



**RUWAIS REFINERY
EXPANSION PROJECT**

**EPC-4 TANKAGE AND ASSOCIATED
INTERCONNECTING PIPING**

AGREEMENT No. 09-5578-E-4

DAEWOO E&C

PROJECT No. 5578

Doc. No. 5578-E4-HSE-HU-003

Rev.
0

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**HSE
(HEALTH, SAFETY AND ENVIRONMENT)
PLAN**

AGREEMENT NO. : 09-5578-E-4

PROJECT NAME : Ruwais Refinery Expansion Project
EPC-4: Tankage & Associated
Interconnecting Piping


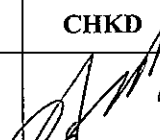


COMPANY : Abu Dhabi Oil Refining Company (TAKREER)

PMC : Mott MacDonald Ltd.

CONTRACTOR : Daewoo Engineering & Construction Co., Ltd.

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SIGNED (Initials)							

NOTES:

- (a) Revisions are denoted by a vertical line placed in the right-hand margin against the revised text.
- (b) PREP = Prepared by, CHKD = Checked by, REVD = Reviewed by, APP'D = Approved by.
- (c) In case of conflict between any requirements stipulated in this document with the contractual requirements, the contractual requirements shall prevail.

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1. INTRODUCTION

1.1 Scope of HSE Plan

This Health, Safety and Environment Plan shall be applied to the project undertaken by CONTRACTOR. This can be modified as site specific HSE (Health, Safety & Environment) Plan for COMPANY's review and acceptance.

The Plan shall describe the health, safety and environmental issues and risks associated with the contracted service.

It shall be based and shall comply with the applicable laws, decrees, administrative rules & regulations, relevant COMPANY's policies, standard operation procedures, and international safe work practices.

CONTRACTOR shall work in accordance with the instructions set forth in Project HSE Plan in effect at the work location.

1.2 Responsibility for Compliance

CONTRACTOR shall comply with all applicable laws, client rules, standards and HSE guidelines, and any other requirements specified by the COMPANY during the performance of work. The laws, rules, guidelines and standards from the client should be provided to all lower tier subcontractors and CONTRACTOR shall be responsible for ensuring such compliance by subcontractors and employees, except in case where such compliance would be contrary to Law.

1.3 Policy Statement

CONTRACTOR is committed to protect Health, Safety and the Environment ("HSE" hereinafter) throughout all stages of its projects. To create an "Incident Free Environment" for all employees, continual improvements and preventative measures will be implemented in compliance with this policy.

CONTRACTOR shall comply with existing laws and regulations on HSE. All HSE issues raised by interested parties shall be passed to senior management for thorough consideration.

CONTRACTOR will establish a HSE Management System based on OHSAS 18001/2007 and ISO 14001/2004.

For all projects, CONTRACTOR shall comply with environmental impact studies, in addition to identifying potential health and safety hazards. Each project will be subject to a "Zero-accident" campaign to help educate employees about avoiding injuries, illnesses and property damage at the workplace, and about protecting the environment from contamination.

HSE performance targets shall be set and these targets shall be annually reviewed by CONTRACTOR's corporate HSE Committee for continual improvement.

The health, safety and environment policy shall be communicated to all employees with the intent that employees are made aware of their individual HSE obligations. Each employee of CONTRACTOR, including higher management, will participate in the implementation of the HSE policy.

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1.4 HSE Objectives & Targets

(1) Objectives

To protect the health & well-being of personnel during work site activities and ensure that safety is a prime consideration in the project execution by establishing and maintaining an injury and incident free culture in the workplace. To avoid contaminating the environments and worksite with hazardous substances that may result from construction activities.

(2) Targets

To achieve Zero Fatality, Zero Lost Time Injuries and No Major Environmental Incident Case.

In order to complete this project without a lost-time accident and ensure our targets, the following guidelines should be applied.

- To establish, implement, and maintain Site Health & Safety Management System based on the OHSAS 18001/1999 & ISO 14001/2004 developed by B.S.I (British Standards Institution) according to the BS 8800.
- To increase the health & safety awareness by establishing, developing, and maintaining an employee HSE Training Program
- To meet or exceed requirements of Environmental Requirements.
- To establish the site emergency procedures and communications with Local Authorities as well as COMPANY Representatives
- To systematically plan, implement, and enforce proper techniques to prevent injuries, property damage, and loss of productivity.
- To comply with the Local Labour Occupational Health & Safety Legislation, Regulation, Rules and Standards, including National, and COMPANY Health & Safety Requirements.

CONTRACTOR & its subcontractors shall support COMPANY Incident & Injury Free Environment Program; CONTRACTOR shall prepare the safety incentive program which shall be applied to the project team, all subcontractors, field supervisors and employees. CONTRACTOR will initiate HSE Campaigns which will require the participation of all CONTRACTOR and its subcontractor's employees.

2. DEFINITIONS AND ABBREVIATIONS

COMPANY	- Abu Dhabi Oil Refining Company (TAKREER)
CONTRACTOR	- Daewoo Engineering & Construction Co., Ltd. or DAEWOO
PROJECT	- EPC-4: Tankage & Associated Interconnecting Piping EPC Work Package for Ruwais Refinery Expansion (RRE) Project
WORK	- Means and includes all work and services to perform and GOODS and other things to provide by CONTRACTOR for EPC-4 Package of RRE Project.

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- SUBCONTRACTOR - any person, firm, or company, employed by CONTRACTOR to perform any work or duty on their behalf
- Home Office - Execution location of the PROJECT's engineering and procurement activities in Seoul, Korea
- UAE - United Arab Emirates
- SITE - Location of the Project in Ruwais, Abu Dhabi, UAE
- AGREEMENT - means the Signature Agreement, the Articles of Agreement and the EXHIBITS
- Document - Any form, letter, facsimile, contract, subcontract, specification, requisition, drawing, or record of any kind required to transmit information from one party to another. It also includes computer generated drawings, lists, charts etc., and other data used to form a permanent record of the Project progress and "As-Built" condition.

3. HSE MANAGEMENT

3.1 Management Leadership & Commitment

CONTRACTOR recognizes Health and Safety at work as a matter of prime importance. Management accepts its responsibilities to ensure, so far as reasonably practicable, the health and safety of employees and others that may be affected by our operations are safeguarded, and that proper attention is paid to the protection of the environment.

CONTRACTOR believes that it is an essential part of responsible management to maintain a high standard of health & safety by the provision of information, by giving training and instruction, together with the establishment of safe systems of the work, a safe construction site and proper care and maintenance of all plants and equipment.

The senior management on site will ensure that the active safety activities are encouraged by all levels of line managers and supervisors through such as;

- (1) Teaching HSE management with equal priority as productivity and cost against these targets.
- (2) Developing HSE targets, both leading and lagging, and objectives and measuring HSE performance against these targets
- (3) Providing adequate resources and competent HSE specialists
- (4) Promoting HSE through regular meetings and site inspections, etc.

3.2 HSE Management System

The Project Team shall establish the Site Health, Safety and Environment Management System (HSEMS) in accordance with the COMPANY's HSE requirements and develop the HSEMS based on OHSAS

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18001:1999 and ISO 14001:2004 in compliance with international health, safety and environment standards.

