Hengyi Industries Sdn Bhd
恒逸实业（文莱）有限公司

HYBN-T9-11-0040-2020-1

No.2 Refinery Dept. Safety Management Rules

炼油二部安全管理细则

Issued Date：October　　颁布日期： 2020 年 10 月

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Preface 前 言

This rule is written based on the company T3 Management Regulations documents.

本细则依据公司 T3 管理制度文件制定。

This rule is effective as of Oct 21, 2020.

本细则从 2020 年 10 月 21 起实施。

The management rule is prepared by: He Kun

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Content 目录

1 Purpose 目的

To identify and evaluate various risks, formulate effective risk reduction measures and strengthen safety accidents in order to systematically standardize the safety management methods of refinery department no. 2.

为系统规范炼油二部安全管理方法，识别、评价各类风险，制定有效风险削减措施，加强安全过程管控，杜绝生产安全事故，特制定本细则。

2 Scope of Application 适用范围

This system is applicable to all personnel of refinery department no. 2.

本制度适用于炼油二部全员

3 Terms and Definitions 术语和定义

3.1 Hazards: it refers to roots or states which may cause personal injury and health damage.

危险源(Hazards)：指可能导致人体受伤、健康损害的根源或状态。

3.2 Major hazards: it refers to hazardous chemicals produced, handled, used and stored for a long time or temporarily and the quantity of hazardous chemicals exceeds the critical quantity of units. Unit indicates one (set of) plant, facility and place or several (sets of) production plants and places belonging to the same production and operation company and of which the edge distance is smaller than 500m.

重大危险源(Major hazards)：指长期或临时地生产、搬运、使用和储存的危险化学品，且危险物品的数量等于或超过临界量的单元，单元指一个（套）的装置、设施和场所，或同属于一个生产经营单位且边缘距离小于 500m 的几个（套）生产装置、场所。

3.3 Hazard identification: it refers to a process to identify hazards and make sure their properties.

危险源辨识：识别危险源的存在并确定其特性的过程。

3.4 Risk: it refers to the possibility that a dangerous incident or a harmful exposure occurs, together with the seriousness of the consequential injury or health damage.

风险：发生危险事件或有害暴露的可能性，与随之引发的受伤或健康损害的严重性的组合。

3.5 Health damage: it refers to the confirmable bad conditions of body or spirit caused or worsened by work activities and (or) work-related situations.

健康损害：可确认由工作活动和（或）工作相关状况引起或加重的不良身体或精神状。

3.6 Risk assessment: it refers to a process to evaluate risks due to hazards, judge sufficiency of existing control measures and confirm whether the risk is acceptable.

风险评价（Risk assessment）：指评估由危险源导致的风险、考虑现有控制措施的充分性,并确定风险是否可接受的过程。

3.7 Hazardous chemical: it refers to combustible, explosive, toxic, harmful and corrosive chemicals causing injuries or damages to personnel, facilities and environment, including explosives, compressed gases, liquefied gases, combustible liquids, combustible solids, spontaneous combustible articles, flammable articles when being wet, oxidizers, organic peroxides, toxics and corrosives.

危险化学品：指具有易燃、易爆、有毒、有害及腐蚀性，对人员、设施、环境造成伤害或损害的化学品，包括爆炸品、压缩气体、液化气体、易燃液体、易燃固体、自燃物品和遇湿易燃物品、氧化剂和有机过氧化物、有毒品、腐蚀品等。

3.8 High risk work: it refers to work which may endanger operators and surrounding facilities, including hot work, work in confined space, blind plate vacuum pumping operation, work at heights, hoisting work, temporary power supply, earthwork, work with road closed, maintenance and repair work, radiography operation, and scaffolding erection and dismantling during production and maintenance in the area within the jurisdiction of the Company.

高风险作业：指公司所辖区域内生产、检修过程中可能涉及的动火、进入受限空间、盲板抽堵、高处作业、吊装、临时用电、动土、断路、设备检维修、射线、脚手架搭设与拆除等，对作业者及周围设施安全可能造成重大危害的作业。

3.9 Critical installations and key points: it refers to process plants for producing, storing and using combustible, explosive, highly toxic, corrosive, high-temperature, high-pressure, vacuum, cryogenic and hydrogenation articles, and tank farms, loading and unloading platforms (stations), oil depots and warehouses where explosion and fire may occur, and utility systems which are critical to production safety.

关键装置及重点部位：指生产、储存、使用易燃易爆、剧毒、易腐蚀、高温、高压、真空、深冷、临氢等工艺装置以及可能形成爆炸、火灾场所的罐区、装卸台（站）、油库、仓库等，对生产安全起关键作用的公用工程系统。

3.10 Production area: it refers to an area covering the main plant area, west warehouse area, east and west jetties and pipe rack between main plant area and west warehouse area (excluding traffic routes). It is divided into a main production area and an auxiliary production area.

生产区域：指由主厂区、西库区、东、西码头、主厂区到西库区管廊所辖的区域（不含交通道路），分为主要生产区域和辅助生产区域。

3.11 Main production area: it refers to an area made of process plants or facilities for producing toxic, corrosive, explosive, combustible and combustion-supporting articles, including the area covering process plant, compressor house, tank group, pump house, oil jetty, system pipe rack, loading and unloading platform, filling station, torch, boiler, circulating water field, sewage farm, thermal power plant and sea water desalination facility.

主要生产区域：指由生产毒害、腐蚀、爆炸、燃烧、助燃物质的工艺装置或设施组成的区域，包括工艺装置及压缩机房、罐组、泵房、油码头、系统管廊、装卸站台、充装站、火炬、锅炉、循环水场、污水处理场、热电厂、海水淡化等设施组成的区域。本细则专指炼油二部各装置。

3.12 Auxiliary production area: it refers to an area covering the plant front area (including office building, center control building, laboratory building, main fire station and maintenance building), warehouse of the whole plant, traffic route within the production area, office building of west jetty and fire station.

辅助生产区域：指厂前区（包括办公楼、中控楼、化验楼、主消防站、维保楼所辖区域）、全厂仓库、生产区内交通道路、西码头办公楼和消防站等所辖区域。

3.13 Fire and explosion protection area: it refers to an area covering the area within the enclosure of plant area of the Company (including production plant, tank farm, loading platform and jetty) and the area within 10m from the equipment and pipeline proper with combustible and explosive gas and liquid and connected equipment and pipelines outside the plant area.

防火防爆区域：指公司生产厂区围墙以内包括生产装置、储罐区、装车栈台、码头等以及延伸到厂区外含有易燃易爆气体、液体的设备、管道本体及与之相连接的其它设备管道附近 10m 以内的区域。

4 Management Responsibilities 管理职责

4.1 Specified administrative authority 归口管理专业

4.1.1 The HSE specialist shall be responsible for formulating and revising these rules and supervising and inspecting the implementation of personnel in each post.

HSE 专业负责制（修）定本细则并监督检查各岗位人员的执行情况。

4.1.2 Responsible for organizing the identification, evaluation and control of hazards in the production process; organizing the identification, evaluation, registration, filing, and verification of hazards, and supervising the implementation of various risk and safety management and control measures.

负责组织生产过程的危险源辨识、评价和控制；组织开展危险源辨识、评估、登记建档、备案、核销等工作，督促各专业落实各类风险安全管控措施。

4.1.3 Responsible for supervising and inspecting the high-risk operation process, operation permit processing and implementation, organizing operation departments to jointly carry out risk identification, formulating and implementing risk reduction measures; responsible for the collection and reporting of various operation permit applications. Responsible for high-risk work permit applications.

负责对高风险作业过程、作业许可证办理及执行情况进行监督检查，组织作业部门共同开展风险辨识，制定落实风险削减措施；负责各类作业许可申请的汇总、上报。负责高风险作业许可证申请。

4.1.4 Organize the compilation of departmental hazardous chemicals MSDS, establish the

department's hazardous chemicals archives, and conduct safety supervision over all aspects of hazardous chemicals. Conduct regular emergency drills for on-site disposal of hazardous chemicals.

组织编制部门危险化学品 MSDS，建立本部门危险化学品档案，并对危险化学品各环节进行安全监管。定期开展危险化学品现场处置应急演练。

4.1.5 Responsible for the management of the allocation and use of various safety equipment in the department.

负责对本部门各类安技装备的配备、使用等进行管理。

4.2 Collaborative Management Specialist 协同管理专业

4.2.1 Process Specialist 工艺专业

4.2.1.1 Responsible for the hazard identification, risk assessment and control of production and process technical management processes.

负责生产、工艺技术管理过程的危险源辨识、风险评价和控制。

4.2.1.2 Responsible for the implementation of process changes, technical improvement measures, blind plate extraction and blockage operations, responsible for formulating and implementing process technology treatment plans involved in various risk operations, and responsible for process technology disclosure.

负责工艺变更、技改技措、盲板抽堵作业的执行，负责制定并执行各项风险作业所涉及的工艺技术处理方案，负责工艺技术交底工作。

4.2.1.3 Responsible for the management of the "chemical safety instructions and chemical safety labels" of the three-reagents used in the production process of each device, formulate storage and use operating procedures and supervise the implementation.

负责各装置生产过程中使用的三剂“化学品安全说明书、化学品安全标签”的管理，制定储存、使用的操作规程并监督执行。

4.2.2 Equipment Specialist 设备专业

4.2.2.1 Responsible for organizing the hazard identification, risk assessment and control in the management of equipment and facilities.

负责组织设备设施管理过程中的危险源辨识、风险评价和控制。

4.2.2.2 Responsible for organizing the implementation of high-risk operations such as ground breaking, hoisting, temporary electricity use, scaffolding and dismantling, and equipment maintenance; responsible for the implementation of the maintenance and construction plan involved in the high-risk operation permit and the supervision and management of the operation process.

负责组织动土、吊装、临时用电、脚手架搭设与拆除、设备检维修等高风险作业的执行；负责高风险作业许可证所涉及的检修施工方案的落实和作业过程的监督管理。

4.2.2.3 Responsible for the verification, maintenance, scrapping and updating of safety equipment.

负责安技装备的检定、维修、报废、更新工作。

5 Management Contents 管理内容

5.1 Management Principles and Content 管理原则及内容

5.1.1 Safety management principles follow the principles of “who is in charge, who is responsible” and “territorial management”, use scientific and effective hazard identification and risk assessment methods to identify various risks in the department, formulate effective control measures and management plans, and prevent accidents occur.

安全管理原则遵循“谁主管、谁负责”和“属地管理”的原则，运用科学有效的危险源辨识和风险评价方法识别出本部门各类风险，制定有效的控制措施及管理方案，预防事故的发生。

5.1.2 The management content includes: hazard identification and risk evaluation, major hazard sources, high-risk operations, hazardous chemicals, key installations and key parts management, etc.

管理内容包括：危险源辨识及风险评价、重大危险源、高风险作业、危险化学品、关键装置和重点部位管理等。

5.2 Hazard Identification and Risk Assessment 危险源辨识和风险评价

5.2.1 Management Requirement 管理要求

This department shall organize and carry out hazard source identification and risk evaluation, determine the risk level, formulate and implement risk control measures in accordance with the following requirements:

本部门应按照下列要求组织开展危险源辨识与风险评价，确定风险等级，制定并落实风险控制措施：

5.2.1.1 Hazard identification and risk assessment of daily management activities shall be organized at least once a year;

每年应至少组织一次日常管理活动的危险源辨识与风险评价；

5.2.1.2 At least one unit process hazard analysis shall be organized every three years;

每三年应至少组织一次装置工艺危害分析；

5.2.1.3 Hazard identification and risk assessment of in-service equipment and facilities shall be organized at least once a year;

每年应至少组织一次对在役设备设施的危险源辨识与风险评价；

5.2.1.4 Hazard identification and risk assessment of various operations during the normal production process shall be organized at least once a year;

每年应至少组织一次正常生产过程中各项作业活动的危险源辨识与风险评价；

5.2.1.5 In daily production activities, various key operations, key equipment and facilities, inspection and maintenance operations, equipment shutdown and major repairs and other operations shall be carried out by the professional organization in charge of the activities for hazard identification and risk evaluation;

日常生产活动中各种关键操作、关键设备设施以及检维修作业、装置停工大修等作业活动前，均应由该项活动主管专业组织进行危险源辨识和风险评价；

5.2.1.6 In the event of changes in process technology, equipment and facilities, materials, management, etc., the specialist applying for the change shall organize hazard identification and risk assessment before the implementation of the change. For details, refer to the HSE Comprehensive Management Rules of Refining Department No. 2.

发生工艺技术、设备设施、材料、管理等变更活动时，变更申请专业应在变更实施前组织进行危险源辨识与风险评价，具体参照《炼油二部 HSE 综合管理细则》；

5.2.1.7 The identification of hazards and risk assessment of new, renovated and expanded construction projects shall be implemented in accordance with relevant regulations of the Brunei government.

新、改、扩建设项目的危险源辨识与风险评价按文莱政府有关规定执行。

5.2.1.8 When engaged in production operations and other related activities, personnel in various installations and positions shall perform hazard identification, risk evaluation and control in accordance with the specified time, cycle, and method, and be responsible for their results.

各装置、各岗位人员在从事生产作业和其它相关活动时，应按规定时间、周期、方法进行危险源辨识、风险评价和控制，并对其结果负责。

5.2.2 Hazard Identification and Risk Assessment Methods 危险源辨识和风险评价方法

5.2.2.1 Hazard Identification Methods 危险源辨识方法

（1）Job Hazard Analysis (JHA) 工作危害分析（JHA）

Used for inspection and maintenance operations, various routine operations, the process of opening and stopping, and various general permit operations, etc.

用于检维修作业、各类常规作业、开停车过程、各类一般许可作业等。

（2）Safety Checklist (SCL) 安全检查表分析（SCL）

Used for intrinsic safety inspection of equipment and facilities

用于设备设施本质安全检查。

（3）Hazard and Operability Study (HAZOP) 危险与可操作性分析（HAZOP）

Used for safety review of production process of new, renovated and expanded facilities.

用于新、改、扩建设施生产工艺安全审查。

（4）Hazard Identification (HAZID) 危险源识别分析（HAZID）

Used for the identification of hazards in the design stage.
用于设计阶段危险源辨析。
（5）Quantitative Risk Assessment (QRA) 量化风险评价（QRA）
It is used in the design stage to identify potential hazards, and quantitatively analyze the probability of potential hazards and possible consequences.
用于设计阶段识别潜在危险，对潜在危险发生的概率及可能造成的后果进行量化分析。

5.2.2.2 Risk Assessment Method 风险评价方法
The risk assessment method generally adopts the risk matrix method.
风险评价方法一般采用风险矩阵法。

5.2.3 Risk Evaluation Report 风险评价报告

5.2.3.1 Risk Assessment Report Preparation 风险评价报告编制
（1）The HSE management specialist summarizes and reviews the reported hazard identification and risk evaluation results of each device before December each year, and reports the hazard identification and risk evaluation results carried out during the year to the company's HSE management department;
HSE 管理专业每年 12 月前汇总和评审各装置的上报危险源辨识、风险评价结果，对年内所开展的危险源识别和风险评价工作结果上报公司 HSE 管理部门；
（2）For the assessed risks, which require project rectification, refer to the "Detailed HSE Comprehensive Management Rules of the Second Refining Department".
对于评价出的风险，需要立项整改的，参照《炼油二部 HSE 综合管理细则》执行。

5.3 Major Hazard Sources 重大危险源

5.3.1 Identification, documentation and evaluation of major hazards
重大危险源的辨识、建档与评价

5.3.1.1 The identification scope includes storage tank area, warehouse area, production site, pressure pipeline, boiler, pressure vessel, etc.
辨识范围包括贮罐区、库区、生产场所、压力管道、锅炉、压力容器等。
5.3.1.2 The HSE Management Department organizes relevant departments to identify and determine the company's major hazards in accordance with GB18218-2009 "Identification of Major Hazardous Sources of Hazardous Chemicals".
由 HSE 管理部组织相关部门按 GB18218-2009《危险化学品重大危险源辨识》识别和确定公司重大危险源。
5.3.1.3 Archived Data of Major Hazards 重大危险源存档资料
（1）Table of basic characteristics of major hazards;

重大危险源基本特征表；

（2）Identification and classification records of major hazards;

重大危险源辨识、分级记录；

（3）Safety technical specifications of all hazardous chemicals involved;

涉及的所有危险化学品安全技术说明书；

（4）Regional location map, floor plan, process flow chart, and main equipment list;

区域位置图、平面布置图、工艺流程图、主要设备一览表；

（5）Major hazard source safety system, description of measures, inspection and inspection results;

重大危险源安全系统、措施说明、检测、检验结果；

（6）The setting of safety warning signs in major dangerous sources;

重大危险源场所安全警示标志的设置情况；

（7）Names of persons in charge of key installations and key parts of major hazards;

重大危险源关键装置、重点部位负责人名称；

（8）Emergency rescue plan, drill plan and summary for major hazard accidents;

重大危险源事故应急救援预案、演练计划和总结；

（9）Risk assessment report of major hazards.

重大危险源风险评估报告。

5.3.1.4 The HSE Management Department organizes safety evaluations for major hazards every 3 years and submits safety evaluation reports.

