定码流、可变码流及帧率，支持16路视频信号独立同步实时压缩，录像、视频同步，绝无滞后

· 手动录像、定时录像、报警联动录像、动态检测录像等多种录像模式，并具有预录功能。

#### 5) 回放和检索

- 96路视频全实时录像的同时，可实现单路回放
- 采用时间流设计，实现快速检索
- 录像检索可按通道，日期时间及报警事件检索
- 可将监控画面拍照成图片，作为证据资料
- 多种录像回放模式：快放、慢放、向前，向后、暂停及逐帧播放等方式。

#### 6) 安全管理功能

· 多级用户管理，可设置不同的用户不同的权限，例如一般用户只能观看授权的摄像头及录像，而管理用户可实现更多的设置功能。

- 多重密码设防控制
- 水印技术，防止图像被删除和篡改，
- 完善的日志管理，对系统的所有操作全部记录在案，防治人为的破坏性操作。

## 7.6 用户培训

### 7.6.1 培训目的

使业主能对整个系统全面了解，熟悉日常维护工作，有能力处理一般性问题，并消除系

统因使用或操作不当而引起的故障，减少突发故障的发生。

#### 7.6.2 培训内容

培训内容可分为面向操作人员和面向管理人员两类。前者注重实际操作，后者偏重系统整体结构、功能和管理等。

#### 7.6.3 面向操作人员的培训内容主要包括：

各子系统的理论基础原理结构；

主要设备、器件的作用安装位置；

维护规程及简单故障判定排除；

竣工图的查阅和修改。

#### 7.6.4 面向管理人员的培训内容主要包括：

系统总体结构及各子系统相互间的关系；

系统重要参数的设定和修改；

竣工图的查阅。

#### 7.6.5 培训过程的组织管理

制定各子系统的培训内容和计划；

对培训内容和计划进行审查、确认；

根据业主要求，在实施过程中进行必要的调整。

#### 四 附图

见附件。

## 五 信息量表

信息量统计（按最终容量）

### 1 115kV 总降站统计（以最终）

#### 1.1 模拟量：

主变 115kV 侧三相电流	(3×2)
主变 22kV 侧三相电流	(3×2)
主变 22kV 侧三相电流、有功功率、无功功率	(5×2)
22KV 母线 I、II 段电压（包括线电压、 $3U_0$ ，计算相电压）	(4×2+3×2)
主变油温	(1×2)
22KV 分段三相电流、有功功率、无功功率	(5×1)
22KV 出线三相电流、有功功率、无功功率	(5×28)
22KV 电容器电流、无功（总三相电流、总无功、三分组单相电流）	(7×2)
22KV 站用变三相电流	(3×2)
直流 110V 母线电压（数据口通信获得充电电流、电池组电压）	(3×1)
系统频率	(1×1)
站用变低压侧三相电流、三相电压（380V）	(6×2)

#### 1.2 数字量

##### 1.2.1 中断量：

事故总信号	(1×1)
主变差动保护动作	(1×2)
主变重瓦斯	(1×2)
主变有载重瓦斯	(1×2)
主变过电流	(1×2)
主变 115kV 充电保护	(1×2)
主变 115kV 零流	(1×2)
主变保护继电器故障	(1×2)
主变 22KV I、II 段零流	(2×2)
22KV 出线保护动作	(4×28)



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22KV 出线继电器故障	(1×2)
22KV 母线接地	(1×2)
电容器保护动作	(6×2)
主变高低压侧断路器位置信号（开合）	(2×4)
22KV 出线断路器位置信号（开合）	(2×28)
电容器组断路器及电容器分组断路器位置信号（开合）	(2×8)
22KV 分段断路器位置信号（开合）	(2×1)
1.2.2 非中断量：	
断路器、有载遥控/就地位置信号	(1×39)
主变过负荷信号	(1×2)
主变轻瓦斯	(1×2)
主变温度高	(1×2)
主变有载轻瓦斯	(1×2)
主变气压高	(1×2)
主变低压侧开关柜小车位置	(1×2)
22KV 出线、电容器、站用变、分段及分段引线、压变小车位置	(1×36)
接地刀位置（22KV 出线、电容器、站用变、电容器组、115kV 侧接地开关、主变中性点隔离开关）	(1×48)
主变分接头位置	(17×2)
115kV 开关六氟化硫气压低报警	(1×2)
115kV 开关六氟化硫气压低闭锁	(1×2)
115kV 其他气室六氟化硫气压低报警	(1×2)
温湿度控制器故障	(1×38)
电压回路断线（失压）	(1×2)
开关未储能	(1×37)
MCB 空气开关跳闸	(1×2)
站用电失压	(1×1)
直流系统故障	(1×1)

故障录波录波启动	(1×1)
故障录波装置故障	(1×1)
故障录波掉电告警	(1×1)
站内烟火报警及备用	(10×1)
<b>1.2.3 开关量输出</b>	
主变高压侧隔离开关	(2×4)
主变高低压侧断路器	(2×4)
22KV 出线断路器	(2×28)
22KV 分段断路器	(2×1)
22KV 电容器及分组断路器	(2×8)
站用变断路器	(2×2)
主变有载调压分接头（上升、下降）	(2×2)
主变中性点隔离开关	(2×2)
<b>1.2.4 复归信号</b>	
<b>2 分站统计（暂估）</b>	
<b>2.1 模拟量：</b>	
22KV 母线 I、II、III 段电压（包括线电压、 $3U_0$ ，计算相电压）	(4×2×6+3×2×6)
22KV 高压柜（含进线、出线、分段）三相电流、有功功率、无功功率	(5×80)
直流 母线电压（数据口通信获得充电电流、电池组电压）	(3×1)
系统频率	(1×12)
<b>2.2 数字量</b>	
<b>2.2.1 中断量：</b>	
事故总信号	(1×12)
22KV 高压柜（含进线、出线、分段）保护动作	(4×80)
22KV 高压柜（含进线、出线、分段）继电器故障	(1×80)
22KV 母线接地	(1×12)
22KV 高压柜（含进线、出线、分段）断路器位置信号（开合）	(2×80)
<b>2.2.2 非中断量：</b>	

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断路器、手车、接地刀、弹簧未储能、遥控、变压器瓦斯、变压器高温	(11×80)
电压回路断线（失压）	(1×80)
MCB 空气开关跳闸	(1×80)
直流系统故障	(1×6)

2.2.3 开关量输出

22KV 断路器	(2×80)
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2.2.4 复归信号

六 供货范围

序号	设备名称	型号规格	数量	单位
1	综合保护			
1.1	主变保护屏			
	RET541B	主变差动保护		台
	REF541M	高压侧高后备保护测控		台
	REF541M	高压侧低后备保护测控		台
	WXD2361	测控装置		台
	WXD-8	保护屏 2260*800*600		面
1.2	22KV 保护分散安装			
	RE_615	高压柜保护		台
1.3	分站保护分散安装			
	RE_615	高压柜保护		台
2	故障录波屏			
	DRL-600	国电南自故障录波器		台
	LQ-300K	EPSON 针式打印机		台
	WXD-8	保护屏 2260*800*600		台

3	直流屏	一套 3 屏		套
4	交流屏	一套 2 屏		套
5	综合自动化通讯设备清单			
5.1	集控站内设备			
5.1.1	监控设备（安装在通讯屏内）			
	监控服务器	RAID1 服务器		台
	监控工作站	DELL 监控工作站显示器		台
	监控系统 PSA+	PSA+ 系统		套
	监控服务器操作系统	windows server 2012 R2		套
	监控工作站操作系统	windows7 旗舰版		套
	通讯管理机	与新能源后台系统通讯		台
	千兆光纤环网交换机	4 光 24 电（罗杰康）		台
	光纤终端盒	光纤终端盒 24 口		只
	光纤尾纤	单模 ST		根
	光纤跳线	单模 ST		根
	ST 耦合器	ST-ST		只
	光缆熔接	按光纤芯数		芯
	拼屏显卡	DVI 显卡		块
	DVI/HDMI 转接线	新能源在集控上的监控画面输出到大屏		套
	屏体及附件	WXD100（2200*800*600）		套
	5.1.2	组态及调试服务		
规约处理		与新能源后台通讯规约开发		套

	集控增量组态调试			
	增量对接服务	集控与新能源系统对接服务： 与新能源总降、DS1、DS2、DS3、 DS4、DS5、DS6 组态调试		套
	集控增量组态调试	集控增量组态调试： 与新能源总降、DS1、DS2、DS3、 DS4、DS5、DS6 组态调试		套
	区域一增量组态调试			
	增量对接服务	区域一与新能源系统对接服务： 与新能源总降、DS1、DS2、DS3、 DS4、DS5、DS6 组态调试		套
	集控增量组态调试	区域一增量组态调试： 与新能源总降、DS1、DS2、DS3、 DS4、DS5、DS6 组态调试		套
5.1.3	通讯附件			
	光缆	8 芯单模，与新能源总降站连接		米
	以太网线	以太网线 300m		套
5.2	总降站设备			
5.2.1	监控主机			
	监控服务器	RAID1 服务器		台
	监控工作站	L 监控工作站显示器		台
	监控系统 PSA+	PSA+系统		套
	监控服务器操作系统	windows server 2012 R2		套
	监控工作站操作系统	windows7 旗舰版		套
	针式打印机	EPSON 针式打印机		台
	激光彩色打印机	HP 激光彩色 A4		台
	大显示屏	60 大液晶显示屏		台
	操作台（含 6 张椅子）	钢木结构（3+3）工位		套
5.2.2	通讯测控屏			

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5.2.3	GPS 卫星时钟	GPS 卫星同步时钟，支持 SNTP		台	
	测控单元	每台不少于 72DI, 20DO, 12AI		台	
	16 口通讯管理机	16 口通讯管理机, 支持规约处理和规约转换		台	
	以太网交换机	24 口以太网交换机		台	
	光电转换器	单模光纤转换器		只	
	光纤终端盒	光纤终端盒 24 口		只	
	光纤尾纤	单模 ST		根	
	光纤跳线	单模 ST		根	
	ST 耦合器	ST-ST		只	
	光缆熔接	按光纤芯数		芯	
	屏体及附件	WXD100 (2200*800*600)		套	
		<b>远动通讯屏</b>			
	远动通讯管理机	与区域一系统及集控系统通讯		台	
5.2.4	远动通讯管理机	预留与电力调度通讯网络接口		台	
	千兆光纤环网交换机	4 光 24 电 (罗杰康)		台	
	光纤终端盒	光纤终端盒 24 口		只	
	光纤尾纤	单模 ST		根	
	光纤跳线	单模 ST		根	
	ST 耦合器	ST-ST		只	
	光缆熔接	按光纤芯数		芯	
	屏体及附件	WXD100 (2200*800*600)		套	
		<b>逆变电源屏</b>			
		逆变器	5kVA		台
		屏体及附件	WXD100 (2200*800*600)		套

5.2.5	通讯附件			
	光缆	8 芯单模，与集控站连接		米
	桥架	热镀锌槽式桥架（带盖板）， 150*100mm		米
	站内通讯电缆	RVVP2*0.75		米
	多模光纤			米
	ABB RER103	ABB 光电转换器 通讯隔离模块		只
	RS422 光电转换器	后台 115kV 端光电转换器		只
	以太网线	六类以太网线		米
5.2.6	组态及调试服务			
	就地组态及调试	就地后台通讯及组态调试		次
	远动组态及调试	远动通讯及组态调试		次
	规约处理转发	与区域一及集控后台的规约开发		次
	规约开发调试	预留与电力调度的规约开发调试		次
	与区域一对接服务	就地后台与区域一系统对接服务		次
	与集控对接服务	就地后台与集控系统对接服务		次
6	视频系统设备清单			
6.1	视频汇集设备(安装在集控站)			
	视频监视主机	监控主机及显示器(高配)		台
	HDMI 显卡	输出到拼屏系统		块
	视频高清解码器	与拼接屏高清矩阵对接(高配)		台
	视频管理软件	视频平台管理软件(高配)		台
	集控与视频联动	集控系统与视屏视频调试及开发		套
	万兆光纤环网交换机	4 万兆光 24 千兆		台
	光纤终端盒	光纤终端盒 24 口		只
	光纤尾纤	单模 ST		根

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	光纤跳线	单模 ST		根
	ST 耦合器	ST-ST		只
	光缆熔接	按光纤芯数		芯
	以太网线	六类以太网线		米
	视频通讯光缆	8 芯单模，与新能源总降站连接		米
	开关电源	DC12V 30A		个
	双向 IP 网络系统软件包	双向 IP 网络系统软件包（含 PC 分控软件）		套
	IP 网络寻呼对讲话筒	IP 网络寻呼对讲话筒		台
	不间断电源	不间断电源 5kVA		台
	视频屏体及附件	WXD100（2200*800*800）		套
	视频通讯调试	现场通讯调试		套
<b>6.2</b>	<b>总降站站内设备</b>			
<b>6.2.1</b>	<b>主机及网络设备</b>			
	视频监视主机	视频监视主机及显示器		台
	硬盘录像机	网络硬盘录像机 256 路输入		台
	监控专用硬盘	希捷监控级 6T		只
	万兆光纤环网交换机	4 万兆光 24 千兆		台
	光电转换器	单模光电转换器		只
	光纤终端盒	光纤终端盒 24 口		只
	光纤尾纤	单模 ST		根
	光纤跳线	单模 ST		根
	ST 耦合器	ST-ST		只
	光缆熔接	按光纤芯数		芯



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	以太网线	六类以太网线		米
	开关电源	DC12V 30A		个
	视频通讯光缆	8 芯单模，与集控站连接		米
	双向 IP 网络系统软件包	双向 IP 网络系统软件包（含 PC 分控软件）		套
	IP 网络寻呼对讲话筒	IP 网络寻呼对讲话筒		台
	视频屏体及配件	WXD100（2200*800*800）		套
6.2.2	<b>摄像机主体</b>			
	115kV GIS 室摄像机	数字高清红外一体枪式摄像机		只
	22KV 开关柜室摄像机	数字高清红外一体枪式摄像机		只
	主变摄像机	数字高清红外一体枪式摄像机		只
	电容器摄像机	数字高清红外一体枪式摄像机		只
	视频球机	数字高清红外球机		只
	摄像机支架	一体机支架		个
	视屏设备壁挂式机柜	摄像机就地电源及通讯机柜		套
	光电转换器	单模光电转换器		只
	以太网交换机	千兆以太网交换机 24 口		只
	光纤尾纤	单模 ST		根
	光纤跳线	单模 ST		根
	光纤终端盒	光纤终端盒 8 口		只
	ST 耦合器	ST 耦合器		只
	开关电源	DC12V 30A		个
	视频通讯光缆	4 芯单模		米
	光缆熔接	按光纤芯数		芯
	机柜电源线	RVVP3*2.0		米

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	摄像机电源线	RVVP2*1.0		米
	摄像机通讯线	六类以太网线		米
	<b>IP 对讲及温湿度设备</b>			
	IP 数字对讲壁挂面板	IP 数字对讲壁挂面板		个
	电源线	RVVP3*2.0		米
	网络温湿度表	网络温湿度表		个
	以太网交换机	高性能以太网交换机 16 口		只
	通讯管理机	通讯管理机（温湿度表通讯）		台
	壁挂式机柜	就地电源及通讯机柜		套
	<b>安装附件</b>			
	安装附件	PVC 管及接地附件(含视频、IP 对讲及温湿度附件)		套
	安装调试	现场安装调试		套

# Technical Specification for Three-Phase Smart Energy Meter

(technical specifications section)

# 1. Standard technical parameter table

Parameters marked with '\*' are critical specifications. Non-compliance with these parameters will be considered a major deviation from the solicitation requirements.

serial number	name (of a thing)	Project requirement value or expression	Bidder's guaranteed value
	Common procurement standards	1307004-0000-g0_General Technical Specification for Three-phase Smart Energy Meters (2013 Edition)_V2	
1.1	*Exterior dimensions	290mm (H) x 170mm (W) x 85mm (Th)	
1.2	Flame retardant temperature		
1.2.1	terminal block	960°C±10°C	
1.2.2	Terminal Block Heat Resistance	≥200°C	
1.2.3	Terminal Cover and Chassis	650°C±10°C	
1.3	Terminal Block Pressure Characteristics		
1.3.1	Voltage and current terminals	≥60N	
1.3.2	Auxiliary terminals	≥10N	
1.4	*LCD		
1.4.1	sizes	85mm (L) x 50mm (W)	
1.4.2	character size	Q/GDW 1356-2013 "Three-phase intelligent energy meter type specification" in the appendix I of the provisions	
1.4.3	life span	>10 years	
1.5	Battery level display		
1.5.1	Total Digits	8	
1.5.2	number of decimal places	Decimal digits 0 to 3 can be set	
1.6	output interface	With electrical energy pulse output, multi-function test interface, alarm output interface	
1.7	*Environmental conditions		
1.7.1	highest temperature	+60°C (indoor)/+70°C (outdoor)	
1.7.2	minimum temperature	-25°C (indoor) / -40°C (outdoor)	
1.7.3	relative humidity	≤95 per cent	
1.7.4	Atmospheric pressure (below 4000 metres)	63.0kPa~106.0kPa	
1.8	Temperature Compensation Circuit	built-in	
1.9	* Clock accuracy		
1.9.1	23°C	≤±0.5s/d	
1.9.2	-25°C ~ +60°C	≤±1.0 s/d	
1.10	stockpile		

1.10.1	Electricity data	≥ 12 settlement days	
1.10.2	Maximum demand data	≥ 12 settlement days	
1.11	Data loss preservation		
1.11.1	Settlement data	≥10 years	
1.11.2	Other data	≥3 years	
1.12	communications interface		
1.12.1	Infrared Interface	1	
1.12.2	RS485	2	
1.13	Rate period		
1.13.1	fig. a series of tricks	≥2	
1.13.2	time zones	≥2	
1.13.3	time slot	≥8	
1.14	*Fundamental error	Factory error data guaranteed to be within 60 per cent of the permissible error limits	
1.15	Reverse phase sequence test	± 0.05 per cent	
1.16	Voltage change (-10%~+10%)		
1.16.1	Cosφ=1.0	±0.1 per cent	
1.16.2	Cosφ=0.5L	± 0.2 per cent	
1.16.3	Voltage change -20%, +15%		
1.16.3.1	Cosφ=1.0	± 0.3 per cent	
1.17	Frequency impact test		
1.17.1	Cosφ=1.0	±0.1 per cent	
1.17.2	Cosφ=0.5L	±0.1 per cent	
1.18	Self-heating test		
1.18.1	Cosφ=1.0	±0.1 per cent	
1.18.2	Cosφ=0.5L	±0.1 per cent	
1.19	Voltage unbalance test	± 0.5 per cent	
1.20	*Error consistency test		
1.20.1	In (Cosφ = 1.0, 0.5L)	± 0.06 per cent	
1.20.2	0.1In (Cosφ=1.0)	± 0.08 per cent	
1.21	*Error variation test		
1.21.1	Amount of error variation at the same load point	≤0.04 per cent	
1.22	Load current rise and fall test		
1.22.1	Amount of error variation at the same load point	≤0.05 per cent	
1.23	Voltage Line Power Consumption		
1.23.1	Line power	Active power ≤1.5W; apparent power ≤6VA	
1.23.2	Auxiliary power supply	Apparent power ≤ 0.5VA; auxiliary power consumption ≤ 10VA	
1.24	Current Line Power Consumption	≤0.2VA	
1.25	*AC voltage test	4kV	
1.26	*Pulse voltage test	6kV	
1.27	Electrostatic discharge test		
1.27.1	Test Voltage	Contact discharge 8kV, air	

		discharge 15kV	
1.28	Surge immunity test		
1.28.1	Test Voltage	4kV	
1.29	High frequency electromagnetic field test		
1.29.1	Amount of error variation	±1.0 per cent	
1.30	Rapid transient pulse group test		
1.30.1	Test Voltage	4kV	
1.31	Conducted Nuisance Test for RF Field Induction		
1.31.1	Amount of error variation	±1.0 per cent	
1.32	Attenuated oscillatory wave test		
1.32.1	Amount of error variation	±1.0 per cent	
1.33	* Batteries		
1.33.1	quantitative (science)	≥1.2Ah	
1.33.2	Lifetime (meter disconnected)	≥5 years	
1.34	dependability	≥10 years	

#### List of Goods Requirements and Scope of Supply

serial number	name (of a thing)	Model No.	unit (of measure)	quantities	note
1	110kV line meter	0.2S level bidirectional three-phase intelligent meter reference voltage: 3×57.7V Basic current: 1.5A (6A)	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	2	Arranged with the electric energy collection device group screen, metering meter should be in line with the "electronic AC energy meter measurement and verification regulations" (JJG596-2012). <b>Gateway meter</b>
1.1	Loss-of-pressure cut-off timer		classifier for individual things or people, general, catch-all classifier	on demand	Configuration by meter
1.2	junction box		classifier for individual things or people, general, catch-all classifier	on demand	Configuration by meter
1.3	Armoured Shielded Network Cable		surname Mi	on demand	
1.4	Meter testing costs		term (in a mathematical formula)	1	
1.5	Voltage paralleling device		classifier for heavy objects, such as machines, TVs, computers; theater performances	1	
1.6	screen body		top	0	

2	Main transformer meter	0.5S analogue bi-directional three-phase smart meter reference voltage: 3×57.7V Basic current: 1.5A (6A)	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	2	Arrangement with the electric energy collection device group screen, metering meter should be in line with the "electronic AC energy meter measurement and verification regulations" (JJG596-2012).
3	Main transformer meter	0.2S analogue bidirectional three-phase smart meter reference voltage: 3×57.7V Basic current: 1.5A (6A)	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	2	Arrangement with the electric energy collection device group screen, metering meter should be in line with the "electronic AC energy meter measurement and verification regulations" (JJG596-2012).
4	22kV Electronic Energy Meter	0.5S grade electronic bi-directional three-phase smart meter Reference voltage: 3×57.7V Basic current: 1.5A (6A)	classifier for birds and certain animals, one of a pair, some utensils, vessels etc	28	Lower 22kV switchgear, metering meter should be in line with the "electronic AC energy meter measurement and verification regulations" (JJG596-2012).

