

印尼达瑞铅锌矿地表土建招标技术文件（二标段）

Technical Tendering Documents for Surface Civil Engineering of Indonesian Dairi Lead-Zinc Mine--Section II

1 招标工程概况

Overview of the Bidding Project

1.1 工程名称

Project Name

印度尼西亚达瑞铅锌矿采选工业场地表土建工程（充填站区域、精矿浓密及压滤区域、尾矿库区域）

Surface Civil Work at Mining and Processing Site of Dairi Lead-Zinc Mine, Indonesia (Filling Station Area, Concentrate Thickening and Filtering Area, Tailing Pond Area)

1.2 工程地点

Project Location

达瑞铅锌矿项目位于印度尼西亚苏门答腊岛西北部，距离印尼第三大城市 Medan 约 120 公里。从印尼 Medan 市区开车至矿区，首先经 Bitumen 国道至 Sidikalang 镇，然后通过低等级的省级公路到达 Sopokomil 村庄，路面车流量较大，车程约为 5 个小时。

Dairi lead-zinc mine is located at the northwest of Sumatra, Indonesia, about 120km away from Medan (the thirdlargest city in Indonesia). The mine area is accessible from Medan by bitumen express way to Sidikalang, and to Sopokomil by low grade provincial standard road; Due to large traffic flow, it will take about five hours for drive.

1.3 现场条件

Site Conditions

本项目处于森林覆盖区，西北部为梯形峡谷，标高约 300~500m，西南方向为山坡，山峰标高约 1300m。

The project is located in forest covered area, trapezoid canyon is dominated in the northwest, the elevation of which is about 300-500m, and hillsides lie in the southwest, with the elevation of mountain peak around 1300m.

矿山所属的 Sopokomil 地区为热带潮湿气候，受东北季风和西南季风影响，温度无明显季节变化，白天平均气温 20~30°C，年平均气温 24~28°C，大多数月份有大量降雨，9~12 月为主要雨季，4~5 月为次要雨季，年降水量 3500~4000mm。

Sopokomil area, where the mine situates, belongs to tropical humid climate with no obvious seasonal change in temperature, and is affected by northeast monsoon and southwest monsoon. The average daily temperature is in range of 20~30°C, and the average annual temperature is 24~28°C. It rains a lot in most months, with the primary rainy season occurring in September to December, and the secondary rainy season occurring in April to May. The annual rainfall is 3500-4000mm.

苏门答腊岛是印尼地震高度活跃岛弧系统的一部分，它同时穿过地震高发的印度洋板块俯冲亚欧板块边缘和 sumatra 断层的延伸段。达瑞铅锌矿区属地震活跃带，地震加速度为 0.37g。

Sumatra, being part of the island arc system, is subject to high seismic activity, it passes through the plate boundary outboard of Indian Plate under-thrusting Eurasian Plate, as well as the extension section of Sumatra fault. Dairi lead-zinc mine area belongs to active seismic zone, and the earthquake acceleration is 0.37g.

1.4 招标工程范围

Scope of the bidding project

本次招标范围为达瑞铅锌矿项目地表土建工程，包括但不限于以下内容的：

The scope of this bid covers the surface civil work of Dairi Lead-Zinc Mine, including but not limited to the following items:

(1) 建筑、结构工程：地表采矿、选矿、公辅设施等建构筑物。

(1) Building and structure works: buildings and structures for surface mining, mineral processing, and public and auxiliary facilities, etc.

(2) 尾矿库工程：尾矿坝、库区场地平整、地下水导排系统、防渗系统、排渗及收集系统、截排洪系统、清污分流系统、监测系统等。

(2) TSF works: Tailings dam, pond site leveling, underground water draining system, anti-seepage system, seepage draining and collection system, flood detention and discharge system, clean water and contaminated water separation system, monitoring system, etc.

1.5 注意事项

Attentions

本次招标文件及招标工程量是基于初步设计阶段条件编制，后续施工图阶段存在调整的可能。

The bidding documents and quantities of works are prepared based on the conditions at the basic design stage, and may be adjusted at the follow-up detailed design stage.

2 建筑、结构工程技术说明

Technical specifications for buildings and structure works

2.1 工程概况

Project overview

本工程设计范围包括采矿设施、选矿工业场地等辅助设施。

The design scope includes mining facilities, mineral processing industrial site and other auxiliary facilities.

主要工程项目有：

The main works include:

采矿工程：充填站；

Mining works: backfilling station;

选矿工程：精矿浓密及压滤；

Mineral processing works: including concentrate thickening and pressure filtration;

给排水工程：循环水系统、工艺回水系统、选厂新水系统、消防水系统、污水处理系统、地表水收集系统；

Water supply and drainage works: circulating water system, process return water system, fresh water system of concentrator, fire water system, sewage treatment system, surface water collection system;

辅助设施：综合仓库；

Auxiliary facilities: integrated warehouse;

电力工程：各车间变配电所等。

Electrical works: transformation and distribution station of each workshop, etc.

本工程建（构）筑物的设计使用年限为 50 年。

The designed service life of the buildings (structures) for the project is 50 years.

本工程建筑耐火等级：除各车间变配电所为一级外，其它建构筑物均为二级。

Anti-fire rating of buildings: except Class-I for the transformation and distribution station of each workshop, the other buildings are Class II.

结构安全等级：均为二级。

Structural safety level: Level II.

地基基础设计等级：均为丙级。

Foundation design level: Class C.

地震加速度为 0.37g，相当于中国标准抗震设防烈度 8 度（0.3g），设计地震分组：第三组

The seismic acceleration is 0.37g, equivalent to seismic fortification intensity of 8 degrees (0.3g) in Chinese standards. Design seismic group: Group III.

2.2 结构工程技术要求

Technical requirements for structural works

2.2.1 规范及标准

Specifications and standards

《建筑工程设计文件编制深度规定》 2016 年版

Provisions on Depth for Preparation of Design Document for Construction Engineering (Edition 2016)

《建筑结构可靠性设计统一标准》 GB50068-2018

Uniform Standard for Reliability Design of Building Structures
GB50068-2018

《工程结构可靠性设计统一标准》 GB50153-2008

Uniform Standard for Reliability Design of Engineering Structures
GB50153-2008

《建筑结构荷载规范》 GB50009-2012

Load Code for the Design of Building Structures GB50009-2012

《钢结构设计标准》 GB50017-2017

Standard for Design of Steel Structures GB50017-2017

《混凝土结构设计规范》 GB50010-2010（2015 年版）

Code for Design of Concrete Structures GB50010-2010 (Edition

2015)

《砌体结构设计规范》 GB50003-2011

Code for Design of Masonry Structures GB50003-2011

《建筑工程抗震设防分类标准》 GB50223-2008

Standard for Classification of Seismic Protection of Building
Constructions GB50223-2008

《建筑抗震设计规范》 GB50011-2010 (2016 年版)

Code for Seismic Design of Buildings GB50011-2010 (Edition
2016)