In order to successfully complete this project, HSE Manager on site shall establish if required, the Project HSE Procedures and Handbooks that will be approved by the Project Manager, prior to commencement of all safety activities.

3.3 Reference Document

The following documents should be read in conjunction with this Site HSE Plan, these procedures are the key to successful HSE Management.

S/N	HSE Document
DTMS-HSE-PG001	Site HSE Plan
DTMS-HSE-PG002	Camp Management Procedure
DTMS-HSE-PG003	HSE Audit & Inspection Procedure
DTMS-HSE-PG004	PPE Management Procedure
DTMS-HSE-PG005	Emergency Response Procedure
DTMS-HSE-PG006	Risk Assessment & Management Procedure
DTMS-HSE-PG007	Security Management Procedure
DTMS-HSE-PG008	Severe Weather Procedure
DTMS-HSE-PG009	Subcontractor's Safety Management Procedure
DTMS-HSE-PH001	Disease Prevention Procedure
DTMS-HSE-PH002	Health Management Procedure
DTMS-HSE-PH003	Malaria Control Procedure
DTMS-HSE-PH004	Water Quality Control Procedure
DTMS-HSE-PS001	Abrasive Blasting Procedure
DTMS-HSE-PS002	Abrasive Wheel Procedure
DTMS-HSE-PS003	Battery Charging & Changing Procedure
DTMS-HSE-PS004	Colour Coding Procedure
DTMS-HSE-PS005	Compressed Gas & Air Procedure

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DTMS-HSE-PS006	Confined Space Entry Procedure
DTMS-HSE-PS007	Crane & Lifting Work Procedure
DTMS-HSE-PS008	Electrical Safety & Energizing Isolation Procedure
DTMS-HSE-PS009	Process Plant Emergency Procedure
DTMS-HSE-PS010	Excavation Work Safety Procedure
DTMS-HSE-PS011	Fall Prevention & Protection Procedure
DTMS-HSE-PS012	Fire Prevention & Protection Procedure
DTMS-HSE-PS013	Floor Grating Safe Removal Procedure
DTMS-HSE-PS014	Forklift Safety Procedure
DTMS-HSE-PS015	Fuel Storage & Handling Procedure
DTMS-HSE-PS016	Hazardous Chemicals & Substances Procedure
DTMS-HSE-PS017	Incident Investigation & Reporting Procedure
DTMS-HSE-PS018	JSA Procedure
DTMS-HSE-PS019	Machine, Power & Hand Tools Safety Procedure
DTMS-HSE-PS020	Manual Lifting & Handling Procedure
DTMS-HSE-PS021	Radiation Control Procedure
DTMS-HSE-PS022	Safety Incentives & Disciplinary action Procedure
DTMS-HSE-PS023	HSE Training Procedure
DTMS-HSE-PS024	Scaffolding Procedure
DTMS-HSE-PS025	Spray & Painting Work Procedure
DTMS-HSE-PS026	Welding & Cutting Work Procedure
DTMS-HSE-PS027	Permit To Work Procedure
DTMS-HSE-PS028	Concrete Work Safety Procedure
DTMS-HSE-PS029	Dredging Work Safety Procedure
DTMS-HSE-PS030	Equipment, Certification & Inspection Procedure
DTMS-HSE-PS031	Land Transportation Management Procedure

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DTMS-HSE-PE001	Environment Management Procedure
DTMS-HSE-PE002	Environmental Emergency Response Procedure
DTMS-HSE-PE003	Housekeeping Procedure
DTMS-HSE-PE004	Waste Management Procedure

CONTRACTOR shall produce additional Project specific work practices and procedures as the project develops.

3.4 Project Specific HSE Plan

Four weeks prior to the start of work at a site, The Project team including subcontractors shall prepare and submit the site specific HSE Plan to COMPANY Representative for review and approval. The plan shall be reviewed on a regular basis by the Project Manager, HSE Manager and Construction Manager. The plan shall describe the safety and environmental issues and risks associated with the contracted services, and shall include the followings as a minimum;

- (1) Organization and Key personnel's Responsibilities.
- (2) Policy Statements, targets and objectives.
- (3) Statutory and Contractual Obligations.
- (4) Hazard Identification and Risk Assessment.
- (5) HSE Management of Sub-Contractors.
- (6) Health, Safety and Environment Committee and Meetings.
- (7) HSE Information and Trainings.
- (8) Communication and Reporting, including plan for comminuting to Sub Contractors.
- (9) HSE Instructions and Supervision.
- (10) Emergency Response Procedure and Plan (to be reviewed at each stage of the project), Plan to include plans for rescue at height and in confined space, as well as site evacuation local and general alarms.
- (11) First Aid and Medical Supports.
- (12) Environmental Control.
- (13) HSE Inspection and Audit.
- (14) Community Safety and Site Security.
- (15) Safe Work Practices and Procedures.
- (16) Identification of significant safety and environmental aspects.
- (17) Minimizing damages to sensitive habitats.

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- (18) Controlling spillage.
- (19) Management of waste materials.
- (20) Effects of earthwork on ground water, soil erosion, and drainage.

3.5 Responsibilities for Key Personnel

CONTRACTOR shall appoint the qualified full-time safety personnel such as HSE Manager, HSE Supervisor, and HSE Officer according to the Local Occupational Health & Safety Legislation and COMPANY's Requirements. The HSE Organizational Chart on project site shall clearly define responsibilities within HSE unit & Project Team

The Roles & Responsibilities of the key HSE personnel and subcontractors are as follows, but are not limited to such;

(1) Project Manager

- Reviewing and approving the site's targets and improvement plan for HSE prepared by the site and the HSE regulation registration log.
- Approving the project site accident prevention plan.
- Providing man-power and technology to be utilized for safe operation of preventive facilities from danger.
- Reviewing and approving the training plan prepared by the site HSE team to implement and maintain HSE improvement activities of the site.
- Reviewing and approving the site's emergency plan against occurrence of significant accident on site.
- Reviewing and approving the monitoring and measurements on the site, identifying the achievement status of HSE improvement plan and implementing in accordance with operational control procedure prepared by site.
- Approving incident investigation/handling reports and non-conformance reports prepared by the HSE Manager during construction and the recommendations coming from these reports, as well as to approve formal investigation reports.
- Checking and improvement of the working environment.
- Approval of Corrective Action Requests (CAR) issued by the HSE Manager to correct improper behavior of subcontractors against HSE improvement activities and policy of CONTRACTOR.
- Periodically appraise the effectiveness of the HSE Management System and ensure that any necessary changes are made.
- Ensure that project specific Health, Safety & environmental protection programs are established, implemented and maintained.