# 电能表装置

(技术规范部分)



# 1.标准技术参数表

打“\*”的项目为主要技术参数,如不能满足要求,将被视为实质性不符合招标文件要求

序号	名称	项目需求值或表述	投标人保证值
	通用采购标准	1307004-0000-g0_三相智能电能表通用技术规范（2013版）_V2	
1.1	*外形尺寸	290mm（高）×170mm（宽）×85mm（厚）	
1.2	耐热阻燃温度		
1.2.1	端子座	960℃±10℃	
1.2.2	端子座热变形温度	≥200℃	
1.2.3	端子盖和底壳	650℃±10℃	
1.3	接线柱压力特性		
1.3.1	电压、电流接线端子	≥60N	
1.3.2	辅助端子	≥10N	
1.4	*液晶屏		
1.4.1	尺寸	85mm（长）×50mm（宽）	
1.4.2	字符尺寸	Q/GDW 1356-2013《三相智能电能表型式规范》中附录I的规定	
1.4.3	寿命	>10年	
1.5	电量显示		
1.5.1	总位数	8	
1.5.2	小数位数	小数位 0~3 位可设置	
1.6	输出接口	具备电能量脉冲输出、多功能测试接口、报警输出接口	
1.7	*环境条件		
1.7.1	最高温度	+60℃（户内）/+70℃（户外）	
1.7.2	最低温度	-25℃（户内）/-40℃（户外）	
1.7.3	相对湿度	≤95%	
1.7.4	大气压力（4000米以下）	63.0kPa~106.0kPa	
1.8	温度补偿电路	内置	
1.9	*时钟准确度		
1.9.1	23℃	≤±0.5s/d	
1.9.2	-25℃ ~ +60℃	≤±1.0 s/d	
1.10	存储		
1.10.1	电量数据	≥12个结算日	
1.10.2	最大需量数据	≥12个结算日	
1.11	数据失电保存		

1.11.1	结算数据	≥10年	
1.11.2	其他数据	≥3年	
1.12	通信接口		
1.12.1	红外	1个	
1.12.2	RS485	2个	
1.13	费率时段		
1.13.1	套数	≥2	
1.13.2	时区数	≥2	
1.13.3	时段数	≥8	
1.14	*基本误差	出厂误差数据保证在允许误差限值的60%以内	
1.15	逆相序试验	±0.05%	
1.16	电压改变(-10%~+10%)		
1.16.1	Cos φ =1.0	±0.1%	
1.16.2	Cos φ =0.5L	±0.2%	
1.16.3	电压改变-20%,+15%		
1.16.3.1	Cos φ =1.0	±0.3%	
1.17	频率影响试验		
1.17.1	Cos φ =1.0	±0.1%	
1.17.2	Cos φ =0.5L	±0.1%	
1.18	自热试验		
1.18.1	Cos φ =1.0	±0.1%	
1.18.2	Cos φ =0.5L	±0.1%	
1.19	电压不平衡试验	±0.5%	
1.20	*误差一致性试验		
1.20.1	ln(Cos φ =1.0、0.5L)	±0.06%	
1.20.2	0.1ln(Cos φ =1.0)	±0.08%	
1.21	*误差变差试验		
1.21.1	同一负载点误差变化量	≤0.04%	
1.22	负载电流升降试验		
1.22.1	同一负载点误差变化量	≤0.05%	
1.23	电压线路功耗		
1.23.1	线路供电	有功功率≤1.5W;视在功率≤6VA	
1.23.2	辅助电源供电	视在功率≤0.5VA;辅助电源功耗≤10VA	
1.24	电流线路功耗	≤0.2VA	
1.25	*交流电压试验	4kV	
1.26	*脉冲电压试验	6kV	
1.27	静电放电试验		
1.27.1	试验电压	接触放电 8kV, 空气放电 15kV	
1.28	浪涌抗扰度试验		
1.28.1	试验电压	4kV	

1.29	高频电磁场试验		
1.29.1	误差变化量	±1.0%	
1.30	快速瞬变脉冲群试验		
1.30.1	试验电压	4kV	
1.31	射频场感应的传导骚扰试验		
1.31.1	误差变化量	±1.0%	
1.32	衰减振荡波试验		
1.32.1	误差变化量	±1.0%	
1.33	*电池		
1.33.1	容量	≥1.2Ah	
1.33.2	寿命（电表断电）	≥5年	
1.34	可靠性	≥10年	

货物需求及供货范围一览表

序号	名称	型号	单位	数量	备注
1	110kV 线路电度表	0.2S 级双向三相智能电度表 参比电压：3×57.7V 基本电流：1.5A（6A）	只	2	与电能采集装置组屏布置，计量表计应符合《电子式交流电能表计量检定规程》（JJG596-2012）。 <b>关口表</b>
1.1	失压断流计时仪		个	按需	按电度表配置
1.2	接线盒		个	按需	按电度表配置
1.3	铠装屏蔽网线		米	按需	
1.4	表计检测费用		项	1	
1.5	电压并列装置		台	1	
1.6	屏体		面	0	
2	主变电度表	0.5S 级模拟量双向三相智能电度表 参比电压：3×57.7V 基本电流：1.5A（6A）	只	2	与电能采集装置组屏布置，计量表计应符合《电子式交流电能表计量检定规程》（JJG596-2012）。
3	主变电度表	0.2S 级模拟量双向三相智能电度表 参比电压：3×57.7V 基本电流：1.5A（6A）	只	2	与电能采集装置组屏布置，计量表计应符合《电子式交流电能表计量检定规程》（JJG596-2012）。
4	22kV 电子式电能表	0.5S 级电子式双向三相智能电度表 参比电压：3×57.7V 基本电流：1.5A（6A）	只	28	下放 22kV 开关柜，计量表计应符合《电子式交流电能表计量检定规程》（JJG596-2012）。

**Technical Requirements for SF<sub>6</sub>  
Gas Leakage Monitoring and  
Alarm System**



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## 0 Scope of supply

serial number	Equipment Name	Quantity	Installation Location	Configuration Type	Remarks
1	SF6 gas leakage monitoring and alarm system	1 set (subject to construction drawings)	within the home	on the ground	System included (subject to final construction drawings): 1 mainframe. 14 SF6 detectors (reference). 3 temperature and humidity controllers (reference). 2 alarm lamps (reference). 2 fan controllers (reference). Distributor 7 (reference).

## 1 General Provisions

### 1.1 Introduction

1.1.1 This specification book is for 115KV substation

The technical requirements of the SF6 gas leakage monitoring and alarm system.

1.1.2 The tenderer shall carefully read all the clauses in the specification including all technical specifications. The technical specifications of the equipment supplied by the Bidder shall be capable of meeting the requirements of this specification.

1.1.3 Manufacturers who are required to supply shall obtain the ISO-9000 qualification certificate.

1.1.4 The SF6 gas leakage monitoring and alarm system provided by the bidder must have good performance and reliable operation experience in the same scale of power supply and distribution projects in the power industry, and provide the supply performance table of the same level in the last 3 years.

### 1.2 Legislation and standards

1.2.1 The equipment and materials supplied must comply with Chinese national standards in force at the date of arrival.

1.2.2 When there is a contradiction between the manufacturing standards and this technical specification, the seller shall propose it in writing to the buyer, and the supply and demand sides shall solve it by negotiation.

### 1.3 Treatment of equipment not meeting guaranteed performance

If, during the acceptance test of the equipment, it is found that the guaranteed performance is not satisfied and the parameters of the equipment are not adjusted to the guaranteed value within three months from the date of the discovery of the problem, the buyer shall have the right to terminate the contract or to return the equipment, or, if the buyer considers the equipment to be operable, to treat the equipment that does not satisfy the guaranteed value at a reduced price.

### 1.4 Environmental conditions at the site

Elevation:	<1000m;
Maximum Operating Temperature:	+45°C ;
Highest monthly average temperature:	+ 45°C ;
Minimum ambient air temperature:	-15°C ;
Maximum Daily Temperature Variation:	25°C ;
Maximum Monthly Average Relative Humidity:	95 per cent (25°C ).

## **2 Technical requirements for equipment**

### **2.1 The system shall be functional:**

- (1) Ambient SF6 gas content detection function.
- (2) Oxygen gas content detection function in the environment.
- (3) SF6 gas content exceeding the standard alarm function.
- (4) Hypoxia alarm function.
- (5) Automatic start function of the fan when there is a lack of oxygen or the SF6 gas content exceeds the standard (at the same time, it can be set not to start the fan automatically according to the customer's needs).
- (6) Timed exhaust function.
- (7) Forced air exhaust function.
- (8) Display of the last exhaust time.
- (9) Operation status voice prompting function.
- (10) Related historical data storage and retrieval function.
- (11) The SF6 leak monitoring and alarm system host must be able to program the address of the transmitter.
- (12) The mainframe is reserved for connecting to the hard contact signals (power failure, fault, alarm) and RS485 communication interface of the station monitoring system, and the communication protocol should adopt the standard Modbus protocol.

### **2.2 Technical parameters or indicators of the system:**

- (1) System operating power supply: AC220V, 50HZ;
- (2) SF6 gas concentration alarm error:  $<\pm 10$  per cent;
- (3) Oxygen concentration detection range in air: 1.0%-25.0%;
- (4) Oxygen concentration indication error:  $<\pm 0.5$  per cent;
- (5) Oxygen deficiency alarm setpoint: 18.0 per cent;
- (6) Oxygen deficiency alarm error:  $<\pm 0.5$  per cent;
- (7) Host alarm output contact power:  $>3A$ ;
- (8) Start fan output contact power:  $>8A$ .



### **3 Other relevant clarifications**

(1) The scope of the system arrangement is the 115kV main substation room and the 115kV GIS distribution unit.

(2) The supplier is responsible for the installation and commissioning of the equipment until the equipment is put into monitoring operation; the ordering party is responsible for cooperating with the on-site construction.

(3) The supplier is responsible for the technical training of the ordering party's operating and maintenance personnel for general maintenance work.

(4) From the date of commissioning of the equipment, the supplier provides products with a warranty period of 4 years. In the warranty period if the finished product manufacturing quality of all the problems found, should be provided by the supplier free of charge to the product for repair or replacement; warranty period, the supplier of equipment for lifelong repair and maintenance.

(5) The supplier should be able to provide simple operating instructions to be placed next to the mainframe to facilitate the operation and maintenance of the operator.

(6) In the event of a failure of the equipment that cannot be resolved, the supplier shall send an officer to the site to solve the problem within 48 hours after being notified.

# **SF6气体泄漏监控报警系统技术规范书**

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## 0 供货范围

序号	名称	数量	安装位置	布置型式	备注
1	SF6 气体泄漏监控报警系统	1 套（以施工图为准）	户内	地上	系统含（以最终施工图为准）： 主机 1 个， SF6 探测器 14 个（参考）， 温湿度控制器 3 个（参考）， 报警灯 2 个（参考）， 风机控制器 2 个（参考）， 分配器 7 个（参考）。

## 1 总则

### 1.1 引言

1.1.1 本规范书为 115KV 变电站

的 SF6 气体泄漏监控报警系统的技术要求。

1.1.2 投标方应仔细阅读规范书中的所有条款，包括所有技术规范。投标方所提供的设备技术规范应能满足本规范书的要求。

1.1.3 要求供货的厂商应获得 ISO-9000 资格认证证书。

1.1.4 投标方提供的 SF6 气体泄漏监控报警系统必须在电力行业同规模供配电工程有良好业绩和可靠运行经验，并提供最近 3 年同等级的供货业绩表。

### 1.2 法规和标准

1.2.1 所提供的设备材料必须符合到货日期止有效的中国国家标准。

1.2.2 当制造标准与本技术规范书有矛盾时，卖方以书面形式向买方提出，由供需双方协商解决。

### 1.3 设备不满足保证性能的处理方法

如在设备的验收试验中，发现不满足保证性能，且在问题发现之日起三个月内未将设备参数调整到保证值，则买方有权中止合同或予以退货，如买方认为设备可以运行，则可对不满足保证值的设备按降价处理。

### 1.4 现场环境条件

海拔： <1000m;

最高环境温度:	+45℃;
最高月平均气温:	+45℃;
最低环境气温:	-15℃;
最大日温差:	25℃;
最高月平均相对湿度:	95% (25℃)。

## 2 设备技术要求

### 2.1 系统应达到功能:

- (1) 环境中 SF6 气体含量检测功能。
- (2) 环境中氧气气体含量检测功能。
- (3) SF6 气体含量超标报警功能。
- (4) 缺氧报警功能。
- (5) 缺氧或 SF6 气体含量超标时风机自动启动功能（同时可根据客户需要设置不自动启动风机）。
- (6) 定时排风功能。
- (7) 强制排风功能。
- (8) 上次排风时间显示功能。
- (9) 运行状态语音提示功能。
- (10) 相关历史数据存储及检索功能。
- (11) SF6 泄漏监控报警系统主机必须可以对变送器进行地址编程。
- (12) 主机预留接至站内监控系统的硬接点信号(失电、故障、报警)及 RS485 通讯接口，通讯协议需采用标准 Modbus 协议。

### 2.2 系统的技术参数或指标:

- |                   |               |
|-------------------|---------------|
| (1) 系统工作电源:       | AC220V, 50HZ; |
| (2) SF6 气体浓度报警误差: | <±10%;        |
| (3) 空气中氧气浓度检测范围:  | 1.0%-25.0%;   |
| (4) 氧气浓度示值误差:     | <±0.5%;       |
| (5) 缺氧报警设置点:      | 18.0%;        |

- (6) 缺氧报警误差: <math>\pm 0.5\%</math>;
- (7) 主机报警输出触点功率: >3A;
- (8) 启动风机输出触点功率: >8A。

### 3 其它相关明确事项

- (1) 系统布置范围为 115kV 主变室及 115kV GIS 配电装置。
- (2) 供货方负责设备安装调试工作，直至设备投入监测运行；订货方负责配合现场施工。
- (3) 供货方负责对订货方的运行人员和维护人员进行一般维护工作的技术培训。
- (4) 自设备投运之日起，供货方提供产品的质保期为 4 年。在质保期内若发现成品制造质量的一切问题，均应由供货方无偿对所供产品进行维修或更换；质保期后，供货方对设备进行终身维修及维护。
- (5) 供货方应能提供简易操作说明置于主机旁以便于运行人员操作和维护。
- (6) 设备出现故障而无法解决时，供货方在得到通知后应在 48 小时内派员到现场解决问题。

## 附件 2：项目管理规定

### 第一部分 通用规定

#### 1 总则

- 1.1 为了确保工程进度和质量，特制定本管理规定。
- 1.2 本管理规定中发包人包含发包人聘请的监理公司，该公司将在发包人授权范围对本工程实行管理。
- 1.3 发包人为整个项目的总负责人，承包人必须按照本管理规定的要求接受发包人的管理。如果承包人不服从发包人的管理，将被视为违约并接受处罚；拒绝纠正并可能导致工程延误的，发包人有权解除合同。
- 1.4 本管理规定是发包人对承包人的基本要求，承包人可在此规定基础上，制定相应的管理办法与规定。

#### 2 项目实施方案/施工组织设计

- 2.1 进场前 7 天，承包人应向发包人和监理公司提交项目实施方案（又称施工组织设计）。
- 2.2 项目实施方案应包括但不限于以下内容：工程概况，工程内容及进度计划，施工部署与平面布置，项目管理组织，设计，施工方案，施工人员，现场物资管理，施工安全措施，施工环境保护措施，职业健康措施，现场治安保卫措施，文明施工措施，质量保证措施，施工进度保证措施，工程风险预测及对策、应急预案，文件管理，培训，成品保护、交付、工程保修措施等。

#### 3 工程内容及进度计划

- 3.1 承包人应对合同约定的工程内容进行工作分解（WBS），作为制定工作计划的依据。
- 3.2 进度计划应分级编制，遵循上一级进度控制下一级进度，下一级进度细化分解上一级进度的原则。
  - 3.2.1 进度计划包括：项目总进度（一级进度计划）：项目实施阶段里程碑进度节点；项目策划进度（二级进度计划）：项目实施阶段主要工作；项目阶段进度（三级进度计划）：项目各阶段详细工作；项目作业进度（四级进度计划）：单项作业活动。
  - 3.2.2 进度计划应与合同约定和发包人的要求保持一致。
  - 3.2.3 应使用 project 软件编制进度计划（项目总进度可以例外）。

#### 4 施工部署与平面布置

- 4.1 承包人应根据现场情况，对其现场区域的用电和用电量、用水和用水量、道路做出安排，以满足安全施工、文明施工要求。
- 4.2 承包人应根据发包人安排的现场区划，将其投入的各种资源、材料、构件、机械、道路、水电供应网络、生产、生活活动场地及各种临时工程设施合理地布置在施工现场，使整个现场能有组织地进行安全施工、文明施工。
- 4.3 承包人应按发包人要求在指定的区域建设生产、办公和生活设施。如果发包人为了项目整体形象、满足管理要求和工作联系便利，统一建设生产、办公和生活用房，发包人将以合理的价格出租给承包人使用，承包人不得无故拒绝。
- 4.4 承包人办公室内应配有办公家具、办公设备（如电话、电脑、传真机、打印机等）。
- 4.5 承包人应建立管理制度，使其生产、办公和生活区域保持整齐、有序、清洁、卫生。

#### 5 项目管理组织

- 5.1 承包人应编制项目管理组织机构图表，确定项目总负责人、承包人代表（承包人项目经理）和主要管理岗位人员，明确职责、权限、通讯方式。
- 5.2 承包人应确定、任命承包人代表（承包人项目经理），任命书/授权书要递交发包人和监理公司备案。
- 5.3 承包人应按照规定和发包人要求设置承包人代表（承包人项目经理）、安全、技术、质量等专职管理人员，负责其所承担工程的项目管理。各岗位人员经发包人认可后，承包

人不得随意变动。承包人若要调换专职管理人员，应报发包人批准。

## 6 项目报告

### 6.1 开工报告

6.1.1 开工报告是承包人说明其已经按规定办理施工相关审批手续、具备施工条件的文件。批准开工报告之前应该完成下列工作：

序号	需要完成的工作	是否完成
1	法律规定的、与承包人施工有关的施工许可	
2	项目实施方案（施工组织设计）审批	
3	发包人对承包人的施工技术、安全交底工作	
4	承包人完全理解发包人的项目管理要求	
5	现场临时用水、用电计划和方案审批	
6	现场道路是否满足要求	
7	承包人使用和负责管理的现场区域是否明确	
8	水电供应是否到位	
9	生产、办公和生活厂区临时设施	
10	承包人营业执照和资质备案	
11	承包人代表授权书原件备案	
12	项目管理组织（主要管理人员是否到岗）	
13	项目主要管理人员职责明确	
14	双方项目经理和现场安全环保负责人共同签订《项目环境、职业健康安全协议》	
15	本项目的重要环境因素和危险源是否识别并制定控制措施	
16	应急预案是否制定	
17	进场人员安全培训记录	
18	进场施工人员核验、办理出入证	
19	特殊工种施工人员资格证备案	
20	施工机具（含测量仪器仪表）核验	
21	工程设备材料核验	
22	施工方案审批	
23	项目安全质量进度保证金交纳	



6.1.2 承包人应在施工开始之前 7 天向发包人和监理公司提交开工报告。

## 6.2 工作月报

6.2.1 工作月报是一份总结上个月工作和安排下个月工作计划的正式文件。对照项目进度计划，对实际工程的安全、进度、质量、成本、问题与解决办法等进行总结，并计划下个月的施工内容和工作改进。

6.2.2 承包人应在每月 25 日向发包人和监理公司提交工作月报。

## 6.3 工作周报

6.3.1 工作周报应包括但不限于以下内容：安全综述，事故报告及解决办法；简短叙述本周每次活动细节，对特别成就突出说明；三周计划，一周进度，二周计划展望；关注的区域及建议改正的措施；人力报告；突出问题。

6.3.2 承包人应在下周的第一个工作日或在每周项目例会上向发包人提交工作周报。

## 6.4 项目终结报告

在发包人接收项目之前，承包人应编制项目终结报告，根据合同约定的工作内容和要求，一一对应总结实际完成情况。

## 7 工作会议

承包人必须参加下列工作会议：

7.1 项目启动会：开工之前，承包人应按照发包人要求的时间、地点、参会人员参加项目启动会。会议主要议题是就项目组织机构、人员、进度计划、施工方案以及技术问题进行初次讨论和确认。

7.2 每周例会：是发包人每周定期召开的工作会议，会议主要议题是本周工作回顾、问题总结、下周工作安排等。

7.3 每天例会：是发包人每天召开的工作协调会，会议主要议题是协调当天的工作和问题解决。

7.4 专题会议：是发包人根据需要不定期召开的工作会议，商议专项问题。

## 8 承包人设计

8.1 承包人承担的工程设计必须满足合同要求。

8.2 承包人承担的工程设计必须经过发包人和监理公司会签方可实施。承包人应将设计会签的内容和时间安排至少提前 10 天书面通知发包人和监理公司。

8.3 承包人如果需要发包人提供设计资料，也应至少提前 10 天书面通知发包人。

8.4 承包人应按照约定时间向发包人提供合格的设计资料。如果不能按期提供设计资料，承包人应至少提前 10 天书面通知发包人。承包人应保证所提设计资料的正确性和准确性。如果因为承包人不能按时提供设计资料且不提前通知发包人和监理公司，或因为承包人所提设计资料错误（或有缺陷）而造成工期延误和工程损失，则承包人承担一切责任。

## 9 施工方案

9.1 承包人应根据其工程内容和实施过程中的现场环境，对主要工作内容、重大施工内容、关键技术、重要设备材料供应等编制施工方案，内容包括但不限于：施工内容，施工场地，施工的主要步骤和过程描述，施工人员状况，施工设施状况，危险作业（如大型设备安装、防爆区域内作业的）的作业文件，安全保护措施，需要发包人协调、配合事宜。

9.2 对于现场危险性较大的分部分项工程、临时用电、特种设备（包括锅炉、压力容器、压力管道、电梯、起重机械、场内专用机动车辆等）、特殊作业（包括爆破、动火、高处/坑口、起重吊装、管道/设备冲洗试压等）、限制空间进入、危险化学品运输/储存/使用等危险性较大的工作，必须分别编制专项施工方案。施工方案经过发包人和监理公司批准后方可实施。

9.3 对特殊气候条件、特殊地理环境下的施工应制定施工方案。

9.4 对于超过一定规模的危险性较大的分部分项工程，应当组织专家对专项方案进行论证。

## 10 施工人员

10.1 承包人应按照合同约定的工程内容和进度计划，制定能够满足合同和发包人要求的施工人员配置计划，包括工种、级别、来源、人数、工作时间等。

10.2 施工人员在进场前 7 天，应填写《进场人员资格审查表》，经过发包人和监理公司核验、办理工作牌后方可进入现场。核验内容包括施工人员审核表、身份证原件和复印件、特殊工种资格证原件和复印件等。未办理工作牌或临时出入证的人员不得进入施工现场。