《建筑地基基础设计规范》 GB50007-2011

Code for Design of Building Foundation GB50007-2011

《建筑地基处理技术规范》 JGJ79-2012

Technical Code for Ground Treatment of Buildings JGJ79-2012

《建筑桩基技术规范》 JGJ94-2008

Technical Code for Building Pile Foundations JGJ94-2008

《门式刚架轻型房屋钢结构技术规范》 GB51022-2015

Technical Code for Steel Structure of Light-weight Building with
Gabled Frames GB51022-2015

《轻型钢结构技术规程》 DG/T J08-2089-2012

Technical Specification for Light Steel Structures DG/T
J08-2089-2012

《构筑物抗震设计规范》 GB50191-2012

Code for Seismic Design of Special Structures GB50191-2012

《非结构构件抗震设计规范》 JGJ339-2015

Code for Seismic Design of Non-structural Components
JGJ339-2015

《工业建筑防腐蚀设计标准》 GB/T50046-2018

Design Standard for Corrosion Protection of Industrial Buildings
GB/T50046-2018

《混凝土结构耐久性设计规范》 GB/T50476-2008

Code for Durability Design of Concrete Structures GB/T50476-2008

《钢结构工程施工质量验收规范》 GB50205-2001

Code for Construction and Acceptance of Steel Structure Engineering
GB50205-2001

《有色金属工程结构荷载规范》 GB50959-2013

Code for Loads of Nonferrous Metal Engineering Structures
GB50959-2013

《建筑基桩检测技术规范》 JGJ 106-2014

Technical Code for Testing of Building Foundation Piles JGJ
106-2014

《有色金属工程设备基础技术规范》 GB51084-2015

Technical Code for Equipment Foundation of Nonferrous Metals
Engineering GB51084-2015

《有色金属工业厂房结构设计规范》 GB51055-2014

Code for Design of Non-Ferrous Industrial Plant Structures
GB51055-2014

《有色金属工程设计防火规范》 GB50630-2010

Code for Design on Fire Protection of Nonferrous Metal Engineering

GB50630-2010

《钢筋混凝土筒仓设计标准》 GB 50077-2017

Standard for Design of Reinforced Concrete Silos GB 50077-2017

《地下工程防水技术规范》 GB 50108-2008

Technical Code for Waterproofing of Underground Works GB
50108-2008

《给排水工程构筑物结构设计规范》 GB50069-2002;

Structural Design Code for Special Structures of Water Supply and
Waste Water Engineering GB50069-2002;

《给水排水工程钢筋混凝土水池结构设计规程》 CECS 138:2002 ;

Specification for Structural Design of Reinforced Concrete Water
Tank of Water Supply and Sewerage Engineering CECS 138:2002;

《有色金属矿山工程建设项目设计文件编制标准》 GB/T 50951-2013

Design Document Preparation Standard of Construction Project for
Nonferrous Mine GB/T 50951-2013

中华人民共和国工程建设标准强制性条文(房屋建筑部分, 2013 年版)

The Compulsory Provisions of Engineering Construction Standards
(Building, Edition 2013)

及其他相关现行国家标准图集。

Other current relevant national standard drawing collections

印度尼西亚相关强制性标准及规定

Relevant mandatory standards and regulations of Indonesia

2.2.2 主要设计技术要求

Main design technical requirements

a) 主要结构材料

a) Main structural materials

(1) 热轧钢筋: HPB300 级, $f_y=270 N / mm^2$

(1) Hot-rolled rebars: HRB300, $f_y=270 N / mm^2$

HRB400 级, $f_y=360 N / mm^2$

HRB400, $f_y=360 N / mm^2$

(2) 钢结构材料: 选用 Q235B 和 Q345B 钢;

(2) Steel structural materials: Q235B and Q345B;

焊条: Q235B 钢及 HPB300 钢筋选用 E43 系列, Q345B 钢选用 E50 系列, HRB400 钢筋选用 E55 系列, 不同级别材料焊接按低级别材料选用焊条;

Welding rods: E43 series for Q235B steel and HPB300 rebar, E50 series for Q345B steel, E55 series for HRB400 rebar; low-grade materials for welding of materials of different grades;

防腐材料: 所有钢结构基面先除锈, 除锈等级为 Sa2 级, 除锈后刷氯磺化聚乙烯漆二底一中一面, 漆膜厚度不小于 110 μ m。颜色参见标准色 B01。(用于有腐蚀性的车间区域, 所有钢结构基面先除锈, 除锈等级 Sa2.5 级, 有腐蚀性钢构件底漆采用聚氯乙烯含氟涂层配套底漆, 底漆无颜色要求, 面层刷聚氯乙烯含氟面漆。做法见 08J333-145-5 大样)。

Anti-corrosive materials: All steel structure bases shall be derusted to Sa2. After rust removal, chlorosulfonated polyethylen paint shall be applied in two layers of primer, one intermediate coat, and one top coat, with a film thickness of not less than 110 μ m. For the color, see the standard color B01. (In case of corrosive workshop area, all steel structure bases shall be derusted to Sa2.5. A primer compatible with polyvinyl chloride fluorine-based coating shall be applied to corrosive steel members, and there is no color requirement. A polyvinyl

chloride fluoride-based top coat shall be applied over the surface layer. For the practice, see detail drawing 08J333-145-5).

防火材料：所有钢结构部分的梁、柱、平台及钢梯等受力钢构件均须做防火涂料保护（最低耐火极限：钢柱不小于 2.5 小时，钢梁不小于 1.5 小时，钢平台及钢梯不小于 1.0 小时，屋面檩条不小于 1.0 小时）。

Fireproof materials: such stress members of steel structures as beams, columns, platforms and ladders shall be protected by applying fireproof coatings (minimum fire endurance: not less than 2.5 hours for columns, not less than 1.5 hours for beams, not less than 1.0 hour for platforms, ladders and roofing purlins).

(3) 混凝土强度等级:

(3) Concrete strength grade:

一般情况下，混凝土结构环境类别地下按“二 a”考虑，其他部分按“一”类考虑。根据工艺要求对于有气相或液相腐蚀介质的车间，须设计防腐保护，环境类别按五类。

Under normal circumstances, the concrete structure environment is considered as Category IIa, and the other parts are considered as Category I. According to the process requirements, the workshops susceptible to corrosive gas or liquid must be designed with anti-corrosion protection. The environment category is considered as Category V.

现浇钢筋混凝土基础：C30~C40

Cast-in-situ reinforced concrete foundation: C30-C40

柱下条形基础、柱下独立基础、基础梁、梁、板、柱、楼梯: C25~C40

Strip foundations and independent foundations under column, foundation beams, girders, slabs, columns, staircases: C25-C40.