HSE 管理部对重大危险源每 3 年组织 1 次安全评价，并提交安全评价报告。

5.3.2 Monitoring and management of major hazards 重大危险源监控与管理

5.3.2.1 Each unit and each team shall conduct regular inspections of hidden dangers in the production area, and immediately rectify the hidden dangers discovered. For specific requirements, refer to the "Detailed HSE Comprehensive Management Rules of the Second Refining Department".

各装置、各班组应定期对生产区域进行隐患排查，对发现的隐患应立即整改，具体要求参照《炼油二部 HSE 综合管理细则》。

5.3.2.2 The equipment profession should establish the use, inspection files or accounts of equipment and facilities related to major hazards (including safety accessories), and regularly inspect and test equipment and facilities of major hazards according to the inspection cycle.

设备专业应建立重大危险源相关设备设施（包括安全附件）的使用、检验档案或台帐，并定期对重大危险源的设备设施依据检测周期进行检验、检测。

5.3.2.3 Obvious safety warning signs must be set up in the production area, and the flammable gas and toxic gas detection and alarm system should be monitored in real time. Inform relevant units and personnel of possible accident hazards and emergency measures in time.

生产区域现场必须设置明显的安全警示标志，对可燃气体、有毒气体检测报警系统应做到实时监

控。对可能发生的事故危害、应急措施等信息及时告知相关单位和人员。

5.4 Management of Hazardous Chemicals 危险化学品管理

5.4.1 Types of Hazardous Chemicals 危险化学品分类

The main hazardous chemical in Refinery Department No. 2 include:

炼油二部的主要危险化学品有：

（1）Kerosene hydrotreating unit: Kerosene, hydrogen, naphtha, H_2S, etc.

航煤加氢装置：煤油、氢气、石脑油、硫化氢等；

（2）Diesel hydrotreating unit: Diesel, (Coking) gasoline, hydrogen, H_2S, lean amine (MDEA), dimethyl sulfide, etc.

柴油加氢装置：柴油、（焦化）汽油、氢气、硫化氢、胺液（MDEA）、二甲基二硫等；

（3）Hydrocracking unit: wax oil, diesel, hydrogen, H_2S, liquefied petroleum gas, naphtha, lean amine (MDEA), etc.

加氢裂化装置：蜡油、柴油、氢气、硫化氢、液化石油气、石脑油、胺液（MDEA）等；

（4）LPG Fractionation unit: Liquefied petroleum gas, isobutane, ethane, propylene, etc.

气体分馏装置：液化石油气、异丁烷、乙烷、丙烯等。

5.4.2 Hazardous Chemicals Management Requirement 危险化学品管理要求

5.4.2.1 Process professionals should organize technical documents such as operating procedures, process cards, etc. according to the production process, technology, equipment characteristics of each device, and the original and auxiliary materials, and the risk of the product.

工艺专业应根据各装置生产工艺、技术、设备特点和原、辅助材料、产品的危险性组织编制操作规程、工艺卡片等技术文件。

5.4.2.2 The HSE professional organizes a general survey of hazardous chemicals every year, and establishes and updates departmental hazardous chemicals files.

HSE 专业每年组织对危险化学品进行普查，建立并更新部门危险化学品档案。

5.4.2.3 The HSE profession shall equip the operating team with emergency equipment such as personal protective equipment and first aid equipment according to the hazardous characteristics of hazardous chemicals, and conduct regular monitoring of the monitoring points of occupational hazards in hazardous chemical workplaces.

HSE 专业应根据危险化学品的危险特性为运行班组配备个人防护用品、急救器材等应急装备，并对危险化学品作业场所职业病危害因素监测点进行定期监测。

5.4.2.4 Operation team personnel must participate in the company's hazardous chemical knowledge training, and employees should be familiar with the hazardous chemical safety technical information involved in this post to ensure the smooth operation and personal safety of

hazardous chemical production, storage, use, transportation, and disposal.

运行班组人员必须参加公司危险化学品知识培训，员工应熟悉本岗位涉及的危化品安全技术信息，以保证危险化学品生产、储存、使用、运输、废弃处置等环节的平稳操作和人身安全。

5.4.2.5 When employees use hazardous chemicals, they must understand and master the relevant content of the corresponding hazardous chemical safety technical specifications and safety operating procedures, and take corresponding preventive measures to avoid personal injury accidents.

员工使用危险化学品时，必须了解和掌握相应危险化学品安全技术说明书和安全操作规程有关内容，并采取相应的防范措施，避免发生人身伤害事故。

5.4.2.6 The use and storage of hazardous chemicals should meet the following requirements:

使用和储存危险化学品应满足以下要求：

（1）Hazardous chemicals that are inflammable, explosive or chemically reacted and produce toxic and harmful gases when exposed to water, heat and humidity shall not be stored in the open, damp, rainy or low-lying places where water is easy to accumulate;

遇水、热、潮湿易燃烧、爆炸或发生化学反应、产生有毒有害气体的危险化学品不得存放在露天、潮湿、漏雨或低洼易积水的地方；

（2）Hazardous chemicals that are easy to burn, explode or produce toxic and harmful gases under sunlight or heat should be stored in a cool and ventilated place, and no heat source is allowed. The temperature of the storage place should not be higher than the spontaneous ignition point and melting point of the article. Flammable liquids in barrels with a flash point below 45℃ shall not be stored in the open air;

日光照射或受热易燃烧、爆炸或产生有毒有害气体的危险化学品应存放在阴凉通风的地方，禁止靠近热源，存放处的温度不得高于物品的自燃点和熔点。闪点在45℃以下的桶装易燃液体不得露天存放；

（3）Hazardous chemicals whose chemical nature conflicts with protection and fire-fighting methods shall not be stored in the same inventory. Radioactive materials must not be stored in the same storage with other dangerous chemicals, oxidants must not be stored in the same storage with flammable and explosive materials, and materials that can burn spontaneously or in water should not be stored in the same storage with flammable and explosive materials;

化学性质与防护、灭火方法相互抵触的危险化学品，不得在同库存放。放射性物品不得与其它危险化学品同库存放，氧化剂不得与易燃易爆物品同库存放，能自燃或遇水燃烧的物品不得与易燃易爆品同库存放；

（5）The locations where hazardous chemicals are stored shall be equipped with corresponding fire-fighting facilities and protective equipment in accordance with fire-fighting codes and regulations.

储存危险化学品的地点，根据消防规范和规定，配备相应的消防设施和防护器材。

5.4.3 Transport of Hazardous Chemicals 危险化学品运输

5.4.3.1 Each management major is responsible for the safety management of the transportation of hazardous chemicals in and out of the device involved in the major.
各管理专业负责涉及本专业的危险化学品运输进出装置过程的安全管理。

5.5 Key Unit and Key Part 关键装置和重点部位

5.5.1 See the table below for the key equipment of refinery department no. 2:
炼油二部关键装置见下表：

Item 序号	Unit 单位名称	Key Unit / Key Part Name 关键装置/重点部位名称	Rank 级别	Location 地理位置	Main Equipment Parameters 主要设计技术参数
1	Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Company Level 公司级	位于炼油厂的经 7-经 8 及纬 4-纬 5 区间	The nominal design capacity of the device is 2.2 million tons/year, the annual operation hours is 8,400 hours, the hydraulics operation range is 60~110%; The working pressure is generally 10.5-19.0mpa, and the operating temperature is generally 290-455 °C. 装置公称设计能力为220 万吨/年，年操作 8400 小时，水力学操作范围为 60~110%；工作压力一般为 10.5－19.0MPa ，操作温度一般为 290－455°C。
2	Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Department Level 部门级	位于炼油厂的经 8-经 9 及纬 4-纬 5 区间	The designed processing capacity of the unit is 600,000 tons/year, the annual operating hours is 8,400 hours, and the operating flexibility is 60-110% of the designed scale. 装置设计加工能力 60 万吨/年，年运行时间 8400 小时，操作弹性为设计规模的 60-110%。
3	Refinery Dept. No. 2 炼油二部	2.2 MMTA 220 Diesel Hydrotreating Unit 万吨/年连续液相柴	Company Level 公司级	位于炼油厂的经 7-经 8 及纬 4-纬 5 区间	The designed capacity of the unit is 2.2 million tons/year, the annual operating hours is 8,400 hours, and the operating

		油加氢装置			flexibility is 60-110% of the designed scale. 装置设计能力 220 万吨 / 年，年运行时间 8400 小时，操作弹性为设计规模的 60-110%。
4	Refinery Dept. No. 2 炼油二部	1.3 MMTA Kerosene Hydrotreating Unit 130 万吨/年煤油加氢精制装置	Company Level 公司级	位于炼油厂的经 7-经 8 及纬 4-纬 5 区间	The designed processing capacity of the unit is 1.3 million tons/year, the operation flexibility is 60% ~ 110%, and the operating hours are 8,400 hours. 装置设计加工能力为130 万吨/年，操作弹性 60%～110%，开工时数 8400 小时。

5.5.2 The key parts of Refining Department No. 2 are shown in the table below

炼油二部重点部位见下表：

Unit **单位**	**Key Unit / Key Part Name** **关键装置/重点部位名称**	**Hazard Point** **危险点名称**	**Brief description of hazard point** **危险点危险性简要描述**
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Hydrotreating reactor R101 加氢精制反应器 R101	Reactor operating temperature and pressure are high, and the mediums involved are oil and hydrogen, etc. There are possible flammable and explosives. 反应器操作温度、压力高，且介质为油及氢气等，具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Hydrocracking reactor R102 加氢裂化反应器 R102	Reactor operating temperature and pressure are high, and the mediums involved are oil and hydrogen, etc. There are possible flammable and explosives. 反应器操作温度、压力高，且介质为油及氢气等，具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Hot separator D103 热高压分离器 D103	Vessel operating temperature and pressure are high, and the mediums involved are complex, etc. There are possible flammable and explosives and at the same

			time there is a risk of channeling. 容器操作温度、压力较高，介质复杂，具有易燃易爆的危险，同时存在高压窜低压的风险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Recycle gas compressor knockout drum D110 循环氢压缩机入口分液罐 D110	Vessel operating temperature and pressure are high, and the H_2S content of the recycle gas is high. There is a risk of death due to poisoning; at the same time, there is a risk of flammability and explosion. 容器操作压力较高，且循环氢内硫化氢含量高，存在人员中毒死亡的风险；同时具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Makeup gas compressor knockout drum D111 新氢压缩机入口分液罐 D111	Vessel belongs to hydrogen system. The medium involved is hydrogen and there is a risk of flammables and explosives. 容器属于临氢系统，介质为氢气，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Recycle gas scrubber C101 循环氢脱硫塔 C101	Operating pressure is relatively high, and the H_2S content of the recycle gas is high. There is a risk of death due to poisoning and at the same time, there is a risk of flammables and explosives. 操作压力较高，且循环氢内硫化氢含量高，存在人员中毒死亡的风险；同时具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Reaction feed pump P102 反应进料泵 P102	High speed pump outlet pressure is high, when leakage occurs, there is a risk of fire explosion. 高速泵出口压力高，发生泄漏，可能存在着火爆炸的风险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Recycle gas compressor K101 循环氢压缩机 K101	Operating pressure is relatively high, and the H_2S content of recycle gas is high. There is a risk of death due to poisoning and at the same time, there is a risk of

			flammables and explosion. 操作压力较高，且循环氢内硫化氢含量高，存在人员中毒死亡的风险；同时具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Makeup gas compressor K102A/B/C 新氢压缩机 K102A/B/C	The operating pressure is high, and it belongs to the hydrogen system. The medium is hydrogen, which may be flammable and explosive. 操作压力较高，且属于临氢系统，介质为氢气，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	2.2 MMTA Unicracking Unit 220 万吨/年加氢裂化装置	Reactor feed furnace F101 反应进料加热炉 F101	The combustion medium is fuel gas, and there is raw oil in the furnace tube, which is inflammable and explosive. 燃烧介质为燃料气，炉管内有原料油，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	1st stage hydrolysis reactor R201A/B 一级水解器 R201A/B	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	2nd stage hydrolysis reactor R202A/B 二级水解器 R202A/B	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Depropanizer I C101 脱丙烷塔 I C101	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的

			危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Deethanizer I C102 脱乙烷塔 I C102	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Depropanizer II C201 脱丙烷塔 II C201	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Deethanizer II C202 脱乙烷塔 II C202	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Propylene fractionator A C203 丙烯精馏塔 A C203	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Propylene fractionator B C204 丙烯精馏塔 B C204	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性

			混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	0.6 MMTA Gas Fractionation Unit 60 万吨/年气体分馏装置	Debutanizer C301 脱异丁烷塔 C301	The medium is flammable, and can form an explosive mixture when mixed with air, and may burn and explode when exposed to heat sources and open flames 介质易燃，与空气混合能形成爆炸性混合物，遇热源和明火有燃烧爆炸的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA 220 Diesel Hydrotreating Unit 220 万吨/年连续液相柴油加氢装置	One stage upflow reaction/separator R101 一段上流式反应/分离器 R101	The operating temperature and pressure of the reactor are high, and the medium is oil and hydrogen, etc., which is inflammable and explosive 反应器操作温度、压力高，且介质为油及氢气等，具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	2.2 MMTA 220 Diesel Hydrotreating Unit 220 万吨/年连续液相柴油加氢装置	Two-stage upflow reaction/separator R102 二段上流式反应/分离器 R102	The operating temperature and pressure of the reactor are high, and the medium is oil and hydrogen, etc., which is inflammable and explosive 反应器操作温度、压力高，且介质为油及氢气等，具有易燃易爆的危险
Refinery Dept. No. 2 Refinery Dept. No. 2 炼油二部	2.2 MMTA 220 Diesel Hydrotreating Unit 220 万吨/年连续液相柴油加氢装置	New hydrogen compressor K101A/B 新氢压缩机 K101A/B	The operating pressure is high, and it belongs to the hydrogen system. The medium is hydrogen, which may be flammable and explosive. 操作压力较高，且属于临氢系统，介质为氢气，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	2.2 MMTA 220 Diesel Hydrotreating Unit 220 万吨/年连续液相柴油加氢装置	Reaction feed heating furnace F-101 反应进料加热炉 F-101	The combustion medium is fuel gas, and there is raw oil in the furnace tube, which is inflammable and explosive 燃烧介质为燃料气，炉管内有原料油，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	2.2 MMTA 220 Diesel Hydrotreating Unit 220 万吨/年连续液相柴油	Product fractionation tower bottom reboiler pump P-203A/B	The outlet pressure of the pump is high, and the temperature of the pump body is high. Once the

	加氢装置	产品分馏塔底重沸炉泵 P-203A/B	medium leaks, it will directly catch fire, and there is a risk of flammability and explosion. 泵出口压力较高，泵体温度较高，介质一旦泄漏直接着火，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	1.3 MMTA Kerosene Hydrotreating Unit 130 万吨/年煤油加氢精制装置	Hydrofining reactor R101 加氢精制反应器 R101	The operating temperature and pressure of the reactor are high, and the medium is oil and hydrogen, etc., which is inflammable and explosive 反应器操作温度、压力高，且介质为油及氢气等，具有易燃易爆的危险
Refinery Dept. No. 2 炼油二部	1.3 MMTA Kerosene Hydrotreating Unit 130 万吨/年煤油加氢精制装置	New hydrogen compressor K102 A/B/C 新氢压缩机 K102 A/B/C	The operating pressure is high, and it belongs to the hydrogen system. The medium is hydrogen, which may be flammable and explosive. 操作压力较高，且属于临氢系统，介质为氢气，存在易燃易爆的风险
Refinery Dept. No. 2 炼油二部	1.3 MMTA Kerosene Hydrotreating Unit 130 万吨/年煤油加氢精制装置	Reaction feed heating furnace F-101 反应进料加热炉 F-101	The combustion medium is fuel gas, and there is raw oil in the furnace tube, which is inflammable and explosive 燃烧介质为燃料气，炉管内有原料油，存在易燃易爆的风险

5.5.3 The daily management of key equipment and key parts implements the principle of two-part management and hierarchical monitoring of oil refining.
关键装置和重点部位的日常管理实行炼油二部分级管理与分级监控原则。

5.5.4 When key installations and key parts are listed as major hazard sources of the company, they shall also be implemented in accordance with major hazard source management requirements.
关键装置和重点部位列为公司重大危险源时，还应按照重大危险源管理要求执行。

5.6 High Risk Work Permit Management 高风险作业票证管理

5.6.1 For high-risk operations, the principles of "who is in charge, who is responsible", "confirmation by level, and process control" are implemented.
高风险作业实行“谁主管、谁负责”、“逐级确认、过程控制”的原则。

5.6.2 High-risk operations mainly include hot fire, access to restricted spaces, blind plate extraction, heights, hoisting, temporary electricity use, ground breaking, circuit breaking, equipment inspection and maintenance, radiographic inspection, scaffolding and dismantling, fire and explosion-proof areas, and inspection and maintenance operations, etc. Among them, ground-breaking operations, hoisting operations, temporary electricity use, scaffolding erection and dismantling, and inspection and maintenance operations are performed in accordance with the professional management rules for equipment, and the blind plate extraction and blocking operations are performed in accordance with the technical professional management rules.