10.3 承包人应制定施工人员管理制度，对施工人员的档案、培训、劳动纪律、考核、奖惩等进行管理。

10.4 项目实施过程中，承包人应定期（至少每周）向发包人和监理公司提交现场实际施工人工时表，包括工种、级别、人数、正常工作工时、加班工时等。

10.5 对于有特殊要求的施工人员，发包人将进行现场核验或技能考核测试。

## 11 现场物资管理

11.1 承包人的物资包括施工机具、工程设备材料、办公物资和生活物资。

### 11.2 施工机具

11.2.1 承包人应按照合同约定的工程内容和进度计划，制定能够满足合同和发包人要求的施工机具配置计划，包括施工机具的名称、数量、来源、设备状况等。

11.2.2 为保证施工机具、测量仪器仪表满足施工要求，在进场之前承包人应对其重新检验校准，填写《进场设备审查表》，经过发包人核验、粘贴使用标示后方可进入现场。核验内容包括施工机具清单、检定证书、使用说明书、实物状况等。未经发包人核验的施工机具不得用于工程施工。测量仪器仪表必须有校准状态标识，保证在有效期内使用。

11.2.3 承包人应根据施工机具的类别，分别制定现场施工机具管理制度，使用过程中应符合定机、定人、定岗、持证上岗、交接、维护保养等规定。

### 11.3 工程设备材料

11.3.1 承包人应按照合同约定进行工程设备材料的采购。应对供应方进行评价，内容包括：经营资格和信誉，设备材料的质量，供货能力，售后服务等。

11.3.2 工程设备材料应经过发包人和监理公司核验后方可进入现场。核验内容包括设备材料清单、生产许可证、产品合格证、检测/检验报告、使用说明书、实物状况等。未经发包人和监理公司核验的设备材料不得用于工程施工。

11.3.3 承包人应制定工程设备材料管理制度（包括移交的甲供材料），对工程设备材料贮存、保管、出入库、搬运、防护、标识等做出规定。

11.3.4 承包人应全面了解其工程范围内使用的工程设备材料并进行跟踪。承包人应设置有能力、有资格的职员负责工程设备材料的管理，应按照综合的、一体化的政策、步骤和施工工艺过程，利用管理软件对设备材料尤其是关键设备材料、大宗材料的状态进行跟踪，包括：采购报价日期，合同签订日期，对方确认合同生效日期，开始制造日期，在对方工地验货日期，发货日期，在港口收货日期，清关日期，入库日期，现场要求到货日期，实际现场接收日期，安装日期。

11.3.5 承包人应对工程设备材料的现场接收、检查、保护、保管、报告短缺或损坏、出库安装、存货情况等采取管理和控制措施。

11.3.6 承包人应遵守有关货物运输的当地法规，遵守海关规定、进口控制、办理港口手续等。

11.3.7 承包人应为其购买工程设备材料准备足够的备件和专用工具，保证在现场随时可用。

11.3.8 承包人应在现场设立一个符合规定的仓库，用以接收、存储和保护工程设备材料。  
11.4 承包人应分类向发包人提交进场物资报表，包括物资的类别、名称、外形尺寸、体积、重量、数量、来源、到场方式、到场日期、离场日期等。

## 12 质量管理

12.1 承包人应通过 ISO 质量管理体系认证或满足 ISO 质量管理体系的要求。承包人应将质量手册及相关文件递交发包人审核、评议。

12.2 承包人应任命一名质量控制经理，负责与发包人项目经理和质量工程师就所有有关质量问题及检验内容开展工作。

12.3 承包人应制定、实施质量计划，并让其雇员和分包商充分了解项目的范围和质量要求。质量计划应包括：1) 项目的质量目标、质量指标、质量要求；2) 项目的质量管理组织与职责；3) 项目的质量保证与协调程序；4) 项目应执行的标准、规范、规程；5) 实施项目质量目标和质量要求应采取的措施。

12.4 承包人应负责或协助发包人完成的质量检验工作，包括：确定质量检验的内容、标准和方法，确定在施工进行阶段进行的质量检验（特别是关键工序、特殊工序、分项工程、主要部位、隐蔽工程等），确定在承包人及其分包商供货商工厂对产品/半成品/构配件的质量检验，进行质量检验及质量问题处理。

12.5 质量检验分为 A、B、C 三级。A 级为最重要的质量控制点，由供货厂商、承包人质量控制经理、监理工程师、业主质量工程师多方共同检验。B 级为重要的质量控制点，由承包人质量控制经理、监理工程师多方共同检验。C 级为一般的质量控制点，由承包人质量控制经理负责检验，发包人和监理公司质量工程师可采用复检、抽检、旁站（现场监督）、巡视（定期或不定期现场监督）、查看检验纪录等方法进行验证。A、B 级检验之前承包人应先行自检，并提前书面通知发包人，商定共同检验的人员、时间、地点。

12.6 承包人负责提供的检验报告，其内容包括但不限于：检验的内容、标准和方法，检验设备，检验所要求的准备，结果和要求的比较，检验的位置、日期和时间，必要时改进措施的建议，负责检验的个人和组织之名称。

12.7 在承包人及其分包商供货商工厂进行产品/半成品/构配件制造的过程应严格控制质量，应有完整的质量记录文件。

12.8 对进场的材料/半成品/构配件必须符合合同要求和国家有关标准，具有出厂合格证，注明厂名、产品型号、规格、出厂日期和检查编号等。材料管理要求：1) 材料型号规格应完全符合设计图纸要求；2) 材料质量应符合国家或部颁标准；3) 每批材料应有合格证或质保书，特种材料（如不锈钢、耐热钢等）应有化学成份表。

12.9 材料进场后，承包人必须填写《进场材料检验表》，经发包人和监理公司检验合格后方可使用。

12.10 承包人负责采购的外购设备，应依据设计图纸、技术要求、会议纪要、协议书等进行采购订货。外购设备检验分为：1) 发货前检验。检验合格，才可以发货。2) 货到现场检验。共同进行检验，检查产品和随货文件（装箱单、合格证、使用说明书、产品样本、测试报告或记录、商检证件复印件等）。检验合格，才可以进入现场安装。3) 安装完成及试运转的检验。

12.11 承包人外协加工的零部件，承包人质检人员应跟踪检查监督，并向发包人提供加工图、材料要求、技术条件、质量检验记录等文件。

12.12 工程设备材料到达现场并检验合格后，承包人组织接收并入库。入库检验包括核对名称、型号、数量、备件、配件，检查外观质量和各种技术资料（包括出厂合格证、产品说明书、装箱单等，压力容器必须提供竣工图）。承包人安装人员在领用安装之前，应对设备进行自检，包括检查外观，对照图纸检查接口方位、标高等，检查配件的质量与数量

是否符合要求等。进口设备以商检检验单为准，未经商检不得进行安装。由承包人负责安装使用的甲供材料到达现场后，双方共同核验，并签署移交单由承包人负责接收和保管。因承包人保管或安装失误造成的损坏由承包人承担全部责任。

12.13 施工过程中所用工程设备材料变更，承包人应填写《代用申请表》，经发包人和监理公司批准后方可实施。

12.14 对于不合格的工程设备材料，监理公司下发《不合格品通知》给承包人，承包人应按照《不合格品通知》的要求修改、重新制作或更换。

12.15 工程/设备的涂漆应按设计或相关协议要求执行，承包人应事先征得发包人同意。

12.16 调试工作分为单机调试、联动调试和试生产三个阶段。发包人项目部负责组建调试小组，编写《调试大纲》并做好调试记录。发包人、承包人及供货厂商应参加调试。承包人应在发包人指导下进行其建设工程的调试和试生产。由于承包人擅自动用或操作不当，造成损坏或其他问题应由承包人承担全部责任。

12.17 如果在施工或调试过程中发生质量事故，承包人应及时查明原因，制订解决方案，并以书面形式报告发包人和监理公司，并按商定的处理方案实施。

12.18 如果承包人不能满足质量要求而被发包人责令停工超过两次，承包人有权要求承包人停工并撤出施工现场，本合同终止，承包人承担违约责任。

12.19 承包人现场人员有责任和义务及时向发包人反映施工过程中发现的无论由何种原因造成的、任何质量问题。

12.20 发包人负责协调对工程进行竣工验收。以发包人提供并认可的验收大纲和国家有关标准、规范为验收依据。对验收时不符合验收标准的部分，承包人负责整改并承担费用。

12.21 工程/设备工程使用铭牌的，需经发包人同意。

### **13 进度管理**

13.1 发包人根据进度计划并结合工程实际施工情况对工程进度实施动态控制。凡因故不能按进度计划完成的子项或工序，承包人应以书面形式报告发包人以便进行调整。在不影响总进度计划和其它交叉工序的情况下，承包人可自行调整子项或工序作业计划。

13.2 承包人每天向发包人报告工程的实际进度，每周向发包人递交进度报表。

13.3 发包人将随时检查和监督承包人施工进度执行情况。如果因外部环境条件影响承包人施工，发包人可据其能力所及根据承包人的请求进行协调。

13.4 如果因承包人自身的原因造成施工进度严重拖期，发包人可采取任何强化管理措施，并责成承包人选择采取包括增加工作时间、更换或增加施工人员、增加施工机具、调整施工顺序、调整改进施工工艺等措施。如果承包人不能满足进度要求又不执行发包人意见，发包人有权要求承包人停工并撤出施工现场，合同终止，承包人承担违约责任。

### **14 培训**

14.1 承包人应按照合同约定，对发包人指定人员进行培训并提供培训资料，使发包人对其提供的设备和相关的生产系统能够独立进行安全操作、保养、故障排除以及检修。

14.2 承包人负责其承担工程的所有设备、各分段系统以及系统整体的技术培训工作，全部培训课程应包括技术说明、安全要求综合理解（含应急和关闭处理程序）、使用说明书与图纸的使用以及技术操作。培训课程主要侧重于（但不限于）下列若干方面：1）设备的原理结构，应用范围及发展前景；2）设备运行培训（适用于操作人员和监管人员），包括设备开动与停车程序，以及各种运行模式；3）设备保养培训（适用于熟练操作人员），包括电气与电子设备的使用以及机械部分基本要领，机械、流体、气动部分的使用以及电气部分基本要领，部件识别、通讯及相互作用，检查、检测过程，试验、检测设备，预防性维护、常规保养程序、保养维护计划，润滑，部件更换程序，调整与校正等。

14.3 培训方式包括课堂授课和现场讲解，不少于 4 课时，并达到能安装、调试、操作、

点检、保养、维修本合同项下设备的条件。

## 15 文件管理

15.1 承包人应按照合同约定，向发包人提供文件、图纸、手册、计算结果等文件资料（包括文本和电子版文件）。

15.2 除非合同中另有约定，承包人提供的文件资料（包括但不限于）、份数及提供时间如下：

文件资料	份数	提供时间
设备总图，技术参数，基础布置图，相关开孔（洞），压缩空气（如有）、水电等资料。	4	方案审查
设备使用和维护说明书，操作手册，系统手册，培训资料，备品备件资料等。	4	设备运至现场
设备安装图纸和资料，设备安装说明和验收标准，材料质量保证书，装箱单，产品合格证书，检验方法和记录，外购件清单、样本和使用说明书及原产地证明等。	4	进场安装时提供
竣工图，设备最终安装、调试和试运行报告。	4	验收前提供
设备的设计图纸，提供完整的电气图纸，易损品、易耗品、备件清单，配套设备说明书，自动控制程序说明，设备运行所需的全部软件及系统程序。	4	预验收前提供

## 第二部分 专项规定

### 1 项目管理制度

#### 1.1 项目概况

本项目位于\_\_\_\_\_。

#### 1.2 工期、劳务管理制度

总包单位进场需提供以下资料：

序号	提供资料目录	提交资料要求	资料份数	保存单位	备注
1	总包合同	复印件	2	发包人和监理公司	
2	缴纳安全及文明施工保证金	复印件	2	发包人和监理公司	
3	项目组织机构表和通讯联络表	复印件（盖公章）	2	发包人和监理公司	
4	营业执照、资质证书、安全生产许可证、税务登记证、组织机构代码证	留存复印件（盖公章）	4	发包人和监理公司	
5	项目管理人员岗位证书（项目经理（含安全B证）、技术负责人、安全负责人、质量负责人、试验员、资料员）	查看原件、留存复印件（盖公章）	4	发包人和监理公司	

序号	提供资料目录	提交资料要求	资料份数	保存单位	备注
6	进场作业人员花名册、劳动合同、身份证、岗位证书	查看原件、保留身份证复印件	3	发包人和监理单位	
7	特种作业人员操作证及花名册	查看原件、保留身份证复印件	2	发包人和监理单位	
8	同项目部签订安全管理协议、临时用电协议、消防管理协议等	双方保存原件,协议明确双方职责、权利和奖励内容	3	发包人和监理单位	
9	分包单位安全管理制度、安全生产操作规程	经分包单位盖章的原件	2	发包人和监理单位	
10	进场设备和电箱、电缆、消防器材等一览表	说明书、合格证、准用证、备案证等原件	3	发包人和监理单位	
11	进场材料一览表	提供说明书、合格证、生产许可证、检验报告等原件	2	发包人和监理单位	
12	农民工工资保证金回执	复印件	2	发包人和监理单位	
13	劳务工人工资发放承诺书	原件	2	发包人和监理单位	
14	质量安全管理体系	复印加盖公章	3	发包人和监理单位	

1.2.1 总包单位管理人员，满足招标文件要求及合同要求，且应满足相关规定的要求。

总包单位项目部关键岗位人员配备标准（未注明均为专职）

序号	工程类别	规模	总人次	项目经理	技术负责人	施工员	质量员	安全员	资料员	取样员(可兼任))	备注
1	房屋建筑工程、装修工程	建筑面积 ≤ 1万 m <sup>2</sup> 以下	6	1	1	1	1	1		1	1、取样员可以兼任,但应具有相应资格。 2、工程面积在 3000 m <sup>2</sup> 以下,配置 1 名项目经理、1 名施工员或质量员、1 名安全员。
		1 万 m <sup>2</sup> < 建筑面积 ≤ 5 万 m <sup>2</sup>	10	1	1	2	2	2	1	1	
		5 万 m <sup>2</sup> < 建筑面积 ≤ 10	11	1	1	2	2	3	1	1	



1.4.6 资料要求:

1.4.6.1 总包单位上报的以下资料一式五份:

工作联系单、技术核定单、设备、材料报价审批表、设备、技术方案、监理工程师通知单回复、工程材料\构配件\设备报审表、隐蔽验收记录、分部分项工程验收记录、检验批验收记录;

1.4.6.2 资料留存单位分别为:建设单位、监理单位、总包单位、档案馆。竣工后提供建设单位归档资料份数,按合同执行。

1.4.6.3 材料、构配件复试报告要求检测单位提供一式四份原件。

1.4.7 样板引路

1.4.7.1 由总包单位组织建设单位、监理单位共同确定样板制作计划。样板计划确定后,由总包单位上报样板计划审批后按限定时间组织实施。

1.4.7.2 样板制作完成后,由总包单位组织建设单位、监理单位共同验收,验收合格后方可展开大面积施工。

1.4.7.3 样板工程实施范围及要求包括但不限于以下内容:

样板工程实施范围及要求	
分部工程	要求
模板工程	<p>尺寸要求: 必须含有柱(墙)模板、楼梯斜板及休息平台、相邻一块楼层梁板的支架,楼层梁板平面面积不小于<math>3\text{m} \times 3\text{m}</math>,层高不小于<math>2.8\text{m}</math>,楼梯斜板宽度不小于<math>1.1\text{m}</math>。</p> <p>构造要求应具有:</p> <p>1) 板: 胶合板、板次楞木、板主楞木;</p> <p>2) 梁: 胶合板、顶部封口托木、木档、通长夹木、梁次龙骨、梁主龙骨、穿墙螺杆;</p> <p>3) 柱: 胶合板、次楞木、主楞木(柱箍)对拉螺栓、对拉螺杆、清扫口、底部压脚板;</p> <p>4) 墙: 胶合板、次楞木、主楞木、穿墙螺杆、顶部封口托木、底部压脚板、清扫口。</p>
钢筋工程	<p>尺寸要求: 同模板工程的梁板面积。 构造要求: 应具有板筋、梁筋、柱(墙)筋、梁柱节点钢筋。</p>
砌体工程	<p>尺寸要求: 按外墙做法进行展示,墙长不小于<math>3\text{m}</math>、墙高不低于<math>2.8\text{m}</math>;</p> <p>构造要求: 应具有顶砌、构造柱、一樞窗。</p>
屋面工程	<p>实体样板展示面积不限,但必须按设计要求展示屋面所有构造层。</p> <p>构造要求: 应具有防水层、保温层、保护层、出屋面管道或</p>



	墙体根部防水、水落口防水构造，设计未作要求的构造层可不做样板。
外墙装饰	实体样板展示面积不限，但必须展示外墙所有构造层；当有多种形式外墙时，取最大面积的外墙做样板展示。
室内装饰装修	实体样板展示面积不限，但必须展示室内装饰装修的所有构造层。
地下室防水	实体样板展示面积不限，但必须展示基层处理、冷底子油涂刷、卷材粘贴、搭接长度、涂膜防水、穿墙套管细部处
卫生间（阳台）防水工程	实体样板展示面积以一间为单位，必须展示穿越楼板管道填嵌处理、卫生间（阳台）防水基层处理、卫生间（阳台）
外窗安装工程	实体样板展示面积不限，但必须展示窗洞留设、附框安装、窗隙填塞收口、窗框及窗扇安装、外窗口打胶。
管道井、地下室、公共走道机电管线安装工程	实体样板展示面积不限，但必须展示机电管线综合布管安装，小管避让大管、有压管避让无压管、一般工艺管道避让重力管道，电力管道配置在水力管道上方、管道配管的间利用，利于后续维修、维护。

## 1.5 物资管理制度

1.5.1 总包单位物资设备进场应提前 7 天提出《物资（设备）进场申请表》，并与项目管理部联系，以便项目管理部提前分配整理物资设备堆放场地。

1.5.2 材料进场前应提供材料供应商资质（营业执照、税务登记证、组织机构代码复印件加盖红章）。

1.5.3 物资设备进场应通知发包人和监理公司验收，并举牌拍照，物资设备进场应随车附带相关合格证、检验报告等证明文件资料，并复印后提供项目管理部，否则项目管理单位项目部有权不予进场。

1.5.4 物资设备进场堆放应按发包人指定堆放场地分类整齐堆放，并按全厂统一标准，设置检验状态标识牌，并做好防雨雪、防风措施。物资设备堆放应符合相关规范规定，不得超高码放、水中浸泡等。易燃易爆物资设备，应经项目安全管理部验收，分类堆放，并做好防火防爆措施。

1.5.5 所有物资设备出场，必须凭《出门证》出场，《出门证》必须经发包人专业工程师、安保工程师、项目经理签发。没有出门证，擅自夹带料具出场，按偷盗论处，视情节轻重处以 5000 元以上处罚。

1.5.6 总包单位小型机具进场应提供《物资（设备）进场申请表》，上报发包人和监理公司备案，以便出场时核对确认。

1.5.7 由发包人提供的材料，应由总包单位有授权的材料人员到现场确认领取材料并办理相关单据。

## 1.6 安全管理制度

1.6.1 总包单位必须建立安全管理体系，提供安全管理体系组织机构图。

1.6.2 安全教育培训-总包方为安全教育责任方

- 入场安全教育、考核：凡进场的所有管理人员、作业人员必须经过安全教育、考核合格，否则不得进场施工；
- 特殊工作作业人员安全教育、考核：凡进场的所有特殊工种作业人员必须经过安全教育、考核合格，并取得特种作业操作证书，否则不得进场施工（特殊工种包括：电工、电焊工、气焊（割）工、场内机动车辆驾驶证、架子工、起重工、司索工等，注：须报“操作证”原件，经发包人和监理公司审核后复印件存档，其原件返还）；
- 各工种作业人员安全教育、考核：凡进场的所有各工种作业人员必须经过安全教育、考核合格、否则不得进场施工。

1.6.3 每日进行班前安全活动，形成影像记录（高清水印照片+不少于 2 分钟安全教育实时视频），每日上报项目安全管理部。

1.6.4 每道工序前，应进行安全技术交底，并上报安全管理部备案。

1.6.5 《动火申请表》、《危险作业审批表》、《临边防护拆除申请表》、《登高作业申请表》应在实施前审批完成。

1.6.6 安全验收

- 所有设备进场前须经发包人和监理公司验收，验收合格后方可进场使用，配电箱统一使用招标文件内要求的品牌。
- 安全设施，施工设备安装完毕后须自检合格报发包人和监理公司验收，合格后方可投入使用。

1.6.7 消防要求

- 明火施工前，应填写《动火申请表》，审批完成后方可进行施工。
- 作业面及材料堆放区由总包单位按规范要求执行配置相应数量灭火器。
- 各区域内现场消防器材禁止擅自使用。

1.6.8 安全防护设施

- 开始施工后施工单位安全规范要求设置必要的安全防护设施，比如：隔离带、防护栏杆、安全网等。

## 1.7 项目会议制度

各单位应按照以下会议制度要求参加相关会议：

序号	会议名称	会议内容	召开时间	参加人员	备注
1	监理例会/ 项目管理 协调会	1、总包/分包单位工作上周工作完成情况，下周计划，安全管理汇报； 2、工程监理（进度、质量、安全）情况； 3、需要建设单位、监理单位协调的事宜。	每周五下午	监理人员，业主，项目管理单位各负责人， 总包和分包的项目经理、技术负责人、安全经理	
2	专题例会	重点质量、安全、进度问题讨论研究	根据需要	专题例会相关人员	
3	晨会	前日工作汇报和本日工作计划	每日早 8:00	业主、监理公司	
4	夕会	本日工作总结和需协调问题	每日晚 5:30	监理公司、总包和分包负责	

				人	
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说明：要求参加例会的人员必须按时到会，有特殊情况者必须提前半天给总监理工程师请假，否则迟到 2~5 分钟罚款 50 元（如缴纳泰铢按 1:5 的比例执行，以下均同此），迟到 10~15 分罚款 100 元，迟到 20 分钟以上者，按旷会处理，罚款 500 元。

### 1.8 工程质量奖罚制度

1.8.1 未上报施工组织设计或施工方案擅自施工的处以 3000-5000 元罚款；需组织专家论证的方案未进行专家论证的，处以 1-2 万元罚款；

1.8.2 未与发包人办理轴线、标高交接手续造成返工的，处以 500 元的罚款，因此造成的返工费用及工期责任由责任单位自行承担；

1.8.3 分项工程检验批未上报分项工程检验批验收记录和隐蔽工程验收记录，处以 500 元罚款，未经发包人、监理单位验收擅自进行下道工序施工的处以每次 2000 元罚款，并无条件返工，由此造成的返工费用和工期责任由责任单位自行承担；