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- Ensure that subcontractor's capacity is adequate to cover sound and safe methods of Health, Safety & Environmental Policy.
- Acquire a full and accurate knowledge and understanding of the COMPANY HSE Policy and ensure that all subordinates appreciate their responsibilities.
- Delegate a clear responsibility for Health, Safety & Environmental protection to all, including subcontractors, through liaison, planning and coordination.
- Make him or any of his Senior Manager available to accompany the HSE Manager on site HSE inspections or accident investigations
- Ensure compliance with statutory regulation that all site registers and accident investigation reports are kept up to date and available at all times.
- Decide in conjunction with operations how best to deal with existing, temporary and future safety services.
- Inform the HSE Manager of all new or additional work so as to anticipate hazards, recommend precautions and instruct all in relevant procedures.
- Ensure that all subcontractors and their employees are made aware of and comply with the organization's HSE policy by giving a copy of the COMPANY HSE Management System to each and obtain a signature, indicating acceptance and verify that all HSE requirements are properly communicated and understood at all levels of supervision as applicable

Note: The responsibilities for Construction Manager are the same as Project Manager and shall take the full responsibilities in the absence of the Project Manager

(2) HSE Manager

- Establishing and Implementing the Project HSE Plan, Procedures, and Handbooks.
- Reporting the results of the auditing & site HSE inspection.
- Preparing and approving HSE Inspection.
- Executing HSE Training for all employees.
- Issuing Non-conformance Report (NCR) and Corrective Action Request (CAR).
- Investigating and documenting all incidents and developing steps to prevent recurrence.
- Completing Job Safety Analysis for specific construction activities.
- Supervising mock drills and training for prompt action against an emergency situation on site.
- Recording and maintaining the statistics of industrial incidents.
- Composing and managing the HSE organization.
- Establishing and revising of the HSE Management System.
- Assigning of the person in charge of risk assessment relating to health & safety and approving risk assessment registration log.

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- Advice Project Manager on suitability of Personnel Protective Equipment with regards to meet the international standards.
- Ensure strict adherences to Work Permit Procedure.
- Ensure adequate safety coverage with a minimum ratio of 1 HSE rep per 100 employees.
- Maintain and audit fire protection and fire fighting equipments.
- Develop and implement appropriate HSE Campaigns and promotions based on performance, incidents and indicators on site and organize incentive schemes.

(3) Section Manager

- Planning and requiring that all work operations be done in compliance with established safety regulations and safe work practices in his area of responsibilities.
- Ensuring the availability of all necessary personal protective equipment (PPE), job safety material, and first-aid facilities.
- Ensuring that all new employees that belong to his group are properly instructed regarding safe work practices, hazards recognition, and training.
- Ensuring that every work activity to be performed by his group has proper Work Method of Statement (WMS) with Job Safety Analysis (JSA), when necessary.
- Communicating health and safety related information and reports to all employees, and other COMPANY's required responsibilities.

(4) Supervisor

- Ensuring that all employees under supervision understand their safety responsibilities.
- Ensure all employees are qualified to carry out their assigned task.
- Organize the site and work places so as to ensure that work is carried out to the required standard, with minimum risk to men, equipment and materials and to ensure that the employees under his responsibility do not engage in unsafe work practices or take unnecessary risks.
- Ensure that employees are provided with the appropriate resources (tools, equipment, supervision, PPE etc.) to safely complete the task.
- Give all employees precise instructions on their responsibilities for correct working methods.
- Check that all machinery and plant are maintained in good condition and report any defects immediately.
- Ensure that all persons under his control know what to do in the event of an incident, fire or other emergency.
- Ensure strict adherence to Work Permit Procedures.
- Ensure that every employee is fully informed of job hazards he may expect to encounter and control measures to prevent any injury.

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- Ensure that all injured employees receive immediate medical treatment.
- Ensure that tasks are allocated to workers only in accordance with the worker's capabilities and qualifications.
- Ensuring proper use of all necessary PPE.
- Acting without delay to address all hazards and unsafe conditions or actions within the scope of area of responsibility.
- Cooperating fully in the investigation of any accidents, taking all necessary measures to prevent recurrence, and reviewing causes and possible prevention of accidents.
- Caring for all injuries immediately.
- Reporting all accidents properly.

(5) Subcontractors

- Abiding by all HSE rules of CONTRACTOR and other related parties.
- Notifying all other subcontractors when actions or activities of subcontractor's work operation may present a safety or health problem to other subcontractor's employees.
- Informing CONTRACTOR of all incidents or injury claims of the subcontractors.
- Reporting and possibly mitigate all observed unsafe conditions or actions to the appropriate Section Manager or HSE Section.
- Establishing and complying with the Project Health & Safety Management System.

(6) Employees

- Consistently observing work conditions, operations, equipment, and tools for the purpose of accident prevention.
- Complying with all CONTRACTOR HSE rules & regulations, local regulations and COMPANY's HSE requirements.
- Using the provided PPE, safety equipments, and safe work practices required for the safe performance of the job.
- Correcting any unsafe work practices within the scope of the work operations and reporting any unsafe work actions or conditions.
- Suspending works if conditions present an immediate danger to life, limb, or property and reporting such conditions immediately.
- Use the correct materials, tools, equipment and methods for the work he is carrying out.
- Report all defects in plant and equipment immediately to his foreman or supervisor.
- Develop a personal concern for himself and others around him.
- Be familiar with emergency procedure.

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Note: The duties & responsibilities of additional HSE key personnel such as health adviser (doctor & nurse), HSE Supervisor, or HSE Officer should be assigned, when the detailed project HSE Plan are prepared.

3.6 Subcontractor Control

Prior to commencement of the Project, Subcontractors shall provide to CONTRACTOR a written HSE programs that covers the site specific hazards and identifies the particular hazards to their businesses and provides precautions to perform the work in a safe manner.

CONTRACTOR shall review subcontractor's HSE programs including policy, plan, organization, activities to be taken for safe work, etc.

The Subcontractors shall also implement COMPANY's HSE Requirements as well as HSE Management System established by CONTRACTOR, and should report their HSE Performance Records including all HSE activities for review on a monthly basis, and CONTRACTOR shall check and control the records and activities for safe work with their monthly report.

Also, CONTRACTOR shall inform the COMPANY Representative of information on the subcontractors and obtain a written approval from the COMPANY Representative prior to any contractual agreement with subcontractors.

4. HSE COMMUNICATIONS

4.1 Kick-Off Meeting

Prior to the start of work at each site performed by subcontractors, a kick-off meeting shall be held and attended by related COMPANY Personnel, Project Manager, HSE manager and Construction manager of Subcontractors. The following items shall be discussed.

- (1) Nature and Scope of Work.
- (2) Site HSE Specific Work Plan.
- (3) Job Safety Analysis & HSE program.
- (4) Reporting and Investigation Procedures of an Incident.
- (5) Health, Safety, Environmental and Security Issues or Issues of current Concerns.
- (6) Community Relations.
- (7) Emergency Response.

4.2 Site HSE Committee Meeting

The Site HSE Committee meeting shall be held on a monthly basis at each work site. However, the frequency of meetings may be increased or decreased, if requested by COMPANY or necessary for HSE improvement.

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The Project Manager, HSE Manager, Section Managers, including Subcontractors' Site Manager shall participate in the Committee; COMPANY representative can join the HSE Committee on their own will, the following topics shall be discussed and reviewed.

- 1) Improvement of Work Environments for Safe Work.
- 2) HSE activities agenda.
- 3) Site inspection and Audit Reports.
- 4) Accident Investigation Report and Recurrence Prevention plan.
- 5) Site Specific HSE performance Review.