现浇钢筋混凝土池体、地坑：根据池内腐蚀性溶液对钢筋混凝土的腐蚀性等级依次如下：

Cast-in-situ reinforced concrete ponds and pits: the concrete strength is as follows according to corrosiveness to reinforced concrete by corrosive solution in the ponds:

弱腐蚀:C30, 抗渗等级 P8;

Weak corrosion: C30, impermeability grade of P8;

中等腐蚀: C35, 抗渗等级 P8;

Moderate corrosion: C35, impermeability grade of P8;

强腐蚀: C40, 抗渗等级 P8。

Strong corrosion: C40, impermeability grade of P8

垫层: 无腐蚀环境: C10 或 C15;

Cushion layer: non-corrosive environment: C10 or C15;

弱腐蚀: C20;

Weak corrosion: C20;

中等、强腐蚀: 沥青混凝土

Moderate and strong corrosion: asphalt concrete

(4) 填充墙:

(4) Infill wall:

无腐蚀环境:

Non-corrosive environment:

▽±0.000 以下: MU15 烧结普通砖, M7.5 水泥砂浆;

Below ▽±0.000: MU15 ordinary vitrified brick and M7.5 cement mortar;

▽±0.000 以上: 框架结构: MU10 烧结多孔砖, Mb5 混合砂浆;

Above $\nabla \pm 0.000$: Frame structure: MU10 perforated vitrified brick, Mb5 composite mortar;

腐蚀环境:

$\nabla \pm 0.000$ 以下: MU15 烧结普通砖, M10 水泥砂浆

Below $\nabla \pm 0.000$: MU15 ordinary vitrified brick and M10 cement mortar;

$\nabla \pm 0.000$ 以上: 框架结构: MU10 烧结多孔砖, M10 水泥砂浆

Above $\nabla \pm 0.000$: Frame structure: MU10 perforated vitrified brick, M10 cement mortar;

根据本工程的实际情况,采用的钢材主要来自中国。钢筋、水泥、木材、石材可在当地或临近国家采购,材料要求均需满足中国及印尼当地规范及标准。

In consideration of the actual situation of the project, the steels to be used will be mainly purchased from China. Rebar, cement, wood and stones can be purchased locally or from neighboring countries. The materials must meet the specifications and standards of China and Indonesia.

b) 施工资质

b) Construction qualification

设计要求具有冶金矿山工程施工经验的单位参加工程建设,并具有进行本工程基本建设需要的施工资质及条件,验收按中国规范验收且需满足印尼相关规范要求。

According to the design requirements, contractors shall be experienced in metallurgy and mine construction and have qualification and conditions required for the project capital construction. The acceptance shall be carried out in accordance with relevant codes and regulations in China and satisfying the requirements in Indonesia.

c) 主要结构设计说明

c) Description of main structural design

(1) 建筑结构的构配件采用中国国家现行通用设计标准图集；柱网平面布置和厂房竖向布置，一般按中国现行标准的规定，符合建筑统一模数要求。

(1) Members and components designed for the building structures are subject to current general design standard drawing collections of China; the plane layout of the column grids and the vertical layout of the plant are generally in accordance with the current standards of China and meet the requirements of the buildings unified modulus.

(2) 主要厂房和建（构）筑物的主要设计方案如下：

(2) The main design schemes of main plants and buildings (structures) are as follows:

1) 精矿浓密及压滤为钢结构，基础采用桩基础。

1) The concentrate thickening and pressure filtration facilities are of steel structure, and pile foundations are recommended.

2) 综合仓库为钢结构，挖方区域子项基础采用钢筋混凝土独立基础基础；回填区域采用桩基。

2) The integrated warehouse is of steel structures, and the foundations for sub-items in the excavation area are independent reinforced concrete foundations; pile foundations are placed in the backfill area.

3) 变配电室为单层钢筋混凝土结构，屋面采用钢结构；柱基采用钢筋混凝土独立基础；回填区域采用桩基。

3) The transformation and distribution rooms are of single-storey reinforced concrete structure, and the roofing is of steel structure; the column foundations are independent reinforced concrete foundations; pile foundations are placed in the backfill area.

4) 循环水系统、地表水收集系统采用现浇钢筋混凝土结构；基础采用筏板基础。

4) The circulating water system and surface water collecting system are of cast-in-situ reinforced concrete structure; raft foundations are recommended.

5) 地下通廊和地下构筑物采用现浇钢筋混凝土结构。

5) The underground corridors and underground structures are of cast-in-situ reinforced concrete structure.

6) 吊车梁:根据使用功能,吊车跨度及起重量和厂房结构确定,采用钢吊车梁。

6) Crane girder: steel crane girders are selected as per use function, span and lifting capacity and plant structure.

(3) 特殊构筑物的结构设计

(3) Structural design of special structures

1) 选场循环水等采用现浇钢筋混凝土结构；

1) The circulating water facilities of the concentrator are of cast-in-situ reinforced concrete structure;

2) 浓密机支架基础采用钢筋混凝土独立基础。

2) The thickener supports are installed on independent reinforced concrete foundations.

3) 挡土墙采用钢筋混凝土结构

3) The retaining walls are of cast-in-situ reinforced concrete structure.

4) 特殊使用要求的结构：地下通廊、水池等有防水要求,采用抗渗混凝土,抗渗等级 P6、P8,内壁采用防水砂浆抹面,抹面缝与混凝土施工缝错开。

4) Structures required for special use: P6 and P8 impermeable

concrete is used for underground corridors and ponds with waterproofing requirements; the inner wall is plastered with waterproof mortar; mortar joints are staggered with concrete construction joints.

2.2.3 注意事项

Attentions

(1) 钢结构施工需考虑预留设备管道等设施安装对钢结构安装的影响;

(1) Any impact caused by installation of reserved facilities such as equipment pipelines shall be considered during installation of steel structures;

(2) 桩基、承台、基础施工等均需包括防雷接地的内容;

(2) The pile foundations, bearing platforms, foundations, etc. shall be grounded to prevent lightning;

(3) 施工单位需自行评估气候环境、外接道路等外部环境对施工进度
的影响;

(3) The construction company shall evaluate impact of the external environment such as the climate and external roads on the construction schedule and progress;

(4) 特殊使用要求的结构: 地下通廊、水池等有防水要求, 采用抗渗
混凝土

(4) Structures required for special use: impermeable concrete shall be used for underground corridors and ponds with waterproofing requirements

(5) 因缺少详勘报告, 结构的基础形式在施工图阶段存在调整的可能。

(5) Due to lack of detailed investigation report, forms of the foundation structures can be adjusted at the detailed design stage.

(6) 各子项的建构筑物的形式及长宽高是基于初步设计条件设计, 后

续施工图阶段存在调整的可能。

(6) The form, length, width and height of the buildings and structures of each sub-item are designed based on basic design conditions, and can be adjusted at the follow-up detailed design stage.

7) 因规范《低合金高强度结构钢》GB/T1591-2018 中已用 Q355 级钢材替换原 Q345 级钢材, 请投标人在报价中充分考虑使用 Q355 级钢材代替原 Q345 级钢材的影响。

(7) Since Q355 grade steel has been used to replace the Q345 grade steel in GB/ T1591-2018, "High strength low alloy structural steels

", The bidders are requested to fully consider the influence of using Q355 grade steel to replace the Q345 grade steel before the submission of an offer.