1.8.4 违反相关质量验收规范中主控项目的处以每处 3000 元罚款，违反一般项目的处以每处 500 元罚款，并无条件整改；

1.8.5 出现质量问题未按质量整改通知单要求整改日期完成的，每超过一天罚款 500 元，整改不彻底视为未整改完成，整改通知单拒绝签收的，每处罚款 1000 元。

1.8.6 未向监理公司上报技术安全交底的，每个分项工程处以 1000 元罚款；

1.8.7 未按图纸设计施工或无设计变更文件擅自施工的处以每处 500 元罚款，因此造成的返工及导致相关工序返工的应承担相应经济赔偿；

1.8.8 施工过程中破坏他人成品、半成品处以每处 500 元罚款，并承担相应返工费用，恶意破坏他人劳动成果者，发包人将予以清理出场，不得在本项目施工作业；

1.8.9 未按审批的施工方案区段划分、施工工艺和操作要点组织施工的处以每次 3000-5000 元罚款；

1.8.10 材料设备进场未提供合格证和复试报告，擅自使用的处以每次 1000-5000 元罚款，并无条件返工处理；

1.8.11 材料设备进场后未按指定场地堆放的处以每处 1000 元罚款；材料设备码放不整齐的处以每处 500 元罚款；材料设备未设置材料名称、规格及检验状态标识牌的处以每处 200 元罚款；

1.8.12 废弃材料未及时按方案要求清理、回收、覆盖的处以每处 100 元罚款；

1.8.13 作业面应每天进行一次作业面场地清理，清扫产生的垃圾，并及时分类回收，否则处以 200 元罚款；

说明：以上罚款均以现金的形式在下发处罚单起 3 天内交到项目管理部，质量问题情节严重的或整改态度不端正的经项目管理部研究处以暂停工程进度款支付或退场处理。

### 1.9 安全文明奖罚制度

1.9.1 对违反《安全管理制度》规定的行为的处罚分为两类：

➤ A 类，罚款：1000 元以上（含 1000 元）；情节严重的送司法机关处理；

➤ B 类，罚款：50 元以上（含 50 元），1000 元以下（不含 1000 元）；情节严重的送司法机关处理；

➤ C 类，警告教育；

1.9.2 违反《安全文明施工管理制度》的责任人，在无能力缴纳罚款时，由总包单位负责足额缴纳罚款。

1.9.3 违反《安全文明施工管理制度》有下列情形之一的，从重处分。

➤ 后果较为严重的；

- 胁迫、诱骗他人或强令违章指挥他人，违章操作的，违反安全生产和文明施工管理条例的；
- 对检举人、证人、执行人进行打击报复的；
- 屡犯或屡教不改的；
- 管理人员违规违纪的。

1.9.4 有下列违规违纪行为者，根据情况给予处罚：

- 有打架斗殴、寻衅滋事、借酒闹事侮辱妇女或者进行其他流氓活动其中之一行为，情节较轻的处以 500 元以上（含 500 元）罚款，5000 元以下（含 5000 元）的罚款，情节严重的送公安机关处理。费用由总包单位代为支付，否则加倍从工程款内扣除。
- 谎报险情、制造混乱，情节轻微的处以 200 元以上（含 200 元），1000 元以下（含 1000 元）的罚款，情节严重的送公安机关处理。
- 各班组或个人拒绝、阻碍项目管理部管理人员的现场管理，情节轻微的给予 200 元罚款，情节严重的给予 1000-5000 元的罚款，并责令其退场。

1.9.5 有下列违反安全文明施工规章制度行为的给予处罚：

- 进入施工现场不佩戴安全帽的，工人每人次处罚 50 元，管理人员每人次处罚 100 元；不扣好安全帽下颚带的，工人每人次处罚 20 元，管理人员每人次处罚 50 元；
- 登高作业超过 2 米（含 2 米），或在各项安全防护不到位的情况下，临边危险作业不系安全带的，工人每人次处罚 100 元。
- 在施工现场非吸烟区吸烟的，工人每人次处罚 100 元，管理人员每人次处罚 200 元。
- 在施工现场或楼层内随地小便的，每人次处罚 200 元；随地大便的，每人次处罚 500 元，并责令违反规定者将现场和楼层内所有卫生清理干净，未抓住违反者的，相关区域施工总包单位负责清扫。
- 进入施工现场不穿戴整齐（如赤膊、短裤、裙服、光脚、穿拖鞋、凉鞋、高跟鞋）每人次每项 50 元；在施工现场施工用水处洗澡的，每人次处罚 100 元。
- 特种作业人员未持证或持他人证件上岗，发现一次处罚当事人 200 元，持假证上岗的发现一次处罚当事人 500 元，持过期证件上岗的发现一次处罚当事人 200 元，相关总包单位负责人连带处罚 500 元；
- 施工班组或个人违章、违规作业，不听项目管理部的正确指挥的，每人次处罚 100 元以上（含 100 元），3000 元以下（含 3000 元）的罚款。（注：违章作业、违章指挥是指违反《建筑施工安全检查标准》（JGJ59-2011）、《建筑施工高处作业安全技术规范》（JGJ80-2016）、《施工现场临时用电安全技术规范》（JGJ46-2012）、《建筑施工扣件式钢管安全技术规范》）。
- 管理人员违章指挥、不正确安排工作的，每人次处罚 500 元，造成较大损失的，追究其法律责任。
- 施工现场的项目管理人员只管生产、不管安全，对责任区内发生的违章、隐患不制止、不整改、不上报的，每人次处罚 200 元。
- 总包单位项目管理人员对各专业班组不进行分部、分项安全技术交底的；交底无该班组所有人员签名的；交底无针对性的；对工作有安排、无检查、未落实的；给予 200 元处罚，并责令整改。
- 拒绝在《整改通知单》上签字的各总包单位项目部负责人给予 2000 元处罚；接收到《整改通知单》却未按期写反馈的项目部相关负责人或具体责任人给予 2000 元处罚，并责令限期写自检记录。
- 酒后进入施工现场违章作业的；或借酒寻衅滋事的，每人次处罚 500 元。
- 非机械操作人员违章操作机械设备，每人次处罚 500 元；

- 故意损坏、移动安全标志、消防设施、安全防护设施的，每人每次处罚 500 元，未经项目管理部相关负责人批准擅自移动安全标志、消防设施、安全防护设施的，每人每次处罚 200 元。
- 因工作需要临时拆除安全防护、安全标志、消防设施等未报项目管理部相关负责人批准擅自拆除的，每人每次处罚 200 元以上（含 200 元）；经批准拆除，作业后未按要求恢复的，每处每次罚款 100 元以上（含 100 元）；未经批准进行有危险或安全隐患作业（包括未办理动火证而动火；未经批准而使用机械设备；未经批准进入危险区或禁区；未经批准私拉乱接电源或停电等，也包括因临时客观原因，局部或暂时已不具备作业条件却仍继续作业）的，罚款 200 元以下（含 200 元）。
- 施工现场不听从项目管理部管理人员指挥随意摆放、乱堆放材料、物件；材料、物件不按要求堆码整齐的；材料阻塞通道不及时转运的；长短料混吊的；每项每次处罚 200 元，并责令立即整改。
- 损坏各自成品、半成品，按情节轻重处以 200 元以上（含 200 元）罚款，并赔偿损失。
- 高空作业时掉下物体的，每人每次处罚 200 元以上（含 200 元），3000 元以下（含 3000 元）的罚款。掉下的物体在找不到责任人时，对所属总包单位给予相应的处罚，如造成伤人毁物事故的，此总包单位须付全部责任。
- 私自罢工或以其他方式或围攻手段扰乱项目管理部正常生产秩序的，每人每次处罚责任人或单位 500 元以上（含 500 元，5000 元以下（含 5000 元）的罚款。
- 当日施工产生的建筑垃圾，应做到随用随清、工完料清。大量的建筑垃圾应在当天转运到垃圾池（或指定地点），少量的建筑垃圾应及时清理并随人带走，应注意做好回收利用工作，对不能及时工完场清的单位，给予每处次 200 元罚款。
- 对于群体性违规，如：5 个人以上吸烟或未带安全帽、系下颚带、或在自己的责任区内有烟头等情况，给予总包单位每人每次 200 元的处罚。
- 脚手架只供施工人员行走和操作时立足，严禁长时间堆放各种建筑材料（余料）、建筑垃圾、如有违反，每人每次处罚 200 元。
- 不按规定进行安全防护的，每处每次处罚 200 元，并限期整改完成，造成后果的追究班组相关责任人的责任。
- 发包人提供的电箱、机械、图牌、标志、灭火器材等及其他设备、设施，必须按相关要求定期保养、维护，发现认为损坏或弄脏影响形象的，给予 200 元以上（含 200 元）处罚。
- 每天项目管理部安全管理人员对施工现场安全文明施工责任区、作业区、施工道路等进行检查，对前一个工作日内产生的施工垃圾或废料，未能按工完料清要求彻底清理干净或未按要求堆码的，分别按规定给予处罚。
- 损坏公共设施的，赔偿同等价值款项后，处罚 500 元；偷盗公、私财物的，处罚 1000-5000 元。
- 凡私自转动、摆弄监控摄像头者均被视为具有盗窃嫌疑，罚款 1000 元。
- 阻挠发包人和监理公司安检人员行使正常公务、故意寻衅滋事的，给予当事人罚款 500 元，所属总包单位给予 2000 元的处罚。
- 项目管理部安全管理人员每半个月对总包单位的班前安全交底活动和记录抽检一次，发现未做或没有记录，每次处罚 500 元。
- 新进场员工入场“三级安全教育”按安全教育制度执行，不得使用年龄未满 18 周岁和 60 岁以上、身体慢性病或残疾的人员，违反者按人数计算每人给予总包单位 200 元罚款，并责令立即退场。
- 施工现场、公共场所、材料堆场及其他禁止区内，禁止乱扔垃圾、杂物、果皮、纸屑

等，不听劝说的每人次罚款 200 元，并责令责任人整改。

- 总包单位项目部相关责任人，每天必须对自己所在的施工现场责任区临边、竖井、电梯井口、洞口、楼梯口、通道口、作业面进行检查并留存书面记录，否则处罚责任人每次 200 元。

#### 1.9.6 违反临时用电系统管理规定的处罚

##### 1.9.6.1 接地与接零保护系统：

- 未采用 TN-S 系统的，每次/处处罚 200 元；
- 工作接地与重复接地不符合要求的，每次/处处罚 200 元；
- 保护零线与工作零线混接的每处/次处罚 300 元；
- 保护零线未使用黄绿双色线的，或材质不合格的，或选材不当的每处/次处罚 500 元；
- 未按《施工现场临时用电安全技术规范》(JGJ46-2012)要求设置重复接地、防雷接地、保护接零的处罚每处/项 500 元。

##### 1.9.6.2 配电箱、开关箱

- 不符合“三级配电箱两级保护”要求的，每处/处罚 200 元；
- 开关箱（末级）无漏电保护器的，无隔离开关每处/次处罚 200 元。漏电保护器失灵仍然使用的，每处/次处罚 200 元；
- 漏电保护器参数不合理或不匹配的，每处/次处罚 200 元；
- 电箱内隔离开关设置不符合要求的，每处/次处罚 200 元；
- 违反“一机一闸一漏一箱”的，每处/次处罚 200 元；
- 闸具等损坏或不符合要求的，每处/次处罚 200 元；
- 电箱内无 PE 专用接线端子板的，每处/次处罚 200 元；
- 电箱无名称、编号、责任人的，每处/次处罚 200 元；
- 电线进出线混乱或进出线无保护措施的，每处/次处罚 200 元；
- 配电箱多路配电无标记的，每处/次处罚 200 元；
- 电箱材质不符合要求的，每处/次处罚 200 元；

##### 1.9.6.3 配电线路

- 电线老化、破皮处为包扎的、接头超过 3 个的，每处/次处罚 200 元；
- 电线随意拖地、浸水的，每处/次处罚 200 元；
- 线路过道无保护或保护不符合要求的，每处/次处罚 200 元；
- 施工现场严禁使用交织线（花线、胶质线）、否则每处/次处罚 200 元。

##### 1.9.6.4 电器装置

- 闸具、熔断器参数与设备容量不匹配、安装不符合要求的，每处/次处罚 200 元；
- 用其他金属代替保险丝的，每处/次处罚 300 元。

#### 1.9.7 违反大、中、小型施工机械及手持电动工具用电管理规定的处罚标准：

##### 1.9.7.1 井架、物料提升机

- 使用倒顺开关的，每处/次处罚 200 元；
- 使用双按钮开关的，每处/次处罚 200 元；
- 无联络信号的，每处/次处罚 200 元；
- 防雷保护范围以外无避雷装置或避雷装置不符合要求的，每处/次处罚 200 元；

##### 1.9.7.2 平刨、圆盘锯（台锯）

- 未做保护接零或不符合要求的，每处/次处罚 200 元；
- 无专用漏电保护器或漏电保护器不符合要求的，每处/次处罚 200 元；
- 无人操作时未切断电源的，每处/次处罚 200 元；
- 电源线、负荷线未按规定保护的，每处/次处罚 200 元；

### 1.9.7.3 手持电动工具

- I类手持电动工具五保护接零的，每台/次处罚 200 元；
- 使用 I类手持电动工具不按规定穿绝缘用品的，每处/次处罚 200 元；
- 电源线破损、拖地、过长、接头较多、走线未按规定架空的，每处/次处罚 200 元；
- 使用多面插座的，每处/次处罚 200 元；
- 无专用漏电保护器或漏电保护器不符合规定的，每处/次处罚 200 元；

### 1.9.7.4 电焊机

- 无做保护接零、无漏电保护的，每处/次处罚 200 元；
- 无二次空载降压保护器、无触电保护器的，每处/次处罚 200 元；
- 二次线超过 30 米的，每处/次处罚 200 元；
- 一次线超过 5 米或不穿管保护的，每处/次处罚 200 元；
- 焊机电源不使用自动开关、专用箱的，每处/次处罚 200 元；
- 焊把线接头超过三处或接头不符合要求或绝缘老化、破损开裂严重的，每处/次处罚 200 元；
- 电焊机未使用专用电缆的，每处/次处罚 200 元；
- 电焊机隔层作业或线路随地拖拉、浸水或挂设不符合要求的，每处/次处罚 200 元；
- 接线端子板损坏或无完好隔离罩的，每处/次处罚 200 元；

### 1.9.8 奖励条件

对于遵章守纪的单位，发包人项目管理部将给予表彰及物质奖励。二周以内没有被发包人/相关方指出 B 类问题的单位，项目早会上表扬；一个月没有 A 类问题或 B 类、C 类问题在三个以下，且一月之内相同问题没有出现 2 次以上的单位，给予 500 元的物质奖励并给该单位公司总部发邮件或传真表扬。

## 1.10 工期奖罚制度

1.10.1 每周施工进度不能按周施工进度计划按时完成的，每项处以 500 元罚款；后经采取相应措施确保了月进度计划按时完成的，返还当月周施工进度滞后产生的罚款。

1.10.2 每月施工进度不能按计划按时完成的，每项处以 1000-3000 元罚款。

1.10.3 合同约定时间节点、工期不能按时完成的按签订合同条款进行处罚。

以上条文总包单位接收后，应向总包全体人员进行交底，条文最终解释权归项目管理单位所有。

## 2 施工总承包现场管理方法

### 2.1 承包人进场保证金

所有承包商进场除进行常规的办理进场手续、签订安全协议、三级安全教育外，还需要预缴安全文明施工保证金，缴纳金额根据合同额大小选定比例，用处：所有进度、质量、安全罚款单均为现金缴纳，当天缴纳现金的为单倍处罚，两天内未缴纳的从保证金内双倍扣除，保证金额度用尽的，下一笔工程款支付前必须补齐，否则不予支付。

### 2.2 承包人项目经理面试

承包人项目经理要经过发包人代表及管理公司项目经理面试方可上岗，第一次面试，承包人法人必须参加，面试不合格的要求更换。

### 2.3 分级管控，充分放权

发包人项目执行经理（项目副经理）管控所有承包人项目经理，区域经理管控区域内承包人项目经理、班组长，工程师管控所辖范围内承包人项目经理、班组长、施工员，项目经理管控所有承包人法人、项目经理。

### 2.4 关于工程款支付

工程款支付前需提交工程款支付申请表+工程量确认单，两表缺一不可，支付申请表需经

过总监理工程师、安全工程师、专业工程师、项目副经理、项目经理、建设单位六级签字流程，工程量确认单需经过专业工程师、项目副经理共同签字确认。

本项目建设单位和管理公司项目经理应有绝对的签字付款权和拒绝签字付款权，没有经过建设单位和管理公司项目经理同意，工程款决不能支付！

## **2.5 关于项目例会**

开会的目的是高效的解决问题，早会：所有项目部管理人员参会，由项目经理主持，梳理前一天工作完成情况及解决当天疑难杂症，时间控制在 30 分钟；夕会：由项目执行经理（项目副经理）主持，项目经理补充，所有分包项目经理及项目部管理人员参加，各分包汇报当天工作完成情况，协调各家分包之间的问题，交代重点应解决问题，时间控制在 60 分钟。

## **2.6 日报、周报、月报**

日报每天申报给专业工程师汇总，在晨会展示，日报一天飘红警告、连续两天飘红通报批评、连续三天则触发罚款机制、连续四天罚款翻倍，指数增长，以此类推。

## **2.7 进度计划约束**

承包人应根据发包人的一级进度计划编制二级、三级、四级进度计划，发包人、承包人项目经理确认签字盖章，约束条款为：无论刮风下雨，每个节点延迟罚款 500~5000 元/天，视情节严重程度而定。

## **2.8 安全文明施工团队建立**

承包人进场即建立专门安全管理工作小组，项目经理任组长，安全经理任副组长，实行总承包安全、分包安全联合管理，安全例会单独组织召开，各承包单位必须按照现场施工人数及工作面配备足够数量的专职安全员，每周组织不少于两次集中巡查，夜巡随机但每周不少于一次；文明施工由安全团队负责，配置专职保洁团队，另配至少一辆洒水车。

## **2.9 恩威并施，奖罚分明**

项目管理部建立公示牌，采取流动红旗（优异）、黑旗（落后）制度，每周轮换，通报并将抄送相应承包人领导，获得红旗单位享有优先拿到工程款权利，黑旗获得单位工程款将延期支付。

项目结束或年末，评选优秀项目经理及分包商并颁发奖状或表扬信！



# 厦门钨业股份有限公司

## 承包商健康、安全和环境总体要求

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## 变更记录

版次	部分	变更描述

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## 1. 目的

1) 本文件旨在针对现场的环境、健康和安全（EHS）管理，提出基本的 EHS 要求，以便在项目施工过程中实现项目的环境、健康和安全目标。除非另有规定，在本文件中使用的术语，应具有合同条款和条件所赋予的含义。

2) 承包商在为项目工作期间，作为其责任的一部分，应始终遵守本文件之规定，否则，会根据导致解除协议和终止合同。

## 2. 范围

本文件所规定的环境、健康和安全总体要求适用于所有监理、项目总承包商、专业承包商、设备供应商及现场服务商。

## 3. 术语和定义

**EHS:** 环境、健康和安全

**建设工程监理:** 工程监理单位受建设单位委托，根据法律法规、工程建设标准、勘察设计文件及合同，在施工阶段对建设工程质量、费用、进度进行控制，对合同、信息进行管理，对工程建设相关方的关系进行协调，并履行建设工程安全生产管理法定职责的服务活动。

**风险识别:** 风险管理流程的第一个步骤，用于定义风险管理的系统方法，旨在系统地识别与所有的流程、活动和服务相关的潜在风险。

## 4. 项目 EHS 要求

对承包商的要求包括但不限于：

1) 承担其环境、健康和安全管理的完全责任，包括管理承诺、预算、人力资源、EHS 管理体系保证和实施等，所有这一切必须符合适用法规之规定。

2) 编制所要求的环境、健康和安全文件（比如，书面程序、方案/计划、检查表等），并在开始工作之前，呈报监理进行评审，评审通过后报甲方备案。

3) 向监理及甲方报告所有的伤害、疾病、事故、泄漏、突发事件以及任何其他事故。

4) 至少每周与分包商和雇员召开安全会议，解决所面临的任何安全问题，并做好会议记录，向监理及甲方提供安全会议的文件和内容。

5) 每日对其高风险工作区域和活动进行检查，并形成检查记录，对于在检查过程中发现的问题及时采取纠正措施。

6) 每周邀请监理和甲方进行联合安全检查，并对所发现的问题及时采取纠正措施。

7) 确认承包商的雇员和分包商，具备执行其工作任务的能力，并接受过适当培训。

8) 将适用于承包商工作现场的项目环境、健康和安全管理要求，通告其分包商、供应商和现场来访人员。如果发现项目的其他承包商违反任何环境、健康和安全管理要求，应立即通知监理以及所涉及的具体分包商。

9) 在任何时间配合政府、甲方或任何其他实体的现场检查和现场评审，以确认符合项目承包商 EHS 规则和要求、EHS 政策、EHS 合同协议和/或 EHS 例行规定。

10) 不仅在其具体工作范围边界以内，而且，在投标澄清过程中公司规定或指定的开放区域，管理好环境、健康和安全管理活动。

11) 如果政府主管机构对承包商的工作场所进行任何检查和现场调查，承包商应提前通知监理及甲方。

## 5. 工作守则和行为标准

1) 如果承包商的工作人员存在以下列示的活动和行为，被禁止参与项目的相关工作：

- 话语淫秽或辱骂他人；涉及种族、民族或性别歧视；行为粗鄙或不道德；性骚扰。
- 未能执行项目的具体指令或规范。
- 故意损毁、污损或滥用相关设施或他人财产。
- 未经适当授权，从现场拿走设施、财物。

2) 项目现场禁用：酒精饮料、违禁药物、武器。拥有上述物品，或者，被怀疑受到酒精或药物影响的任何人，将被拒绝进入项目现场。如果发现任何个人持有酒精饮料和/或违禁药物，将立即被驱离工作现场。受到酒精、违禁药物或不正确使用处方药物影响的人员，将被驱离作业现场和项目，并且，在规定的时期内，禁止再次进入。严格禁止员工在身处项目区域期间，在其管控范围内存在上述药物，或者，制造、销售、分发、购买、拥有、传送或使用此种药物。