In addition, the minutes of this meeting, attendees and the HSE Performance report shall be recorded and retained for audit purpose by COMPANY, which gained HSE related data i.e. HSE Statistics, Audit Result, Training Status, Award & Disciplinary Action taken etc., during the month shall be reported to CONTRACTOR's Head office.

4.3 HSE Meeting

(1) Toolbox Meeting

In order to inform potential hazards of the job site, all employees shall participate in the tool box meeting prior to each shift, and the attendance shall be documented and retained. This meeting shall be conducted by CONTRACTOR or subcontractor line supervision, and should address the scope of the task, the tools and equipment required, roles of the individuals, inherent risk of the task and remedial measures and any adjacent work which could affect or impact on the task. All workers should be allowed a chance to comment, ask questions and add their observations at this time. The toolbox meeting should take less than 20 minutes. The concerns and recommendations rose at the tool box meetings and line supervision shall be feed-backed through the line organizations. HSE personnel will monitor and support supervisors to make it more effective and meaningful; if necessary an interpreter should be assigned to translate it in the local language. The Toolbox Meeting must be redone whenever the task or conditions change.

(2) Tool Box Talk

“Tool Box Talk” on a special topic prepared by the HSE section, in coordination with other disciplines should be conducted weekly along with lessons learned through incidents experienced during the week, any other safety activity or announcement i.e. safety campaigns, Special instructions received by client, safety incentive program etc.

(3) Weekly HSE Meeting for HSE Personnel

Weekly HSE personnel's meeting shall be held once a week. CONTRACTOR and its sub contractors HSE personnel will participate in this meeting Topics to be discussed including site HSE concerns & recommendations, HSE instructions and lessons learned from incidents. The attendees shall be recorded with minutes of meeting and shall be made available for audit purpose by COMPANY.

(4) Weekly Progress Meeting

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CONTRACTOR will hold a Weekly Progress Meeting to be attended by all Section Managers including Construction Manager and HSE Manager. Depends upon the COMPANY requirement; the COMPANY can participate in the meeting to discuss project issues including HSE and Quality. HSE issues will be discussed including result of weekly site inspection and actions to be taken to rectify HSE deficiencies. A review of outstanding action items from all sources such as Inspections Audits Investigations and observation programs should be reviewed for progress and closure.

4.4 HSE Awareness

The HSE officers shall post HSE posters, signs, and notices, in the appropriate language(s), in prominent locations at the site to inform the potential hazards and maintain safety awareness.

HSE bulletins shall be issued to notify particular HSE issues and progress in achieving objectives, targets, and performances to employees.

Safety Flash and Safety Alert shall be issued to notify the serious incidents; lesson learned and control measure to avoid recurrences.

All available catalogues, publications and information regarding HSE will be made available and circulated.

The HSE Management Plan and procedure documents shall be available for easy reference of supervisors or whoever required. Also the relevant COMPANY's Procedures / HSE Documents will be located at the same place.

4.5 HSE Campaigns

CONTRACTOR shall conduct the following HSE campaigns in order to revise employees' safety first spirits and promote project HSE performances.

(1) Zero Accident Campaign

The project team members acquiring 'Target Time or Days without lost time incident' shall be given appropriate compensation – Awards Certificate signed by President and Prize Money (Cash Awards) - by the Overseas HSE Team at the Head Office. The method of setting "Zero-Lost-Time-Accident Target Time" and acquisition of Zero-Lost-Time Records and the compensation Procedures are recorded in the Health & Safety Control Procedure.

(2) Specific HSE Campaign

A specific HSE Campaign will be launched time to time as per the findings of HSE audits, Walkthroughs or lesson learned from the incidents.

4.6 Documentations

All documents shall be prepared, reviewed and approved by authorized personnel and distributed to the responsible organization to secure traceability. In case of changes or modification, the documents shall be reviewed and approved according to the above procedures.

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The following documentation shall be kept by HSE Manager, and be available for inspection at any time by the COMPANY Representatives and Head Office.

- (1) Environmental Protection Measures & Waste Management Procedures.
- (2) Emergency Response Plans & Measures.
- (3) The results of HSE Inspection & Audit.
- (4) Effluent Discharge Plan & Water Management Plan.
- (5) HSE Training Register & Matrix.
- (6) Minutes and Attendances of all HSE Meetings.
- (7) Minutes and Attendances of HSE Committee meetings.
- (8) Certification & Verification Records for Personnel & Equipments.
- (9) Job Safety Analysis & HSE Improvement Program.
- (10) Register of Hazards Found, Corrective Action & Follow-up.
- (11) Accident & Incident Reports & Investigation Results.
- (12) Incentive Awards Program & Results.
- (13) Behavioral Based Safety Observation & Results.
- (14) HSE Communications & Notices.
- (15) MSDS.
- (16) HSE Objectives, Targets, and Results of Performance Review, etc.

5. HSE TRAINING & DRILLS

CONTRACTOR shall provide HSE training to all employees to inform job hazards and prevent potential risks, and confirm that they are properly trained and qualified to perform the work and can use all applicable safety equipments & devices including PPE.

The training program in details shall be prepared and executed by HSE Manager, Supervisors or other qualified personnel. All employees shall complete their mandatory training courses according to the monthly (or yearly) training schedule. The detailed mandatory training program is stipulated in CONTRACTOR, HSE Training Procedure for guidance.

5.1 HSE Induction

5.1.1 Project HSE Induction

All employees shall attend Project HSE induction briefing conducted by HSE Trainer or a relevant person nominated by HSE Manager. The purpose of HSE induction training is as follows;

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- Introduction.
- Project Overview.
- Project HSE Policy & Target.
- HSE Responsibilities.
- Safety Management.
- Health Management.
- Environment Management.
- Incentives & Disciplinary Procedures.
- Emergency Response Procedures.
- Site Tour.

Induction will include Confined Space Entry and Working at Heights training. This will ensure that all new personnel are equipped with the mandatory training requirements prior to physically entering the work site area. Only once the induction is completed, will the workers training passport be stamped authorizing him/her to proceed to site.

Combining CSE and WAH with the general site induction will eliminate any problem relating to personnel proceeding to inspect or carry out an activity/task where there is a danger of CSE or WAH on site without having completed the respective training modules.

5.1.2 On the Job HSE Orientation

After completing the Project HSE Induction the new employee should wear all mandatory PPEs for site and will report to his supervisor. The supervisor will impart him the Site HSE Induction. This shall be recorded and added to the employees training records along with the name of the supervisor that conducted the orientation.

The main aim of this induction is:

- (1) Testing worker's competency and experience in its field.
- (2) To communicate the site specific rules, familiarization of area, muster points, welfare facilities and medical aids.
- (3) To share important safety practices and programs.
- (4) To remind Site HSE Policy.

Basically, CONTRACTOR shall comply with the subjects of induction training as the client requirements and additional subjects for workers in their specific working areas.

5.1.3 Visitors HSE Induction

All visitors to site shall be given an outline briefing of their responsibilities as contained in the formal induction which includes the site specific Emergency Response Plan.

Such visitors shall be given information stating the site rules.