2.3 建筑工程技术要求

Technical requirements for building works

2.3.1 规范及标准

Specifications and standards

《建筑工程设计文件编制深度规定》(2016 年版)

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《建筑设计防火规范》 GB50016-2014 (2018 修订版)

Code for Fire Protection Design of Building GB50016-2014 (Rev. 2018)

《工业建筑防腐蚀设计规范》 GB50046-2018

Standard for Anticorrosion Design of Industrial Constructions GB50046-2018

《泵站设计规范》 GB/T50265-2010

Design Code for Pumping Station GB/T50265-2010

《办公建筑设计规范》(JGJ67-2016)

Design Code for Office Buildings (JGJ67-2016)

《民用建筑设计通则》(GB 50352-2005)

Code for Design of Civil Buildings (GB 50352-2005)

及其他相关现行国家和当地标准图集

Other relevant current national and local standard drawings

2.3.2 设计原则

Design principles

设计遵循“技术先进，经济合理，稳妥可靠，切实可行”的设计原则。在满足各专业对建筑要求的前提下，尽量选用国家现行标准，积极采用经过实践检验的新结构，新材料，根据本工程的实际情况，采用的钢材、钢筋主要来自中国。水泥、木材、石材可在当地或临近国家采购。

The design shall be based on the principles of being technically advanced, economically rational, stable, reliable and feasible". New well-proven structures and materials meeting the current national standards shall be selected as possible, provided that requirements of various disciplines on the construction are met. In consideration of actual conditions of the project, steel and rebars will be mainly purchased from China. Cement, wood and stone can be purchased locally or from neighboring countries.

2.3.3 建筑构造及处理

Building construction and treatment

(a) 楼地面

(a) Floor slabs

(1) C30 混凝土地面(内配双层钢筋网)用于中间矿堆堆场地面；

(1) C30 concrete ground (provided with double-layer reinforcing mesh) is recommended for the intermediate ore stockpile;

(2) C25 细石混凝土地面用于一般车间地面;

(2) C25 fine aggregate concrete ground is recommended for ordinary workshops;

(3) 防滑地砖, 用于办公室、试化验室, 食堂, 浴室等房间。

(3) Non-slip floor tiles are laid for offices, testing rooms, labs, canteens, bathrooms, etc.

(4) 不发火地面用于应急柴油发电站

(4) Non-sparking ground is provided for the emergency diesel power station

(5) 高标号水泥砂浆用于变配电室地面

(5) High-grade cement mortar is used for the ground of the transformation and distribution rooms

地面基层做法:

Construction method of ground base course:

1) 150 厚 C15 混凝土;

1) 150 thick C15 concrete;

2) 100 厚碎石 (卵石) 灌砂夯实垫层;

2) 100 thick gravel (pebble) sand-filled compacted bedding course;

3) 素土夯实

3) Plain soil compacted

楼面基层做法:

Construction method of floor base course

- 1) 20 厚 1:1 水泥砂浆结合层;
- 1) 20-thick 1:1 cement mortar bonding course;
- 2) 15 厚 1:2 水泥砂浆找平层;
- 2) 15-thick 1:2 cement mortar leveling course;
- 3) 现浇钢筋混凝土板上刷水泥浆一道;
- 3) One layer of cement mortar applied on cast-in-situ reinforced concrete slab;

(b) 屋面防水及保温

(b) Roofing waterproofing and insulation

屋面均采用 0.6mm 厚 YX35-125-750 型 (V125) 彩色压型钢板; 内衬钢丝网夹 100 厚离心玻璃棉毡。屋面防水采用钢结构屋面自防水;

The roofing consists of 0.6mm thick YX35-125-750 (V125) color profiled steel sheets; the lined wire mesh is sandwiched with 100-thick centrifugal glass wool blanket. The roofing is of self-waterproof steel structure;

(c) 内墙面及天棚 (砖墙部分)

(c) Inner wall and ceiling (brick wall)

1:1:6 水泥石灰砂浆 15 厚, 纸筋灰面 5 厚, 白色涂料 2 遍, 用于一般车间。

For ordinary workshops, 15-thick 1:1:6 cement lime mortar, 5-thick paper strip mixed with lime mortar, and two layers of white paint are applied.

1:2.5 水泥砂浆底 20 厚, 纯水泥浆贴白色瓷板, 用于卫生间等房间。

For rooms such as washrooms, a bottom layer of 20-thick 1:2.5 cement mortar is laid, and white ceramic tiles are laid with pure cement mortar.

所有内墙有阳角处，每边做 100 宽护角，护角做法为 1:3 水泥砂浆 20 厚 1800 高。

External corners at all interior walls are protected by 100-wide angle beads consisting of 20-thick and 1800-high 1:3 cement mortar.

厂区生活设施天棚采用石膏板吊顶，卫生间采用铝塑板吊顶。

The gypsum board ceilings are provided for the living facilities in the plant area, while the aluminum composite panel ceilings for washrooms.

(d) 外墙面（砖墙部分）

(d) Exterior wall (brick masonry)

墙面采用 1:3 水泥砂浆底 15 厚，1:2 水泥砂浆面 10 厚，外刷涂料。

For the walls, a bottom layer of 15-thick 1:3 cement, a surface layer of 10-thick 1:2 cement mortar and exterior paint are applied.

1) 墙体（砖墙部分）

1) Wall (brick masonry)

采用 240 厚烧结多孔砖。±0.000 以下采用 MU10 砖，M5 水泥砂浆砌筑，±0.000 以上采用 MU10 砖，M5 混合砂浆砌筑。

240-thick perforated vitrified bricks are laid. MU10 bricks and M5 cement mortar are laid below the level of ± 0.000; M10 bricks and M5 mortar are laid at above the level of ±0.000.

墙身防潮层做法采用 1:2.5 水泥砂浆（内掺 5%防水剂）20 厚，设于标高-0.060 处。

The wall damp-proof layer consists of 20-thick 1:2.5 cement mortar (added with 5% water-proof agent), and is laid at a level of -0.060.

2) 墙体（钢结构部分）

2) Wall (steel structure)

1.2 米以上为 0.6mm 厚彩色压型钢板，板型为 YX38-300-900 型，颜色为象牙白；标高正负 0.000 米以上，1.2 米以下为 MU10 烧结多孔砖，M5 混合砂浆砌筑，

YX38-300-900 0.6mm-thick ivory white profiled steel sheets are placed above the level of 1.2m; MU10 perforated vitrified bricks and M5 composite mortar are laid above the level of ± 0.000 and below the level of 1.2m.

(e) 门窗:

(e) Doors and windows:

窗采用单层玻璃塑钢窗，门采用钢门，木门，防火门。

The windows are of single-layer glass PVC-coated steel frame; steel, wooden and fire doors are recommended.

(f) 通风与采光

(f) Ventilation and day lighting

利用高侧窗组织自然通风，对通风要求较高的车间采用成品屋面自然通风器或机械通风。

The natural ventilation is provided by using clerestory windows; in case of workshops with high ventilation requirements, natural ventilation using finished roofing or mechanical ventilation is provided.