3) 对于本政策而言，只要不损害员工履行其工作职责的能力，按照医生规定的方法服用处方药将另当别论。

4) 项目始终禁止各类致命和非致命武器，但不包括用于施工作业的小型刀具以及其他手动、电动工具和火药驱动的工具。

## 6. 承包商环境、健康和安全管理计划

### 6.1. 概述

1) 对于项目施工期间的所有环境、健康和安全管理绩效，承包商应承担最终责任。

2) 在项目的不同阶段，均有具体的环境、健康和安全管理要求，因此，承包商应在每个项目阶段侧重不同方面的环境、健康和安全管理要求。

3) 本节之规定是对于执行所有相关活动，包括承包商的工程施工活动的一般要求。承包商应至少在开始每个阶段的施工活动之前，制定安全技术方案，详细说明该阶段存在的风险和潜在风险：

- 确定相关风险或潜在风险的预防和缓解措施。
- 在开始该阶段的施工活动之前，所建议采取的措施摘要。
- 有关承包商控制的工作场所和计划活动的具体项目环境、健康和计划，该计划必须体现上述风险识别报告的研究结果，并反映项目规定的相关要求。

4) 承包商必须：

• 从制定计划到完成所计划的每个项目阶段的工作范围，满足工作现场的环境、健康和计划要求。

- 邀请监理及甲方参与风险识别评审。
- 在每个项目阶段的活动开始之前，向监理提供该项目阶段和工作现场的环境、健康和计划，以便对其进行评审。

- 执行和监督落实所有的环境、健康和计划要求。
- 确保所有的安全标志清晰及可识别，包括供应商提供的安全标志。

5) 所确定的项目阶段包括但不限于：

- 详细设计；
- 桩基施工；
- 主体结构施工；
- 钢结构施工；
- 机电安装；
- 系统连接和预调试；
- 调试和启动。

6) 承包商应制定相应的工作流程，以便对关键的环境、健康和计划文件、记录（最新版、受控和可获取性）进行评估和审核。

7) 应明确规定参与相关工作的承包商和分包商组织机构所有人员的环境、健康和计划职责，并向安全领导小组报告其绩效。

8) 承包商的环境、健康和计划应符合适用的国家和地方政府法规以及项目对于相关工作的环境、健康和计划要求。

9) 承包商必须：

• 规定和执行一个工作流程，制定书面程序，配置适当的资源，进行有效的信息交流，对实现项目环境、健康和计划目标的绩效进行评估（监督、监控、审计和评审）。



- 在承包商的审计过程中证明，对于所有分包商的环境、健康和安全管理体系统执行了持续评估和跟踪流程。这些活动不减轻在本合同项下对承包商的环境、健康和安要求。

10) 在执行相关工作时，承包商必须：

- 确保完全符合适用的法律法规。
- 确保充分符合最严格的地方标准、国家标准或行业惯例。
- 确保完全符合公司在本文件中规定的环境、健康和安要求。公司的要求，不能免除承包商应承担的任何责任和义务。

- 监督、监管、审计和评审承包商组织机构的所有方面，确保符合本文件规定的环境、健康和安要求。

- 在开始工作之前，应向监理及甲方提交环境、健康和安计划以及其他相关的环境、健康和安文件，以便进行审批。

## 6.2. 承包商环境、健康和安组织机构和岗位职责

1) 承包商的组织结构和职责分配，应在所有的层级体现线性管理承诺，以便实施项目的环境、健康和安管理体系。

2) 承包商应任命至少一名环境、健康和安经理，以及在每 50 名现场人员中至少任命一名环境、健康和安人员，少于 50 名工人的工作区域，应配备 1 名环境、健康和安人员，以满足环境、健康和安管理体系的要求。

3) 承包商和所有分包商的环境、健康和安专员，均应向公司提交简历，并得到公司批准。

## 6.3. 岗位职责

承包商和分包商的所有工作人员必须：

- 1) 经过培训，知道如何在安全地执行其所负责的任务，并保护环境。。
- 2) 配合公司所有的环境、健康和安事件以及现场评审，参与事件调查分析，并提供改进环境、健康和安绩效的措施。
- 3) 遵守适用于其规定职责和责任的所有承包商和分包商政策、程序、惯例以及国家法规；
- 4) 符合本文件规定的培训要求，并参加承包商计划的所有项目环境、健康和安会议。
- 5) 如果由于不符合本文件规定的环境、健康和安要求，公司认为有必要，可以指令承包商补充环境、健康和安资源，并且，应由承包商承担与资源配置相关的所有费用。

## 6.4. 承包商项目环境、健康和安经理

承包商必须：

1) 任命一名实践经验丰富、具备相应资质、受过专业教育并胜任项目相关工作的环境、健康和安全管理经理。

2) 在项目环境、健康和安全管理经理的领导下，分配适当数量具有相应技能、资格和专业知识的健康和安全专员（每 50 名现场工作人员至少设 1 名专员）。

3) 确保承包商项目环境、健康和安全管理经理在环境、健康和安全管理体系、计划和支持方案的执行、沟通、监管、评审、审计和持续改进方面拥有足够权威和专门预算。

4) 承包商项目环境、健康和安全管理经理应负责：

- 承包商环境、健康和安全工作人员的聘用选择和能力培养。
- 选择管理所有分包商的环境、健康和安全工作人员。
- 执行承包商的环境、健康和安全管理计划。

## 6.5. 承包商安全员

承包商安全专员的职责应包括但不限于：

- 1) 在所有工作活动的计划过程中，积极提供职业健康和安全管理建议。
- 2) 领导工作现场的系统安全检查和参与安全管理审计。
- 3) 领导安全事件的初步调查。
- 4) 监督执行作业程序和工作实践。

注：以上描述只是提供一些信息，供承包商在制定其全部岗位职能和责任时予以参考，并纳入其项目环境、健康和安全管理计划。

## 6.6. 承包商的环境、健康和安全管理培训

根据国家法规要求，承包商必须为其新员工提供充分的 EHS 培训（3 级教育）。这些培训必须体现其 EHS 方针和政策、相关 EHS 标准和程序、岗位和职责，以及针对其项目合同范畴内的作业风险和措施。承包商应制作特定不同样式或颜色的帽贴在培训合格后发放给工人张贴于安全帽上以表明该工人已通过该培训并考试合格，便于现场监督检查。

1) 承包商 EHS 教育与培训

- 常规作业活动：在现场驾驶车辆、文明施工、噪声（包括听力保护）、射线探伤、涉水作业、作业许可证制度、脚手架和挂牌制度、开挖作业、起重吊装作业、高处作业（包括安全带、生命绳）、人工搬运、动火作业（焊接、切割、打磨、气瓶储存和使用、接火措施等）、呼吸保护、有害物质、受限空间进入、系统隔离及挂牌、上锁、临时用电安全、气动操作工具、设备检查程序。

- 非常规作业活动：重型设备、起重机和卡车的使用、关键吊装计划的制定和实施、检查工作场所以及现场环境、健康和安全管理检查、交叉作业、涉及特殊作业的许可和程序。

2) 专项环境、健康和安全管理培训

- 任命完全胜任的培训教师/导师，执行动手实践/具体环境、健康和安全教育培训，并且，应进行基于绩效的能力检验考试。

- 在现场工程开工之前，确保分包商的所有人员得到必要的环境、健康和安全教育培训以及承包商要求的相关工作培训，并且，满足公司的要求。

- 制定和保持培训流程，详细规定具体的培训要求和方法，并对确认的安全施工关键事项进行评审。

- 更新具体职位或任务所需环境、健康和安全教育培训的培训计划表。

- 合同价格应包含承包商工作现场参与项目人员的环境、健康和安全教育培训费用。

## 6.7. 沟通与交流

承包商必须：

- 1) 具备有效手段，与项目业主、其他承包商及其分包商交流环境、健康和安全问题。

- 2) 制定环境、健康和安全教育促进计划，提高其员工的环境、健康和安全教育意识。承包商制定任何货币奖励计划，均应告知监理及项目业主。

- 3) 保持和提高其员工及其分包商所有员工的环境、健康和安全教育意识，包括安排自己的定期环境、健康和安全教育会议，并且，在整个项目施工过程中应参加所计划的环境、健康和安全教育会议。项目业主可以参加此种的环境、健康和安全教育会议。

- 4) 可以在任何工作场所或工作区域召开的环境、健康和安全教育会议至少应包括：

- 每日工具箱会议：在开始进行每一天或每一班的工作之前，或者，在开始执行新的工作任务之前，员工与其直接主管/领班举行的非正式会议。会议的持续时间不应超过 10 分钟，并且，应旨在使员工的注意力集中于安全工作惯例以及当天计划执行的工作任务。会议应使用全体员工的通用语言，以便进行最清晰的沟通。

- 每周环境、健康和安全教育会议：每周举行一次，会议由总承包商环境、健康和安全教育经理或其指定的人员进行主持和记录，监理、分包商 EHS 代表可以参加会议，讨论诸如下列事宜：上一次会议决定采取的行动事项评审；期间发生的事故、事件和险情；针对上述事宜所采取的补救措施；员工在执行相关任务时遇到的问题；所计划的未来一周新的活动安排；定期评审适用于所执行的任何工作任务的任何工作安全分析；主管和领班可以通过此种会议，对持续努力改进环境、健康和安全教育绩效的员工进行表彰奖励；每周环境、健康和安全教育会议的持续时间不应超过 45 分钟。

## 6.8. 检查和审计

EHS 检查和审计对于持续提升承包商 EHS 绩效和进一步完善 EHS 管理体系十分重要。

- 1) 日常 EHS 检查

所有的现场 EHS 人员都必须对现场潜在 EHS 问题、不达标区域和偏差进行观察和检查，并向现场管理层提出整改建议。

#### 2) 现场 EHS 周检

总承包商必须建立一个周 EHS 巡检制度，由项目总承包商牵头，监理代表需要参加，并邀请项目甲方参与。

#### 3) 施工设备检查

- 总承包商必须指定一名胜任人员作为施工设备和机具检查的负责人。该胜任人员必须具备专业技术和知识。在执行该任务前，监理将对其资格进行审核。

- 总承包商必须遵守项目 施工设备检查的色标制度，即发给检查合格的施工设备一个彩色标签，贴在设备上。

#### 4) 月度 EHS 自检

总承包商将牵头、协调该检查，承包商的项目经理应计划参加检查人员。该检查也可以与项目安全领导小组月度会议同时进行，作为总承包商月度安全领导小组会议的支持性现场 EHS 活动。

#### 5) 第三方 EHS 审计

- 公司将雇佣一个独立第三方 EHS 审计机构，按每个月或每个季度周期，对项目进行 EHS 体系执行绩效审计。

- 总承包商必须积极配合该审计，并制定针对第三方 EHS 审计机构提出的项目完成整改与提升（带时间线）的计划，并按时提供反馈。

#### 6) 政府检查或调查

总承包商必须积极配合政府部门检查或调查，比如，事故调查，劳资纠纷或例行检查等。

### 6.9. 作业安全分析

承包商根据工作性质、涉及的专业和界面以及工作现场的条件和环境，进行工作安全分析。

1 工作安全分析是在环境、健康和安全的范畴内将一项工作或任务分解为多个步骤并进行分析的工具。需要作业许可的一般性工作，承包商施工主管应提前落实控制措施，并将 JSA 分析表交由承包商 EHS 主管审核，审核完成后送至监理处，由监理最终批准放行。应在每个工作场所传达至相关工作所涉及和影响的所有人员，并且，在涉及新的人员时，重新予以传达。

承包商应制定工作安全分析效率评估流程，并根据评估结果，提高工作安全分析质量。应与监理共享工作安全分析的评估结果，用于评审和改进工作安全分析流程。

在开工之前，承包商应将针对任何具体工作任务进行的工作安全分析呈报项目监理，以便审批。

## 6.10. 作业许可证

### 1) 承包商必须:

- 执行与工作活动的潜在风险相适应的工作许可证制度，并且，至少应符合如下一般原则。
- 在开工之前，准备、签发和发布在涉及潜在风险和界面的工作现场使用的工作许可证。
- 如果承包商根据工作需要，出于内部管理目的，决定使用任何新的工作许可证，那么，在使用新的工作许可证之前，应由项目内部进行审批。此外，新的工作许可证不得与项目的现有工作许可证相抵触或重叠。

2) 各类作业许可证应在开工之前 24 小时，由项目内部分级进行审批，具体可参考 [XTC 14 3 002-2022《动火作业许可证》](#)、[XTC 14 3 003-2022《开挖许可证》](#)、[XTC 14 3 004-2022《吊装作业许可证》](#)、[XTC 14 3 005-2022《脚手架安装、使用许可证》](#)、[XTC 14 3 006-2022《受限空间许可证》](#)、[XTC 14 3 007-2022《挂牌、上锁许可证》](#)、[XTC 14 3 009-2022《射线、探伤许可证》](#)、[XTC 14 3 033-2022《交叉作业许可证》](#)。

## 6.11. 承包商大（特殊）项目

在承包商的现场施工阶段，必然存在某些涉及重大新建、翻新、起重或潜在极端高风险作业的大型项目或特殊项目。对于这些项目，承包商应:

- 1) 制定特定现场的施工安全计划，详细说明适用于该项目的规则、规章和程序，并呈报监理及甲方，以便审批。
- 2) 在开始作业之前，对所有的承包商及其分包商工作人员进行作业前交底。
- 3) 制定该项目的事故应急预案，并通报进入该项目现场的所有承包商。
- 4) 每周至少与分包商及其员工举行一次安全会议，立即解决所遇到的任何安全问题，并形成会议记录。
- 5) 向监理提供安全会议的文件和内容。
- 6) 至少每周对项目现场进行安全检查，并形成记录。

## 6.12. 个人防护用品

- 1) 承包商应完全负责为其员工和分包商提供适当的个人防护装备，且不得收取费用。
- 2) 在项目执行过程中，如果当地政府有强制条文规定工种安全帽颜色要求，应按所在地规定办理。
- 3) 总的来说，进入任何工作现场均需使用 3 种关键的标准个人防护装备（安全帽、安全鞋和反光背心）。
- 4) 以下是对于某些常用个人防护装备之相关要求:

- 承包商工作人员在执行暴露于火焰或电弧的作业任务时，应穿着阻燃或 100% 棉长袖衫和长裤。
- 禁止穿着运动鞋、凉鞋或时装鞋。
- 在存在坠落风险的区域作业时，应正确使用监理及甲方审批验收的全身式双钩安全带。
- 在规定的区域应正确使用听力保护装置。
- 在规定的区域应使用符合法规要求的安全帽。
- 在规定的区域应正确使用眼睛和面部保护装置。
- 在规定的区域应正确穿着醒目服装（比如反光背心）。
- 如果行政或工程控制未能将空气污染物减少至监管部门规定的限定值以内，应正确使用呼吸系统防护用具。
- 承包商应负责确保对其工作人员进行适当的健康体检和培训。
- 如果使用其他经过批准的个人防护装备，比如面罩、防护服、手套等，可以避免损伤或疾病风险，承包商的工作人员应使用这些个人防护装备。
- 在任何时候必须穿着合适的服装和鞋。必须穿着全身服装。至少必须穿着 10 厘米（四英寸）短袖的 T 恤衫和长裤。

### **6.13. 事件报告**

- 1) 发现不安全行为和状态，应立即向主管领导报告。
- 2) 如果面临迫在眉睫的危险，应停止工作。在承包商纠正相应问题，并使监理审批通过之前，不得恢复工作。
- 3) 国家法律规定的任何“事故”，应立即报告业主和监理，其他事件（轻伤、未遂和财产损失情况）应在 24 小时以内书面报告业主。对于所有的工伤事故，承包商均应形成事故调查记录。承包商应在事发 48 小时以内，向监理及业主提交事故调查和整改措施副本。
- 4) 承包商应为其工作人员提供足够数量的急救用品。

### **6.14. 承包商的 EHS 奖励与处罚计划**

- 1) 总承包商必须制定一个 EHS 激励与处罚计划实施细则，以奖励工人良好的 EHS 表现，其 EHS 激励计划实施细则应遵循以下项目奖励模式。
- 2) 经济处罚不是目的，其旨在提高环境、健康和安全绩效，从而建立一个安全、整洁的施工现场。
- 3) 公司从来都不鼓励经济处罚，但在此根据合同要求建立一个适从标准，其意在于承包商如果不能安全、环保地执行项目现场作业，处罚将是有的。

4) 项目原则是业主项目管理层和监理对承包商开出的处罚单，不能转罚于那些违章工人。对此，我们的理解是，承包商对其工人负有完全的培训、安全环境保障、监督和管理责任。如果对此要求不遵从，该承包商将承担双倍额度的处罚。

## **6.15. 安保问题**

承包商应在其合同规定的区域内承担所有的安保责任，其中包括：

- 1) 设置适当的围墙，检查出入的人员、材料、车辆，防范斗殴事件等。
- 2) 定期检查围栏和大门，如果发现损坏，进行维修或更换。
- 3) 在围栏上设置危险警告标志，禁止擅自进入。
- 4) 在适当的位置安装大门，作为车辆出入口。
- 5) 安装独立的大门，用于工作人员和来访人员通行。在非工作时间，应锁闭大门。
- 6) 在出现应急情况时，通知监理及业主，报告导致安保问题的任何事项。这包括盗窃、恐吓、暴力行为、安保设备故障以及违反安保规章制度。
- 7) 随时携带项目员工卡。出入项目所辖区域，必须携带该员工卡，出示通行，或者，按照要求交给安保和/或管理人员检查。
- 8) 将员工卡借给他人使用，双方都受到纪律处分，包括开除。
- 9) 如果车辆入口与人行道交叉，应安装适当的指示牌，以提醒驾驶员和行人注意交通安全。
- 10) 如果车辆和行人交通流量较大，应提供交通信号设施或者安保人员在现场指挥车辆和行人通行。在设备和材料运抵现场时，这特别有必要。

## **7. 现场环境、健康和安全管理**

基于项目在典型施工过程中的潜在风险，以下列出承包商制定环境、健康和安全管理计划或组织施工活动需要作为指南或/和要求的某些惯例和程序。

### **7.1. 高空升降车**

- 1) 承包商员工操作动力平台、人员升降机和车载工作平台，必须经过培训和授权。
- 2) 确认设备附有相应的操作手册。
- 3) 阅读、理解并遵守设备和操作手册上所有的“危险”、“警告”、“注意”事项和操作说明。
- 4) 所有的操作人员必须熟悉操作手册中规定的设备应急控制和应急操作方法。
- 5) 禁止操作安全指示标牌或标志遗失或难以辨认的任何设备。
- 6) 确认控件功能符合相应的操作说明。
- 7) 应稳定地站立在设备的底板；禁止坐在或爬上吊篮筐的边缘或使用木板、爬梯等物品形成工作支承点。

- 8) 不得滥用液压、机械或电气安全装置。
- 9) 当在篮式升降机上作业时，必须始终设置制动，并使用轮刹。
- 10) 在作业位置起臂时，吊篮内的工作人员和设备都不得移动，除非该设备特别设计用于此类作业。
- 11) 工作人员不得置身于诸如托梁、横梁以及吊篮的护栏等架空危险载荷的下方或其之间。升降机的运动伤及工作人员。
- 12) 确保支臂平台主要设计为人员运载工具，并配备升降控制装置。
- 13) 避免在另一台升降机的正上方或正下方架设升降机。
- 14) 与最近的架空线保持至少 3 米的最小距离。
- 15) 工作人员在吊篮内作业时，应始终使用全身式安全带，并以系索连接至支臂或吊篮的指定连接点，防止从吊篮中坠落。
- 16) 在升降机上作业时，禁止将安全带系索连接至邻近的柱子、构筑物或设备。
- 17) 如果架设在垫子或坚固的表面，使用支腿。
- 18) 不得超过设备的负载限制。应计算工作人员、工具和材料的组合重量。
- 19) 禁止车辆、设备、行人或工作人员从吊篮下方通过。只要有，应使用围护，防止车辆或人员进入吊篮下方的区域。
- 20) 禁止直接在移动平台的栏杆上挂载材料。
- 21) 始终确保妥善放置电动工具，禁止以其电源线系挂在移动平台的工作区。
- 22) 在所有的行驶条件下，设备操作员必须根据地面条件、交通流量、能见度、坡度、人员位置以及导致碰撞或人身伤害危险的其他因素，限制行驶速度。
- 23) 发现设备液压/燃料泄漏，应立即报告。
- 24) 必须总是以收拢状态停放升降机。
- 25) 注：如果制造商没有在吊篮上标记或正确标记升降机的技术信息，承包商应在吊篮上特别标记这些信息，比如，荷载能力。

## **7.2. 围护和作业告示牌**

- 1) 承包商在工程施工过程中，其主管领导应负责设置必要的围护和作业告示牌，为承包商的工作人员和现场员工提供安全保障措施。
- 2) 必要时，应环绕开挖区域、公共设施检修孔、地板开口、屋顶、高架平台、某些类型的高架作业区，设置围护、警示带和/或作业公告牌，提示人们防范坠落或其他危险。
- 3) 在这禁止进入的区域，应使用围护带进行封闭，并设置“危险！禁止进入！”标志。任何人未经许可不得进入采用警示牌或围护带封闭的任何区域。
- 4) 应考虑沿着围护，设置适当的照明或反光警示带或标志，提醒人们注意交通安全。



### 7.3. 压缩气体

- 1) 承包商使用压缩气体时，应防止气流指向工作人员或不相关人员。
- 2) 气瓶应妥善存放，并标记气体名称。
- 3) 所有的气瓶都必须具有减震圈，存放的气瓶应配置合适的护盖，并以垂直固定状态存放。
- 4) 在气瓶闲置、空瓶或移动时，必须关闭阀门。在移动或存放气瓶时，应装配阀门保护盖。
- 5) 承包商放置气瓶，应保持安全距离，或采取隔离措施，防止受到热加工和阳光直射影响。
- 6) 氧气瓶应与燃气瓶或可燃材料（特别是油料或润滑油）分开储存，其最小间距应为 6 米，或者，设置耐火等级至少半小时的不燃屏障，且其高度至少应为 1.5 米。
- 7) 在首次使用或安装之前，应确认调节器、软管和喷枪组件状态良好，并使用气密水检查是否存在泄漏。如果发生泄漏，应将气瓶转移至建筑物以外的安全位置。
- 8) 损坏或泄漏的气瓶应停止使用，并附加“禁止使用”标签，转移至隔离区域。
- 9) 气瓶不得用作滚筒或支架。
- 10) 所有的气瓶，如果有疑问，无论是空瓶还是满瓶，均应视为满瓶进行处置。
- 11) 禁止将气瓶放入受限/封闭空间。其附件（软管、喷枪等），如果在当前执行的任务中不使用，不得遗留在无人值守的受限空间。
- 12) 承包商不得在工作现场重新填充气瓶或在一个气瓶中混合气体。
- 13) 不得使用起重磁铁或吊链吊带吊运气瓶。
- 14) 必须使用批准的装置吊运气瓶。
- 15) 应正确标识所有的压缩气瓶。
- 16) 气瓶应以垂直状态进行固定。至少应使用直径 1.2 厘米的绳索、铁链或 9 号铁丝固定气瓶。禁止将气瓶置于自由直立状态。
- 17) 存放气瓶时，应与热源保持安全距离。
- 18) 损坏的软管应停止使用，并附加“禁止使用”标记。
- 19) 气瓶的气体用完时，应将气瓶撤出工作现场，并且，在工作结束时，所有的气瓶均应撤出工作现场。
- 20) 承包商应在其管理的压缩气体储存区域设置标志，注明其公司名称。