高风险作业主要包括动火、进入受限空间、盲板抽堵、高处、吊装、临时用电、动土、断路、设备检维修、射线探伤、脚手架搭设与拆除、防火防爆区域和检维修作业等。其中，动土作业、吊装作业、临时用电、脚手架搭设与拆除、检维修作业按照设备专业管理细则执行，盲板抽堵作业按照工艺专业管理细则执行。

5.6.3 The validity period of the high-risk work permit is shown in the table below:

高风险作业许可证有效期限，见下表：

Validity Period of High Risk Operation Permit

高风险作业许可证有效期限

Item 序号	Work Permit 作业许可证	Validity Period (continuous) 有效期限（连续）
1	Special Hot Work 特级动火	≤8 hours ≤8 小时
2	Grade 1 Hot Work 一级动火	≤8 hours ≤8 小时
3	Grade 2 Hot Work 二级动火	≤72 hours ≤72 小时
4	Confined Space 受限空间	≤24 hours ≤24 小时
5	Ray Work 射线作业	For operating units: ≤10 hours 运行装置≤10 小时 Shutdown due to overhaul is approved and determined according to actual conditions 停工大检修根据实际情况审批确定
7	Working at Height 高处作业	For operating units: ≤12 hours 运行装置≤12 小时 For shutdown due to overhaul ≤72 hours 停工大检修≤72 小时
8	Roadblock Work 断路作业	≤72 hours ≤72 小时

5.6.4 Approval of High Risk Work Permit 高风险作业许可证审批

5.6.4.1 The approval of high-risk work permits is divided into three levels: application, review

(countersign), and approval. Approvers at all levels must implement the main responsibility of management, and improve the efficiency of approval while ensuring that HSE risks are under control. See the table below:

高风险作业许可证审批分为申请、审核（会签）、批准三个层次，各层次审批人员必须落实管理主体责任，在保证 HSE 风险受控的同时提高审批效率。见下表：

High-risk work permit approval schedule

高风险作业许可证审批明细表

Item 序号	High Risk Work Permit 高风险作业许可证	Application 申请	Review or Signature 审核或会签	Approval 批准
1	Special hot work 特级动火	Applicant of operating department 运行部申请人	Operation Department Deputy Head of HSE, Safety Management Staff of HSE Management Department 运行部主管 HSE 副部长 HSE 管理部安全管理人员	Operation department HOD 运行部部长
2	Grade 1 hot work 一级动火	Applicant of operating department 运行部申请人	Operation department HSE engineer 运行部 HSE 工程师	Operation Department Deputy Head of HSE 运行部主管 HSE 副部长
3	Grade 2 hot work 二级动火	Applicant of operating department 运行部申请人	Operation department HSE engineer 运行部 HSE 工程师	Operation Department Deputy Head of HSE 运行部主管 HSE 副部长
4	Entering confined spaces 进入受限空间	Applicant of operating department 运行部申请人	Operation department HSE engineer 运行部 HSE 工程师	Operation Department Deputy Head of HSE 运行部主管 HSE 副部长
5	Ray work 射线作业	Applicant of operating department 运行部申请人	Operation department HSE engineer / Safety management staff of HSE management department 运行部 HSE 工程师/HSE 管理部安全管理人员	Operation Department Deputy Head of HSE 运行部主管 HSE 副部长
6	General work at height 一般高处作业	Applicant of operating department 运行部申请人	Operation department specialist engineer 运行部专业工程师	Operation Department HSE Engineer 运行部 HSE 工程师
7	Special work at height 特殊高处作业	Applicant of operating department 运行部申请人	Operation department HSE engineer 运行部 HSE 工程师	Operation Department Deputy Head of HSE 运行部主管 HSE 副部长

8	Roadblock work (Namely public area/road occupation application form) 断路作业(即公共区域/道路占用申请单)	Specialist department (unit) 作业部门（单位）	The department/scheduling department where the roadblock area is located 断路区域所在部门/计划调度部	Fire control supervisor of HSE management Department HSE 管理部消防主管

5.6.4.2 When the high-risk operation permit involves the change of key personnel, the changed personnel shall sign on the high-risk operation permit with the approval of the approver. In case of large number of personnel changes, it should be handled again.

高风险作业许可证涉及关键人员变动时，应经审批人同意后，变更人员在高风险作业许可证上签字。变更人员较多时，应重新办理。

5.6.4.3 High-risk operation permit is the basis of the operation, the relevant personnel must strictly go through the examination and approval procedures, the application, review, approval personnel must sign on the spot, is strictly prohibited to sign before confirmation; No alteration or proxy signature is allowed. If modification is really necessary, the approving person shall sign for confirmation at the modification place.

高风险作业许可证是作业的依据，相关人员必须严格履行审批手续，申请、审核、批准人员必须现场签字，严禁先签字后确认；不得涂改、代签，确需修改时，应经批准人在修改处签字确认。

5.6.4.4 In case of emergency and urgent repair operation is needed, the operation permit shall be applied according to the following requirements:

发生紧急突发情况，需要紧急抢修作业时申请作业许可证按照以下要求办理：

（1） The operation team leader shall be the job applicant after receiving the telephone authorization.

运行班组长在接到电话授权后作为作业申请人。

（2） The authorizer's leave or public leave shall be approved by the person in charge of his/her work.

批准人休假或公出，由主持其工作的人员批准。

5.6.5 High Risk Work Permit Cancellation 高风险作业许可证取消

When any of the following situations occurs, the operation department and the operation department are responsible for immediately terminating the operation, canceling the high-risk operation permit, and re-applying if the operation is to continue.

当发生下列任何一种情况时，运行部门和作业部门都有责任立即终止作业，取消高风险作业许可证，若要继续作业应重新办理。

5.6.5.1 The operating environment and conditions, and the content of the operation have changed;

作业环境和条件、作业内容发生变化；

5.6.5.2 The actual operation has a significant deviation from the requirements of the operation plan;

实际作业与作业计划的要求发生重大偏离；

5.6.5.3 On-site operators discover major safety hazards;

现场作业人员发现重大安全隐患；

5.6.5.4 Violations are found; in the state of emergencies.

发现有违章行为；突发事故事件状态下。

5.6.6 High-risk work permit closed 高风险作业许可证关闭

After the operation is completed, the guardian of the operation team signs and confirms after passing the on-site acceptance, then the high-risk operation permit can be closed and returned to the HSE engineer for filing.

作业完成后，运行班组监护人在现场验收合格后签字确认，方可关闭高风险作业许可证，并返回HSE 工程师存档。

5.6.7 Filling in the High Risk Work Permit 高风险作业票证填写

5.6.7.1 Applicants should prepare relevant materials before starting the work. The analysis results can be analyzed using the laboratory analysis sheet, and the results can be filled in the high-risk work permit. Mark “√” in □ for the required confirmation options, mark "×" in □ before the inapplicable option, regardless of the need to confirm or the inapplicable option, the relevant personnel should sign and confirm. For the content that does not need to be filled in, always use "/".

作业前作业申请人应准备好相关资料，分析结果可以使用化验分析单，将结果填入高风险作业许可证，对需要的确认选项在□划“√”，不适用的选项前的□划“×”，无论需要确认还是不适用的选项均应由相关人员签名确认。对不需要填写的内容，一律用“/”表示。

5.6.7.2 The relevant materials involved in the high-risk operation permit include but are not limited to:

高风险作业许可证涉及的相关资料包括但不限于：

（1） Related drawings
相关附图；

（2） Risk assessment results
风险评估结果；

（3） Procedures and measures
方案措施。

5.6.7.3 The job applicant shall participate in the work covered by the high-risk operation permit on the spot. When the operation involves multiple responsible persons, the responsible persons involved shall be listed in the high-risk operation permit application form.

作业申请人应实地参与高风险作业许可证所涵盖的工作，当作业涉及多个负责人时，涉及的负责人均应列在高风险作业许可证申请表内。

5.6.7.4 After receiving the work permit application from the work applicant, the content that the reviewer and approver should confirm includes:

在收到作业申请人的作业许可证申请后，审核人、批准人应确认的内容包括：

（1） Confirm the details of the operation;

确认作业详细内容；

（2） Confirm all supporting documents, including job task risk analysis, safe construction plan,relevant schematic diagram of the operation area, qualification of the operation unit, etc.;

确认所有的支持文件，包括工作任务风险分析、安全施工方案、作业区域相关示意图、作业单位资质等；

（3） Confirm whether all HSE risk reduction measures that should be taken before and after the operation are applicable, including system isolation, oxygen deficiency, toxic and harmful gases, flammable and explosive gases, working environment gas detection time and frequency, emergency measures, etc.;

确认作业前、作业后应采取的所有削减 HSE 风险措施是否适用，包括系统隔离，缺氧、有毒有害气体、易燃易爆气体、作业环境气体检测时间和频次，应急措施等；

（4） Analyze and evaluate the mutual influence of the surrounding environment or adjacent operation areas, and confirm measures to control and reduce HSE risks;

分析、评估周围环境或相邻作业区域的相互影响，并确认控制削减 HSE 风险的措施；

（5） Confirm the high-risk operation permit period and others.

确认高风险作业许可证期限和其他。

5.6.7.5 When an ongoing operation receives an emergency stop or evacuation signal, all operation permits are immediately invalidated. If there is a need to continue the operation after the emergency is resolved, the applicant should re-apply.

正在进行的作业接到紧急停止或撤离信号时，所有的作业许可证立即失效。如紧急情况解除后需要继续作业，应重新办理。

5.6.8 High Risk Work Permit during Holidays (Statutory Holiday, Saturday, Sunday)

节假日（法定节日、周六、周日）高风险作业许可证管理

5.6.8.1 All majors should follow the principle of "maintaining stable production during holidays". During the non-holiday production period, the hidden danger investigation should be carried out seriously, various hidden dangers should be dealt with in time, preventive and remedial inspection and maintenance work should be done, and various high-risk operations especially hot work should be avoided during the holidays, so as to reduce the production equipment risks of.

各专业要以“维持节假日平稳生产”为原则。在非节假日生产期间，应认真开展隐患排查，及时处理各类隐患，做好预防性、补救性检维修工作，尽量避免在节假日期间安排各类高风险作业尤其是

动火作业，从而降低生产装置的风险。

5.6.8.2 On the eve of holidays, each profession shall faithfully report all kinds of high-risk operations arranged by the profession, which shall be implemented only after approval of the professional leaders and approval of the HSE management department of the company by the HSE personnel in charge.

节假日前夕，各专业应如实上报本专业安排的各类高风险作业，专业主管领导同意后经 HSE 主管人员报公司 HSE 管理部门审批后方可实施。

5.6.8.3 In principle, on holidays and daily nights from 20:00 to 8:00 the next day, high-risk operations are not allowed in each production facility.

原则上节假日和日常夜间 20:00 至次日 8:00，各生产装置内不允许进行高风险作业。

5.6.8.4 On holidays and daily nights from 20:00 to 8:00 the next day, when there are high-risk operations that affect normal production and operation and require emergency repairs, the approval level needs to be increased by one level.

节假日和日常夜间 20:00 至次日 8:00，当出现影响正常生产运行须紧急抢修的高风险作业时，审批级别需提高一个档次。

5.6.8.5 During holidays, risky operations during equipment shutdown and overhaul will not be upgraded.

节假日逢装置停工大修期间的风险作业不升级。

5.6.7 Archive and Management of High Risk Work Permits 高风险作业许可证存档与管理

5.6.7.1 The work permit is in triplicate: the first page: the application department keeps it; the second page: the guardian’s preservation; the third page: the operator’s preservation.

作业许可证一式三联：第一联：申请部门保存；第二联：监护人员保存；第三联：作业人员保存。

5.6.7.2 After the high-risk operation permit is issued, no further modifications are allowed. HSE supervisors regularly summarize and count various high-risk operation permits, and report the number of various high-risk operation permits to the HSE Management Department every month.

高风险作业许可证签发后，不得再做任何修改。HSE 主管人员定期对各类高风险作业许可证进行汇总，统计，每月将各类高风险作业许可证数量上报 HSE 管理部。

5.6.7.3 The retention period of all high-risk work permits is one year.

所有高风险作业许可证保存期为一年。

5.7 High Risk Operation Requirements 高风险作业要求

5.7.1 Before the operation, the operation department and the supervisor of the operation application shall identify possible hazards in the operation and formulate corresponding safety measures.

作业前，作业部门和作业申请主管人员一起对作业可能存在的危险源进行辨识，制定相应的安全

措施。

5.7.2 Before the operation, the operation department (unit) should make a safety report for the personnel participating in the operation, the main contents are as follows:

作业前，作业部门（单位）应对参加作业的人员进行安全交底，主要内容如下：

5.7.2.1 The possible hazards at the job site and during the operation and the specific safety measures to be taken;

作业现场和作业过程中可能存在的危险源及应采取的具体安全措施；

5.7.2.2 The method of use and precautions for the use of personal protective equipment used in the operation;

作业过程中所使用的个体防护器具的使用方法及使用注意事项；

5.7.2.3 Knowledge of accident prevention, avoidance, escape, self-rescue, mutual rescue, etc.;

事故的预防、避险、逃生、自救、互救等知识；

5.7.2.4 Related accident cases and experiences and lessons.

相关事故案例和经验、教训。

5.7.3 Before the operation, each professional supervisor should perform the following tasks:

作业前，各专业主管人员应进行如下工作：

5.7.3.1 Isolate, clean, and replace equipment and pipelines, and confirm that they meet the safety requirements for operations such as hot fire and entry into restricted spaces;

对设备、管线进行隔离、清洗、置换，并确认满足动火、进入受限空间等作业的安全要求；

5.7.3.2 Take corresponding safe disposal measures for radioactive sources;

对放射源采取相应的安全处置措施；

5.7.3.3 Clarify the underground concealed works at the operation site;

对作业现场的地下隐蔽工程进行交底；

5.7.3.4 Workplaces with corrosive media should be equipped with eyewash and spray facilities;

腐蚀性介质的作业场所应配备洗眼器和喷淋设施；

5.7.3.5 The night work site should be equipped with lighting devices that meet the requirements.

夜间作业场所应设置满足要求的照明装置。

5.7.4 Before the operation, the operation department and the person in charge of the operation application shall jointly check to confirm that the equipment and process treatment meet the safety requirements. At the same time, the following requirements must be met:

作业前,作业部门和作业申请主管人员共同检查，确认设备、工艺处理等满足安全要求，同时还需符合如下要求：

5.7.4.1 Fire-fighting passages and driving passages on the job site should be kept unblocked; debris that affects operational safety should be cleaned up;

作业现场消防通道、行车通道应保持畅通；影响作业安全的杂物应清理干净；

5.7.4.2 The ladders, railings, platforms, covers and other facilities on the job site should be complete and firm, and the temporary facilities used should ensure safety;

作业现场的梯子、栏杆、平台、盖板等设施应完整、牢固，采用的临时设施应确保安全；

5.7.4.3 Effective protective measures should be taken for pits, wells, trenches, holes, etc. that may endanger safety at the operation site, and warning signs should be set, and red warning lights should be set at night; electrical power supplies on operating equipment should be reliably cut off, and the power switch should be locked and safety warning signs should be added;
作业现场可能危及安全的坑、井、沟、孔洞等应采取有效防护措施，并设警示标志，夜间应设警示红灯；作业设备上的电器电源应可靠断电，并在电源开关处加锁并加挂安全警示牌；

5.7.4.4 The gas protection equipment, fire-fighting equipment, communication equipment, lighting equipment, etc. used in the operation should be intact;
作业使用的气体防护器具、消防器材、通信设备、照明设备等应完好；

5.7.4.5 Scaffolding, hoisting machinery, electric welding equipment, hand-held electric tools and other tools used in the operation should meet the requirements of operational safety; hand-held and mobile electric tools that exceed the safe voltage should be equipped with leakage protection devices.
作业使用的脚手架、起重机械、电气焊用具、手持电动工具等各种工器具应符合作业安全要求；超过安全电压的手持式、移动式电动工器具应配有漏电保护装置。

5.8 Hot Work 动火作业

5.8.1 Scope of Hot Work 动火作业范围

5.8.1.1 Unconventional operations that can directly or indirectly generate open flames are inclusive of, but not limited to:
能直接或间接产生明火的非常规作业。包括但不限于：

（1） Electric welding, gas welding, brazing, plastic welding and other welding cutting;
电焊、气焊、钎焊、塑料焊等焊接切割；

（2） Electric heat treatment, electric drill, sanding, sandblasting, pneumatic pick and breaking, hammering, blasting, ferrous metal impact and other operations that generate sparks;
电热处理、电钻、打磨、喷砂、风镐及破碎、锤击、爆破、黑色金属撞击等产生火花的作业；

（3） Open flame operations such as blowtorch, stove, electric stove, liquefied gas stove, simmering pipe, boiling asphalt, and frying sand;
喷灯、火炉、电炉、液化气炉、煨管、熬沥青、炒沙子等明火作业；

（4） Fuel mechanical equipment such as generators with power sources and air compressors with power sources are installed in the production area;
在生产区域内设置自带动力源的发电机和自带动力源的空气压缩机等燃油机械设备；

（5） Use non-explosion-proof electrical equipment in flammable and explosive hazardous areas.
在易燃易爆危险区域使用非防爆的电器设备等。

5.8.1.2 According to the dangerous degree of the hot parts, hot work is divided into three levels according to the dangerous degree of the hot parts: Special hot work, Grade 1 hot work, and

Grade 2 hot work.