(g) 建筑消防

(g) Building fire prevention

根据《建筑设计防火规范》GB50016-2014（2018 修订版）及《有色金属工程设计防火规范》GB 50630-2010 的要求，根据建筑生产的火灾危险性分类的不同，进行建筑物的防火设计。建筑耐火等级不低于二级设计。

The fire protection of buildings shall be designed as per requirements

of Code for Fire Protection Design of Building GB50016-2014 (Edition 2018) and Code for Design on Fire Prevention of Nonferrous Metals Engineering GB 50630-2010 and based on classification of building fire hazards. The fire rating of the building shall not be lower than Grade II in the design.

单层建筑平面均至少 2 个出口直接对外，便于人员疏散。

The single-storey buildings shall be provided with a minimum of 2 exits to facilitate evacuation.

各建筑物内走廊、楼梯、安全出口的位置、数量、宽度、疏散距离，除满足工艺设备布置和操作要求外，均满足设计规范规定的安全疏散要求。

The location, quantity, width and evacuation distance of corridors, staircases and emergency exits in each building shall meet the requirements not only for process equipment layout and operation but also safe evacuation stipulated by the design specifications.

对于体量较大的厂房，设有环形消防车道，均可满足消防车通行。厂区内主要道路环行，均可满足消防车通行，消防车均可达到每栋建筑物前。消防车道宽大于 4.0 m。

Circular fire lanes shall be provided for the buildings with greater dimensions and main ring roads shall be provided in the plant area to allow passage of fire trucks. Each building can be accessed by fire trucks. The width of the fire lane shall be greater than 4.0m.

(h) 安全防护：

(h) Safety protection:

1) . 所有建筑物内外平台、洞口临空处设置安全防护栏杆，距基准面高度小于 20 米的平台栏杆采用 1050 高，距基准面高度大于 20 米的平台栏杆采用 1200 高。另外悬挂安全操作标志。

1). Internal and external platforms and openings of all the buildings shall be provided with safe protection railings; 1050 -high platform

railings shall be provided at less than 20m from the base level, and 1200-high platform railings shall be provided at more than 20m from the base level. Besides, the safety operation signs shall be provided.

2) . 高度超过规范要求的直爬梯均设置护笼。

2). Vertical ladders exceeding the specified height in specifications shall be provided with cages.

3) . 所有疏散门均向疏散方向开启。

3). All evacuation doors shall be opened in the evacuation direction.

4) . 所有出入口处均设置雨篷。

4). All entrances and exits shall be provided with awnings.

5) .所有厂房高侧窗、天窗处玻璃均采用安全玻璃。

5). Clerestory windows and skylights of all the workshops shall be made of shatterproof glass.

6) .大跨度、大进深车间屋面采用采光板增加车间内采光。

6). Roofing of the workshops with large span and depth shall be provided with daylighting panels to increase daylighting.

7) .对跨度大工艺上对通风要求较高的厂房，采用挡风板天窗或自然通风器形式进行有组织自然通风。

7). For the workshops with a large span and high ventilation requirements, natural ventilation shall be provided by windshield skylights or natural ventilators.

(i) 建筑节能处理

(i) Building energy conservation

本地区全年气温相对较稳定，全年平均气温 20~30，气候温暖，变化较小，建筑物可不做节能处理

The annual temperature in the region is relatively stable with an average temperature of 20~30°C. Due to warm climate and small temperature variation, energy conservation is not required for the buildings.

2.3.4 注意事项

Attentions

(1) 地面地基的压实系数不应小于 0.9，其含水量应控制在规范的许可范围内

(1) The coefficient of compaction of the ground shall not be less than 0.9, and the water content shall be controlled within the permitted range of the specification.

(2) 碎石夯入土中的地基加固法适用于柔软地基地区，施工要求见《建筑地面工程施工及验收规范》第 3.07 条，灰土施工方法见该规范之第 4.1.1 条至第 4.1.4 条

(2) The ground reinforcement method that the macadam is tampered into the soil shall be appropriate to the soft ground area. See Article 3.07 of Code for Acceptance of Construction Quality of Building Ground for the construction requirements. See Article 4.1.1 to Article 4.1.4 of this Specification for the construction method of lime earth.

(3) 季节性冻土地区的地面，在冻土范围内应设置防冻胀层，材料一般为中粗石，砂卵石，防冻层厚度见《建筑地面设计规范》之有关规定，防冻层应注意排水，设置防冻层的地面，纵横向缩缝均应采用平头缝，其间距不应大于 3 米

(3) As for the ground of the seasonal frozen soil region, an anti-frost heaving course shall be set in the range of frozen soils, generally with the medium coarse stone or sandy gravel. See the thickness of the frostproofing course in the relevant regulations of Code for Design of Building Ground. The drainage of the frostproofing course shall be noted. The ground of the frostproofing course shall be set. Flat joints shall be adopted as the transverse and longitudinal contraction joints,

with the spacing of not more than 3m.

(4) 无论作为垫层或面层的混凝土，均须按《建筑地面设计规范》要求分仓浇筑或留缝（伸缝或缩缝）

(4) The concrete as the cushion or surface course must be placed in different silos or the joints (expansion or contraction joints) shall be reserved in accordance with the Code for Design of Building Ground.

(5) 地面混凝土垫层应在纵横向设置缩缝，纵向缩缝应采用平头缝或企口缝，其间距 3-6 米，采用企口缝时垫层不小于 150mm,拆模时混凝土强度不低于 3MPa,横向缩缝宜采用假缝，其间距为 6-12 米

(5) Longitudinal and transverse contraction joints shall be provided on the concrete cushion. Flat joints or rebate joints shall be adopted as the longitudinal contraction joints, with the spacing of 3-6m. The thickness of cushion shall not be smaller than 150mm when rebate joints are used. The concrete strength shall not be lower than 3MPa while the formwork is removed. Dummy joints should be used as the transverse contraction joints, with the spacing of 6-12m.

(6) 受液态介质作用的楼地面，应设坡向地漏或地沟的坡度，地面可用基土找坡，坡度 1-2%，楼面坡度为 1%

(6) The flooring affected by the liquid medium shall be provided with a slope to floor drain or a slope for the trench. The ground can be sloped with the foundation soil, with the slope of 1-2%. The floor slope is 1%.

(7) 块材面层之结合层，采用 1：3 干硬性水泥砂浆

(7) The 1:3 hard cement mortar shall be used for the bonding layer of the block surface layer.

(8) 防水层：材料为 1.5 厚沥青聚氨酯，沥青防水涂料等涂刷性防水层，或用其他防水材料代替，防油层用聚氨酯 2 厚，防水层，防油层在墙柱处翻起高度不小于 250mm

(8) The waterproof layer: the 1.5mm thick asphalt polyurethane and asphalt waterproofing paint shall be used, or replaced by other waterproof materials. The oil-proof layer shall adopt 2mm thick polyurethane. The turning up height of the waterproof layer and the oil-proof layer at the wall column shall not be less than 250mm.