### 7.4. 吊车与起重

- 1) 承包商应根据中国的相关法规和项目的起重吊装安全要求，制定其书面起重吊装使用程序，并在执行涉及使用起重机的作业任务之前，呈报监理及业主审查、批准。

2) 承包商应提供相关文件，证明承包商的每一名起重机操作员、起重工和信号员均经过适当培训，符合适用的国家、地方法规要求以及项目的起重作业要求。

3) 承包商应负责移动设备操作员的培训/考试和相应的上岗许可管理，并满足其他适用的特定运输要求。

4) 只有具备有效证书并经过认证的起重机操作员、起重工和信号员可以参与起重作业。

5) 操作起重机和机动设备的承包商员工，必须通过监理的资格审核。

6) 承包商应提供相关文件，证明承包商操作起重机和其他机动设备的每一名员工均具备相应的资格，符合适用的国家和地方法规要求。

7) 国标 GB5144-2006《塔式起重机安全规程》和建工行业建设标准 JGJ196-2010《建筑施工塔式起重机安装、使用、拆卸安全技术规程》规定了塔式起重机设计、制造、安装、使用、维护、检查和测试等方面的安全技术要求。

8) 在每天开始起重作业之前，承包商应通过进行规定项目的检查，确认起重系统可以正常运行。承包商还应向监理提供此种起重机检查记录。

9) 承包商不得使吊运的重物处于无人看护状态。在移动吊运的重物时，起重机操作员应确认所有的人员均应撤离吊运路径。工作人员不得置身于吊运重物的下方。

10) 承包商应采用围护和其他适当的控制方法，确定一个限制性起重作业区域，尽量避免由于吊运的重物摆动或坠落造成人身伤害。必须根据预期通过的行人或车辆潜在流量，确定起重作业区域的边界。至少应在交通流量不大的区域配备足够的警戒人员，防止任何行人通过起重作业区域。如果有人擅自进入起重作业区域，必须停止起重作业。

11) 在将任何起重机运抵项目现场之前：

- 承包商应在执行涉及使用起重机的作业任务之前，向监理及业主呈报承包商的书面起重吊装程序进行审批，并且，在开始作业之前，说明其相关风险。

- 承包商应负责起重机操作员的培训/考试，并满足其他的适用要求。

- 承包商应负责移动设备操作员的培训/考试和相应的上岗许可管理，并满足其他适用的特定运输要求。

12) 任何吊车的安全操作：

- 不得从有人使用的建筑物、车辆、人群或机械设备上方吊运重物。如果有，应为起重机操作员提供一个自动报警系统，可以在吊运路径进入“限制”或“危险”区域时向操作员发出警告。另外，还应在这些限制操作区域提供视觉标志。起重工可以通过与起重机操作员保持无线电联络，在吊运路径接近限制区域时向操作员提供二次报警。

- 要求提供在起重工和起重机操作员之间保持无线电专用通话链路的系统功能。如果通信中断，应立即停止起重机的运行，直到恢复通信。

- 起重机操作员应在起重机上随时甄别异常噪音或其他问题，并进行相应的处理。应在每日检查表上记载此类事件。

- 如果起重作业区域的工作人员没有通过口哨或喇叭发出声音通知，不得执行吊运操作。

#### 13) 塔吊的额外要求:

- 安装公司的资质等级和安装人员的资格证，应符合国家相关法规要求。完成安装工作时，应通知国家质量技术监督局进行现场检查和验收。

- 应按照规定之力矩拧紧塔身和起重臂的所有紧固件及设备附件，并进行标记。应采用扭矩条纹进行标记。

- 由于风力/天气会对塔身造成影响，因此，塔式起重机在停止运行时应设置为可以 360 度自由旋转或“风向标”状态。这时，吊钩应完全收回，以防止对周围的建筑物造成任何损坏。这不适用于台风气象条件，在台风来临之前最好降下起重臂，以免破坏起重机。

- 除了起重机操作员的每日检查，还应在使用过程中应按使用说明书且不低于 GB/T31052.3 的规定进行检查和维护，各项检查和维护均应作好记录，检查和维护结果应有检查和维护人员的签字。这些检查报告也应至少呈送监理。

- 在安装高密度塔式起重机的情况下，承包商应充分评估起重臂交叉的潜在风险，以避免发生起重臂碰撞。必要时，应采取积极的预防措施，比如，使用数字传感器类型的系统，或者，妥善规划起重机的正确安装位置。

#### 14) 检查/记录

通常的惯例是由起重机操作员在现场对所有的连接部位、紧固件、钢丝绳以及任何其他松动部件或物体每天进行目视检查。监理由根据现场的业务和技术服务状态，规定在哪一天开始或结束此种每日检查。

应在每个班次开始时，使用 [XTC 14 3 025-2022 《吊车司机日检表》](#) 进行记录，并呈报环境、健康和安全部和/或机电管理部审核。除了其他法规要求，起重机操作员应在开始每个班次的作业之前（或依照其他规定），对如下检查进行记录：

- 螺栓的扭矩条纹（适用于塔式起重机）；
- 液压系统，比如软管、配件等，是否存在泄漏现象（若适用）；
- 起重臂和悬臂，包括螺栓松动；
- 所有的钢丝绳和钢缆；
- 所有的电动机、卷筒、变速箱以及可见的轴承和轴衬；
- 所有电气部件的磨损和损坏；
- 索具，即吊钩、吊索、吊链和卸扣；
- 负载极限开关、高度限位开关、水平限位开关或任何其他保护装置测试；

- 确认卷扬机和小车电缆正确缠绕在卷筒上；
- 机载消防；
- 所有的传动带和驱动轮对准；
- 根据制造商的技术规范，记录所有的油、液位和润滑油；
- 小车电缆、滚轮、轨道、转盘轴承和轱辘；
- 绳卡、绳套和绳环；
- 装配在起重臂上的操作室；以及
- 设备周围的地面条件是否能够提供适当的支持，包括地面沉降、地下水或类似条件。
- 如果每日或每周检查中发现问题，必须立即进行处理。如果所发现的问题对于起重机的安全运行至关重要，则必须停止运行，直到予以修复。应在检查报告上记载维修情况。

## 7.5. 叉车

1) 承包商负责操作叉车（比如，叉式升降机、越野叉车和其他物料搬运设备）搬运、储存和处置物料的员工，必须经过培训和认证。

2) 承包商应为操作机动工业车辆的员工制定所需的培训计划和现场具体操作程序。

## 7.6. 电气安全

1) 中国国家建筑行业标准 JGJ 46-2005 《施工现场临时用电安全技术规范》应作为项目现场电气安全的主要指南，主要关注：三级配电系统、三相五线制接零保护系统、二级漏电保护系统、户外防水工业插座/插头。

2) 承包商应在开工之前，制定其针对性的临时用电施工组织设计（方案），并呈报监理审批。在现场施工环境发生变化或随着施工阶段推进，原临时用电施工组织设计（方案）与现场时情况不符时，承包商应组织对临时用电施工组织设计（方案）进行更新，并再次呈报监理审批。

3) 以下是若干细节要求：

- 该规范适用于任何电气设备/电路的安装、维护、修理和拆卸。
- 首次或大修之后对设备/电路进行通电之前，应进行适当的检查测试，以确保其安装正确。
- 在小修之后，将电气设备/电路重新投入使用之前，应进行适当的检查，确保已经拆除所有的安全装置，并已经安装了所有的防护、屏蔽、盖板。
- 发现任何电气设备/电路损坏或存在其他缺陷，应通知公司的电工，如有必要，报告主管领导。
- 应使用批准的材料和方法，对导线的接头、接点和自由端进行妥善绝缘。

- 所有电气装置和/或硬件，包括线夹、插座盖、护套、预留孔、面板、门等，应按照相关要求正确安装和维护。完成工作后，盖板/面板/门应保持关闭状态。

- 安装和维护所有的电气开关、接线盒、插座等装置时应使用盖板，防止工作人员触及内部配线导体。当完成工作时，应拆除盖板。

- 所有的插座、电线连接器和连接插头，应设计为仅能连接那些电压/电流额定值相同或更低的附件。

- 在一般情况下，连接电源线和插头的所有设备和工具必须接地。（双重绝缘工具和设备不需要接地）

- 电气设备周围的工作空间，包括配电室，不得用作储物间。

- 所有的断路器应清楚地标识“开”和“关”工位。

- 220V 电源延长线必须是三线式，必须包含设备接地导线。如果三相设备延长线应是 4 芯，工作线为 N+1 线芯。

- 电源延长线只能连接带有接地或漏电断路器的插座。

- 不能使用电源线提起或放下设备，电源线也不能打结；

- 布置电源线必须躲避锋利锐角和突出物；

- 不得通过窗户或门布置电源线，除非采取避免损坏的保护措施，并且只能是临时布置；

- 不得使用 U 型钉或导电材料固定电源线，亦不得采用损坏外层护套或绝缘层的方式悬挂电源线。

4) 如果发现如下任何情况，应停止使用电线/电缆并立即进行更换：

- 缺失接地插脚/接地线。

- 外部防护层损坏，内部导线裸露（无绝缘）。

- 车辆碾压导致电线变形（内部导线在外部保护层内变形）。

- 电线的外部保护层从连接器（插头或插座）的保护套内被拉出。

5) 经由人行道或其他通道布置电线时，必须使用电线保护材料或绝缘带进行覆盖，以免造成绊倒危险。

6) 穿过道路敷设电线/电缆时，应使用坡道或以其他能够承受交通负载的适当覆盖方法进行保护，以免损坏。所采取的保护方法应能够防止保护装置发生移动。

7) 禁止在潮湿场所（即环绕或接近水体或其他液体的区域）执行电气作业，除非绝对必要，并且只进行适用于该场所/条件的额定/经过批准的电气连接。

8) 在潮湿场所作业时，必须采取如下特殊预防措施：

- 在任何潮湿的工作面上放置干燥屏障。

- 带进作业空间的手提灯，其电压不得超过 12 伏，除非采用接地漏电保护器或漏电断路器或可靠的接地方式提供保护。

- 在开始作业之前，清除积水/化学物质。禁止在存在积水/化学物质的场所执行电气作业。
- 不得在潮湿场所使用电源延长线，除非其设计包括接地导体和接地插脚。
- 确保电线远离积水。

9) 所有功率等级的配电盘均应予以妥善管理，并标注承包商名称以及责任电工姓名和联系电话。

## 7.7. 开挖

1) 承包商应在开工之前制定书面的开挖程序，呈报监理进行评审。

2) 承包商应妥善规划用于排水的雨水汇集坑。

3) 承包商应提供相关文件，证明承包商从事开挖作业的每一名员工均接受过开挖培训，符合适用的国家和地方法规以及项目的要求。

4) 在开工之前，应制作开挖许可公告牌，并安装在开挖现场。

5) 如果不能确定土壤类型，应以最保守的施工方式，即 C 类施工方式进行开挖。这意味着最大允许开挖深度小于 6 米时，应采用 1½:1 的长度/深度边坡比（或 34 度的坡度）。

6) 当开挖深度达到或大于 1.2 米时，应采取适当的保护措施，防止从开挖面滚落的松散岩石或土壤对施工人员造成伤害。禁止施工人员在不稳定的边坡下方作业。

7) 开挖作业面上的施工人员与撤离途径的距离建议保持在 7.5 米以内。

8) 开挖作业面内使用的梯子应妥善固定，并且，应高出开挖边缘至少 1 米。

9) 应以支护、支撑或放坡的方式对施工人员提供保护，防止塌方。

10) 开挖作业面内不得积水。

11) 对于在开挖过程中会遇到的诸如下水道、电话线、燃料管线、电线、供水管线等地下公共设施或任何其他地下设施，应进行定位和标记，并在开始使用动力设备进行开挖作业之前通知相关部门。

12) 承包商在进行开挖施工时，必须安排一名安全检查员参与开挖作业。

13) 必须妥善存放开挖渣土或其他松散材料，其距离开挖面的边缘不得小于 1 米，除非开挖面经过特别支撑，允许增加负载，并提供合适的踢脚板/阻挡木或其他安全保障措施。

14) 如果开挖作业面存在缺氧、富氧、可燃或有毒气体，应对作业面的空气进行检测和持续监测。

15) 如果在开挖作业面邻近，或者，在距离开挖作业面边缘 1 米以内操作移动设备，应采用如下警示系统之一：

- 护栏

- 手势或机械信号，或者
- 阻挡木方

16) 应环绕所有的开挖作业面安装围护栏杆，防止坠落。如果开挖深度小于 1.2 米，可以采用警示带、护栏或其他保护手段。如果开挖深度大于 1.2 米，必须在距离开挖作业面边缘 1 米处安装固定围护栏杆。

17) 一旦在开挖处完成相关工作，承包商应尽快回填。承包商应尽在每个工作日结束时进行回填，避免明挖基坑构成危险，尤其是在夜间。对于不能在工作日结束时回填的项目，承包商应对开挖处设置适当的护栏、围墙和/或采用钢板进行覆盖，安装夜间警示反光标识。

18) 如果承包商造成任何地下公共设施损坏，应立即停止作业，并报告监理。

19) 承包商必须遵守与项目有关的规范要求。如果承包商在开挖过程中遇到任何可疑物质（即项目开挖工程图纸未标注的变色土壤、管道、石棉等），应立即停止施工，并联系监理。如果遇到污染土壤，监理应对其妥善清除处置作出安排和指导。

20) 承包商应在开挖的沟槽或基坑周边，设置明显的警示标志以及护栏或围挡，防止危及行人安全。

21) 如果现场条件要求，或者，开挖深度达到或大于 1.2 米，承包商应对开挖处采取适当的防护措施（放坡、管沟支撑或支护）。对于开挖深度较浅的项目，当施工人员的高度小于开挖深度时，需要采取保护措施。

## **7.8. 防坠落保护**

1) 承包商应在开工之前制定书面的防坠保护程序，呈报监理审批，并且说明相关的风险。

2) 承包商应提供相关文件，证明承包商从事高空作业的每一名员工均接受过防坠保护培训，符合适用的国家和地方法规之规定以及公司的要求。

3) 确保对工作现场进行评估，确认其步道和工作面具备安全支承工作人员的强度和结构完整性。

4) 确保为距离无防护措施临边 1.2 米距离内的所有工人（不分工种）设置防护栏杆或个人坠落防护系统。

5) 个人防坠落系统由锚固点、连接器、全身安全带组成，并包括系索、速差器、生命绳或一个合适的组合。

6) 如果作业面存在高于下层结构 1.2 米的楼板孔，应确认已经通过个人防坠系统、盖板或护栏系统为相关工作人员提供保护。

7) 确保通过护栏系统，为利用高度达到或超过 1.2 米的坡道、过道以及其他通道执行作业任务的工作人员提供防坠保护。

8) 在楼面开孔（天窗、洞口、舱门口等）两米以内处作业，需要提供适当的防坠保护。

9) 对于楼板孔，应以固定盖板提供防护，盖板的强度应能够支持任何施加载荷或等于楼板的设计承载能力；或者，除了楼梯入口，应在所有的暴露侧采用配置踢脚板的标准固定栏杆系统提供防护。

10) 当以盖板对楼板孔进行防护时，应清晰地标明“危险孔口！禁止拆卸！”。

11) 护栏应 1.2 米高，并配置至少 0.6 米高的中间护栏，以及 0.18 米的踢脚板。

## 7.9. 消防

1) 在开始工作之前，应指定一个应急集合地点，并告知所有的工作人员和分包商。

2) 承包商应在开工之前，制定其针对性的临时用电施工组织设计（方案），并呈报监理审批。

3) 在承包商的整个工作现场，应在指定的适当地点配置灭火器。建议配置 ABC 干粉灭火器，其性能适合扑救大多数火灾。

4) 承包商配置的灭火器，应每月进行检查，并在彩色贴上填写检查日期、检查人姓名等信息，予以张贴。

5) 工作人员必须能够使用灭火器、消防软管站或其他消防装置。到达此类设备的通道必须保持畅通。

6) 工作人员必须知道最接近的灭火器、消防出口和火灾报警器（若适用）。工作人员应能够顺利通过指定的消防出口。

7) 在设备运行或灼热时，不得加油。

8) 应使易燃材料远离灼热表面和点火源。

9) 易燃材料应存放在防火柜内。

## 7.10. 手动和电动工具

1) 在开工之前，应由承包商对所有手工工具和电动工具进行检查，并在允许使用的工具上贴上检查标签。

2) 承包商应对所有的手工工具、电动工具和类似设备进行检验，无论是业主提供的工具设备，还是承包商提供的工具设备，均应保持安全状态。

3) 如果为电动工具设计了防护装置，使用时应配置此种防护装置。

4) 如果在特定的设备操作地点存在造成人身伤害事件隐患的，应采取防护措施。

5) 应为使用手工工具和电动工具，以及暴露于坠落、抛射、研磨、飞溅物体风险，或暴露于有害粉尘、烟气、喷雾、蒸汽、工业气体风险的员工提供必要的特定防护装备，保护其免受伤害。



### 7.11. 危险化学品

1) 运抵项目现场的任何化学物质，必须附有使用当地语言填写的相关《安全数据表》。必须在现场保存《安全数据表》，并可随时向监理和业主呈报。必须在经过批准的容器内保存所有的化学物质，包括易燃物质。

2) 承包商使用的化学物质容器必须正确标记相应化学物质的名称及其物理/健康/环境危害。

3) 每个承包商必须制定危险化学品管理程序，包括所使用的每一种化学物质之现场存放完整《安全数据表》、化学物质库存清单、以及适当的人员培训（即相关的物理和健康危害知识、正确的处置方法和个人防护装备使用培训）。

4) 应对将要使用的所有化学物质的《安全数据表》进行评审，以防止事故发生。

5) 承包商应负责为访客和员工提供粉尘的防护措施。

### 7.12. 重型设备

一般来说，重型施工设备包括挖掘机、推土机、装载机、起重机（汽车吊、履带吊、塔吊）、空中/剪式升降机、混凝土搅拌站、垂直/水平运输设备等。

1) 只有具备法定操作证书并接受过设备使用培训的获得授权的人员方可操作重型设备。

2) 承包商应提供相关文件，证明承包商每一名操作机动设备的员工均具备相应的资格，符合适用的国家和地方法规要求以及项目的要求。

3) 设备应处于良好工作状态，并且，在使用之前，应由承包商进行检查。在检查合格的设备上，应张贴彩色检验标签。

4) 应随时使用安全装备，比如安全带。

5) 应遵循制造商的使用建议。

6) 重型设备的操作员应每天对设备进行检查，并填写和保管检查记录。

### 7.13. 动火作业

动火作业是指涉及产生火焰或火花的任何作业活动。这包括但不限于焊接、热处理、打磨、切割、焚烧、融化冻管、热铆接、应用喷灯屋面防水作业或类似作业。应依照规定取得[XTC 14 3 002-2022《动火作业许可证》](#)。

### 7.14. 文明施工

1) 承包商应在建设、拆迁、改建和维修过程中，在所有的支持和工作区域保持内务整洁。

2) 承包商的工作人员必须保持通道和工作区域整洁，不存在障碍物和碎屑。

3) 通道不得存放绳索或钢丝绳，以避免绊倒行人。

4) 在施工过程中，应定期清除可燃废料、杂物、垃圾和非必要化学品。

5) 建筑物或其他结构物内部或周围的工作区域、通道和楼梯内不得存在带有突出钉子的木材、木材碎片以及其他杂物。

6) 每个班次结束之前进行现场清理。

7) 持续控制粉尘（若适用）。

8) 在指定的适当容器中存放所有的垃圾，包括废油漆、废溶剂、废机油等。含油的抹布必须在防火容器中进行存放。

9) 妥善布置电源延长线、电缆和软管，以尽量降低羁绊风险。

10) 堆垛材料应远离围栏。应保证在堆垛倾倒的情况下，不会有任何物品越过围栏，以免伤及围栏外面的人员。

### **7.15. 火药驱动工具**

1) 使用火药驱动工具的承包商员工必须具备相应的资格。

2) 应由经过特殊培训的员工使用火药驱动工具。

3) 禁止在易爆易燃环境中使用火药驱动工具。

4) 应每天或使用之前对火药驱动工具进行检查。

5) 严禁将火药驱动工具指向任何人。

6) 除非立即使用，否则，禁止加载火药驱动工具。加载的火药驱动工具不得处于无人看管状态。

7) 使用适当的个人防护装备（眼睛和面部防护）。

8) 在击发火药驱动工具时，其喷口必须配置防护装置，以限制碎片飞溅。

9) 在处置含有未使用/未击发药筒的火药驱动工具射弹带之前，应将其置于水中至少浸泡24小时。禁止随意放置射弹带。

### **7.16. 梯子**

1) 在启用之前，必须对所有的梯子进行检查，并贴上色标标签。

2) 每个使用梯子的人，都必须在使用之前对梯子进行目视检查。

3) 所有的梯子必须处于良好状态，没有任何损坏或不合格零件。

4) 梯子上不得粘附润滑油、机油或存在其他打滑危险。

5) 如果需要在门口设置梯子，必须将门固定和/或张贴警告标志。

6) 在梯子上，必须总是面对梯子。如果有必要从梯子上转身工作，必须使用安全带。如果站在梯子上工作，不得站在梯子顶部的第三级以上。

7) 在上、下梯子时，应保持三点接触。

8) 金属梯子或导电的梯子，不得在电焊作业中使用，或者，靠近电线或电气设备。

9) 项目现场，禁止使用自制木梯或竹梯。根据作业特点选择其他适合的梯子，比如，玻璃钢、铝合金梯子等，但必须保证其质量、技术参数。

10) 如果有必要在脚手架顶部以及接近高架平台、屋顶或楼板孔边缘的部位使用梯子，必须对梯子进行固定，并且，作业人员应使用安全带。

11) 如果是作为高空作业区的通道，梯子的顶端必须至少超出支持物体 1 米。

12) 便携式梯子不能以水平状态用作平台或步道，并且，仅允许负载一个人。

13) 梯子的使用角度应保证其顶部支点与梯子底部之间的水平投影距离不大于梯子长度的四分之一。

### **7.17. LOTO 挂牌、上锁**

1) 承包商应在开工之前制定书面的安全挂牌、上锁程序，呈报监理及业主进行评审。

2) 承包商应提供相关文件，证明承包商从事能量隔离相关作业的每一名员工均接受过安全挂牌、上锁程序培训，符合适用的国家和地方法规要求以及公司的要求。

3) 除非根据安全挂牌、上锁程序切断电源，执行安全挂牌、上锁，并确认零功率，否则，必须认为电线和电路带电。

4) 承包商不得操作已执行安全挂牌、上锁的任何设备、开关或阀门。

5) 对于电源延长线和便携式手工工具，承包商必须提供和使用接地漏电保护器。

6) 承包商必须自行提供其执行安全挂牌、上锁程序所需的锁具和标牌。

7) 执行安全挂牌、上锁程序所使用的标牌至少应清晰地显示以下信息：执行人的姓名、承包商的公司名称、联系方式（手机和/或办公室电话号码）以及执行安全挂牌、上锁程序的日期。