动火作业根据动火部位危险程度，装置内动火分为三级：特级动火、一级动火、二级动火。

（1） Special hot fire includes but is not limited to the following situations:

特级动火包括但不限于以下情况：

1）Do not replace the containers, equipment, pipelines and other equipment with flammable, explosive or flammable or toxic media, and work directly on the body;

在带有易燃易爆或可燃、有毒介质的容器、设备、管线等设备不置换直接在本体上动火作业；

2）Thermal open fire operations such as electric welding, opening, cutting, heat treatment, etc., on equipment, containers, and pipelines with flammable, toxic media or high temperature and high pressure media under pressure shall be managed according to special hot operations;

可燃、有毒介质或高温高压介质的设备、容器、管线上带压进行电焊、开孔、切削、热处理等热工明火作业按特殊动火作业管理；

3）There may be flammable, explosive or combustible, toxic media in industrial water wells, dirty (oil) pools and other places where the hot work that must be carried out for production needs to be handled according to special hot fire;

可能存在易燃易爆或可燃、有毒介质工业下水井、污（油）水池等部位确属生产需要必须进行的动火作业按特殊动火处理；

4）When the unit is shut down for overhaul, and the first hot fire in the unit after the process is qualified;

装置停车大检修，工艺处理合格后装置内的第一次动火；

5）Special hot work lead by the HOD of the operation department organized by related functional departments (unit) to jointly conduct risk assessment; establish a reliable work plan (safety measure) and emergency plan and implement them effectively, and only after the operation department HOD's approval can the hot work be carried out.

特殊动火必须由运行部部长牵头，组织相关职能部门及动火作业部门（单位）共同进行风险评价；制定可靠的工作方案（安全措施）及应急预案并有效落实，经运行部部长审批后方可动火。

（2） Grade 1 hot work includes but is not limited to the following situations:

一级动火包括但不限于以下情况：

1）Process production unit area in production state;

处于生产状态的工艺生产装置区；

2）Dangerous chemical warehouses, various oil tank farms, pipe corridors, combustible gas and combustion-supporting gas tank farms within the fire dike (industrial water wells, sewage tanks, areas within 15 meters from the tank wall without fire dikes);

危险化学品库、各类油罐区、管廊、可燃气体及助燃气体罐区防火堤内（工业下水井、污水池、无防火堤的距罐壁 15 米以内的区域）；

3）Houses, loading and unloading areas and tank washing stations, laboratories or

computer rooms with combustible liquids, combustible gases, combustion-supporting gases and toxic media;

可燃液体、可燃气体、助燃气体及有毒介质的房屋、装卸区和洗槽站、实验室或机房；

4）Vessels, pipelines, and equipment that store and transport flammable, explosive, toxic liquids and gases in normal production facilities are isolated and subjected to hot work after the process is qualified;

正常生产装置内储存、输送易燃易爆、有毒液体和气体的容器、管线、设备等进行了隔离且进行工艺处理合格后进行的动火作业；

5）The operating production facility is divided into zones 1 and 2 according to the explosive gas environment, and the explosive dust environment is divided into zones II;

运行生产装置内按照爆炸性气体环境划分属于 1、2 区的区域，爆炸性粉尘环境划分属于 II 区的环境；

（3） Grade 2 hot work includes but is not limited to the following situations

二级动火包括但不限于以下情况：

1）The device is shut down for major repairs, and the process is qualified. After the inspection and acceptance of the production transfer to the inspection and acceptance organized by the Planning and Scheduling Department, and the first hot operation is implemented safely, the device can be managed according to the second level of hot work;

装置停工大修，工艺处理合格，经计划调度部组织生产转检修验收确认后并安全实施了第一次动火作业的装置内动火，可以按二级动火管理；

2）Qualified vessels and pipeline hot work after transportation to a safe place, purging

运到安全地点，并经吹扫处理后动火分析合格的容器、管线动火；

3）Other temporary hot fires that are not classified as first-level hot fires and special hot fires.

不属于一级动火和特殊动火的其它临时动火。

5.8.2 Hot Work Requirement 动火作业要求

5.8.2.1 While meeting the above requirements, special hot work should also meet the following requirements:

特殊动火作业在符合上述要求的同时，还应符合以下规定：

（1） When the production is unstable, no hot work should be carried out under pressure without replacement;

在生产不稳定的情况下不应进行带压不置换动火作业；

（2） Work plans should be formulated in advance, safety and fire prevention measures should be implemented, and a full-time fire brigade can be invited to the scene to monitor if necessary;

应预先制定作业方案，落实安全防火措施，必要时可请专职消防队到现场监护；

（3） The operation department shall notify the planning and dispatching department and related departments in advance, and can take corresponding emergency measures in time under abnormal circumstances;
运行部门应预先通知计划调度部及相关部门，在异常情况下能及时采取相应的应急措施；

（4） The operation should be carried out under positive pressure, and the work site should be well ventilated and exhausted;
应在正压条件下进行作业，作业现场通排风良好；

（5） Special-grade hot work need to ensure continuous monitoring of ambient gas conditions on site, and record the detection data every 2 hours.
特级动火需要保证现场持续监测周围环境气体情况,并且间隔 2 小时记录一次检测数据。

5.8.2.2 For special, first and second class hot fires, only one hot spot is limited to one permit. The hot work is subject to two-person guardianship. The application department and the operation department (unit) will each send one person, mainly the guardian of the department; During the overhaul period, one guardian can simultaneously monitor the hot work in the same device area and on the same working surface. In principle, no more than 3 hot work are allowed.
特级、一级和二级动火，实行一张许可证只限一处动火，动火实行双人监护，申请部门和作业部门（单位）各派一人，以申请部门监护人为主；大检修期间的二级动火，一名监护人可同时监护同一装置区域内、同一作业面的动火，原则上最多不准超过 3 处。

5.8.2.3 All open fire operations are strictly prohibited during the shutdown of the unit for purging and the feeding and start-up of materials; floor drains, drains, various wells, exhaust pipes, pipelines, etc. of the production sewage system must be tightly sealed; not within 30 meters of the same hot work area construction operations such as flammable solvent cleaning and painting should be carried out at the same time.
装置停工吹扫及投料开车过程中，严禁一切明火作业；生产污水系统的地漏、排水口、各类井、排气管、管道等必须封严盖实;在同一动火区域 30 米范围内不应同时进行可燃溶剂清洗和喷漆等施工作业。

5.8.2.4 If hot work involves special operations such as entering confined spaces, temporary electricity use, and high-altitude operations, a corresponding special safety operation permit must also be obtained.
动火作业涉及进入受限空间、临时用电、高处作业等专项作业的，还须办理相应的专项安全作业许可证。

5.8.2.5 When hot work involves adjacent installations, the applicant should contact the personnel of the neighboring departments to jointly take safety measures and sign opinions in the relevant party column of the hot work safety permit.
动火作业涉及相邻装置时，申请人与相邻部门人员联系，共同采取安全措施并在动火安全作业许可证相关方栏内签署意见。

5.8.2.6 In the process safety measures, measures such as emptying, purging, replacement,

analysis, removing and adding blind plates, setting isolation barriers, preparation of fire-fighting equipment, oily sewage wells, and floor drain plugging are all proposed and implemented by local departments.

工艺安全措施中的排空、吹扫、置换、分析，拆加盲板、设置隔离屏障，消防器材的准备，含油污水井、地漏封堵等措施，均由属地部门提出并安排落实。

5.8.2.7 In any of the following situations, anyone can ask for immediate termination of the operation. The guardian shall immediately withdraw the operation permit after confirmation and inform the approver of the reason for the termination of the permit. If the operation needs to be continued, the operation should be handled again when:

发生下列任何一种情况时，任何人可以提出立即终止作业的要求，监护人确认后立即收回作业许可证，并告知批准人许可证终止的原因，需要继续作业应重新办理：

（1） The surrounding environment, content and conditions of the operation have changed;

作业周边环境、内容和条件发生变化；

（1） Hot work does not meet the requirements of the operation plan;

动火作业与作业计划的要求不符；

（2） On-site workers discover major safety hazards that may cause personal injury.

现场作业人员发现重大安全隐患，有可能造成人身伤害的情况。

5.8.2.8 The operation department should set up guards in the hot work construction area, and it is strictly forbidden to enter the hot work area by persons or vehicles not related to the hot work operation. The application department shall equip fire trucks and medical rescue equipment and equipment if necessary according to the degree of risk of the operation.

作业部门在动火施工区域应设置警戒，严禁与动火作业无关人员或车辆进入动火区域，申请部门根据作业的风险程度，必要时配备消防车及医疗救护设备和器材。

5.8.2.9 If it is necessary to set up a fixed hot zone in a safe place in the production area, the application department shall fill in the "Fixed Hot Work Zone Application Form", and submit it to the supervisor for approval after the review by the Planning and Dispatching Department and the safety assessment by the HSE Management Department.

在生产区域内安全有保障的地点如需设置固定动火区，由申请部门填写《固定动火区申请表》，经计划调度部审核、HSE 管理部进行安全评估审核后报主管领导批准。

5.8.2.10 The setting of the fixed hot work zone must meet the following safety requirements:

固定动火区的设置须满足以下安全要求：

（1）Set in the upwind or crosswind direction of the annual minimum frequency wind direction in the flammable and explosive area, to ensure that the combustible gas will not spread to the fixed hot zone when the production is normally empty or a leakage accident occurs;

设置在易燃易爆区域全年最小频率风向的上风或侧风方向，在生产正常放空或发生泄漏事故时，能保证可燃气体不会扩散到固定动火区；

（2） The distance from flammable and explosive plants, warehouses, tank farms, equipment, installations, wells, drains, water-sealed wells, etc. should not be less than 30m, and meet the fire separation requirements;

距易燃易爆的厂房、库房、罐区、设备、装置、阴井、排水沟、水封井等不应小于 30m，并符合防火间距要求；

（3） Fixed fire areas are not allowed to store combustibles and other sundries. Complete fire prevention measures should be formulated and implemented, obvious signs should be set up, sufficient fire extinguishing equipment should be equipped, and the person responsible for fire prevention should be assigned;

固定动火区不准存放可燃物及其他杂物，应制定并落实完善的防火措施，设置明显的标志，配备足够数量的灭火器材，落实防火责任人；

（4） For hot work in a fixed hot area, the application department shall be responsible for hot fire safety management, and supervise and inspect the hot work units and personnel to implement various safety measures for hot work in the area;

固定动火区内动火作业办理固定动火手续，由申请部门负责动火安全管理，监督检查动火单位和人员落实区内各项动火作业安全措施；

（5） HSE supervisors are responsible for supervising and inspecting the safety management status of hot work in fixed hot fire areas, and urge professional supervisors or responsible teams to do a good job in safe hot work management; the safety management status of hot work in fixed hot fire areas every 3 months organize a comprehensive safety assessment, and cancel the fixed hot zone when the assessment fails or the environment changes.

HSE 主管人员负责对固定动火区的动火作业安全管理状况进行监督检查，督促专业主管人员或责任班组做好安全动火管理；每 3 个月对固定动火区的动火作业安全管理状况组织进行一次综合安全评估，评估不合格或环境发生变化时则取消固定动火区设置。

5.8.3 Gas Analysis Requirement 气体分析要求

5.8.3.1 Hot work must carry out combustible gas analysis and testing, and the hot work can only be carried out after the gas analysis is qualified; the sampling points for hot analysis must be representative. In larger equipment, upper, middle and lower sampling should be taken; If there is a fire on a long material pipeline, sampling should be done in sections in a completely isolated area.

动火作业必须进行可燃气体分析检测，气体分析合格后方可进行动火作业；动火分析的取样点要有代表性，在较大的设备内动火，应采取上、中、下取样；在较长的物料管线上动火，应在彻底隔绝区域内分段取样。

5.8.3.2 If there is a fire outside the equipment, environmental analysis should be carried out at least within 10m of the fire point. Qualified personnel trained in gas analysis should use a portable gas detector to complete the environmental inspection work, and the analysis result should be filled in the hot work safety operation permit.

在设备外部动火，应至少在动火点 10m 范围内进行环境分析,经气体分析培训合格人员使用便携式气体检测仪完成环境检测工作，分析结果填入动火安全作业许可证。

5.8.3.3 When the equipment, pipelines, containers, etc. are confirmed to be purged and

effectively isolated, the gas detection and analysis will be carried out by the Quality Inspection Department for the first hot work operation. After the first safe hot work, under the circumstance that the effective isolation measures and the safety environment have not changed, the operation department will train qualified personnel (guardians) to complete the environmental gas detection work through the gas analysis and analyze the gas detection work of the subsequent hot work. The result is filled in the hot fire safety operation permit.

设备、管道、容器等经确认吹扫合格、有效隔离后首次动火作业时，气体检测分析工作由质量检验部进行检测分析。经首次安全动火作业后，在有效隔离措施和安全环境未发生改变情况下，后续动火作业的气体检测工作由运行部通过气体分析培训合格人员（监护人）完成环境气体检测工作，并将分析结果填入动火安全作业许可证。

5.8.3.4 The interval between hot work analysis and hot work should not exceed 30 minutes. If on-site conditions do not permit, the interval may be relaxed, but not exceed 60 minutes. If the analysis and test report is used, it must be attached to the upper left side of the front face of the hot work Permit stub. If the operation is interrupted for more than 60 minutes, the sample shall be re-sampled and analyzed. The work shall be analyzed before starting fire. Special fire operation should be monitored at any time.

动火分析和动火间隔不应超过 30 分钟，如现场条件不允许，间隔时间可适当放宽，但不应超过 60 分钟，采用分析检测报告单的，必须附在动火安全作业许可证存根正面左上方；作业中断时间超过 60 分钟，应重新取样分析，每项动火前均应进行动火分析；特殊动火作业期间应随时进行监测。

5.8.3.5 If toxic and harmful media exist in the site of ignition, the concentration shall be tested and analyzed. If the content exceeds the prescribed standard, corresponding safety measures shall be taken, and it shall be indicated in the column of "Supplementary safety Measures" in the safe operation license of ignition.

动火部位存在有毒有害介质的，应对其浓度做检测分析，若其含量超过规定的标准，应采取相应的安全措施，并在动火安全作业许可证“补充安全措施”一栏注明。

5.8.3.6 When performing hot gas analysis in the restricted space, it is required to use a portable gas detector for real-time monitoring in the restricted space. In case of any abnormality, the hot gas should be stopped and reprocessed for sampling analysis. If it is necessary to sample the gas in the restricted space with a balloon, the samples should be kept for at least 8 hours after the analysis results are obtained.

对受限空间内的气体进行动火气体分析时，要求在受限空间内使用便携式气体检测仪实时监测，出现异常应停止动火，重新处理后再采样分析；如果需要对受限空间内气体进行球胆采样待分析结果出来后，采样分析样品至少要保留 8 小时。

5.8.3.7 Standard for hot gas analysis 动火气体分析合格标准

（1）When using combustible gas detector for gas analysis, the measured gas concentration less than or equal to 20% of the lower limit of gas explosion (LEL) is qualified;

使用可燃气体检测仪进行气体分析时，被测的气体浓度小于或等于气体爆炸下限（LEL）的 20%为合格；

（2）When using other analytical means to carry out gas analysis, when the lower limit of

flammable gas explosion (LEL) is greater than or equal to 4%, the analytical detection data is less than 0.5% (volume percentage); As a qualified; When the lower limit of flammable gas explosion (LEL) is less than 4%, the analysis and detection data is less than 0.2% (volume percentage), which is qualified.

使用其他分析手段进行气体分析时，可燃气体爆炸下限（LEL）大于等于 4%时，分析检测数据小于 0.5%（体积百分数）；为合格；可燃气体爆炸下限（LEL）小于 4%时，分析检测数据小于 0.2%（体积百分数）为合格。

（3）The production and storage facilities such as equipment and pipelines that contain or contain hazardous chemicals and production equipment in Class A and B areas shall be completely isolated from the production system, cleaned and replaced, and the operation shall be carried out only after qualified sampling analysis.

凡在盛有或盛装过危险化学品的设备、管道等生产、储存设施及处于甲、乙类区域的生产设备上动火作业，应将其与生产系统彻底隔离，并进行清洗、置换，取样分析合格后方可作业。

5.9 Entering Confined Space 进入受限空间作业

5.9.1 Definition and scope of confined space operations 受限空间作业的定义和范围

Restricted space refers to enclosed and semi-enclosed facilities and places in the production area with restricted import and export, poor ventilation, inflammable, explosive, toxic and harmful substances, or lack of oxygen, which poses a threat to the health and life safety of personnel entering. Such as various towers, kettles, tanks, tanks, furnaces, drums, pipes, containers and basements, manholes, pits (pools), sewers, trenches, pits, wells, ponds, culverts, cabins, underground concealed works, and airtight containers. Long-term unused facilities or poorly ventilated places, etc. All equipment, facilities and places that are poorly ventilated and are likely to cause accumulation of toxic and harmful gases and hypoxia. The restricted space is divided into two states: general and special;

受限空间是指生产区域内，进出口受限，通风不良，可能存在易燃易爆、有毒有害物质或缺氧，对进入人员的身体健康和生命安全构成威胁的封闭、半封闭设施及场所。如各类塔、釜、槽、罐、炉膛、锅筒、管道、容器以及地下室、窨井、坑（池）、下水道、沟、坑、井、池、涵洞、船舱、地下隐蔽工程、密闭容器。长期不用的设施或通风不畅的场所等一切通风不良、容易造成有毒有害气体积聚和缺氧的设备、设施和场所。受限空间分为一般和特殊两种状态；

5.9.1.1 General restricted space 一般受限空间

（1）Existence or possible generation of toxic and harmful gases, mechanical, electrical and other hazards;

存在或可能产生有毒有害气体、机械、电气等危害；

（2）Existence or possible production of materials for burial operators;

存在或可能产生掩埋作业人员的物料；

（3）The internal structure may trap workers in it (such as fixed equipment or four walls tilted

inward).