2.4 各建（构）筑物的设计方案及主要工程量详见附表《地表建（构）筑物设施工程量表》。

See the Bill of Quantities of Surface Buildings and Structures Construction for the design scheme and main quantities of each building (structure).

6 尾矿库工程技术说明

Technical description of tailing storage facility

6.1 规范及标准

Standard and regulation

《尾矿设施设计规范》（GB 50863-2013）

TSF Design Code (GB 50863-2013)

《尾矿库安全技术规程》（AQ 2006-2005）

Technical Regulations for Safety of Tailing Storage Facility (AQ 2006-2005)

《碾压式土石坝设计规范》（SL 274-2001）

Design Code for Rolled Earth and Rock Dam (SL 274-2001)

《防洪标准》（GB 50201-2014）

Flood Protection Standard" (GB 50201-2014)

《土工合成材料应用技术规范》（GB/T 50290-2014）

Technical Regulation for Application of Geosynthetics (GB/T 50290-2014)

《尾矿库安全监测技术规范》（AQ 2030-2010）

Technical Regulation for TSF Safety Monitoring (AQ 2030-2010)

6.2 坝基及库区清表

Topsoil cleaning of dam foundation and storage area

6.2.1 技术说明

Technical description

清除坝基及库区表层土，厚度约20~30cm，并对表土进行收集堆存，以备用于封场覆土。

The topsoil of dam foundation and storage area, of which the depth is about 20~30cm, shall be cleaned, collected and stored for the future use in the closure of mine.

6.2.2 注意事项

Notice

如遇根系发达的木本植物，应挖除其根系；如遇不良地质及特殊岩土，应及时联系勘察和设计单位，针对实地情况进行特别处理。

If the woody plant with developed root is found, the root shall be excavated; if the unfavorable geology and special geotechnical is found, the contact with the survey and design institute is required for the sake of special treatment on the ground.

6.2.3 工程量统计

Engineering quantity statistics

见附表。

Refer to attached table for details.

6.3 库区土方平整

Leveling on the earth of storage area

6.3.1 技术说明

Technical description

(1) 场地挖方自上而下进行，如遇岩体边坡需要爆破，须请具有专业资质的爆破队伍进行爆破施工，爆破施工方法应采取控制爆破。

(1) The excavation of the site shall be carried out from top down. If blasting is required for the rock slope, it shall be completed by a professionally blasting team. The controlled blasting is required for blasting method.

(2) 场地填方施工前应进行现场碾压试验。土石料摊铺厚度30~50cm，摊铺时控制土石料颗粒粒径不应大于摊铺厚度的2/3，必要时应将大块孤石解小，避免填筑架空。

(2) On-site rolling test shall be completed before the site filling. The thickness of earth and stone pavement is 30~50cm. The particle size of earth and stone shall be less than 2/3 of the pavement thickness. If necessary, the large lump should be broken to smaller ones to avoid the void in filling

(3) 场底填方土石料压实度不小于0.94，边坡填方压实度不小于0.9。对于浅填方区域，先采用大台阶进行超填，超填部位需分层碾压，超填宽度以满足碾压设备通行为宜，然后再清挖形成最终边坡。

(3) The compactness of filling material at the bottom of site is not less than 0.94 and the compactness of filling material on the slope is not less than 0.9. In the shallow filling area, the large step method is adopted for overfilling. The overfilling shall be rolled in layers, with the overfilling width being sufficient for the travelling of rolling equipment, before the excavation is conducted to form the final slope.

(4) 边坡修整后要求光滑整齐，无凹凸不平。转弯及边角均要求采取圆角过渡，对于陡峭的边坡要求削缓平顺，不可形成台阶状、反坡或突然变坡，边坡变坡宜小于20°。

(4) After trimming, the slope shall be smooth and tidy without ruggedness. The rounded corner transitions are required for both corner and turn. For steep slopes, cutting to smooth and gentle slope is required, with the step, counter slope or sudden slope being

forbidden. The slope should be less than 20°.

6.3.2 注意事项

Notice

库区土方平整与尾矿坝坝基处理、尾矿坝筑坝、地下水导排等设施施工存在交叉，应做好施工组织设计，施工过程中做好安全管理，避免安全事故发生，施工前做好应急预案，制定突发事件的应急处理措施。

As the earth leveling in reservoir area interferes with the treatment of tailing dam foundation, construction of tailing dam and construction of groundwater draining facility, the construction design shall be well organized, and safety management of construction shall be well done to avoid accident in the construction. The emergency plan shall be prepared before construction and the emergency response for incident shall be made.

6.3.3 工程量统计

Engineering quantity statistics

见附表。

Refer to attached table for details.

6.4 坝基处理

Dam foundation treatment

6.4.1 技术说明

Technical description

针对坝体所在位置的砂土地基采用振冲碎石桩处理。

(1) The sand foundation where the dam body is located is treated with vibroflot gravel pile.

(2) 处理面积包括坝基底部分以及坝基外缘扩大的部分，其中坝基外缘扩大的范围不小于坝基下可液化土层厚度的1/2。现阶段暂取坝基下可液化土层平均厚度15m，则坝基外缘扩大范围超过坝基7.5m。由于坝基处理为大面积满堂处理方式，桩孔布置采用等边三角形布置。桩的间距根据

上部结构荷载大小和场地土层情况并结合所采用的振冲器功率大小综合考虑，现阶段暂考虑55kW振冲器，布桩间距2.5m。填料采用含泥量不大于5%的碎石，粒径30~100mm。

(2) The treatment area includes foundation base of dam and the enlarged portion of outer edge of dam foundation, of which the enlarged portion shall not be less than 1/2 of the thickness of liquefiable soil layer under dam foundation. At this stage, the average thickness of liquefiable soil layer under dam foundation is 15m and the outer edge of dam foundation is expanded beyond the dam foundation by 7.5m. Since the dam foundation is treated by the large-area full-scale method, the equilateral triangle pattern is adopted for the pile hole arrangement. The spacing of piles is considered according to the load of superstructure and the soil layer condition of site as well as the power of vibrator. Currently the 55kW vibrator is temporarily considered, with the spacing of piles being 2.5m. The filler is made of crushed stone with mud content of 5% max. and particle size of 30 ~100 mm.

6.4.2 注意事项 Notice

KP公司及Golder公司在前期工作中对尾矿库的岩土勘察钻孔数量偏少，且部分钻孔资料缺失，对尾矿坝及库区的地层分布，特别是液化土层的分布和其他不良地质情况缺乏全面的勘察和评估，难以满足设计深度要求。坝基处理方式和范围需要结合详细的工程勘察确定。

In the previous work conducted by KP and Golder, the geotechnical investigation boreholes in the tailings pond were limited, and some borehole data are missing. The lack of comprehensive reconnaissance and evaluation of stratum distribution at the tailings dam and pond area, especially the distribution of liquefied soil layers and other adverse geological conditions, makes it difficult to meet the depth requirements at basic design stage. The treatment method and scope of dam foundation shall be determined based on detailed engineering survey.