### **7.18. 交通维护**

1) 车辆在任何时间进行装卸作业，均不得堵塞任何门、道路、建筑物入口、消防通道或妨碍接近消防栓。

2) 使用任何车辆作为牵引车时，应确保牢固锁定牵引钩、牵引杆和安全链，并且，应开启转向指示灯双闪。

3) 如果承包商的车辆在任何时间妨碍某一路段通行，必须安排信号疏导人员提示过往车辆。

### **7.19. 材料处理**

1) 应利用高空作业升降平台或绳索，传递和回收在高空作业区域使用的工具和设备。禁止从高处扔下工具和设备。

- 2) 应分层固定所有的材料，通过叠放、上架、阻塞或联锁，防止其坠落。
- 3) 应以极为明显的方式，张贴楼板、工作平台、吊篮、脚手架等设施的安全载荷限制。
- 4) 工作区域不得存在杂物。
- 5) 应安全地存储材料，避免受到冲击或挤压。
- 6) 应始终保持走廊和通道畅通。
- 7) 禁止将不相容的材料储存在一起。
- 8) 正在建设的建筑物中，距离升降机通道或楼板孔 1.8 米以内的部位禁止储存材料。
- 9) 在堆放木材之前，应拔掉木材上的钉子。

#### 7.20. 便携式发电机

- 1) 承包商在项目工作现场使用便携式和车载发电机，必须遵守国家相关法规的要求。
- 2) 承包商应执行的一般安全工作规程包括但不限于：
  - 根据制造商的使用说明和安全指南，维护和操作便携式发电机。
  - 妥善接地，以避免电击。查阅发电机的用户手册，确定正确的接地方式。
  - 检查便携式发电机，确认是否损坏，或者，燃油管是否松动。
  - 停止使用存在缺陷的设备，并附加标记或标签，表示不能保证使用安全。
  - 仅使用配置接地三插脚插头的耐用型户外电源延长线。
  - 应保持发电机干燥，并且，仅在遮篷式开放结构物之下的干燥表面上运行。
  - 在触摸发电机之前，擦干双手。
  - 按照制造商的说明，使用接地漏电保护器。
  - 加油之前，关闭发电机，并使之冷却。
  - 妥善储存燃料，确定管理责任，防止任何泄漏导致环境污染或造成火灾。
  - 燃油发电机根据其型号按国家规范要求使用相应的清洁燃料。

#### 7.21. 脚手架

1) 在授予合同之后一个月以内，承包商应制定书面的脚手架安装使用管理程序，呈报监理及业主审核。

- 2) 承包商在脚手架选型上必须遵循的原则为：
  - 遵循国标，没有成熟规范支持的脚手架类型禁用
  - 不接受以竹材料作为脚手架部件

3) 在安装脚手架之前，应填写 [XTC 14 3 005 2022 《脚手架安装、使用许可证》](#)，由承包商内部的施工和 EHS 代表、项目监理批准。

4) 承包商应提供相关文件，证明承包商的每一名脚手架工均接受过脚手架安装培训，符合上述法规要求，并具备法定操作证。

5) 必须按照上述法规要求，安装和维护脚手架。脚手架应配置适当的刚性完好底座，禁止使用诸如桶、箱、砖或混凝土块等不适当的物件支承脚手架。

6) 应使用螺旋千斤顶、垫板和底基木，以确保实现可靠支承。

7) 确保在平台的所有开放侧和末端安装护栏。

8) 应为脚手架平台提供安全通道。

9) 禁止工作人员以攀爬剪刀撑系统的方式作为通行手段。

10) 禁止使用不稳定物件支持脚手架。

11) 禁止在风暴或狂风气象条件下使用脚手架。

12) 承包商应依照相关规范要求，安装脚手架护栏和踢脚板。

13) 脚手架及其组件，应能够可靠支承四倍预期负荷。

14) 在未配置标准护栏或完整盖板的脚手架平台上，工作人员必须妥善系好安全带。必须在踏上脚手架之前系好安全带，并且，在离开脚手架之前禁止解开安全带。安全带必须连接至独立的救生索或建筑结构—每个人一条生命绳。

15) 在移动脚手架时，任何人不得置身于脚手架上。在移动之前，必须移除脚手架上的工具和材料，或者，予以固定。禁止置身于移动脚手架上，在上方拉动脚手架。

16) 在使用移动脚手架时，应锁定脚轮。

17) 在安全防护网完整的脚手架平台上，砖、瓦、砌块或其他类似材料的堆放高度不得超过 60 厘米。

18) 承包商安装脚手架，必须安排一名能胜任人员（比如，施工负责人），参与所有的脚手架作业。这包括脚手架的安装、拆卸、改装、检查和使用。

19) 在每个作业班次开始之前，以及在发生影响脚手架结构整体性的事件之后，应施工负责人对脚手架进行检查。施工负责人应能够识别与脚手架类型相关的风险，并通晓控制或降低风险的相应程序。

20) 应使用脚手架标签，在脚手架的每个出入口，显示每日检查结果。

21) 所有的脚手架标签必须为整体绿色、黄色或红色：

22) 绿色标签：已经检查完毕，并确认可以安全使用的脚手架，悬挂绿色标签。在完成最初的检查确认之后，应在脚手架的每个出入口悬挂绿色的“安全脚手架”标签。在此中情况下，安全带可不作为强制要求。

23) 黄色标签：在为了满足作业要求，已经对脚手架进行过修改，存在使用风险时，应以黄色的“警示”标签，更换所有的绿色“安全脚手架”标签。该标签显示对于安全使用脚手架的特殊要求。该标签的最低要求应包括：

- 并记载授权使用黄色标签脚手架的负责人姓名。

- 在脚手架已经恢复安全状态，并由安全检查员完成检查之前，禁止取下黄色标签。如果根据检查结果，应在脚手架上悬挂适当的红色或绿色标签，方可取下黄色标签。

- 使用黄色标签，并非旨在取代绿色标签。应尽一切努力，尽快恢复脚手架的绿色标签状态。在此种情况下，必须佩戴、系挂安全带。

24) 红色标签：在安装或拆卸脚手架期间，或者，脚手架无人看管，以及在认为脚手架不适合使用的情况下，应以红色“危险”标签取代所有的绿色“安全脚手架”标签或黄色“警示”标签。该标签的最低要求应包括：

- 在标签的正面上，填写检查日期和检查人的姓名。
- 在标签的背面上，注明“正在安装”、“正在拆除”、“需要维修”或“防止碰头”。
- 在任何时候，如果脚手架的状态已经发生变化，导致对脚手架的整体性产生疑问，必须完成脚手架重新检查。

25) 应在每个脚手架标签上显示的信息必须包括：

- 搭设、挂牌日期。
- 检查人姓名（印刷体和手签体）。
- 检查日期。
- 负责安装/维修/拆除的承包商。
- 禁止在距离架空电线 4 米以内的位置使用或安装脚手架。
- 禁止在脚手架顶部使用梯子或临时装置增加高度。
- 固定的脚手架梯子，在任何位置的高度，不得超过 7.5 米。

26) 对于特殊类型的脚手架，比如型钢悬挑脚手架、承重结构脚手架（满堂脚手架），应进行设计计算。

## 7.22. 剪式升降车

- 1) 承包商操作剪叉式升降机的人员必须经过培训及认证。
- 2) 须按照制造商建议测试、检验及维护剪叉式升降机。
- 3) 确保控件功能与制定的相符。
- 4) 如果剪叉式升降机配备有系挂点，工人在操作时必须始终将安全带挂钩挂在该点。
- 5) 在升降机上作业时，切勿将安全带系挂至邻近的柱子、构筑物或设备上。
- 6) 稳立在地面上，切勿在吊篮边缘坐下或攀爬，或使用木板、爬梯等物品作为作业点。
- 7) 穿着全身式安全带，系索始终挂在指定的系挂点。
- 8) 如存在导致升降机不稳定的危险源，应在远离该危险源的牢固平整表面上作业。
- 9) 与电源保持距离（如输电线、变压器）。
- 10) 切勿超过指定的荷载限值。

- 11) 将支腿架在垫板或坚固表面。
- 12) 升起之前先设置刹车，并稳定升降机。
- 13) 切勿拆除或站在护栏上，以免超出限制高度。
- 14) 在斜面上作业时，应使用轮挡。
- 15) 在升降车内有工人的情况下，当升降车在升高时时禁止移动，除非设备特别设计用于此类作业。
- 16) 在升降机降落后，将剪叉式升降机转移至/离开作业点。
- 17) 报告所有出现的问题和故障。

### **7.23. 恶劣天气预案**

- 1) 承包商应编制一份恶劣天气环境事故应急预案，并提交监理及甲方审议批准，其中应特别强调项目所在地出现的台风、暴雨、地质灾害、中暑等危险源。
- 2) 所有作业区和设备做好迎接出现的恶劣天气环境的准备及防护。
- 3) 作业现场必须保证各零散物资的安全，准备应对恶劣天气环境。
- 4) 在遭受了恶劣天气、现场恢复作业前，应进行全面的安全检查。

### **7.24. 机动车辆安全**

- 1) 遵守项目车辆限速（除非另有贴示，否则不超过 20 公里/小时）与安全驾驶规定。
- 2) 所有张贴的限速、停车标志和指定的停车区标识必须遵守。
- 3) 在项目界限内行驶时，也必须遵守国家的交通法规。
- 4) 人员不得在小车和卡车的载货区骑乘，应在车里座位上等待。
- 5) 任何车辆允许的载客人数受此车辆座位数的限制。
- 6) 在项目现场、行人、应急车辆及游客车辆具有优先通行权。
- 7) 必须安装前大灯在夜间使用。所有车辆必须有前大灯和尾灯；天气恶劣时或夜间必须保持前大灯亮起。
- 8) 使用任何车辆作为牵引用途时，确保牵引钩、连接杆、安全链已固定锁定。必须打开双闪。
- 9) 严禁分心驾驶。禁止开车使用电话。
- 10) 承包商应按照项目指定的模板制定交通标志。
- 11) 发生任何车辆事故必须立即报告监理和业主。防御性驾驶是确保所有驾驶员安全环境的关键因素。
- 12) 租赁车辆和设备应贴上标签（建议用一块木板或纸板），附上承包商的公司名称和联系信息。

13) 确保由具有资质的机械工定期对项目现场内外的车辆及设备上的安全零件进行安全检查和维修。这些零件包括但不限于：

- 视野开阔的（视镜和挡风玻璃）雨刷和雨挂
- 制动器—包括应急刹车
- 风扇皮带
- 前大灯
- 尾灯
- 刹车灯
- 信号灯
- 液压升降机
- 动力转向
- 轮胎-包括备胎
- 千斤顶
- 用于各设备的喇叭或警铃
- 通风设备
- 所有座位的安全带
- 发电机和启动器
- 吊臂、焊缝和螺杆
- 液压软管、液压耦合器及液压泵

#### **7.25. 放射源**

1) 放射源在到达承包商作业现场之前，应获得所有要求的国家法律许可和项目现场需要的 [XTC 14 3 009-2022 《射线、探伤许可证》](#)。

2) 尽量将射线探伤作业的时间安排在非高峰期（比如，夜晚）。

3) 承包商射线探伤作业地点周围，应妥善设置围护。作业时警示区内的作业人员需佩戴相应的 PPE，非授权人员不能入内

4) 不使用时，应按照下列要求将放射源存放在安全设施内：

- 已经由监理审核并提出意见的承包商施工方案（注：原则上严禁在作业现场存放放射源）
- 适用的法律要求

#### **7.26. 应急管理**

1) 应急设备



承包商不得阻塞或阻碍应急设备诸如现场急救工具、灭火器、消防栓、变压器、应急发电机及泄漏吸附材料和工具的通道。

## 2) 应急报告

- 立即将所有事故汇报给监理及业主，落实项目应急响应预案。这些包括但不限于：事故和伤害；看到烟或火苗；化学品或危险物质泄漏；恶劣天气影响；人身安全威胁。

- 汇报应急情况时时，请提供如下信息：汇报人姓名、电话号码和住址；事故地点（项目名称/项目号、建筑物名称、楼层及房间号）；事故性质及严重程度（人身伤害、事故、泄漏、冒烟/火灾、损坏等）；泄漏物料的名称和数量（如适用）；最安全的泄漏疏散路线（如适用）。

## 3) 应急预案

承包商应充分考虑应急物资（根据当地的公共和项目资源），并编制专项应急预案，并在预案中包括如下信息：

- 承包商有责任在应急情况时执行其制度。
- 在作业场地应清楚张贴应急联络方式和应急响应信息。
- 自行熟悉作业区。找到出口、火灾报警器、灭火器、应急洗眼装置、应急淋浴的位置，并确定从现场及建筑物最方便的撤离路线。

- 确定预定的集合地点。

- 承包商应为其承包商工人提供足够数量的急救物资。

- 应急出口门上应标有相应的标志。

- 不得阻塞应急出口。

- 承包商应确保在发生应急情况时需要疏散或就地避难时人员的安防体系已就绪。

- 承包商至少每年组织一次应急疏散演习和消防演习。

## 4) 应急响应

- 事故发生时，所有人员应按照应急响应程序通过最近的安全出口撤离到预定的集合地点。

- 切勿忽视建筑物应急警报。如果发出撤离信号，应立即停止活动，并前往指定的集合地点。

- 将所有事故汇报业主和监理。

- 立即向应急救援人员报告失踪人员及其推测位置。

# 8. 职业健康与卫生

## 8.1. 健康和医疗方案

作为环境、健康和安安全部门方案的一部分，承包商应：

1) 按照国家 GBZ188《职业健康监护技术规范》为涉及职业危害岗位人员提供入职前体检、在职健康监控和离职体检等。承包商应将所有体检记录保存以备业主或业主雇佣的第三方检查和审计。

2) 确保承包商健康和医疗计划在其设施及各分包商作业现场的建立并实施。

3) 确保所有承包商人员的健康状况适合将要承担的工作。

4) 承包商应为现场人员提供如下医疗福利：

- 确保具备符合法规和项目管理方要求的现场急救能力（包括持证的急救人员、现场急救诊所、担架、急救箱、急救药品等）。项目急救人员应在整个项目期间持有有效的“现场急救/心肺复苏”证书，急救人员与现场工人数比例为 1：100。

- 按照职业健康评估的要求，应进行定期体检。

- 安排专业的应急治疗和住院事宜。这些安排事项应记录在案并且按照项目的要求应可查阅。

- 应急疏散时，当项目认为有必要为承包商人员提供医疗人员，其费用将由承包商承担。

- 承包商应检查其人员及分包商人员是否坚持执行最高的卫生标准。

## 8.2. 噪音控制

承包商应定期开展噪声评估并以报告形式记录此类评估。噪声级大于 85dba 的地方需要按照该噪声级的规定，采取适当的听觉防护措施。

承包商必须：

1) 进行噪声评估，以确定这些地区是否噪声暴露级高。

2) 制定噪声底线及检测程序。

3) 提高对噪声防护必要性的认识。

4) 确保这些地区有足够明显的标识，通过安全会议和入职培训期间的沟通来提高人员的意识。

5) 实施系统的噪声监控计划以保证人员接触 85dba 的平均时间不超过八（8）小时。

## 8.3. 饮用水

承包商应：

1) 确保在作业区周围提供充足的饮用水和荫蔽休息区。

2) 承包商应定期提交水质检查和化验报告。

3) 将饮用水储存在洁净、合适的容器内。

4) 采用饮用水专用桶运输饮用水，并派专人上锁、看护。

5) 为预防中暑，允许适量饮水和休息。

#### 8.4. 餐饮人员健康审查（如有）

在入职前及此后每年，承包商应检查所有餐饮人员是否已完成包含如下项目的体检：

1) 传染疾病部位（如皮肤、耳朵、上呼吸道及胃肠道）的定期临床体检。

2) 如果有临床症状，应进行入职前胸透检查。应考虑个人的病历、临床体检发现及选定体检项目（如结核菌素）。

#### 8.5. 急救箱

承包商必须：

1) 提供仅用于应急的急救箱。对急救箱进行定期检查，保持急救响应物资备品充足、有效。

2) 确保在每班 100 名员工中至少培训一名（需要特别指出）急救人员，且有立即使用作业现场急救箱的权限，至少包括以下项目：

- 一张指南卡。
- 2 盒独立包装无菌敷料。
- 两包无菌眼垫，随附件。
- 六条独立包装三角绷带。
- 三盒超大无菌型独立包装非药物伤口敷料。
- 一瓶洗眼液。
- 一种人工呼吸用口罩。
- 乳胶手套。
- 消毒毛巾。
- 一条锡箔纸急救毯。

#### 8.6. 中暑预防

1) 承包商应按照《防暑降温措施办法》（2012）规定，制定完整中暑预防计划，提供关于导致中暑危害因素的培训及应遵守的防护措施。计划包括：

- 中暑类型。
- 风险因素。
- 症状（疾病、疲劳、中暑）。
- 预防和现场急救。

2) 总承包商应采取必要措施预防高温环境作业人员发生中暑，并严格按照政府要求，包括但不限于降温物资、劳保用品（PPE）的准备及分发，合理安排作业时间等。还应按照当地的高温预警要求做出适当响应。

3) 承包商还应当考虑并实施预防措施对冬季低温环境作业人员加以防护。

## 8.7. 卫生

作为其健康管理的一部分，承包商应落实卫生程序及惯例，以满足本节要求。以下是承包商在现场所提供的食宿的相关要求（如有）。

### 1) 食堂要求

承包商应为食堂配备足够的座位，还应具有以下特点：

- 地板应密封好，防止灰尘进入。
- 应提供足够数量的窗户。
- 为餐厅提供电子杀虫措施。
- 食堂外设有洗手盆。洗手盆旁边提供肥皂和纸巾，还有纸巾弃置箱。
- 所有门、窗和其它开口都要有纱窗防护。
- 为保持环境健康，应提供适当的通风和空调措施。
- 应提供适宜照明措施。

### 2) 厨房要求

如果承包商或其分包商为员工提供厨房准备三餐，厨房应具有以下条件：

• 地板防潮、防滑、接缝和裂隙的厚度应不能容许灰尘、细菌和害虫存在。地板和墙的夹角及接合处应覆盖好。

- 墙壁、地板和天花板应光滑、颜色浅，而且从地板到天花板耐用性高。
- 所有窗户都要安装网状纱窗。
- 厨房应有空调。油烟罩以合适尺寸安装灶头顶和抽油烟机上。油烟罩应配备有经设计好的固定灭火系统。

• 厨房区照明灯的强度应不低于 500lx。通用作业区照明灯的强度应不低于 300lx。

• 在食品贮藏的室内，除非提供防虫储物箱，否则应提供支架以便食品容器的下层至少高于楼面 30cm。

• 与食物直接或间接接触的设备或家具，应采用容易清洗的材料制成，以避免污染食物。

• 门应用纱网密封严实并自动关闭。双开门应具有视野面板。

• 厨房应配备足够数量的适用水池，这样的水池应供应足够的冷热水，以便满足洁净餐饮的要求。

• 定期检查菜碟是否有裂纹、不透水防护外壳是否破裂为碎片。为避免再被使用，此类菜碟应及时更换并销毁。仓库应存有 15% 的更换餐具。

• 大型厨房应提供除霜冷冻柜（冰箱）用于速冻肉类/鸡肉的解冻。冷冻食品，特别是肉类和鸡肉，不得在水池或室温下解冻。

- 应为所有值班人员在冰箱保存熟食样品至少 48 小时。
- 为保存食材，应提供适当且充足的冷藏及制冷设备。
- 小型冷冻库应提供金属排架及良好的照明设施。在机组外应设置温度计，以便显示设备的温度读数。

- 作为具体用途（肉类、猪肉、鱼肉等）的切肉板应制定不同颜色标识。应培训员工避免交叉污染。

- 各类食品均应贮藏于光照充足有空调的室内。
- 排架应经过非吸湿性清洁处理。建议采用由抗腐蚀金属制造的管式移动支架。应避免使用碗柜。

- 清洁剂、洗涤剂、拖把、刷子不应放在储存食品的地方。
- 所有熟食应和生食分开以避免交叉污染。
- 仅饮用水用于清洁和准备食物。
- 禁止在厨房或餐厅内吸烟。
- 厨房的废水在排放至污水池之前，应通过油分离器预处理。
- 应分开收集、堆放、运输及处理食物垃圾。

## 9. 环境保护

### 9.1. 环境保护

1) 遵守全部环境影响评价报告批复及业主持有的其它相关及该项目的其它环境许可证。

2) 遵守全部适用于本工程的相关环境法规要求和指导方针，此外还强制要求以下人员遵守：

- （任何级别的）分包商。
- 承包商现场雇佣的全部人员。
- 承包商同意在现场工作的任何其他人员。
- 还应确保各分包合同、采购单等文件中包含相应要求。

3) 承包商应在切实可行的情况下，采用“环境友好”型产品及做法开展工作，且：

- 不得使用法规明令禁止的物料及设备；
- 避免在现场使用高噪声级及高排放的机械/设备/装置；
- 工作时，使用双层容器或防渗托盘以避免油类或化学物品外溢或泄漏。

4) 制定、实施并遵守环境管理计划。

5) 采取必要的环境保护措施，包括保护在开展服务的任何地点的动植物群及其它自然资源或资产。

6) 缓解对环境的不利影响（包括妥善处理所有危害和无危害的废品诸如油料、化学品、污水和垃圾）

7) 如发生环境应急事件，立即报告业主及监理，采取合理措施补救环境，待公司同意后，如果承包商发现或被告知以下情况，应通知其它相应的政府机构：

- 在操作区域上方、内部或周围出现任何构成有害物质释放或任何违法行为的情况；
- 任何警告或实质上的扣留、行为或通告指明该作业区不合法规、公司政策或其它规程的；
- 确保在作业现场发现的化石和文物免受损害或干扰。承包商应向公司报告这些化石和文物的位置，并暂停该地点的作业，留待公司的进一步指示。