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Visitors shall be provided with safety equipment hard hat, safety shoes, safety glasses etc. and accompanied at all times while on site. All visitors shall be informed of the location and layout of assembly points.

5.2 Supervisors Induction

In addition to the basic HSE Induction, Supervisors shall attend further induction. The Supervisor Induction shall be executed for 1 day. The induction will be developed in an interactive format, which will combine all the key elements of the training into a practical application. The main objective is to allow the Supervisors to exercise their ability to coordinate work tasks and schedule accordingly. At the end of the training/induction, Supervisors will be tasked with a scenario which they will have to coordinate.

The following subjects are introduced & conducted.

- (1) Tools for achieving incident & injury free culture, Zero Accident Philosophy.
- (2) Supervisor's Roles & Responsibilities.
- (3) Risk assessment.
- (4) Constructively correct unsafe acts & conditions.
- (5) Effectively acknowledge and recognize safe work practices.
- (6) Implementing the site specific HSE work plan.
- (7) Incident investigations & HSE inspection.
- (8) Behavioral Based Safety & Job Safety Analysis.
- (9) Permit to work (PTW) system administration (briefly discussed, separate training module).
- (10) Lockout & Tagout (LOTO) System (briefly discussed, separate training module).
- (11) Confined Space Entry & etc.

5.3 Training Register

The HSE Manager shall prepare & maintain the training register of employees who have been inducted and when received additional training or re-training. This register shall be including all kinds of on-site training carried out by subcontractors and shall be made available for audit purpose by COMPANY Representative at any time. Training hours will be tracked as a leading indicator.

5.4 Certification of Personnel

The below workers shall be registered, certified and trained by qualified personnel for demonstration of their competency to perform their work safely.

- Crane operators, riggers, earth moving equipment operators, welders, cutters, fork lift drivers, mobile platform operators, radiographers, scaffolders and blasting workers.
- Crane operators, riggers etc. shall be certified by an accredited third party and be valid for a specific period of time. These workers will not be certified by CONTRACTOR personnel.

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- First-aider, confined space entry, fire fighter, fire warden and certified Gas Testers.

5.5 Specialized Training

The specialized training shall be conducted by qualified personnel for craft workers and equipment operators working at areas in which major hazards are identified from job safety analysis. The below crafts and operators shall participate in specialized training as a mandatory, and their competency to perform their work well should be identified by written or oral test.

- (1) Crafts: riggers, welders, cutters, mobile platform operators, radiographers, scaffolders, blasting workers, explosive workers, and workers involve in grinding.
- (2) Operators & Drivers: crane, earth moving equipment, fork lift, dump truck, pump car, vehicles with wheels.
- (3) First Aid Personnel, Confined Space Entrees, Fire Watcher, Signalers & Flag men and certified gas testers.
- (4) The following additional HSE trainings shall be conducted if required.
 - Specialized HSE Training Course for Specific Works.
 - Monthly Regular Safety Training Course for safe work practice.
 - HSE Inspection & Accident Investigation Training Course for HSE personnel.
 - Emergency Procedure & Response Training Course for medical personnel. The ERT will receive appropriate training from a third party. The training will be comprehensive enough to handle most emergency situations on site.

5.6 HSE Training List

The HSE Manager will facilitate the training through the assistance of competent & knowledgeable persons in every specific fields or third party for specialized training in the following training topics. The below training materials can be found in the web based HSE Database of CONTRACTOR and they can be modified upon the project requirements.

	S/N	HSE Document
1	DW-HSE-TM001	HSE Induction
2	DW-HSE-TM002	Emergency Response
3	DW-HSE-TM003	Environmental Management
4	DW-HSE-TM004	Supervisors Training
5	DW-HSE-TM005	Conducting Toolbox Meeting
6	DW-HSE-TM006	Risk Assessment & JSA

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7	DW-HSE-TM007	Security Management
8	DW-HSE-TM008	PPE
9	DW-HSE-TM009	Control Of Substance Hazardous to Health (COSHH)
10	DW-HSE-TM010	Permit to Work
11	DW-HSE-TM011	Crane & Lifting Safety
12	DW-HSE-TM012	Confined Space Entry
13	DW-HSE-TM013	Colour Coding and Inspection
14	DW-HSE-TM014	Fall Protection and Prevention
15	DW-HSE-TM015	Fire Prevention and Protection
16	DW-HSE-TM016	Defensive Driving
17	DW-HSE-TM017	Electrical Safety -Construction
18	DW-HSE-TM018	Scaffolding Safety
19	DW-HSE-TM019	Excavation Safety
20	DW-HSE-TM020	Welding and Cutting
21	DW-HSE-TM021	First Aid Training
22	DW-HSE-TM022	Manual Handling
23	DW-HSE-TM023	Power and Hand Tools Safety
24	DW-HSE-TM024	Lockout & Tagout
25	DW-HSE-TM025	Abrasive Wheels
26	DW-HSE-TM026	Achieving Safety Culture
27	DW-HSE-TM027	HSE Auditing
28	DW-HSE-TM028	Lifting Inside Fabrication Shop (Using Overhead Crane)
29	DW-HSE-TM029	Behaviour Base Safety
30	DW-HSE-TM030	Radiography Safety
31	DW-HSE-TM031	Sexually Transmitted Disease (STD)
32	DW-HSE-TM032	Cancer Causing Chemicals
33	DW-HSE-TM033	Leading Indicator
34	DW-HSE-TM034	Cold Stress

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35	DW-HSE-TM035	Heat Stress
36	DW-HSE-TM036	Crane & Lifting Safety (For Rigger & Operator)
37	DW-HSE-TM037	Compress Gas Safety
38	DW-HSE-TM038	Trenching and Shoring (For Civil Excavation Group)
39	DW-HSE-TM039	Drug and Alcohol Awareness
40	DW-HSE-TM040	Ergonomics (For Office Personnel)
41	DW-HSE-TM041	Eye and Face Protection
42	DW-HSE-TM042	Foot Protection
43	DW-HSE-TM043	Head Protection
44	DW-HSE-TM044	Hearing Protection
45	DW-HSE-TM045	Forklift Safety
46	DW-HSE-TM046	Hypertension
47	DW-HSE-TM047	Hydrogen Safety
48	DW-HSE-TM048	Office Safety
49	DW-HSE-TM049	Working at Heights
50	DW-HSE-TM050	Hazard Identification Process
51	DW-HSE-TM051	Machine Guarding
52	DW-HSE-TM052	Malaria Control
53	DW-HSE-TM053	Incident Investigation & Reporting
54	DW-HSE-TM054	Injury and Illness Prevention

5.7 HSE Drills

The HSE Drills shall be conducted as per emergency preparation and response plan. The drills provided against emergency situations shall be prepared, implemented and reviewed periodically.

As a part of the HSE Drills uniformed evacuation exercises will be planned with coordination of COMPANY and HSE section to evaluate the performance of CONTRACTOR and subcontractor personnel on an emergency situation. A scenario will be formed by depending on the emergency situations and the following formats will be noted for a typical evacuation drill in case of fire, explosion, gas leak, spill etc. in gas plant facilities

- (1) Response to sirens and indications.
- (2) Escape route selected as per wind direction.