内部结构可能将作业人员困在其中（如内有固定设备或四壁向内倾斜收拢）。

5.9.1.2 Special confined space 特殊受限空间

（1）The confined space cannot be qualified through process purging, cooking, and replacement treatment, and the pipelines and valves connected to the confined space cannot be disconnected or blind plates are added;

受限空间内无法通过工艺吹扫、蒸煮、置换处理达到合格，与受限空间相连的管线、阀门无法断开或加盲板；

（2）There is no guarantee that the oxygen concentration inside the work space is qualified, and the toxic and hazardous substances are higher than the maximum allowable concentration of the occupational exposure limit of hazardous factors in the workplace.

无法保证作业空间内部的氧气浓度合格，有毒有害物质高于工作场所有害因素职业接触限值的最高容许浓度。

5.9.1.3 Some areas or locations do not meet the definition of confined space, but have potential hazards that occur when entering the confined space, and should be managed according to the operation of entering the confined space, including but not limited to the following situations:

有些区域或地点不符合受限空间的定义，但具有进入受限空间时发生的潜在危害，应按进入受限空间作业管理,包括但不限于以下几种情况：

（1）Vertical wall dikes higher than 1.2 meters, the operator is exposed to physical or chemical hazards, toxic and harmful gases heavier than air, and there is no step inside or outside the dike to the top;

高于 1.2 米的垂直墙壁围堤，作业者身体暴露于物理或化学危害，比空气重的有毒有害气体之中，且围堤内外没有到顶部的台阶；

（2）The depth of ground breaking or trench opening is greater than 1.2 meters or the head of the personnel is below the ground during operation, and there is no evacuation channel;

动土或开渠深度大于 1.2 米或作业时人员的头部在地面以下，没有撤离通道；

（3）Purging the space with inert gas may cause gas hazards near the opening of the space. This can be regarded as a confined space (during entry preparation and entry, gas detection should be carried out to determine the size of the hazardous area around the opening, and set up isolation areas and Warning signs to prevent accidental entry).

用惰性气体吹扫空间，可能在空间开口处附近产生气体危害，此处可视为受限空间（在进入准备和进入期间，应进行气体检测，确定开口周围危害区域的大小，设置隔离区域和警示标志，防止误入）。

5.9.2 Safety Management of Entering Confined Spaces 进入受限空间作业安全管理

5.9.2.1 Before the operation starts, first conduct a hazard risk analysis, and formulate a special plan for relatively risky operations. In the plan, the safety responsibilities of the person in charge,

guardian, and operator on the site should be specified, and an emergency plan should be formulated.

作业开始前，首先进行危害风险分析，对较大风险性作业应制定专项方案，方案中应明确现场负责人、监护人、作业人安全职责，制定应急预案。

5.9.2.2 Before working in a confined space, process, equipment and HSE engineers should conduct special safety training or safety notifications for on-site safety leaders, guardians, operators, emergency rescuers, etc. of the operation department (unit), including the hazards and safety of the operations they are engaged in Preventive measures, specific content of the operation plan, correct use of labor protection equipment for testing instruments, emergency response measures in emergency situations, etc., and relevant records should be kept.

受限空间作业前，工艺、设备和 HSE 工程师应对作业部门（单位）现场安全负责人、监护人、作业人、应急救援人员等进行专项安全培训或安全告知，内容包括所从事作业危险有害因素和安全防范措施、作业方案具体内容、检测仪器劳动防护用品正确使用、紧急情况下应急处置措施等，并应做好相关记录。

5.9.2.3 Before entering the confined space for work, the connected pipelines and valves should be cut off by adding a blind plate or dismantled for isolation. Do not use water sealing or valve closing, etc in substitution of adding a blind plate or dismantling. A safety warning sign should be hanged around the blind plate. After the power supply of electrical equipment in the confined space is effectively cut off, the power switch should be locked and a warning sign should be attached.

在进入受限空间作业前，与其相连的管线、阀门应加盲板断开或拆除一段管道进行隔绝，不能用水封或关闭阀门等代替安装盲板或拆除管道，盲板处应挂醒目的安全警示牌，受限空间内用电设备的电源有效切断后应在电源开关处上锁并加挂警示牌。

5.9.2.4 Good air circulation should be maintained in the confined space. The following measures can be taken:

应保持受限空间空气流通良好，可采取如下措施：

（1）Open manholes, hand holes, material holes, air doors, smoke doors and other facilities that communicate with the atmosphere for natural ventilation;

打开人孔、手孔、料孔、风门、烟门等与大气相通的设施进行自然通风；

（2）When necessary, forced ventilation by fans or ducted air should be used. Before the ducted air, the team guardian should analyze and confirm the medium and air source in the duct. During normal operation, it is prohibited to use the industrial air in the production unit for air supply.

必要时，应采用风机强制通风或管道送风，管道送风前应由班组监护人应对管道内介质和风源进行分析确认，正常作业时禁止使用生产装置内的工业风进行送风。

5.9.2.5 Before operation, the confined space should be cleaned or replaced according to the characteristics of the materials contained (over) in the confined space. The oxygen content must be analyzed and tested. For confined spaces that may contain flammable gases, toxic and harmful gases, they must also be Combustible gas, toxic and harmful gas analysis and detection, and meet the following requirements:

作业前，应根据受限空间盛装（过）的物料特性，对受限空间进行清洗或置换，必须对氧含量进行分析检测，对可能存在可燃气体、有毒有害气体的受限空间，还必须进行可燃气体、有毒有害气体分析检测,并达到如下要求：

（1）The oxygen content is generally 19.5%-21%, and should not exceed 23.5% in an oxygen-rich environment;

氧含量一般为 19.5%～21%，在富氧环境下不应大于 23.5%；

（2）The content of toxic and harmful gases does not exceed the occupational exposure limits of hazardous factors in the workplace. The occupational exposure limits of commonly used toxic and hazardous chemicals are shown in the following table (for reference only):

有毒有害气体含量不超过工作场所有害因素职业接触限值，常用有毒有害化学物质职业接触限值见下表（仅供参考）：

Occupational hazard exposure limit

职业危害接触限值

Item 序号	Name 中文名	Occupational hazard exposure limit (mg/m^3) 职业接触限值（mg/m^3）		
		Max allowable concentration (MAC) 最高容许浓度（MAC）	Time weighted average allowable concentration 时间加权平均容许浓度	Short contact Allowable concentration 短时间接触容许浓度
1	H_2S 硫化氢	10	—	—
2	Ammonia 氨	—	20	30
3	Benzene 苯	—	6	10
4	CO 一氧化碳		20	30
5	CO_2 二氧化碳	—	9000	18000
6	Toluene 甲苯	—	50	100
7	Sulfur dioxide 二氧化硫	—	5	10
8	Liquefied petroleum gas 液化石油气	—	1000	1500

（3）The combustible gas concentration requirements are the same as those specified in 5.8.3.7 of this standard.

可燃气体浓度要求同本标准 5.8.3.7 条规定。

5.9.2.6 Strictly monitor the gas concentration in the confined space, and the monitoring requirements are as follows:

应对受限空间内的气体浓度进行严格监测，监测要求如下：

（1）When entering restricted spaces such as equipment, pipelines, containers, wells, etc. that may contain or produce flammable, toxic, or asphyxiating media, the first gas detection and analysis work is completed by the Quality Inspection Department after the purge is qualified and

effective isolation is confirmed, and the analysis results Fill in the work permit. Workers in confined spaces (except for corresponding labor protection equipment) should be equipped with at least one (four-in-one) portable gas detector capable of detecting four types of gases: LEL, O2, H2S, and CO for continuous detection. If an abnormal alarm occurs, the operation should be stopped immediately And withdraw from the working space;

进入可能存在或产生可燃、有毒、窒息介质的设备、管道、容器、井洞等受限空间作业，在确认吹扫合格、有效隔离后首次气体检测分析工作由质量检验部完成，并将分析结果填入作业许可证。受限空间作业人员（采取相应劳动防护装备除外）至少配备一台（四合一）能检测 LEL、O_2、H_2S、CO 四种气体的便携式气体检测仪持续检测，发生异常报警，应立即停止作业并撤出作业空间；

（2）Gas detection and analysis work in semi-open confined spaces such as equipment, pipelines, foundation pits, culverts, etc. that have not contained flammable or toxic media. Gas detection and analysis work shall be completed by qualified personnel who have passed gas detection training and use qualified portable gas detectors, and Fill the analysis result into the operation permit;

没有盛装过可燃、有毒介质的设备、管道、基坑、涵洞等半敞开环境的受限空间的气体检测分析工作由经过气体检测培训合格的人员使用合格的便携式气体检测仪完成气体检测工作，并将分析结果填入作业许可证；

（3）During the construction operation, the guardian shall check whether the gas environment of the working space is qualified every 2 hours;

施工作业过程中由监护人每间隔 2 小时检测一次作业空间的气体环境是否合格；

（4）Within 30 minutes before the operation, gas sampling and analysis should be conducted in the confined space, and entry can be made only after the analysis is qualified; if the site conditions do not allow, the interval can be appropriately relaxed, but should not exceed 60 minutes;

作业前 30 分钟内，应对受限空间进行气体采样分析，分析合格后方可进入；如现场条件不允许，间隔时间可适当放宽，但不应超过 60 分钟；

（5）When painting paints with volatile solvents, continuous analysis should be done and forced ventilation measures should be taken; confined spaces that may release harmful substances should be continuously monitored. If there is a significant change in the monitoring analysis results, the operation should be stopped immediately and personnel should be evacuated, Deal with the scene, and resume operation only after sampling and analysis are qualified;

涂刷具有挥发性溶剂的涂料时，应做连续分析，并采取强制通风措施；对可能释放有害物质的受限空间，应连续监测，如监测分析结果有明显变化，应立即停止作业，撤离人员，对现场进行处理，在取样分析合格后方可恢复作业；

（6）When the operation is interrupted for more than 60 minutes, sampling and analysis shall be performed again.

作业中断时间超过 60 分钟时，应重新进行取样分析。

5.9.2.7 The following protective measures should be taken when entering the following restricted spaces:

进入下列受限空间作业应采取如下防护措施：

（1）If inflammable, explosive, oxygen-deficient or toxic restricted space fails to meet the requirements after cleaning or replacement, anti-static work clothes and work shoes should be worn, isolation protective mask should be worn, explosion-proof low-voltage lamps and explosion-proof tools should be used, and rescue rope should be tied when necessary;

易燃易爆、缺氧或有毒的受限空间经清洗或置换达不到要求的，应穿防静电工作服及工作鞋，佩戴隔离式防护面具，使用防爆型低压灯具及防爆工具，必要时应拴带救生绳；

（2）In restricted spaces with acid and alkali and other corrosive media, wear anti-acid and alkali work clothes, work shoes, gloves and other anti-corrosion protection products;

酸碱等腐蚀性介质的受限空间，应穿戴防酸碱工作服、工作鞋、手套等防腐蚀护品；

（3）For noise-producing confined spaces, earplugs or earmuffs and other noise-proof protective equipment should be worn. In restricted spaces where dust is generated, dust-proof masks, goggles, etc. should be worn;

产生噪声的受限空间，应配戴耳塞或耳罩等防噪声护具。产生粉尘的受限空间，应配戴防尘口罩、眼罩等防尘护具；

（4）In high-temperature restricted spaces, wear high-temperature protective equipment when entering, and take protective measures such as ventilation, heat insulation, and wearing communication equipment when necessary;

高温的受限空间，进入时应穿戴高温防护用品，必要时采取通风、隔热、佩戴通讯设备等防护措施；

（5）In low-temperature restricted spaces, you should wear low-temperature protective equipment when entering, and take measures such as heating and wearing communication equipment when necessary.

低温的受限空间，进入时应穿戴低温防护用品，必要时采取供暖、佩戴通讯设备等措施。

5.9.2.8 The lighting and electricity safety requirements are as follows

照明及用电安全要求如下：

（1）The lighting voltage in confined spaces should be less than or equal to 36V, and the lighting voltage should be less than or equal to 12V when working in humid containers and small containers; when the working environment originally contains explosive liquids, gases and other media, use explosion-proof flashlights or explosion-proof safety with voltage ≤12V Running lights, running light transformers should not be placed in or on the container;

受限空间照明电压应小于或等于 36V，在潮湿容器、狭小容器内作业照明电压应小于等于 12V；当作业环境原来盛装爆炸性液体、气体等介质的，则使用防爆电筒或电压≤12V 的防爆安全行灯，行灯变压器不应放在容器内或容器上；

（2）In the wet container, the operator should stand on the insulating board while ensuring the reliable grounding of the metal container.

在潮湿容器中，作业人员应站在绝缘板上，同时保证金属容器接地可靠。

5.9.2.9 Before the operation, the operator must fully understand the content, place, time and requirements of the operation, and be familiar with the hazard factors and safety precautions in

the operation; The safety measures shall be confirmed by the implementation, and the operation permit shall be handled. After the consent of the guardian, the operator may enter the restricted space to work.

作业前作业人必须充分了解作业内容、地点、时间、要求，熟知作业中的危害因素和安全防范措施；安全措施应经落实确认、办理了作业许可，经监护人同意后，作业人方可进入受限空间内作业。

5.9.2.10 The guardian shall register the tools and materials brought by the operators, and shall not bring anything other than the operating equipment into the restricted space. After the work is finished, enter the restricted space; Do not throw materials, tools and other articles during operation. Do not take off the protective mask under toxic and anoxic environment. Do not fill the restricted space with oxygen or oxygen-rich air; When leaving the restricted space, operators and working instruments should be checked, and only after they are confirmed to be correct can they be submitted for inspection.

监护人应对作业人员所带的工具、材料须进行登记，禁止携带作业器具以外的物品进入受限空间。作业结束后，进入受限空间；作业中不应抛掷材料、工器具等物品；在有毒、缺氧环境下不应摘下防护面具；不应向受限空间充氧气或富氧空气；离开受限空间时应清点作业人员和作业工器具，确认无误后，方可交验。

5.9.2.11 Outside the restricted space, a certain number of emergency rescue equipment and fire extinguishing equipment shall be provided in accordance with the regulations. Safety warning boards shall be set up at the entrance, and the entrance and exit shall be unblocked to facilitate personnel access, rescue and evacuation.

在受限空间外配备一定数量符合规定的应急救护器具和灭火器材，入口处设置安全警告牌，且确保出入口畅通，便于人员出入和抢救疏散。

5.9.2.12 In case of abnormal conditions or discomfort or difficulty in breathing during operation, the operator shall immediately send a signal to the guardian of the operation and quickly leave the site. In case of abnormal changes in safety measures during operation, the operator shall stop the operation immediately, and the operator shall not enter the restricted space to work again until the safe working conditions are reached.

作业中如发现情况异常或感到不适和呼吸困难时，作业人立即向作业监护人发出信号，迅速撤离现场，安全措施如在作业期间发生异常变化，立即停止作业，待处理并达到安全作业条件后，方可再进入受限空间作业。

5.9.2.13 When the work content and environmental conditions change, the work permit shall be re-applied, and the environmental conditions and safety measures shall be re-confirmed, and the work can only continue after qualified. Without work permission and guardian, it is forbidden to enter the restricted space for work.

当作业内容和环境条件变更时，需重新办理作业许可，应重新对环境条件和安全措施予以确认，合格后才能继续作业。无作业许可和监护人，禁止进入受限空间作业。

5.9.2.14 Under special circumstances, operators can wear long tube mask, air breathing apparatus, etc., but when wearing long tube mask, must carefully check its air tightness, at the

same time to prevent the long ventilation pipe from being squeezed, inhalation mouth should be placed in the upper air outlet of fresh air, and there is a special person to monitor. When an accident occurs, it shall immediately report to the police, rescue personnel must wear qualified protective equipment to enter the equipment, and at least one person to do contact work outside, it is prohibited to blindly rescue.

在特殊情况下，作业人员可戴长管式面具、空气呼吸器等，但佩戴长管面具时，一定要仔细检查其气密性，同时防止通气长管被挤压，吸气口应置于新鲜空气的上风口，并有专人监护。发生事故时，应立即报警，抢救人员必须佩戴合格的防护器具进入设备，并至少有一人在外部做联络工作，禁止盲目施救。

5.9.2.15 The operator shall have the right to refuse the operation and report to the superior in the case of forced risky operation in violation of these provisions, failure to implement safety measures and absence of the guardian of the operation.