8) 无论业主从何种来源收到的各种投诉，将直接告知承包商。如果承包商从任何其它来源收到投诉，应立即报告业主及监理。

## 9.2. 承包商的计划、方案和程序

1) 在开展现场施工作业前，承包商应向业主提交“合规检查表”，供业主审核认可。应包括与环境保护管理相关的所有承包商责任的界定，通过以下方式实现：

- 全面了解环境影响评价报告/批复有关要求。
- 识别需要办理的许可或执照以及办理时间。
- 识别其它相关环保要求。

2) 应在开始施工工作前，提交《承包商环境管理计划》供业主审议通过，应详细说明承包商拟采取的减轻产生的环境影响的措施（空气污染、雨水和污水管理、噪声控制、固体废弃物控制等），包括获取相关环境许可。业主将会同监理对提议的《承包商环境管理计划》进行审议并批准。

## 9.3. 环境监测

1) 承包商应按照当地政府规定，设立在线边界噪声及扬尘的监测系统。

• 在政府指定位置设立环境在线监测设备，并将系统和当地政府的监测系统联网，以满足法规要求。

- 在线监测系统的硬件和软件需要根据当地规章的要求进行设置。
- 直到实际工作完成为止，应对安装装置进行保养，此后应按照业主的指令拆除或移位取样装置和附件；并将受该装置影响的区域恢复到业主满意的程度。

2) 承包商需在环境监测计划中明确事件行动计划，使整体工程施工期间有关的监测超标项能够以正确的方式得到妥善处理。整改措施的行动级将基于承包商环境审核程序。

3) 如果在工程开工后，业主认为施工设备或施工方法带来严重环境污染影响，或达到限值时，则承包商应对此类设备或施工方法作出检查，并制定补救方案，在获准后执行：

- 在制定这些补救措施时，承包商应复查正造成污染影响的所有施工污染源，并提议对施工设备位置和施工活动计划进行修改，安装施工设备隔音或防尘装置，配置替代承包商设备，或采取有效减小污染的其它措施。

- 如果那些补救措施包括使用其它或替代性承包商设备，那么这些设备必须经业主批准后才能在现场使用。

- 如果补救措施包括对先前已经批准的承包商设备的维修或整改，那么在该维修或整改完成并且维修或整改的充分适当性得以标定并且审批之前，不得在现场使用那些设备。

- 如果已经审批的补救措施没有得到落实，并且仍然存在严重影响，业主可命令承包商暂停工作，直到这些措施得到落实为止。

#### **9.4. 泄漏处理**

1) 承包商应根据在用化学品特性制定《化学品泄露应急预案》，发生泄露事故时，承包商应立即启动《化学品泄露应急预案》。

2) 承包商应确保承包商工人熟悉项目泄漏事件通知及疏散纲要，并且知道事故应急的集合地点。

3) 承包商应告知业主及监理任何泄漏事件。

4) 发生泄漏事故时，承包商必须对泄漏点/区域进行围堵、清理被污染的区域及设备，并准备泄漏清理材料。

5) 承包商应立即对泄漏事件做出响应，并妥善控制以免造成环境危害、环境退化、并避免污染物进入雨水或生活污水的排放通道，并确保工人安全。

6) 如果泄漏事件涉及危险、易爆或易燃物品，必须撤离该地区。

7) 排雨水前,检查是否有油污。如果在雨水表面观察到有油污，则需作为油类接触水加以处理。切勿排放到地表。

8) 承包商应每年组织《化学品泄露应急预案》演练并保存演习报告。

#### **9.5. 石棉和纤维**

1) 长期吸入一定量的石棉可导致石棉肺、肺癌、胸膜间皮瘤或胃肠癌等疾病。含有石棉的材料，不应带到项目范围内。

2) 所有纤维材料必须附有安全数据表。

3) 如果接触到石棉，承包商应通知公司其位置 and 在工作范围内的其它作业位置。

#### **9.6. 混凝土管理（切割、处理、冲洗）**

1) 在切割或拆除过程中产生的混凝土粉尘应通过润湿或吸尘等优化控制工艺加以控制。

2) 应提供或预制混凝土冲刷区以阻止混凝土混合料输送车的泥浆被冲刷进入雨水系统。

- 3) 混凝土养护用水经过二次沉淀处理后应重复使用。
- 4) 混凝土切割工应配备好适当的个人防护用品，如护目镜、面罩、耳塞、口罩等。

## 9.7. 废弃物管理

1) 承包商应编制《废弃物管理程序》作为《环境管理计划》的附件一并提交供业主和监理审查和认可。

2) 《废弃物管理程序》将确定：

- 执行工作产生的废物。
- 承包商拟采取的最大限度减少和处理废物的措施。
- 如有必要，承包商采取措施保护生态的措施。

3) 承包商应随情况变化，更新《废弃物管理程序》，将其它分包商包括在内。

4) 承包商应与业主合作，以满足对废弃物集中堆放、管理或处理的任何要求。

5) 危险废弃物和放射性废弃物应由具有资质的第三方处理：

- 需要经过特殊处理、储存及处置的危险、被污染或放射性废弃物，将受到特殊的限制。涉及危险源的详细情况、应采取的预防措施以及废弃物处理、储存和处置的特殊安排通常需要在行动开始前提交监理供审议。

- 易燃废物（油浸/油脂废品）应储存在金属容器内，远离出现的明火源。有害废物必须按照当地法规予以储运。

6) 建筑垃圾应每天及时处置，建筑垃圾应符合法规要求

7) 废物容器（需要分类为危险和非危险）将定位于适当位置，且不允许超装。

8) 承包商应建立废弃物处置台帐。

9) 禁止做法——下列废弃物管理做法是严令禁止的：

- 在现场燃烧废弃物。
- 在垃圾堆场处理液体废物。
- 在任何河道、水系或现场排水系统排放任何类型的废水或化学废品。
- 将储罐/油漆罐排向外界。

## 9.8. 空气质量控制

承包商应在施工现场识别所有空气污染源，并按照政府大气污染防治条例和环保部门制定的要求落实空气污染控制措施，这些措施应包括但不限于：

1) 按照《中华人民共和国大气污染防治法》及其实施细则要求开展工作，征得业主及环保部门事先书面同意之前，承包商不得使用产生空气污染燃料的炉子、锅炉和其它类似设备。

2) 如果工作开始后，业主认为承包商设备和工作方法将引起严重的空气污染影响，那么承包商应检查这些设备，并起草补救方案，在得到批准后执行这些补救方案。



3) 如果已经获批的补救措施没有得到执行，并且严重影响依然存在，业主可以命令承包商暂停工程，直到这些措施得到落实为止。

#### 4) 粉尘控制

- 使用低能耗、低污染物排放的工程机械。使用高质量、低大气环境影响的燃料。加强施工机械的维护保养。禁止超负荷工作。

- 总承包商对责任区的粉尘污染控制负全责；具体的粉尘污染控制行动预案应落实到位，并事先调拨有粉尘污染控制的专项预算。

- 在现场各区域有车辆频繁过往或堆放材料的地方配备经许可的坚硬路面，并保证路面上没有零散材料。

- 在施工现场周围根据政府要求提供高度不低于 2.5m 的硬围栏。

- 为传送带配备挡风板，封闭输送机转运点及料斗排料区以尽减少粉尘排放。

- 完全封闭所有输送产生粉尘材料的所有输送带，并配备皮带清洗器。

- 用不透水的挡板，完全封闭输送材料的料斗升降机。

- 使用密目安全网从建筑物地平面开始封闭脚手架，直到脚手架最高一层。

- 车辆在施工现场需遵守限速规定，以最大限度减少粉尘排放。

- 裸露地面应经常洒水。总承包商应将洒水和扬尘控程序落实到位，并指令设备和人员来管理洒水和尘控。

- 在粉体材料装车、卸车或转送之前，在适用的情况下给粉体材料喷水，以保持粉体材料湿润。

- 在开挖之前，给开挖工作区域喷水，在作业期间或作业完成之后，也要给喷水，以保持湿润。

- 报道风速会超过 4 级时，立即停止土方开挖施工，并扩大覆盖范围。

- 遵守当地关于恶劣大气污染天气施工管理的法规。

- 在裸露土壤或回填土上面覆盖纤维覆膜或化学覆盖剂覆盖或洒水；或在长期裸露的土壤上植草，以防风吹引起扬尘。

- 会产生粉尘排放的混凝土及施工材料应存放于仓库内或覆盖好。

- 禁止在现场搅拌混凝土和砂浆。

- 施工垃圾存放在经批准的封闭区域内，并由具有资质的供应商进行运输和处理。

- 各现场车辆出口处提供车辆清洗设施，并确保车辆离开现场前已洗净每辆车车身和车轮上的积灰。

- 需要准备预拌混凝土，以尽量减少混凝土搅拌产生的粉尘和噪音。

- 搬运残渣时严禁投掷。

5) 严禁在施工现场排放有毒气体，包括但不限于露天燃烧沥青毡、橡胶、塑料、涂料，使用含苯、粗苯、重苯及混合苯的稀释剂或溶剂。

6) 厨房产生的烟和含油气体在通过排气漏斗排放出去之前，应由油烟净化系统收集并处理。

## 9.9. 雨水和废水管理

1) 施工期生产废水和生活污水均严禁排入周边地表水体。

2) 所有产生的废水包括厕所、厨房和类似设施排放的生活废水，都进入临时储槽（如化粪池），委托有资质的单位定期外运处理。处理费用由承包商承担。

3) 未经环保部门的事先同意，不得允许任何污水、污垢、受污染水、冷却水、热水或化学品直接或间接（通过径流）排放进入任何公共下水道、雨水排水通道、土壤、河流、或水道里。

4) 混泥土养护水及沉淀处理后循环使用。

5) 应很好地压实土方工程最终表面，在最终表面形成后，应尽快开展随后的永久性工程或表面保护，以防止暴风雨的冲蚀。必要时提供适当的截水沟。

### 6) 雨水管理

• 承包商应在每个雨季到来前向监理提供书面的雨水管理程序，详细介绍尽量减少废水进入施工现场地表径流的控制措施。

• 按照施工计划或现场准备方案，雨水排水渠应分开建造。

• 建议建立雨水收集池，以便将雨水再用于洒水、抑尘、洗车等用途。

• 将雨水从管沟或基础开挖中抽出来，并通过适当的除淤泥设施，如沉淀池，然后排放到雨水沟。

• 抽出基坑的地下水，以降低基础施工中的地下水位，并通过适当的除淤泥设施，如沉淀池，然后排放到雨水沟。施工降水需要单独审批。

• 防止施工车辆和设备发生漏油等污染事故，特别是在基坑开挖阶段，要防止污染物滞留在基坑底部。

7) 浇筑混凝土、抹灰、内部装饰、清洁工作和其它类似活动所产生的废水，将通过在排水沟入口安装条式过滤器的方式，首先除去大块物质。必要时还要进行 pH 值调节。此类废水不得外排到公共环境中。

8) 承包商员工及分包商必须安全妥善处理有害及有毒材料。

9) 承包商工人不得将化学品或含化学品的水源倒入任何永久性的还是临时性的排水渠，包括雨水渠。

10) 盖好并临时密封人孔（包括新建人孔），防止淤泥、施工材料或垃圾进入排水系统，并防止暴雨径流进入污水管网。

11) 尽将车辆和设备保养区、洗车场和润滑车间设在有屋顶的地方。

- 这些室内区域的排水，应通过隔油处理设施，连接到污水收集系统。

- 漏油或溢油应立即收集起来，并清洁干净。

- 应按照《中华人民共和国固体废物污染防治法》，妥善收集和存储废油，以便回收利用或处置。

12) 应给所有燃料罐和化学存储区域配置锁具和封闭区域现场。

13) 施工现场存放的油料和化学溶剂等物品应设有专门的库房，地面应做防渗漏处理，存放容器也应采取防止泄漏的措施。

14) 在暴雨或暴雪到来前、期间及到来后采取措施尽量减少对环境不利影响

15) 承包商应开展并记录每周环境检查并对任何已识别的缺陷采取及时纠正措施。在预测的气象环境（如大雨、极端天气变化）发生前后，应进行检查

16) 如果已经获批的补救措施没有得到执行，并且严重影响依然存在，业主可以命令承包商暂停工程，直到这些措施得到落实为止。

#### **9.10. 边界噪声控制**

1) 承包商应关注《中华人民共和国环境噪声污染防治法》和当地政府的规定。

2) 如承包商需要进行夜间施工（晚 10 点到早 6 点），应根据当地政府的相关规定，申请办理《夜间施工许可证》，并在许可期限内施工。许可证复印件应提交业主备份。

3) 承包商应采取一切必要措施，确保施工机械和技术在施工现场不会对周围环境和社区产生太多的噪音干扰。承包商还应采取适当的工作方法，以尽量减少施工噪声影响。

4) 承包商应选择低噪声级设备，并加强各种施工机械维护以减少噪声发生。

5) 承包商应使用适当的工作方法，以尽量减少噪音影响，并配置有经验且接受过适当培训的人员，以确保这些方法得到落实或执行。

6) 安排好车辆运输的路线和时间，特别是重型车辆，尽量回避敏感区和敏感时间。减少或取消车辆在夜间运输，如果必须，应采取降噪措施。

7) 尽量减少使用发电机、空压机、搅拌机、电动锯机和切割机，并提供隔音措施。为操作员提供个人防护用品。

### **10. 培训**

在招投标过程中，所有潜在投标商都必须接受该文件培训。

### 附件 3：安全文明施工投入的内容

为建立良好的安全生产环境，提高安全意识，加强和规范安全生产投入的使用，根据《中华人民共和国安全生产法》以及《企业安全生产费用提取和使用办法》（财企[2012]16号）之规定，并结合本项目的实际需要，本合同已包含承包人安全生产投入所需的费用，具体内容及金额如下详见下表：

序号	内容	金额 (元)	说明
1	个人劳动防护用品		安全帽、安全鞋、安全带、防护眼镜、防护面罩、防护耳塞、防毒面罩等。
2	设备安全设施		防护罩、限位限速装置、安全锁、报警设施等。
3	作业场所防护措施		通风设备、防护栏杆、防护网、防护板、防滑、成品保护、照明、楼板屋面阳台等临时防护、通道口防护、预留洞口防护、电梯井口防护、楼梯边防护、垂直方向交叉作业防护、高空作业防护、 <b>动火作业防护、吊装作业防护、操作平台交叉作业等。</b>
4	安全警示标志及宣传		安全警示标志牌、现场围挡（包括大门）、各类图表、企业标志、厂容厂貌、材料堆放、现场防火等
5	消防设施		消防器材、消防通道、消防标志等
6	紧急个体处置设施		逃生绳索、应急照明等。
7	施工安全用电		电箱标准化、电气保护装置、外电防护措施等。
8	特种设备检验检测		锅炉、压力容器（含气瓶）、压力管道、电梯、 <b>叉车、起重机械等。</b>
9	安全培训		<b>特种作业操作人员需持证上岗、入厂安全教育培训、作业安全技术交底培训等</b>
10	目视化		公示牌、看板、场地和设施标识、工装、证件、标语等。
11	临时办公生活设施		办公室、会议室、卫生室、门卫室、吸烟室、厕所、区域美化硬化、仓库等
12	临时施工场地		场地硬化、临时道路、临时用电、临时给排水维护等。
13	生活卫生设施		饮水设备、淋浴、消毒（ <b>按照疫情防控要求</b> ）等
14	环境保护		污染源控制、垃圾清理外运、排水排污、防尘、防噪音、清洁、绿化、白蚁防治等。
15	治安		治安综合治理、监控设备等
16	卫生		医药保健器材和物品、防蚊虫叮咬、防暑降温等。
17	现场人员的意外伤害保险		
18	其他相关费用		检查、评估、整改、事故调查、文件资料等。

施工安全责任，包括但不限于：

1. 施工单位应单独列支安全投入并在施工前提供施工全过程、按时间、分类别安全费用使用计划。

## 2 开工前准备工作

(1) 施工单位应在施工前提供施工全过程、按时间、分类别安全费用使用计划，且施工单位单独列支的安全投入应不低于工程预算。

## 3 施工过程管理

(1) 施工单位应定期（月度或季度）汇报安全费用使用情况给业务单位和监理单位。

## 4 工程预算管理

(1) 工程预算应包含工程安全文明施工费。

## 附件 4：保密协议

鉴于甲乙双方在合同项目的实施以及合作过程中向对方提供或从对方获得保密信息，双方均希望对本协议所述保密信息予以有效保护，特签订本协议。

1 本协议所指的“保密信息”包括：

1.1 承包人从发包人获得的与合同项目有关或因合同项目产生的任何商业、营销、技术、管理、运营数据或其他性质的资料，无论以何种形式或载于何种载体，无论在披露时是否以口头、图像或以书面等方式呈现，均表明其具有保密性。

1.2 承包人从发包人获得的保密信息，包括但不限于：技术方案、工程设计、工艺流程、技术指标、计算机软件、数据库、研究开发记录、技术报告、检测报告、实验数据、试验结果、图纸、样品、样机、模型、操作手册、技术和管理文档、相关的函电，等等。其他保密信息，包括但不限于：客户名单、采购计划、采购资料、定价政策、财务资料、进货渠道，等等。

2 上述“保密信息”不包括下述信息：

2.1 该保密信息已经或正在变成普通大众可以获取的信息。

2.2 能书面证明接受方在获得保密信息之前已经熟知该信息（但本合同项目实施前，承包人在同发包人交往中获得的相关信息，仍需按保密信息处理）。

2.3 由第三方合法提供给接收方的不涉及协议另一方商业秘密的信息。

2.4 由接受方或以其名义独立开发的、与协议所述保密信息无关的信息。

3 协议双方同意，在上述保密信息进入公共领域之前：

3.1 没有披露方的书面同意，接受方不得为自己的利益而直接或间接使用从披露方获得的任何保密信息。

3.2 没有披露方的书面同意，接受方不准直接或间接向任何第三方披露从披露方获得的保密信息，但为项目之目的而需要了解保密信息的本协议双方的员工或指定的律师、会计师和其他专业人士除外。

3.3 对于将获得保密信息的员工或指定的律师、会计师和其他专业人士，接受方需告知他们本协议项下其所负的义务并且承担确保该等员工或指定的律师、会计师和其他专业人士遵守本协议项下的保密义务的全部责任。

3.4 任何时候，只要收到保密信息拥有方的书面要求，接受方应立即归还全部保密信息，包含该保密信息的媒体及其任何或全部复印件或摘要。如果该保密信息属于不能归还的形式、或已经复制或转录到其他资料或载体中，则应删除。

4 保密期限

4.1 本协议自签署之日起，永久有效。

5 违约责任

5.1 如果承包人不履行本协议所规定的保密义务，应当承担违约责任，一次性向发包人支付合同总价15%的违约金。

5.2 因承包人的违约行为侵犯了发包人的商业秘密权利的，发包人可以选择根据本协议要求承包人承担违约责任，或者根据国家有关法律、法规要求承包人承担侵权责任。

5.3 如果因为协议一方的违约行为造成协议另一方损失，违约方应当承担违约责任。

6 本协议业已包含了双方对合约事项的全部理解，它可取代此前的所有相关意思表示、书面材料、谈判或谅解。

发包人： 法定代表人： 委托代理人： 日期：       年   月   日	承包人： 法定代表人： 委托代理人： 日期：       年   月   日
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## 附件 5：廉洁协议

为加强公司招标工作以及合同签订和执行过程中的廉洁管理，依法规范甲、乙双方廉洁自律行为，防止违反廉洁从业各项规定的违法违纪行为发生，甲、乙双方自愿签订本协议。

### 一、廉洁责任

(一) 承包人及相关工作人员，应与发包人工作人员（包括但不限于亲属、利益关系人等）保持正常、合法的交往，按照有关法律法规和程序开展业务工作，禁止违反廉洁从业规定行为发生。承包人对其工作人员以及承包人关联单位人员违反本协议的行为负责，并遵守以下要求：

1. 不得向发包人工作人员赠送现金、礼金、购物卡、各种有价证券及其他支付凭证、贵重物品、回扣、好处费、感谢费、干股等。
2. 不得为发包人工作人员提供可能影响公正执行业务的宴请、健身、KTV、洗浴、娱乐、旅游或涉及黄赌毒等活动。
3. 不得为发包人工作人员报销应由发包人或个人支付的费用。
4. 不得为发包人工作人员合资合伙、借车（临时性除外）、借钱、租赁、装修住房、婚丧嫁娶、配偶子女的工作安排以及境内外旅游等支付费用。
5. 不得给予发包人工作人员任何其他形式的利益或好处。
6. 不得给予发包人工作人员的配偶、子女及其配偶等亲属和其他特定关系人以上任何形式的利益和好处。

(二) 发包人及相关工作人员不得以任何理由向承包人索要以上任何形式的利益或好处。

### 二、违约责任

(一) 发包人工作人员如有违反本协议的，一经查实，发包人将对责任人按照廉洁从业有关规定严肃处理。构成犯罪的，则移交司法机关追究其法律责任。

(二) 发包人及发包人工作人员若违反本协议，发包人有权按照本协议约定追究承包人违约责任。构成犯罪的，则移交司法机关追究其法律责任。承包人工作人员违反本协议的，不视为其个人行为，而视为承包人行为。

(三) 承包人若违反本协议，发包人将视违约情节轻重，对承包人警告、宣告中标无效、终止执行合同、市场禁入、列入失信者黑名单。

(四) 承包人若违反本协议，造成合同终止执行的，承包人承担由此给发包人造成的经济损失和其他一切损失。

### 三、举报

承包人人员可通过以下方式对发包人工作人员违反本协议的行为如实举报或投诉，发包人受理渠道为：\_\_\_\_\_，邮箱地址：\_\_\_\_\_，举报电话：\_\_\_\_\_。

### 四、其他约定

(一) 本协议作为招标文件的组成部分，随中标项目商务合同一并签订。

(二) 本协议对甲、乙双方持续产生约束力，双方履行廉洁从业义务不因业务合同履行完毕而终止。

(三) 本协议履行中产生的任何争议，向发包人所在地有管辖权的人民法院提起诉讼。

发包人： 法定代表人： 委托代理人： 日期：       年   月   日	承包人： 法定代表人： 委托代理人： 日期：       年   月   日
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