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- (3) Panic behavior of the personnel.
- (4) Possession of escape sets.
- (5) All efficiency in stopping hot works.
- (6) Total time consumed for evacuation.
- (7) Assembly point head count.

Corrective action will be implemented on defective actions by providing the employees with more training and information, as required.

6. RISK MANAGEMENT

6.1 Risk Assessment Procedure

In accordance with the pro-active approach to HSE, the risk assessment techniques shall be applied so that potential hazards can be identified and evaluated prior to execution, and then mitigation methods will be applied. CONTRACTOR shall carry out a systematic assessment of all health, safety and environmental risks during the planning of all construction activities. The main aim is to mitigate the risk or bring it down to the acceptable ALARP (As Low as Reasonably Practicable) level.

The stages for performing these assessments as detailed herein are;

- (1) List all types of work during the activities.
- (2) Identification of the health, safety and environmental hazards of each type of work.
- (3) Assess the severity of risk using the risk assessment matrix.
- (4) Indicate how each risk will be controlled.
- (5) Indicate the need for specific job safety analysis, where the normal procedures and controls are expected to be inadequate.
- (6) Risk Assessment action follow up and evaluation of action plan.

Risk assessments shall be done using the attached Takreer RAM as an integral part of CP-HSE25.

6.2 Job Safety Analysis

The CONTRACTOR shall apply TRA (Task Risk Assessment) instead of JSA. Form is attached as an integral part of CP-25.

Job safety analysis details of the sequence of each work, the equipment used at each stage or phase, the hazards controlled, the precautions to be taken and the responsibilities of persons involved. Job safety analysis shall be prepared by CONTRACTOR and subcontractors, and be approved by COMPANY Representatives in case of high risky works determined by risk assessment. The results of job safety analysis shall be communicated to everyone involved in the activities and shall be used and monitored by

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supervisors and field engineers. A copy of approved JSA shall be attached with the work permit and available at the location of work activity as an easy reference and guideline for all.

The changes and problems which occur during the work itself should be continuously assessed by the work supervisor and HSE team.

Prior to the commencement of any work, the Job Safety Analysis & Risk Assessment associated with the work shall be implemented, and the high-leveled risks and actions necessary to prevent the occurrence of the hazards should be registered. The hazards associated with work performances shall be minimized and/or controlled through;

- (1) Engineering out the problem at source.
- (2) Substitution of a less hazardous process, activity or substance.
- (3) Installation of protective devices.
- (4) Enforcement of special rules and procedures.
- (5) Providing proper supervision, supported by training, instruction and relevant information.

Job safety Analysis, (JSA), is appropriate for any task where the hazards and control measures need to be formally assessed. A JSA is to be raised for all activities with a significant risk for which a specific established safety precaution is not in place.

As a minimum a JSA must be raised for;

- (1) Non routine or one-off tasks.
- (2) New tasks or tasks requiring new work methods.
- (3) Routine tasks that are carried out under unusual circumstances.
- (4) When requested by COMPANY.

In general routine tasks should be dealt with by established procedures however a JSA should still be completed for;

- (1) Routine tasks that have the potential for serious incidents.
- (2) Routine tasks which have a history of incidents or near-miss.

In all of the above cases the JSA is used to both identify hazards and to establish necessary controls and recovery measures.

6.3 Hazards Communication

- (1) Industrial Hygiene Control

While performing construction activities, CONTRACTOR shall apply all industrial hygienic standards on personnel accommodation and catering facilities by local rules and regulations, and provide proper trainings for the hazards. All workers shall be provided with the information on the industrial Hygiene such as;

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- Noise.
- Vibrations.
- Chemical Products.
- Dust, fumes and vapors.
- Asbestos, etc.

CONTRACTOR also has the management program on workers related with risky work. CONTRACTOR will implement programs such as Medical Examination & Fitness, Licensing of Equipment Operators and Orientations. CONTRACTOR shall have a job specific orientation for workers. During the orientation, the workers shall be tested and interviewed orally or by written examination regarding their competency and experience in their work areas. After the test, qualified workers shall be deployed to their respective jobs.

(2) Toxic or Hazardous Materials

CONTRACTOR shall ensure that all employees comply with all applicable standards and regulations to reduce contaminant concentration levels to the lowest achievable level. The Project HSE Manager shall;

- Evaluate all operations, materials, and equipments to determine the presence of hazardous environment if hazardous or toxic agents might be released into the work environment.
- Evaluate operations, materials and equipment involving potential exposure to hazardous substance agents or environments.
- Maintain a list of hazardous substances, agents, and environments and recommended action for their control.

CONTRACTOR will set up a communication system with neighboring facilities to ensure that in the event of exposure to loss of containment of NH3 or H2S from neighboring facilities there is notification from the relevant persons if their dispersion modeling's show any form of impact on the EPC 4 area.

The monitoring program shall include the followings;

- Use of approved and calibrated detection device.
- Monitoring by a trained and competent person.
- The Record of findings and actions taken.

The HSE Manager shall establish the Hazardous Substance Control Procedure as follows;

- Eliminate the substances when possible.
- Minimize exposure to toxic and hazardous substance by ventilation, wetting and etc.
- Consider use of PPE in case of exposure.
- Provision of spill kits and training of spill responders.

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When hazardous substances are procured, the HSE Manager shall ensure that manufacturers / vendors provide MSDS (Material Safety Data Sheet), make them available at the work site, and that appropriate training is given for safe handling, transporting, storage and usage.

(3) Radioactive Materials

Radioactive materials shall be properly controlled when brought onto a site, and machines that produce radiation should be designed so that exposure of personnel is kept to a minimum. The HSE Manager shall establish safety plans for use of radioactive materials or machines that produce radiation prior to being procured at the site.

CONTRACTOR shall notify all relevant Government Statutory Authorities and COMPANY of the location of all permanent or semi-permanent storage area for gamma radiography sources under his care.

All other instructions are laid down in CONTRACTOR HSEMS Radiation Control Procedure; COMPANY and local government regulations shall be strictly followed.

6.4 Security Management

CONTRACTOR & Subcontractors are normally responsible for security on their respective construction site, offices, accommodations and temporary facilities, and responsible for day-to-day management of security. CONTRACTOR shall prepared security procedures and implemented in accordance with COMPANY and Government security requirements;

- (1) To prevent entry of unauthorized persons or vehicles onto the site, offices and facilities by restricting access through a main gate patrolled by officer and security guards.
- (2) To identify all employees and visitors through electronic access system or identification card system.
- (3) To store construction materials, equipment and plant securely.
- (4) To prevent unauthorized removal of materials and equipments.

The theft of equipment and materials from Construction Sites place a great deal of burden on the profit margin of CONTRACTOR and its Subcontractors.

Stolen materials not only require replacing with additional associated costs, which would not have been budgeted for, but will also have a severe bearing on Project Completion Dates. This is due to the fact that many parts and materials are supplied to Overseas Projects from other countries, thus resulting in delays on receiving necessary replacements and affecting production schedules.