对违反本规定的强令冒险作业、安全措施不落实、作业监护人不在场等情况作业人有权拒绝作业，并向上级报告。

5.9.2.16 The restricted space operation with great difficulty, great labor intensity and long time should adopt the mode of rotation operation

难度大、劳动强度大、时间长的受限空间作业应采取轮换作业方式。

5.10 Work at Height 高处作业

5.10.1 Scope of work at height 高处作业的范围

Height work refers to the work carried out at the height or falling height (h) above 2m (including 2m) with the possibility of falling. According to the specific operating height, it is divided into first level 2m≤h≤5m, second level 5m < h≤15m, third level 15m < h≤30m and special level h>30m.

高处作业是指作业高度或坠落高度（h）在 2 米以上（含 2m），有坠落可能的高处位置进行的作业。按照具体作业高度分为一级 2m≤h≤5m，二级 5m＜h≤15m，三级 15m＜h≤30m 和特级 h>30m。

5.10.2 There are 8 objective risk factors that directly cause falling:

直接引起坠落的客观危险因素分为 8 种：

5.10.2.1 The gust wind is above level 5 (wind speed 8.0m/s);

阵风风力五级（风速 8.0m/s）以上；

5.10.2.2 High temperature work of level Ⅱ or above

Ⅱ级或Ⅱ级以上的高温作业；

5.10.2.3 Operations with cold water temperature equal to or lower than 12℃;

接触冷水温度等于或低于 12℃的作业；

5.10.2.4 Insufficient light or poor visibility in the workplace;

作业场所光线不足或能见度差；

5.10.2.5 The distance between the working activity range and the dangerous voltage charged body is less than the regulations in the following table:

作业活动范围与危险电压带电体距离小于下表的规定：

The distance between the operating range and the dangerous voltage charged body

作业活动范围与危险电压带电体的距离

Voltage level of hazardous voltage charged body/kV 危险电压带电体的电压等级/kV	≤10	35	63～110	220	330	500
Distance/m 距离/m	1.7	2.0	2.5	4.0	5.0	6.0

5.10.2.6 Swing, the foothold is not flat or has only a small flat surface, that is, a rectangular flat surface with a diameter of less than 500 mm on either side, a circular flat surface with a diameter of less than 500 mm, or a flat surface of other shapes with similar dimensions, so that the operator cannot maintain a normal posture;

摆动，立足处不是平面或只有很小的平面，即任一边小于 500mm 的矩形平面、直径小于 500mm 的圆形平面或具有类似尺寸的其它形状的平面，致使作业者无法维持正常姿势；

5.10.2.7 Working environment with toxic gas or oxygen content of less than 19.5% in the air;

存在有毒气体或空气中含氧量低于 19.5%的作业环境；

5.10.2.8 The working environment that may cause various disasters and accidents and rescue various disasters that occur suddenly.

可能会引起各种灾害事故的作业环境和抢救突然发生的各种灾害事故。

5.10.3 Work at heights without any of the objective risk factors listed in 5.10.2 are classified according to the Class A method specified in the following table. Work at heights with one or more of the objective risk factors listed in the following item shall be classified according to the Class B method.

不存在 5.10.2 列出的任一种客观危险因素的高处作业按下表规定的 A 类法分级。存在下项列出的一种或一种以上客观危险因素的高处作业按 B 类法分级。

High altitude work classification

高处作业分级

Classification 分类法	Working height at height/m 高处作业高度/m			
	2≤h≤5	5＜h≤15	l5＜h≤30	h＞30
A	Ⅰ	Ⅱ	Ⅲ	Ⅳ
B	Ⅱ	Ⅲ	Ⅳ	Ⅳ

5.10.4 The first-level high-altitude operations include high-altitude operations performed on slopes with a slope greater than 45 degrees.

一级高处作业包括在坡度大于 45 度的斜坡上实施的高处作业。

5.10.5 The second and third levels of high altitude operations also include the following situations:

二级、三级高处作业还包括以下情形：

5.10.5.1 Carry out high-altitude operations near lifting (hoisting) openings, pits, wells, ponds, ditches, holes, etc.;

在升降（吊装）口、坑、井、池、沟、洞等附近进行高处作业；

5.10.5.2 Carry out high-altitude operations near lifting (hoisting) openings, pits, wells, ponds,

ditches, holes, etc.;

在易燃、易爆、中毒、易灼伤的区域或转动设备附近的高处作业；

5.10.5.3 High-altitude operations on towers, kettles, furnaces, tanks and other chemical containers, equipment and overhead pipelines without platforms or guardrails;

在无平台、无护栏的塔、釜、炉、罐等化工容器、设备及架空管道上进行的高处作业；

5.10.5.4 High-altitude operations carried out in towers, kettles, furnaces, tanks and other equipment;

在塔、釜、炉、罐等设备内进行的高处作业；

5.10.5.5 Work at high places near venting pipelines or chimneys and equipment that emit toxic, harmful gases and dust.

在临近排放有毒、有害气体、粉尘的放空管线或烟囱及设备的高处作业。

5.10.6 Special high altitude operations include high altitude operations in the following situations:

特级高处作业包括下列情形的高处作业：

5.10.6.1 Work at heights with strong winds under gusts of level 6 (wind speed 10.8m/s) and above;

在阵风风力为六级（风速 10.8m/s）及以上情况下进行的强风高处作业；

5.10.6.2 Operation at high temperature or high altitude in high temperature or low temperature environment;

在高温或低温环境进行的异温高处作业；

5.10.6.3 Work at heights on rainy days when it rains;

在降雨时进行的雨天高处作业；

5.10.6.4 High-altitude operations at night with artificial lighting outdoors;

在室外完全采用人工照明进行的夜间的高处作业；

5.10.6.5 Suspended high-altitude operations under the condition of being close to or in contact with charged objects;

在接近或接触带电体条件下进行的悬空高处作业；

5.10.6.6 Suspended height operations carried out without a foothold or without a firm foothold.

在无立足点或无牢靠立足点条件下进行的悬空高处作业。

5.10.7 Work permit classification for high level work 高处作业作业许可分级

Work permit must be obtained for work at height. There are two types of work permit: general and special:

高处作业必须办理作业许可，高处作业许可分一般和特殊两种：

5.10.7.1 Assignments include Ⅰ generally high, Ⅱ, Ⅲ level and 5.10.4 and 5.10.5 covered by content.

一般高处作业包括Ⅰ、Ⅱ、Ⅲ级和 5.10.4 和 5.10.5 所涵盖的内容。

5.10.7.2 Special height work includes the contents covered by super and 5.10.6.

特殊高处作业包括特级和 5.10.6 所涵盖的内容。

5.10.8 Work safety management at height 高处作业安全管理

5.10.8.1 No person suffering from high blood pressure, heart disease, anaemia, epilepsy, mental illness or other conditions unfit for work at heights shall be allowed to perform work at heights.

凡患高血压、心脏病、贫血病、癫痫病、精神病以及其他不适于高处作业的人员，不得从事高处作业。

5.10.8.2 Operators should be familiar with the height of the work should know the knowledge should be able to master the operation skills.

作业人员应熟悉高处作业应知应会的知识，掌握操作技能。

5.10.8.3 The applicant and the operation department shall provide the operator with necessary safety education, including safety knowledge of the operation, handling of possible accidents in the operation and rescue methods, etc.

作业申请人与作业部门对作业人进行必要的安全教育，内容包括所从事作业的安全知识、作业中可能发生的意外情况的处理和救护方法等。

5.10.8.4 When working at a special height, the operation department should make an emergency plan, which includes the escape route and rescue method for the operation staff in an emergency situation, the life-saving facilities and fire-fighting equipment equipped at the scene, etc. Site personnel should be familiar with the contents of the emergency plan.

特殊高处作业时，作业部门应制定应急预案，内容包括：作业人员紧急状况时的逃生路线和救护方法，现场应配备的救生设施和灭火器材等。现场人员应熟知应急预案的内容。

5.10.8.5 All workers should wear full-body double-hook safety belt. Safety belt should be hung high and low. The safety belt shall be hung on the strong member above the construction work place and shall not be hung on the part with sharp edges and corners. There should be sufficient clearance below the seat belt hanger. Insulating tools or uniform should be used for working at high electrified places. Special height work should also wear communication tools.

高处作业人员应配戴全身式双挂大钩安全带，安全带应高挂低用。安全带系挂在施工作业处上方的牢固构件上，不得系挂在有尖锐棱角的部位。安全带系挂点下方应有足够的净空。带电高处作业应使用绝缘工具或穿均压服。特殊高处作业还应佩戴通讯联络工具。

5.10.8.6 Work on the high ground should be supervised by a special person, should set up a security alert area, operators should not rest in the work place.

高处作业应设专人监护，应设安全警戒区，作业人员不应在作业处休息。

5.10.8.7 Discharge of poisonous and harmful gases, dust near the vent pipe or chimney etc during operations, shall be determined in advance contact workshop related personnel, contacts, and take effective safety protection measures, equipped with necessary and conform to the standards for homework personnel protective equipment (such as air breathing apparatus, gas mask or respirator filter type, etc.).

在临近排放有毒、有害气体、粉尘的放空管线或烟囱等场所进行作业时，应预先与车间有关人员取得联系、确定联络方式，并采取有效的安全防护措施、为作业人员配备必要且符合规范标准的防护器材（如空气呼吸器、过滤式防毒面具或口罩等）。

5.10.8.8 When working on light materials such as color steel plate roofs, asbestos tiles, and corrugated plates, firm scaffold boards should be laid and fixed, and anti-skid measures should be provided on the scaffold boards.

在彩钢板屋顶、石棉瓦、瓦棱板等轻型材料上作业，应铺设牢固的脚手板并加以固定，脚手板上要有防滑措施。

5.10.8.9 Reliable anti-skid measures should be taken when working in rainy weather; in severe weather such as strong winds and dense fog above grade 5, high-altitude operations of grade IV, open-air climbing and high-altitude operations should not be carried out; after typhoons and heavy rains, work safety facilities should be taken Check and deal with the problem immediately.

雨天作业时，应采取可靠的防滑措施；遇有 5 级以上强风、浓雾等恶劣气候，不应进行Ⅳ级高处作业、露天攀登与悬空高处作业；台风、暴雨后，应对作业安全设施进行检查，发现问题立即处理。

5.10.8.10 Tools, materials, parts, etc. used in the operation should be put in a tool bag. The tools should be tied with a safety rope and the safety rope of the tool should be tied to the operator's wrist. When not in use, put the tool in the tool cover (bag) When going up and down, you should not hold objects in your hands, and should not throw tools, materials and other objects. When tools and materials that are easy to slide and roll are stacked on the scaffold, measures should be taken to prevent them from falling.

作业使用的工具、材料、零件等应装入工具袋，工具在使用时应系有安全绳，并将工具的安全绳套系在作业人员的手腕上，不用时将工具放入工具套（袋）内上下时手中不应持物，不应投掷工具、材料及其他物品。易滑动、易滚动的工具、材料堆放在脚手架上时，应采取防坠落措施。

5.10.8.11 In the same falling direction, crossover operations are generally not allowed. If cross operations are required, a safety protection layer should be set in the middle. Cross operations with a fall height of more than 24 meters should be provided with double protection. When intersecting with other operations, it should go up and down according to the designated route, and should not work up and down vertically. If vertical operations are really necessary, reliable isolation measures should be taken.

在同一坠落方向上，一般不得进行上下交叉作业，如需进行交叉作业，中间应设置安全防护层，坠落高度超过 24 米的交叉作业，设双层防护。与其他作业交叉进行时，应按指定的路线上下，不应上下垂直作业，如果确需垂直作业应采取可靠的隔离措施。

5.10.8.12 Due to the necessity of operation, when the safety protection facilities are temporarily dismantled or changed, the relevant person in charge shall agree and take corresponding protective measures, and shall be restored immediately after operation.

因作业必需，临时拆除或变动安全防护设施时，应经相关负责人同意，并采取相应的防护措施，作业后应立即恢复。

5.10.8.13 Adequate lighting should be provided for high-altitude operations at night, and the

lighting in explosion-proof areas shall meet the requirements of protection level. If an operator finds an abnormal situation during the operation, he should send a signal in time and leave the scene quickly.

夜间高处作业应有充足的照明，防爆区域的照明满足防等级要求。作业人员在作业中如果发现异常情况，应及时发出信号，并迅速撤离现场。

5.10.8.14 Before continuing to work after the work at a height is interrupted, the environmental conditions and safety measures should be reconfirmed. When the content of the work and the environmental conditions change, it is necessary to reapply for the permit for safe work at the height.

当高处作业中断后继续作业前，应重新对环境条件和安全措施予以确认，当作业内容和环境条件变化时，需要重新办理高处安全作业许可。

5.11 Ray Work 射线作业

5.11.1 Any radiographic operation, such as radiographic flaw detection and radioactive level gauge maintenance, within the scope of the second part of oil refining, must be completed before 16:00 on the same day. In case of any change in operating conditions, location and environment, the operation must be stopped immediately and the license must be renewed.

凡在炼油二部范围内进行射线探伤、放射性料位计检修等射线作业，必须在当日 16:00 前提前办理完毕射线安全作业许可证，如果作业条件、地点及环境等发生变化，必须立即停止作业，重新办理许可证。

5.11.2 Radiation operations are carried out by at least 2 personnel with operational qualifications, each of whom is equipped with a personal dose alarm and personal dosimeter to control the radiation dose in accordance with national or international protection standards.

射线作业由至少 2 名具备作业资质的人员进行，每名人员配备一台个人剂量报警仪和个人剂量计，遵照国家或国际防护标准控制辐射剂量。

5.11.3 In principle, the radiation operation time is stipulated to start at 20:00 at the earliest every night and end at 6:00 am the next day; the effective time does not exceed 10 hours; for special circumstances that do need to be carried out during the day, the operating unit must be at least 2 in advance Permission for radiological safety operations was completed within hours.

射线作业时间原则上规定每天最早晚上 20:00 开始，最晚次日凌晨 6:00 结束；有效时间不超过 10 小时；对于特殊情况下确实需要在白天进行的射线作业，作业单位必须提前至少 2 小时办理完毕射线安全作业许可。

5.11.4 Before ray operation, the safety protection area must be delineated-the supervision area, and the warning tape/rope conforming to the specification shall be used for isolation, and danger signs and protective facilities shall be set up: clear warning signs shall be hung in all directions of the supervision area. The warning signs are in use Write "Beware, Ionizing Radiation" in English, have an internationally accepted radioactive sign, and have a fluorescent effect; for night work, install warning lights on every direction and entrance fence.

射线作业前，必须划出安全防护区域——监督区，使用符合规范的警戒带/绳进行隔离，并设置危险标志和防护设施：在监督区域的各个方向悬挂明显警告牌，警告牌上用中英文写上“当心，电离辐射”，有国际通用放射性标志，并具备荧光效果；夜间作业在每个方向及入口围栏上安装警示灯。

5.11.5 Before the ray operation, the operating unit must notify the departments and units or personnel within the affected area, and at the same time carry out on-site clearance, and confirm that there are no unrelated personnel within the supervision area before starting operations.

射线作业前，作业单位必须通知影响范围内的部门和单位或人员，同时进行现场清场，确认监督区范围以内没有无关人员之后方可开始作业。

5.11.6 For M-RT radiographic operations, at least one guardian should be arranged to monitor the periphery of the supervision area; for other radiographic operations, at least two guardians should be arranged to monitor the periphery of the supervision area.

对于 M-RT 射线作业，至少安排 1 名监护人员在监督区外围进行监护；其他射线作业，至少安排 2 名监护人员在监督区外围进行监护。

5.11.7 The person in charge of the operation department or the on-duty shift leader shall conduct a review and inspection of the detection equipment used in the on-site supervision area to determine whether the radiation dose in the supervision area meets the standard.