6.4.3 工程量统计 Engineering quantity statistics

见附表。

Refer to attached table for details.

6.5 尾矿坝 Tailing dam

6.5.1 技术说明 Technical description

(1) 尾矿坝坝体结构型式为不透水斜墙堆石坝，筑坝材料来自采矿废石以及粘土、砂砾料（尾矿库库区及工业场地平基取料，或外购）。坝体上游坡面铺设GCL+1.5mmHDPE土工膜，膜下为粘土斜墙，粘土斜墙与堆石之间设反滤层，依次为粗砂层、砾石层。堆石坝体与坝基之间设排渗垫层。

(1) The body structure of the tailings dam is impermeable inclined wall rockfill dam. The dam construction materials are from mining waste rocks, clay and gravels (taken from the tailings pond and industrial site leveling or outsourced). GCL+1.5mm HDPE geo-membrane is laid on the upstream slope of the dam body, and the clay inclined wall is laid underneath the geo-membrane. The reversed filter layer is set between the clay inclined wall and the rockfill, composed of the coarse sand layer and the gravel layer successively. Seepage discharge cushion is arranged between the rockfill dam and dam foundation.

(2) 堆石石料要求：新鲜、坚硬，块度不大于60cm，小于2cm的不超过5%，饱和单轴抗压强度不小于40Mpa，软化系数不低于0.75。砾石料要求：粒径3~20mm，含泥量小于5%。中粗砂料要求：粒径0.2~2mm，含泥量小于5%。粘土料要求：渗透系数不大于10⁻⁵cm/s，水溶盐含量不大于3%，有机质含量不大于2%。

(2) Rockfill stone is required to be fresh and hard with block not more than 60cm, but only 5% of them is less than 2cm. It is featured by saturated uniaxial compressive strength not less than 40Mpa and

softening coefficient not less than 0.75. Gravel material is required to have particle size of 3~20mm with mud content less than 5%. Medium coarse sand material is required to have particle size of 0.2~2mm with mud content less than 5%. Clay material is required to have permeability coefficient not more than 10-5cm/s, water-soluble salt content not more than 3% and organic matter content not more than 2%.

(3) 机械碾压堆石坝体施工前应进行石料级配~虚铺厚度~碾压设备~碾压遍数的试验，得出相应参数后以指导大面积施工。原则上虚铺厚度不超过80cm，堆石孔隙率控制在23%~28%之间。如检测孔隙率低于20%时，应对上坝材料以及碾压遍数进行复核，避免大量风化石料、软岩上坝。砾石的填筑标准以控制相对密度不低于0.75，砂的相对密度不低于0.7。粘土料每层碾压厚度不大于50cm，碾压压实度不小于0.96，与最优含水量允许偏差为±3%。

(3) Before the construction of mechanical rolled and compacted rockfill dam, the test of stone grading ~ loose paving thickness ~ rolling equipment ~ rolling pass number shall be carried out to obtain the relative parameters to guide the large-area construction. In principle, the thickness of loose pavement shall not exceed 80 cm and the rockfill porosity shall be controlled between 23% ~ 28%. If the porosity is detected less than 20%, the construction material of upper dam and the number of rolling should be checked to avoid excess of weathered stone and soft rock being used in dam. The relative density of gravel in construction shall be not less than 0.75 and the relative density of sand shall be not less than 0.7. The thickness of each layer of clay material is not more than 50cm and the compactness of rolling is not less than 0.96, with the allowable deviation from the optimum water content being ±3%.

6.5.2 注意事项 Notice

(1) 尾矿坝加高建设的堆石料主要来源于采矿废石。由于采矿废石为逐年出坑，且规划废石场容积有限（征地红线限制），坝体加高需协调废石

出坑时间以及废石场中转容积。由于基建期加上生产期的总废石量难以满足总筑坝方量的要求，因此考虑基建期首先选择工业场地及库区土石方平整的选优土石料来筑坝，剩余部分待井下废石出坑后直接运至尾矿坝下游逐年碾压堆筑。

(1) The rockfill materials for the tailings dam heightening are mainly from the mining waste rocks. Since the mining waste rocks are out of the stope year by year, and the volume of the planned waste rock dump is limited (the red line restriction of the land acquisition), it is necessary to coordinate the time of waste rocks going out of the stope and the transfer volume of the waste rock dump for dam heightening. Due to the fact that the total amount of waste rocks in the capital construction period and production period cannot meet the requirements of the total amount for dam construction, the selected earth and rock materials from site preparation of industrial sites and pond area will be used in the first place for dam construction in the capital construction period, and then the rest of the dam will be built with waste rocks taken out from the stope and directly transported to the downstream of tailings dam for compacting year by year.

(2) 尾矿坝施工时应注意与地下水导排盲沟的施工交叉协调

(2) When the tailing dam is under construction, the coordination with the construction of groundwater drainage blind ditch shall be attended to.

6.5.3 工程量统计

Engineering quantity statistics

见附表。

Refer to attached table for details.

6.6 防渗设施

Seepage prevention facility

6.6.1 技术说明

Technical description

(1) 尾矿库库区及尾矿坝上游坝面采用1.5mmHDPE土工膜防渗，土工膜下设钠基膨润土防水毯（GCL）保护层。

(1) 1.5mm HDPE geo-membrane anti-seepage is considered for the tailings pond area and upstream surface of tailings dam, under which GCL protection layer will be arranged.

(2) 所有防渗材料施工时，施工人员必须穿软底鞋进入施工区域，施工区域禁止吸烟。

(2) During construction of all the anti-seepage material, the construction personnel must wear soft-soled shoes to enter the construction area, smoking is prohibited in the construction area.

(3) GCL施工要求：铺设时搭接宽度20~25cm，搭接处撒膨润土粉。铺设时不能沾水。

(3) GCL construction requires that in the pavement the overlapped width shall be 20~25cm where the bentonite powder shall be spread, no water is allowed during pavement.

(4) HDPE土工膜施工要求：施工前应根据膜材规格和场地形状合理规划膜材的平面布置，充分利用膜材。边坡区域必须用整块膜，不得出现横缝。每天焊接工作开始前，必须进行试焊，确定焊接参数。两焊接土工膜的重叠部分不得少于10cm。

(4) HDPE geomembrane construction requires that before the construction the layout of membrane shall be reasonably planned according to the membrane specification and the site shape to make full use of membrane. A complete piece of membrane must be used in the slope area and no transverse seam is allowed. Before the start of welding work every day, the trial welding shall be conducted to determine the welding parameters. The overlapped part of two welded geomembranes shall not be less than 10 cm.