Major fires on Construction Sites usually occur outside of normal working hours (nights, weekends and holiday periods) when there are fewer people around to detect and extinguish the fire. CONTRACTOR effective 24-hour security with regular patrols will be required for preventing major fires and theft of plant, materials and associated equipment. Fire watchers shall remain on site 30 minutes after the cessation of all hot works.

As a minimum, the following requirements are to be done to assist in providing an effective Plant Protection Organization. Plans, layouts and general arrangement for warehouse, storage of equipment,

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waste tipping areas, vehicle route (especially emergency vehicles) and vehicle parking area will be established. The notice of site speed limit with relevant signs shall be conducted.

6.5 Emergency Preparedness & Response

The HSE Manager on site shall identify the potential emergency problems resulting from the risk assessment at the site and report them to the Project Manager, COMPANY Representatives, and all HSE related personnel. The fires, explosion, natural disaster, medical emergency, environmental contamination, and major security incident are considered as an emergency situation.

Before the start of this project, Emergency Response Plan (ERP) shall be prepared by the HSE Manager on site after performing job hazard analysis or risk assessment to determine potential emergency situations, toxic materials, and unsafe conditions. It shall be periodically reviewed by the progress of work or site & work circumstances. The ERP shall be approved by the COMPANY Representatives as well as the Project Manager.

The following are some of the items to be considered in making ERP;

- (1) Emergency Escape Procedure.
- (2) Emergency Route Assignments.
- (3) Emergency Situations and Evacuation Procedure.
- (4) Communication Facilities and Emergency Telephone Number posted in the conspicuous place near or on the telephone.
- (5) First Aid supplies, Fire-fighting resources and Rescue Procedure.
- (6) Outside Emergency facilities and services, in case that the workplace is far from medical facilities, such as local hospital medical aid by chopper(Medivac), local fire departments, International SOS Service.
- (7) Training program (Emergency Mock Drill) for Emergency Situations and Evacuation Procedure.
- (8) Emergency Action to be taken when emergency situation occurred after regular working hours.
- (9) Composition and qualification of Emergency Response Team.
- (10) Muster point coordinators.
- (11) Detection and alarms.
- (12) Head counts and procedures for missing personnel.

The following should also be considered during the preparation of the ERP;

- (1) Setup and layout of assembly points.
- (2) The composition and numbers of the rescue team, fire team and first aiders.
- (3) A proper flow chart and the methods for proper communication during emergency situations (radio, pager etc).

6.6 Health & Medical

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(1) Health Management

The site specific HSE plans in construction and operation areas shall meet the COMPANY requirement and will comply with all applicable HSE Laws and Regulations. It is also the responsibilities of CONTRACTOR to provide healthy & hygienic facilities not only in site but also in accommodation.

CONTRACTOR shall maintain a general camp hygiene standard for living quarters for its entire employee, including toilet facilities, ventilation, water supply and rubbish disposal. Food and drinks shall be handled only by trained and certified healthy personnel. Food storage, preparation and cooking will be done as per CONTRACTOR and COMPANY's Health standards. Regular fumigation & placement of anti rodent's chemicals shall be done to take away rodents and other insects.

The drinking water quality shall be ensured through compliance with the drinking water standard (guidelines for drinking water quality, World Health Organization: 1993). The cold potable water for drinking shall be provided to employees around the work areas. To prevent workers from heat problems, they shall be properly permitted with reasonable access to water and rest according to the standards.

(2) Medical Facilities

At the work area, CONTRACTOR shall provide the medical clinic operating 24 hours a day for emergency medical care to our and subcontractor's personnel that sustain injury or illness at the site. The clinic shall be equipped with 2 beds for overnight observation for diagnosing, investigating and treating simple trauma, general practice and occupational health. Qualified doctors/or experienced nurses shall have a capability to respond to emergency medical cares, provide life saving treatment and stabilization prior to evacuation. If the state/or national emergency medical center are in remote areas from the site (generally, it takes more than 5 to 10 minutes to arrive at the emergency center), an ambulance equipped with medical facilities shall be provided for emergency situations.

The first-aid boxes and devices shall be adequately provided by CONTRACTOR and Subcontractors for their use at the work area and camps. We shall ensure that at least 1 in every 50 of our/or subcontractor's employees will be trained with first aid and has immediate access to a first aid box at the work place. At least one AED will be located on site for emergency situations.

6.7 Housekeeping

CONTRACTOR is aware that many hazards to employees, when they are performing construction related activities, may be present and that keeping a construction site clean of debris can reduce hazards. The three main reasons for housekeeping are as follows:

- (1) To reduce accident agents and risk of fire.
- (2) To conserve space, materials and effort.
- (3) To create safe working conditions.

In order to reduce potential hazards in construction related activities, all employees shall implement the followings and should report any hazards on the construction site to their supervisor.

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- (1) Noncombustible scrap material and debris that consists of form and scrap lumber with protruding nails, and all other debris, shall be kept clear from work areas, passageways, and stairs in and around buildings or other structures. De-nailing areas are to be set up where required and all scrap will not be disposed of until de-nailing has been completed.
- (2) Combustible scrap materials and debris shall be removed at regular intervals during course of construction without increasing the hazards exposure to employees who remove such debris.
- (3) All construction waste shall first be collected into containers before disposal.
- (4) Additional separate containers shall be provided with lids for collection and separation of hazardous wastes including used oil, used oil filters, oily rags and flammable wastes as well as caustics, acids, harmful dust, etc. A designated hazardous waste deposal area is to be established and managed according to environmental standards.
- (5) Spillage of oil or chemicals shall be cleaned up immediately in view of the hazards from fire, slippery surface, toxic substances, etc, and used clean-up material shall be disposed of properly by properly trained and equipped personnel. MSDS's should be available for spill response teams as well as any fire fighting personnel.
- (6) Glass containers shall never be stored in an elevated area.
- (7) All employees must conduct housekeeping around their working area 20 minutes before finishing their daily job. The time can be changed according to the site's circumstances.

CONTRACTOR shall maintain road and other site operating facilities affected by its operations in a clean and uncluttered condition at all times to ensure transportation safety and maximize the efficiency of operations at a site as well. All obstacles shall be removed. Any and all dirt, mud, concrete, debris, trash, waste, spoil, refuse, etc. shall be cleaned up and removed immediately.

6.8 Transportation

(1) Motor Vehicle Safety

Land Transportation Management Procedure is created so as to ensure that vehicles that are used by CONTRACTOR and subcontractors are fit for purpose and maintained to the highest standards, and work practices are so designed as to ensure the safety of all vehicle drivers and passengers. CONTRACTOR shall ensure that all employees travel only in vehicles that are provided with passenger seats and 3 point inertia reel seat belts which shall be installed and used in all vehicles carrying personnel, equipped with fire extinguishers and with first aid box. Drivers and vehicles must be licensed and registered. The drivers shall undergo to Drug / Alcohol Test when requested by traffic patrol or HSE personnel.

An observer should be used for reversing if the motor vehicle is not equipped with a back-up alarm. An observer must be used when backing any mobile equipment on the construction site. A spotter is to be used when moving large loads or equipment around site. The cabs of motor vehicles must be equipped with safety glass, windshield wipers, and a system for defogging the windows. Motor vehicles that transport workers must equipped with seats and safety belts for every passenger.