运行部值班负责人或当班班长对现场监督区使用检测仪器进行复核检查，以确定监督区的辐射剂量是否符合标准。

5.11.11 Instructions and requirements for filling out the radiological safety work permit:

射线安全作业许可的填写说明和要求：

5.11.11.1 "Applicant" fill in the name of the operation requirement department; "Applicant" fill in the personnel of the operation requirement department responsible for organizing this operation;

“申请单位”填写作业需求部门名称；“申请人”填写作业需求部门负责组织本次作业的人员；

5.11.11.2 "Operating unit" fill in the full name of the operating unit responsible for this radiographic inspection operation; the "person in charge of site operations" must be the specific person in charge of the site on the day of the operation;

“作业单位”填写负责本次射线探伤作业的作业单位的全称；“现场作业负责人”必须为作业当天现场的具体负责人；

5.11.11.3 "Operation location" must be filled in accurately and specifically, such as device name, equipment location number, road name, etc.; "Operation content" must be filled in clearly and not ambiguously, such as "carrying out pipeline weld inspection";

“作业地点”须填写准确、具体，如装置名称、设备位号、道路名称等部位；“作业内容”须填写清楚，不模糊，如“进行管道焊口探伤”；

5.11.11.4 "Type of radioactive source" must fill in the type of radioactive source used on the day of the operation, and indicate which type of radiation it belongs to, such as gamma rays or X-rays; "Source code" must fill in the code of the radioactive source used; "Source intensity" must fill in truthfully according to the intensity of the actual source;

“放射源类型”须填写作业当天使用的放射源类型，同时注明其射线类型属于哪种，如 γ 射线或 X 射线；“源编码”填写所使用的放射源的编码；“源强度”须根据实际的源的强度如实填写；

5.11.11.5 "Operator" fill in the name of the person responsible for this ray operation, and at the same time fill in the admission card number and job safety qualification certificate number of each operator;
“作业人员”填写负责进行本次射线作业的人员姓名，同时填写每名作业人员的入场证号、作业安全资格证号；
5.11.11.6 "Guardian" fill in the name and admission card number of the full-time security guard assigned by the operating unit, and fill in their mobile phone number;
“监护人员”填写作业单位指派的专职安全监护的人员姓名及入场证号，并填写其手机号码；
5.11.11.7 "Operation safety measures" must be confirmed item by item by the operating unit to ensure that all operating conditions are met;
“作业安全措施”必须由作业单位进行逐项确认，确保所有作业条件都具备；
5.11.11.8 "Units affected by radiographic operations" shall be signed and confirmed by the person in charge of the notified unit;
“射线作业影响范围单位”一项由被告知单位负责人签字确认；
5.11.11.9 After the operation is completed, the on-site person in charge of the area unit to which the operation belongs (the operation department is generally the shift leader) or the job applicant shall inspect the site clearance and recovery, and sign on the "Completion Acceptance" column to confirm that the safety operation permit is closed .
作业完毕后，由作业所属区域单位现场负责人（运行部一般为当班班长）或作业申请人对现场清场恢复情况进行检查，并在“完工验收”一栏上签字确认本次安全作业许可证关闭。

5.11.12 Procedures and notification requirements for radiographic work permits 射线作业许可的办理程序和通告要求

5.11.12.1 Inform the HSE supervisor of the radiation operation plan in advance, and apply for the radiation safety operation permit on the day of operation. In principle, the application for the radiation safety operation permit submitted after 16:00 will not be accepted on the day;
射线作业计划提前告知 HSE 主管人员，并在作业当天申办射线安全作业许可，原则上对 16:00 后上报的射线安全作业许可申请当天不予受理；
5.11.12.2 The operating unit holds the radiological safety operation permit, signs the relevant units in the order of the approval procedures, and goes to the HSE engineer for approval and registration before 16:30. The on-site person in charge of the affected unit (usually the shift leader) only after signing and confirming, can work according to the approved time;
作业单位持射线安全作业许可，按照审批程序的先后到涉及的相关单位进行签字，并于 16：30 之前到 HSE 工程师处进行审批登记，作业开始前由影响范围单位现场负责人（一般为当班班长）签字确认后，方可按批准时间作业；
5.11.12.3 The HSE supervisor will notify the entire company of all radiographic operations in the department before 17:00;
HSE 主管人员将在 17:00 前将当天本部门所有射线作业进行全公司通告；

5.12 Roadblock Work 断路作业

5.12.1 Before the operation, the operation application unit shall, in conjunction with the relevant supervisors of the department, formulate a traffic organization plan and apply for a circuit breaker operation permit.

作业前，作业申请单位应会同本部门相关主管专业制定交通组织方案，办理断路作业许可证。

5.12.2 The operating unit shall set up traffic warning signs at the cut-off intersections and related roads as needed, and set up road fences, road operation warning lights, guide signs and other traffic warning facilities near the operation area.

作业单位应根据需要在断路的路口和相关道路上设置交通警示标志，在作业区附近设置路栏、道路作业警示灯、导向标等交通警示设施。

5.12.3 Carry out fixed-point operations on the road, and the construction can be completed within 2 hours during the day and within 1 hour at night. In the case of on-site traffic commanders directing traffic, as long as the operation area is equipped with corresponding traffic warning facilities, that is, it will be installed during the day. Cone traffic road signs or road fences. Cone traffic road signs or road fences and road operation warning lights are set at night, but signs are not required.

在道路上进行定点作业，白天不超过 2 h、夜间不超过 1 h 即可完工的，在有现场交通指挥人员指挥交通的情况下，只要作业区设置了相应的交通警示设施，即白天设置了锥形交通路标或路栏，夜间设置了锥形交通路标或路栏及道路作业警示灯，可不设标志牌。

5.12.4 When working at night or in rainy and foggy days, road work warning lights should be installed. The warning lights should be set up with safe voltage, and the height should be 1.5 m from the ground and not less than 1.0 m. It should be able to emit a continuous, flashing or rotating red light clearly visible from a distance of at least 150 m.

在夜间或雨、雾天进行作业应设置道路作业警示灯，警示灯设置采用安全电压，设置高度应离地面 1.5 m，不低于 1.0 m。应能发出至少自 150 m 以外清晰可见的连续、闪烁或旋转的红光。

5.12.5 After the roadblock operation is over, the operating unit should clean up the site, withdraw from the traffic warning facilities such as the work area, road fences, road operation indicators, and guide signs. The responsible team should check and verify and report to the relevant profession.

断路作业结束后，作业单位应清理现场，撤出作业区、路口设置的路栏、道路的作业指示灯、导向标等交通警示设施，责任班组应检查核实，并报告有关专业。

5.13 Safety inspection and maintenance 检维修作业安全

5.13.1 Before the device is delivered for overhaul, all majors should conduct self-inspection. The equipment specialty is responsible for the organization, and the HSE specialty and the process specialty participate in the safety confirmation of the equipment shutdown and delivery.

装置交付检修前，各专业应先进行自检。由设备专业负责牵头组织，HSE 专业、工艺专业参加，进行装置停工交付检修安全确认。

5.13.2 During the overhaul period, professional supervisors must go to the overhaul site for safety supervision and inspection; related operations are performed in accordance with high-risk operations management requirements.

检修期间专业主管人员必须到检修现场进行安全监督检查；相关作业按高风险作业管理要求执行。

5.13.3 Safe and civilized maintenance 安全文明检修

5.13.3.1 The arrangement of maintenance personnel should pay attention to the combination of work and rest to prevent accidents caused by excessive fatigue;

检修人员安排要注意劳逸结合，防止过度疲劳发生意外事故的发生；

5.13.3.2 Industrial waste should be piled up at designated locations, and should not be randomly dumped or placed randomly. The spontaneous and combustible materials such as ferrous sulfide should be properly disposed of, and Sinotrans should be contacted quickly to prevent spontaneous combustion and ignition causing fire;

工业垃圾应按指定地点集中堆放，不得随意乱倒、乱放，对清理出的硫化亚铁等自燃、易燃物质要妥善处理，并迅速联系外运，防止自燃、引燃引起火灾；

5.13.3.3 Construction work must be "three cleansing" and "two cleansing" (three cleansing: clean hot purge and replacement, clean maintenance and installation equipment parts, clean use of lubricating grease; two cleansing: clean on duty and finish work Clean the material and the site);

施工作业必须做到“三净”、“二清”（三净：动火吹扫置换要净，检修安装设备机件要净，使用润滑油脂要净；二清：当班施工当班清、工完料净场地清）；

5.13.3.4 Temporary protective measures should be added to the removed railings and damaged platforms, and they should be restored to their original conditions after the completion of the construction;

对拆除的栏杆、损坏的平台处加临时防护措施，施工结束后应恢复原样；

5.13.3.5 Throwing objects, tools and sundries at high altitude is prohibited;

禁止高空抛扔物件、工具和杂物；

5.13.3.6 It is forbidden to use gasoline or volatile solvents to scrub machines, accessories, vehicles, hands, and work clothes;

禁止使用汽油或挥发性溶剂洗刷机、配件、车辆和洗手、洗工作服；

5.13.3.7 It is strictly forbidden to discharge dirty oil, toxic and harmful substances into sewers, open ditch and ground.

严禁将污油、有毒有害物质排入下水道、明沟和地面。

5.13.4 Post-overhaul startup requirement 检修后开工安全要求

5.13.4.1 Before the installation of the device is started, the department shall confirm the conditions for the overhaul delivery and start-up;

装置在开工前，本部门对检修交付开工条件进行确认；

5.13.4.2 The craft major is responsible for the preparation of the start-up plan, which is reported to relevant functional departments for review and company leaders for approval. At the same time, organize operators to conduct training on the content of maintenance changes, so that the operators are familiar with the equipment start-up purge time, steps, quality, safety, environmental protection and other requirements;

工艺专业负责编制开工方案,报相关职能部门审核，公司领导审批。同时对检修变更内容组织操作人员进行培训，使操作人员熟知装置开工吹扫时间、步骤、质量、安全、环保等要求；

5.13.4.3 Before starting construction, conduct a comprehensive inspection of safety facilities such as ventilation, communication, fire protection, ladders, platform railings, combustible gas alarms, safety valves, and lighting, and they must be in good condition;

开工前对通风、通讯、消防、梯子、平台栏杆、可燃气体报警器、安全阀、照明等安全设施进行全面检查，须处于完好状态；

5.13.4.4 Pressure vessels and storage tanks and other equipment and pipelines that have passed the maintenance shall be subjected to pressure test, leak test, and air tightness test according to the regulations, the transmission equipment shall undergo a single test run, and the safety device shall be debugged and reset. Untested equipment, pipelines, meters and interlocks cannot be put into production;

通过检修的压力容器及贮罐等设备、管线，须按规定进行试压、试漏、气密性试验，传动设备进行单体试车，安全装置调试复位。未经试验的设备、管道、仪表和联锁等不能投入生产；

5.13.4.5 Airtight equipment and pipelines that accept flammable and explosive materials must be replaced by gas according to the process requirements before entering the materials. The blind plate shall be disassembled and assembled. The operation department shall designate a person to review and confirm one by one, and no omissions shall be allowed

接受易燃易爆物料的密闭设备和管道，进入物料前须按工艺要求进行气体置换，盲板拆装，运行部应指定专人逐个复查确认,不得遗漏。

5.13.4.6 When igniting flammable and explosive materials, strictly control hot work and vehicle traffic.

引易燃易爆物料时，严格控制动火作业、车辆通行。

5.14 Safety management of fire and explosion-proof areas 防火防爆区域安全管理

5.14.1 Management principles 管理原则

5.14.1.1 The use of non-productive temporary open flame operations in the equipment areas of the second oil refining department must be handled in accordance with the management regulations.

炼油二部各装置区域内使用非生产性临时明火作业，必须按照管理规定办理动火手续。

5.14.1.2 Persons without valid certificates are prohibited from entering the installation areas of the department, and entering the installation areas shall not use safety, fire-fighting facilities, communication facilities, process pipelines, equipment, valves, underground pipelines and various cables without authorization.

禁止无有效证件者进入本部门各装置区域，进入装置区域不得擅自动用安全、消防设施，通讯设施、工艺管线、设备、阀门、地下管线和各种电缆等。

5.14.1.3 Temporary facilities such as temporary work sheds, tool boxes, etc., are not allowed to be stored in the fire-proof and explosion-proof area during production and operation.

生产运行期间装置防火防爆区域内禁止存放暂设工棚、工机具箱等临时设施。

5.14.1.4 Temporary motor vehicles entering the installation areas of the department shall wear qualified flame arresters, drive along the designated route, and apply for a motor vehicle entry permit. The motor vehicle entry device permit shall be issued by at least the team leader or above, and the time shall not exceed 8 hours, and the vehicle driving route shall be specified on the permit.

临时机动车辆进入本部门各装置区域的，佩戴合格的阻火器，按指定路线行驶，并办理机动车进入装置许可证。机动车进入装置许可证至少由班长以上人员开具，时间不得超过 8 小时，并在许可证上明确车辆行驶路线。

5.14.1.5 Motor vehicles are forbidden to park in the installation area for a long time (except in carports and garages). When temporarily parked, the fire-fighting passage cannot be blocked, and it cannot be parked on the safety exit or evacuation passage.

机动车辆禁止长时间停放在装置区域内（在车棚、车库的除外）。临时停放时，不能堵塞消防通道，不能停放在安全出口或疏散通道上。

5.14.1.6 It is forbidden to burn garbage and conduct accident drills with open flame operations in the equipment area of the department.

部门各装置区域内禁止焚烧垃圾、进行有明火作业内容的事故演练。

5.14.1.7 No unit or individual shall arbitrarily move or damage various fire-fighting signs, reminders, safety warning signs and other signs in the various installation areas of the department.

任何单位和个人不得擅自移位或损坏本部门各装置区域内的各种消防标志牌、提示牌、安全警示等标牌。

5.14.1.8 Smoking, carrying non-explosion-proof electronic equipment, and storing explosives is strictly prohibited in the second oil refining area.

炼油二部区域内禁止吸烟、携带非防爆电子设备,严禁存放爆炸物品。

6 Inspection and supervision 检查与监督

6.1 The HSE specialty of Refining Department No. 2 is responsible for supervising and inspecting the implementation of safety management of each post. For those who fail to perform

as required, the relevant personnel will be held accountable in accordance with the relevant provisions of the Performance Evaluation Rules of Refining Department No. 2.

炼油二部 HSE 专业负责监督检查各岗位安全管理执行情况，对未按要求执行的人员，按照《炼油二部绩效考核细则》相关条款追究有关人员责任。

6.2 Matters not covered refer to the company's HSE professional management system.

未尽事宜参照公司 HSE 专业管理制度执行。

7 Appendix 附则

7.1 These rules are managed by the HSE professional.

本细则由 HSE 专业归口管理。

7.2 See Table 1 for the compilation and approval of this system version.

本制度版本编制和审批情况见表 1。

Table 1 Document version preparation and approval status

表 1 文件版本编制和审批情况

1	21/10/2020	He Kun 何昆	Hai Cheng 海诚	Sun Jian Huai 孙建怀
Version 版本	Issue Date 颁布日期	Editor 编制人	Reviewer 审核人	Approver 批准人

8 Attachments 附件

Attachment 1 Job Hazard Analysis (JHA) Method

附件 1 工作危害分析 JHA 方法

Attachment 2 Safety Checklist (SCL) Method

附件 2 安全检查表法 SCL 方法

Attachment 3 Hazard and Operability Analysis (HAZOP) Method

附件 3 危险和可操作性研究 HAZOP 方法

Attachment 4 Risk Assessment Criteria

附件 4 风险评价准则

Attachment 1 附件 1

Job Hazard Analysis (JHA) Method 工作危害分析 JHA 方法

1 Division of identification and analysis units 辨识分析单元划分

It shall, at the level of Operation Dept. and functional departments, allocate business backbones to divide and identify analysis units of operations of the Operation Dept. and their departments level by level. Operation Dept. shall classify its operations and prepare list of operations mainly based on operational procedure (on the basis of work instruction). Functional departments shall classify their operations and prepare their lists of operations mainly based on their functions (on the basis of job responsibilities). The results of the division of the above identification and analysis units (operations) must be reviewed and determined by leadership of Operation Dept. or functional departments. 以运行部和职能部门为单元，抽调业务骨干对所在运行部或职能部门的作业活动进行逐级划分辨识分析单元。其中运行部主要按照操作流程（以作业指导书为基础）进行作业活动划分，编制作业活动清单。职能部门主要按照部门职能（以岗位职责为基础）进行作业活动划分，编制部门工作活动清单。上述辨识分析单元（作业活动）划分的结果须经所在运行部或职能部门领导审核确定。

2 dentification of job hazards 岗位危险源辨识

2.1 All departments shall prepare and distribute lists of operations to all teams. 各部门将编制的作业活动清单下发各班组。

2.2 Crew leaders shall use pre-shift meeting, routine meeting or team event to organize all post holders to participate in discussion which shall cover: accuracy and completeness of lists of operations issued, major hazards and risk of each operation, and extent of such risks. Relevant activities shall be put into crew safety activity record. 班组长利用班前会，班务会或班组活动的时间组织各岗位员工参加讨论，讨论内容包括：下发的作业活动清单是否准确是否完善、各项作业活动中主要存在的危险源和风险，风险的大小。相关活动登载进入班组安全活动记录。

2.3 After crew-based discussion, each employee shall identify hazards and risks of her or his work and fill identification results in Job Hazard Analysis (JHA) Record. 班组讨论后，每个岗位员工针对自身工作活动识别危险源和风险，并将结果填写到《工作危害分析（JHA）记录表》。

2.4 Crew leaders shall collect results of hazard identification and risk assessment made by employees and report them to Operation Dept. 班组长汇总员工危险源和风险评价的结果上报运行部。

3 Department-level hazard identification and risk assessment 部门危险源辨识与风险评价

3.1 Staff composition 人员构成

Operation Dept. shall allocate backbone employees to form the hazard identification and risk assessment team which is composed of safety officer, technicians (process and equipment), field managerial personnel and experienced operators. These participants shall be representative and have rich practice experience and they shall cover working activities of all crews in Operation Dept. 运行部抽调骨干组成危险源辨识与风险评价小组，包括安全员、技术员（工艺、设备）、现场管理人员，有经验的岗位操作员工等。人员要有代表性，要覆盖本运行部

的各班组工作活动，参与人员的实践经验需丰富。

3.2 Hazard identification for department-level operations 部门作业活动危险源辨识

3.2.1 HSE Engineer of a department shall collect hazard and risk identification forms submitted by all crews and use them as the basis for their hazard identification and risk assessment. 部门HSE 工程师汇总各班组上报的危险源和风险识别表，作为部门危险源辨识与风险评价的基础。

3.2.2 Members of department-level hazard identification and risk assessment team shall discuss each operation and operation step based on list of operations and conduct hazard identification. Identification results shall be included in Job Hazard Analysis (JHA) Record. 部门危险源辨识与评价小组成员针对按照作业活动清单，对每项作业活动和作业步骤逐项讨论，进行危险源辨识。辨识结果列入《工作危害分析（JHA）记录表》。