双轨焊缝焊接前，焊接区域要用布擦干净，确保焊接质量。每条双轨焊缝及每处单轨焊缝均要用记号笔在焊缝边标注施工相关信息。每条双轨焊缝均要进行气压检测，每条单轨焊缝均要进行电火花或真空检测。膜

材施工过程中应做好防风措施。

Before the double-track welding, the welding area should be cleaned with a cloth to ensure the welding quality. Each double-track weld seam and each single-track weld seam shall be marked with construction information on the weld side with a marker. Each double-track weld seam shall be subjected to air pressure testing and each single-track weld shall be subjected to electric spark or vacuum detection. Windproof measures should be taken during the installation of membrane.

6.6.2 注意事项

Notice

由于缺乏印尼相关环保规范，防渗结构层参照国内一般工业固体废物贮存处置场的污染控制标准选择GCL+1.5mmHDPE膜，防渗层结构有可能根据当地环保要求进行调整。

Due to lack of relevant environmental protection regulations in Indonesia, the anti-seepage structural layer selects the GCL+1.5mm HDPE membrane with reference to the pollution control standard of domestic general industrial solid waste storage and disposal site. The anti-seepage layer structure may be adjusted according to the local environmental protection requirements.

6.6.3 工程量统计

Engineering quantity statistics

见附表。

Refer to attached table.

6.7 库区排渗设施

Drainage facility in storage area

6.7.1 技术说明

Technical description

库区防渗结构层上部设置纵横交错的排渗盲沟，坡度不小于2%，排渗盲沟内铺设卵（碎）石和DN400HDPE花管。盲沟采用倒梯形断面，底宽2m，深2m。在上游坝脚的中部位置设集渗坑，集渗坑采用倒梯形断面，底宽10m，长30m，深2m。经排渗盲沟收集的渗水汇集至集渗坑后，抽排至库外第二水池进行处理后达标排放。

Crisscrossed blind ditches are arranged at the upper of the anti-seepage structure layer of TSF pond with the slope not less than 2%. Gravels (crushed stones) and DN400HDPE tubes are set inside. The blind ditch has an inverted trapezoidal section with 2m bottom width and 2m depth. Seepage collection sump is set in the middle part of the upstream dam foot. The seepage collection sump has an inverted trapezoidal section with 10m bottom width, 30m length and 2m depth. The seepage water collected in the blind ditch is converged in seepage collection sump before be pumped to the 2nd tank outside the TSF pond and discharged after treated up to the standard.

6.7.2 工程量统计

Engineering quantity statistics

见附表。

Refer to attached table.

6.8 库区地下水导排设施

Groundwater drainage facilities in storage area

6.8.1 技术说明

Technical description

场底防渗结构层下部沿原始山沟的中央底部设置地下水导排盲沟，导排盲沟内铺设卵（碎）石和DN400HDPE花管，盲沟采用矩形断面，宽3m，深2m。地下水导排盲沟延伸至库外的分流井，若检测达标则排至自然水体Lae Sopokomil河。

In the lower part of the anti-seepage structural layer of TSF site, the underground water drainage ditch is arranged along the central bottom

of the original gully, with gravels (crushed stones) and DN400HDPE tube set inside. The blind ditch has a rectangle section with 3m width and 2m depth. The underground water drainage ditch extends to the diversion well outside the TSF pond. The underground water will be drained to the natural water body (Lae Sopokomil river) if it is tested up to the standard.

6.8.2 工程量统计
Engineering quantity statistics

见附表。

Refer to attached table.

6.9 防排洪设施
Flood control facility

6.9.1 技术说明
Technical description

库内排洪方式采用溢洪道，溢洪道布置在尾矿坝的北端，C15细石混凝土砌块石结构。溢洪道采用倒梯形断面，底宽3m，深2m。由于尾矿坝分期加高，溢洪道也需要根据坝顶高程的变化分期建设，溢洪道由低到高逐一使用不同标高的引水渠。

The spillway is adopted as flood discharge method in the tailings pond which is arranged at the north end of tailings dam. The spillway will be constructed of C15 pea gravel concrete masonry structure, for which inverted trapezoidal section is adopted, with 3m width and 2m depth at the bottom. As the tailings dam is heightened by stages, the spillway also needs to be built in stages according to changes in the elevation of the dam top. The spillway also uses diversion channels of different elevations in sequence from low to high elevation.

6.9.2 工程量统计
Engineering quantity statistics

见附表。

Refer to attached table.

6.10 清污分流设施 **Division facility of clean and dirty flow**

6.10.1 技术说明 Technical description

最终锚固平台上设置周边路沟结合式截洪沟，中间锚固平台上设置临时路沟结合式截洪沟，把坡面未经污染的雨水拦截后直接排往库外。路沟结合式截洪沟为C25混凝土结构，其中靠边坡侧设排水沟，倒梯形断面，底宽1m，深1m，靠库内侧设拦水坎，高度40cm。

The road-ditch combined flood detention ditch is arranged on the periphery of final anchoring platform, and temporary road-ditch combined flood detention ditch is arranged on the intermediate anchoring platform to directly discharge the uncontaminated rainwater intercepted from slope out of the TSF pond. The road-ditch combined flood detention ditch is in the C25 concrete structure, in which the draining ditch is arranged on the slope side, in inverted trapezoidal section with width of 1m and depth of 1m at the bottom, and the water retaining ridge is arranged on the inner side of pond, with height of 40cm.

6.10.2 工程量统计 Engineering quantity statistics

见附表。

Refer to attached table.

6.11 监测设施 **Monitoring facility**

6.11.1 技术说明 Technical description

(1) 坝体沉降、水平位移观测桩。观测断面间距100m，每个断面4~5

个观测点，采用C15素混凝土块，30*30cm，上面设沉降控制点钉，304不锈钢材料。

(1) Observation piles for dam body settlement and horizontal displacement. Observation sections has a spacing of 100m, each section has 4 or 5 observation points with C15 plain concrete blocks sized 30*30cm, which is set with the settling control pins made of S.S. 304.

(2) 坝体浸润线观测孔。观测断面间距100m，每个断面4~5个观测点。观测孔直径约130mm，孔中下dn110HDPE管，管外包200g/m²土工布，深度15~20m。

(2) Observation hole for phreatic line of the dam body. Observation sections has a spacing of 100m, each section has 4 or 5 observation holes with 130mm diameter. Dn110HDPE tube is set in the hole, tube out-wrapped with 200g/m² geotextile, depth 15m 20m.

(3) 库内及溢洪道设置醒目、清晰和牢固的水位观测标尺。

(3) The conspicuous, clear and robust water level observation scale shall be set up in the TSF pond and spillway.

(4) 尾矿库周边布置地下水监测井5口，尾矿库南侧上游布置1口作为对照井，尾矿库东侧和南侧下游方向布置3口污染监视监测井，尾矿库北侧布置1口作为污染扩散监测井。

(4) 5 groundwater monitoring wells are arranged around the TSF. One is arranged at the upstream of north side of the TSF as comparison well, 3 pollutant monitoring wells are arranged at the downstream of the east side and north side of the TSF, and one is arranged at the north side of TSF as monitoring well for pollutant diffusion.

6.11.2 工程量统计

Engineering quantity statistics

见附表。

Refer to attached table.