Attachment 2 附件 2

Safety Checklist (SCL) Method 安全检查表法 SCL

1 Division of Identification and Analysis Units 1 辨识分析单元划分

The list of facilities and equipment shall be prepared according to the main areas and facilities and equipment, with the department as a basic unit. The results of the division of the above identification and analysis units (equipment) must be reviewed and determined by the leader of the department in charge. 以部门为基础单元，按照主要区域和设施设备，编制设施设备清单。上述辨识分析单元（设备）划分的结果须经所在部门领导审核确定。

1.1 Make statistics and analysis, and prepare the list of equipment and facilities of the department; 统计、分析，并编制本部门的设备设施清单；

1.2 Note in the statistical process that equipment and facilities with the same or similar performance and functions can be combined. 在统计过程中注意、相同或类似性能、功能的设备设施可以合并。

2 Preparation of the Safety Checklist 安全检查表的编制

2.1 The equipment safety checklist of the industry (or the department) can be used for reference or referenced. 可借鉴、引用本行业（或本部门）的设备安全检查表。

2.2 Where there is no corresponding safety checklist, a safety checklist shall be prepared as required below. 无相应的安全检查表则应按如下要求编制安全检查表。

2.2.1 The checklist used shall be based on the principle of professional HSE checklist (for professional check), and supplement the contents in the corresponding daily HSE checklist; 使用的检查表应为专业性 HSE 检查表为原则（专业检查用），补充相应的日常 HSE 检查表的内容；

2.2.2 The check items shall be divided for the first level according to the workplaces and areas of the units, such as pump houses, tank farms, duty rooms, etc.; 检查项目应依据单位的工作场所、区域做一级划分，如泵房、如罐区、如值班室等；

2.2.3 The critical equipment, key large-scale equipment and facilities can also be divided into the first-level check items, such as boilers, oil tanks, etc.; 如果是重点设备、大型关键设备设施，也可划分为一级检查项目，如锅炉，如油罐等；

2.2.4 The check points shall be divided on the equipment and facilities within the workplace and area for division of the secondary level, in which the equipment shall be divided with the pipeline valve as the demarcation point. 关于检查点的划分，应在该工作场所、区域内的设备设施进行二级划分。其中设备划分应以管线阀门为分界点；

2.2.5 The division of check points shall be defined point by point specific to the main components, instruments, valves, auxiliary facilities, etc. of the equipment and facilities; 检查点的划分应针对该设备设施的各主要部件、仪表、阀门、辅助设施等逐项明确；

2.2.6 The check standards shall be developed in accordance with the way of the checklist preparation, which can be briefly described as “from far to near, from top to bottom, and from outside to inside”. 检查标准则应按照编制检查表的方式进行检查标准制定，概略描述就是“由远及近、由上及下，由外及里”。

3 Intrinsic Safety Checking of Equipment and Facilities 设备设施本质安全排查

The department shall organize the equipment and facilities maintenance and management personnel to derive possible deviations according to the equipment safety checklist (i.e. the contents violating relevant check standards and requirements in the safety checklist, which is the unsafe status of the equipment and facilities). 部门组织设备设施维护和管理人员，根据设备安全检查表导出可能存在的偏差（即违背安全检查表中相关检查标准、要求的内容，此即为物的不安全状态）。

3.1 Aimed at the above-identified hazards, the possible harmful consequences shall be defined, mainly accidents, equipment and property losses, which shall be specifically described in accordance with the relevant national accident classification standards. 针对上述辨识出的危险源，明确其可能产生的危害后果，主要是事故、设备、财产损失，具体按照国家有关事故分类标准进行描述。

3.2 The appropriate safety management and control measures corresponding to the hazards shall be investigated and verified, in which the corresponding specific terms shall be found out mainly from the safety management rules and regulations, the safety operation regulations, the safety inspection procedures and the equipment management systems so as to have knowledge about the possible corresponding loopholes or undefined points. 查证对应该危险源的相应安全管理、控制措施，其中重点从安全管理规章制度、安全操作规程、安全检修规程、设备管理制度中查找相应的明确条款，从而了解可能存在的相应漏洞或未明确的地方。

3.3 The safety checklist of the department shall be prepared according to the above hazard identification. 根据以上危险源辨识情况，编制完成本部门的安全检查表。

The intrinsic safety risks of the equipment and facilities shall be discussed and identified item by item through the method of safety checklist, the identification results of which shall be filled into the Safety Checklist (SCL) Analysis Record of the department. 采用安全检查表法逐项讨论，识别设备设施本质安全风险，辨识结果填入部门《安全检查表（SCL）分析记录表》。

Attachment 3 附件 3

Hazard and Operability Analysis (HAZOP) Method 危险和可操作性研究（HAZOP）方法

1 Composition of the Analysis Group 分析组的组成

1.1 The HAZOP analysis group shall consist of at least 4 people. Generally speaking, the analysis group of 5 to 7 people is more ideal. It shall include the group leader, recorders and personnel familiar with the process design and operation. HAZOP 分析组最少由 4 人组成，一般来说，5～7 人的分析组比较理想。包括：组长、记录员及熟悉过程设计和操作的人员。

1.1.1 Group leader: a senior engineer with experience in industrial safety and practical hazards and operability analysis; 组长：应具备工业安全和实际进行危害及可操作分析经验的资深工程师担任；

1.1.2 Process engineer: familiar with basic process design, process and production operation methods; 工艺工程师：熟悉基本工艺设计、流程、生产操作方法；

1.1.3 Equipment engineer: with relevant equipment knowledge and experience; 设备工程师：具备相关设备知识和经验；

1.1.4 Instrument engineer: familiar with the knowledge and experience related to instrument control system; 仪表工程师：熟悉仪表控制系统相关知识和经验；

1.1.5 HSE engineer: having knowledge of laws and regulations and standards related to HSE; HSE 工程师：了解 HSE 相关的法律法规和标准；

1.1.6 Production operators: with certain experience in practical production operation. 生产操作人员：具备一定的实际生产操作经验。

2 Determination of Analysis Object, Purpose and Scope 确定分析对象、目的和范围

2.1 The purpose, object and scope of the analysis must be as clear as possible. 分析的目的、对象和范围必须尽可能的明确。

2.2 The analysis object is usually determined by the person in charge of the device or the project, with assistance from the organizer of the HAZOP analysis group. 分析对象通常是由装置或项目的负责人确定的，并得到 HAZOP 分析组的组织者的帮助。

2.3 The analysis shall be carried out as per the correct direction and established goals, and the dangerous consequences to be considered shall be determined. 应当按照正确的方向和既定目标开展分析工作，而且要确定应当考虑到哪些危险后果。

3 Acquisition of Required Information 获取必须的资料

Prior to the HAZOP analysis, the following information or data must be collected: 在进行 HAZOP 分析工作之前，必须收集下列资料或数据：

3.1 P&ID diagram—key for HAZOP analysis, which must be accurate; P&ID 图— HAZOP 分析的关键，必须准确 ；

3.2 Important information of HAZOP analysis; HAZOP 分析的重要信息；

3.3 The physical, chemical and hazardous characteristics of hazardous materials; 危险物料的物、化和危险特性；

3.4 Process description, material and energy balance; 工艺说明，物料和能量平衡；

3.5 Equipment design information, material texture and structure; 设备设计信息，材质、结构；
3.6 Arrangement plan or layout plan of the device; 装置布置或平面布置图；
3.7 Process flow diagram (PED); 工艺流程图（PED）；
3.8 Previous accident information, inspection reports and operation records. 以往事故信息、检查报告、操作记录。

4 Turning of Information into Appropriate Tables and Setting of Analysis Order 将资料变成适当的表格并拟定分析顺序

4.1 In order to make the analysis process orderly, the organizer of the analysis group usually develops detailed plans before the analysis meeting and must take a certain time to determine the best analysis procedure based on the specific analysis object. 为了让分析过程有条不紊，分析组的组织者通常在分析会议开始之前要制定详细的计划，必须花一定的时间根据特定的分析对象确定最佳的分析程序。
4.1.1 Continuous process: updated drawings, Directory of Preliminary Deviations and worksheet. 连续过程：已更新的图纸，初步偏差目录，工作表。
4.1.2 Intermittent process: operating procedures. 间歇过程：操作程序。

5 Arrangement of HAZOP Analysis Meeting HAZOP 分析会议安排

Each analysis node shall take an average of 20 to 30 minutes; and each device shall be assigned for 2 to 3 hours. 每个分析节点平均需 20～30 分钟；每个设备分配 2～3 小时。
5.1 The duration of each meeting shall not exceed 4-6 hours (preferably in the morning), and the analysis meeting shall be held in a continuous manner. 每次会议持续时间不要超过 4～6 小时（最好安排在上午），而且分析会议应连续举行。
5.2 It is better to divide the device into several relatively independent areas. After each area is discussed, the meeting group shall make appropriate modifications and then continue the analysis and discussion for the next area. 最好把装置划分成几个相对独立的区域，每个区域讨论完毕后，会议组作适当修整，再进行下一区域的分析讨论。
5.3 As for large-scale devices or technological processes, it can be conducted simultaneously by forming multiple analysis groups, with the organizer of an analysis group acting as the coordinator who shall first divide the process into several relatively independent parts and then assign them to each group to complete. 对于大型装置或工艺过程，可以考虑组成多个分析组同时进行，由某个分析组的组织者担任协调员，协调员首先将过程分成相对独立的若干部分，然后分配给各个组去完成。
6 Implementation of HAZOP Analysis Meeting HAZOP 分析会议实施

For HAZOP analysis, process drawing or operation procedures shall be divided into List of Systematic Analysis Nodes or Steps and Directory List of Preliminary Deviations, and then guide words shall be used for finding out the dangers during the process. The result is: HAZOP 分析需要将工艺图或操作程序划分为《系统分析节点或步骤清单》、《初步偏差目录清单》，然后用引导词找出过程的危险。得到的结果为：
6.1 Causes, consequences, protective devices and recommended measures of deviations; 差的原因、后果、保护装置、建议措施；

6.2 More information is needed for further analysis of deviations. 需要更多的资料才能对偏差进行进一步的分析。

Analysis Record for Hazard and Operability Analysis (HAZOP) is formed by the results above. 上述结果形成《危险和可操作性研究（HAZOP）分析记录表》

Attachment 4 附件 4

Risk Assessment Criteria 风险评价准则

1 Risk refers to the combination of possibility and consequence of a certain hazardous incident. 风险是发生特定危害事件的可能性及后果的结合。

$$R= L\times S$$

2 In the formula above: R—risk degree; L—occurrence possibility of incident; S—severity of incident consequence 上式中：R—风险度；L—事件发生的可能性；S—事件发生后果严重性

Table 5 L-Refer to Table Below for the Occurrence Possibility of Incident 表 5 L-事件发生的可能性可参照下表制定

Grade 等级	Criteria 标准
5	No preventive, monitoring and control measures are take at site, or no danger is detected, or a similar accident or incident occurs once a week. 在现场没有采取防范、监测、控制措施，或危害的发生不发现，或一周发生一次类似事故或事件
4	The occurrence of hazards is not easy to be detected, with no detection system on the site no monitoring conducted, or control measures have been taken on the site but they have not been effectively implemented or the control measures are improper, or a similar accident or incident occurs no more than three times within a month. 危害的发生不容易被发现，现场没有检测系统，也未信做过任何监测，或在现场有控制措施，但未有效执行或控制措施不当，或一月发生三次以内类似事故或事件
3	No protective measures (such as protective devices, personal protective equipment, etc.) are taken, or they are not implemented in strict accordance with the operation procedure, or the occurrence of hazards is easy to be detected (with monitoring system on the site), or monitoring has ever been conducted, or a similar accident or incident occurs once every six months. 没有保护措施（如没有保护装置、没有个人防护用品等），或未严格按操作程序执行，或危害的发生容易被发现（现场有监测系统），或曾经做过监测，或半年发生一次类似事故或事件
2	A hazard shall be monitored regularly once it is detected in time, or prevention and control measures are taken on the site and can be effectively implemented, or a similar accident or incident occurs once a year. 危害一旦能及时发现，并定期进行监测，或现场有防范控制措施，并能有效执行，或一年发生一次类似事故或事件
1	The sufficient and effective prevention, control, monitoring and protection measures are taken, or the employees have a very high awareness of safety and health and can strictly implement the operation procedures. It's highly impossible that a similar accident or incident might occur. 有充分、有效的防范、控制、监测、保护措施，或员工安全卫生意识相当高，严格执行操作规程，极不可能发生事故或事件

Table 6 Discrimination criteria on severity of event consequences 表 6 S-事件后果严重性判定准则

Grade 等级	Legal, regulatory and other requirements 法律、法规及其他要求	Person 人	Property loss (10^4 yuan) 财产损失/万元	Environmental pollution and resources consumption 环境污染资源消耗	Unplanned shutdown 非计划停工	Enterprise image 企业形象
5	Violation of laws, regulations and standards 违反法律、法规和标准	Triggering the death of one or more persons 造成 1 人及以上死亡	＞50	Major environmental pollution at sea and on the PMB island 海上、PMB 岛上重大环境污染	Parking for more than 12 hours 停车 12 小时以上	Significant international and domestic impact 重大国际国内影响
4	Potential violation of regulations and standards 潜在违反法规和标准	Triggering serious injuries of one or more persons 造成 1 人及以上重伤	＞25	Severe pollution within the company 公司内严重污染	Parking for 6-12 hours 停车 6-12 小时	Domestic impact of Brunei 文莱国内影响
3	Inconformity with the safety policies, systems, provisions and other rules of the superior company or the industry 不符合上级公司或行业的安全方针、制度、规定等	Triggering minor wounds and chronic diseases 造成轻伤、慢性病	＞10	Moderate pollution within the company 公司内中等污染	Parking for 1-6 hours 停车 1-6 小时	Regional impact 地区影响
2	Inconformity with the safety operation procedures and provisions of	Slight injuries and intermittent discomfort 轻微受伤、间歇不舒服	＜10	Pollution within the scope of a device 装置范围内污染	Parking within 1 hours 停车 1 小时以内	Environment of the company and PMB island 公司及 PMB 岛上环境

	the company 不符合公司的安全操作程序、规定					
1	Complete conformity 完全符合	No casualty 无伤亡	Damage free 无损失	No pollution 没有污染	No shutdown 没有停工	No damage to the image 形象没有受损

Table 7 R-Discrimination Criteria on Risk Level 表 7 R-风险等级判定准则

Risk degree 风险度	Level 等级	Action/control measures to be taken 应采取的行动/控制措施	Implementation period 实施期限
20～25	Significant risk 巨大风险	Halt operation before hazards have been weakened by measures. Assess improvement measures. 在采取措施降低危害前，不能继续作业，对改进措施进行评估	Immediately 立刻
15～16	Major risk 重大风险	Take emergency measures to lower the risks. Set up operation control programs. Examine, measure and evaluate the risk regularly. 采取紧急措施降低风险，建立运行控制程序，定期检查、测量及评估	Immediate or recent rectification 立即或近期整改
9～12	Moderate 中等	It is suggested to establish goals and operation specifications and strengthen training and communication. 可考虑建立目标、建立操作规程，加强培训及沟通	Governance within 2 years 2 年内治理
4～8	Acceptable 可接受	It is suggested to establish the operation specifications and the operation instruction. Check implementation condition on a regular basis. 可考虑建立操作规程、作业指导书但需定期检查	Governance at the time of both conditions and funds ready 有条件、有经费时治理
＜4	Slight or negligible risk 轻微或可忽略的风险	Control measures are not required, but record shall be kept, and attention shall be paid to avoid the escalation of the risk. 无需采用控制措施，但需保存记录，加以注意，避免风险等级上升	

Tale 8 Risk Matrix 表 8 风险矩阵

Frequently (ly/time) 频繁（ly/	L5	D 5	C 10	B 15	A 20	A 25

次）						
More (5y/time) 较多（5y/次）	L4	D 4	D 8	C 12	B 16	A 20
Occasionally (20y/time) 偶尔（20y/次）	L3	E 3	D 6	C 9	C 12	B 15
Rarely (100y/time) 很少发生（100y/次）	L2	E 2	D 4	D 6	D 8	C 10
Unlikely (1000y/time) 不太可能（1000y/次）	L1	E 1	E 2	E 3	D 4	D 5
Class 类别		S1	S2	S3	S4	S5
		Negligible 可忽略	Slight 轻微	Major 严重	Significant 重大	Disastrous 灾难性
Risk level 风险级别		Negligible risk 忽略风险	Acceptable 可接受	Moderate 中等	Major risk 重大风险	Significant risk 巨大风险
Risk level code 风险等级代码		I	II	III	IV	V
Color code 颜色标示						
Requirements for rectification measures 对整改措施要求		No requirement 没有要求	Additional safety measures may be considered. 可以考虑增加安全措施	Administrative measures shall be provided and internal engineering measures shall be taken where possible. 提供行政措施，尽可能采用内工程措施	Safety measures must be provided and at least one engineering measure be provide. 必须提供新的安全措施，提供至少一项工程措施	Protection LOPA analysis must be made, and safety measures be taken. 必须进行保护 LOPA 分析，采取安全措施