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All traffic on work sites shall observe a safe speed, as specified by project requirements, and shall always comply with the posted speed limit.

(2) Construction Equipment with wheels

Construction Equipments and vehicles' driving speed shall be limited to the 10 km/h in the work place. All construction equipments operators shall be the experienced and qualified operators from working on the job site. They also must hold a certification or license operating construction equipments such as transporters, earthmovers, excavators, lifting equipments, etc. The towing of any equipment shall be allowed by CONTRACTOR after checking and inspecting safety pins, chains, shackles, etc.

(3) Marine Safety

When conducting marine operations, a safe ramp or walkway (gangway) shall be provided, unless it is safe to board the vessel without them. When a rope ladder is used, it shall be of the double-rung or flat-tread type, and it shall be hung without slack from its lashings, or be pulled up entirely.

When the upper end of the ramp or walkway is flush with the bulwark or rests on it, a handrail at least 840mm high shall be provided between the top of the bulwark and the deck. Substantial steps that are properly secured are also required. The ramp or walkway must be kept free of obstructions and it must be illuminated for its entire length.

Workers on barges must not be allowed to walk along the sides or around deck loads fore or aft, unless there is a safe passage. Each barge in use for marine operations must be equipped with at least one 760mm life ring with 27.5 meters or more line attached.

All workers whose jobs require working over or adjacent to, water more than 20 % of the time, or in emergency conditions shall receive water survival training prior to start of work at the workplace. The Personal Floatation Devices (PFD) approved by US Coast Guard, UK, or Korea shall be used by CONTRACTOR, subcontractors, and third party personnel while traveling off-shore, while on any boat/or vessel, transferring to or from any watercraft, and when working over, or adjacent to, water locations. All vessels shall be equipped with at least one PFD for each person. All other life saving equipments shall be provided as per the SOLAS (Safety Of Life At Sea) standards. CONTRACTOR and subcontractors shall prepare and implement the diving safety program in accordance with COMPANY Requirements.

Barges must be equipped with stationary radio, hand held radio, back-up battery flare sticks and cell phone etc.

7. MONITORING & MEASUREMENT

7.1 Behavior-Based Safety

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Basically, Behavior-Based Safety (BBS) is an established method of using positive reinforcement to change unsafe individual behaviors. The process starts with a behavioral hazard analysis to identify “AT-RISK” behaviors. These can be determined by using the followings.

- (1) Behavior Observation System
- (2) Incident, injury and near miss reviews.
- (3) Use of antecedent and incident reports.
- (4) Employee interviews.
- (5) Brainstorming.
- (6) Combinations of these tools and methods.

Using the inventory of at-risk behaviors, a checklist shall be developed to assist in the observation of work behavior. In addition, a list of corresponding behavior definitions shall be established to maintain consistency in observations. Observers record safe and at-risk behaviors on a datasheet and provide feedback to workers about their performance. The feedback reinforces the necessity for safe behaviors. Observation data will be used to identify barriers to safe behaviors.

Removing these barriers lowers the worker’s exposure to at-risk conditions and makes it easier for employees to work safely. Removing barriers and communicating successes increase individual involvement in the process. Many of these employees take home their BBS experience, which helps decrease off-the-job injuries. The basic model of BBS program shall be consisted of the following elements;

- (7) Analysis to identify a list of at-risk behaviors.
- (8) Investigation of the antecedents to at-risk behaviors.
- (9) The observation process.
- (10) Action plans to influence at-risk behaviors and conditions.
- (11) Feedback.

Summary, the BBS system should;

- (12) Be employee-based for continuous improvement.
- (13) Analyze tasks and hazards to identify critical safety behaviors.
- (14) Analyze behavior based on the job observation.
- (15) Use feedback about safety performance as reinforcement.

And, the basic BBS principles are;

- (16) Behavior is the cause of most accidents.
- (17) Consequences motivate behavior.
- (18) What gets measured gets done.
- (19) Feedback is essential to improvement.

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(20) Quality is built-in early in the process.

(21) Conversations change organizations.

7.2 HSE Inspection

The Site HSE Inspection Schedule shall be prepared by HSE Manager in order to identify and correct unsafe conditions, facilities, equipments, and work practices as well as demonstrating management's commitment to the safety program.

The results of inspection should be recorded, documented, stored by the HSE Section. The kinds of Site Inspections executed are listed below;

- (1) Daily Site Patrol by HSE personnel.
- (2) Daily construction equipment check by operator.
- (3) Weekly Management HSE Walkthrough by COMPANY, CONTRACTOR Senior Managers, Subcontractors' Management and HSE Personnel.
- (4) Random HSE Inspection by Project, Construction, Sectional and HSE Managers.
- (5) Other specialized inspection if required.

7.3 HSE Audit

The Audit is focused on assessment of Project Management, subcontractor's HSEMS and HSE activities. Recommended corrective actions for non conformances should be submitted with CONTRACTOR and/or subcontractor's written report for improvement of HSEMS and audit result will reflect project incentive scheme.

Following subcontractor's mobilization on site, Health, Safety and Environmental Management System audits will be scheduled and conducted to each subcontractor on a rolling 6 months basis. Audit team shall be organized by CONTRACTOR HSE Manager; a prepared audit checklist will be used.

The project is subject to audits that will be conducted by Overseas HSE Audit Team throughout the project HSEMS and activities according to annual Corporate HSE Audit Procedures.

The Audit Team shall be organized by Overseas HSE Team Manager or designee and consist of Overseas HSE Team members are the followings;

- Audit Team leader
- Auditors

A dedicated HSE Audit checklist shall be used in the audit. If there's any management system failure, Audit Finding Report (AFR) shall be issued to the project. Corrective Action Report should be submitted to Overseas HSE Team within 15 days after issuance of AFR.

In the occasion where occurrence of fatality or LWC from serious fault, accident which led to social criticism or request of client, special audit team will be organized as soon as possible.

The Special Audit Team shall be composed of the following;

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- Overseas HSE Team Manager and/or Staffs
- Project HSE Manager and/or Staffs

Special Audit Team carries out accident investigation and HSEMS audit at a time.

The purpose of Special Audit is to identify Root causes and management system failures from the accident, preparing and monitoring action plan for the prevention of recurrence of accident and for improvement of management system.

The result of the audit shall be recorded in an appropriate document that the Project Manager receives and has access to.

Audits of health & safety related aspects shall include any visitors as well as employees' health & safety, and the scope of audit is to access the following aspects, and the extra audit should be executed by HSE Management Team or Third Party, if required. Because the basic purpose of HSE audit is to assess;

- (1) Effectiveness of Project HSE Management System.
- (2) Implementation of Project HSE Program.

The key elements to be audited and include the following items as a minimum:

- (3) Policy.
- (4) Organization and responsibilities.
- (5) The site specific HSE work plans and implementation.
- (6) Monitoring and measuring system and results.
- (7) Continual improvement of HSE system.
- (8) Statistics and performance records.
- (9) Corrective actions to be taken.

7.4 HSE Incentives and Disciplinary Program

CONTRACTOR HSE Incentives & Disciplinary Action section shall be applied to all project site personnel's of CONTRACTOR. The purpose of this is to encourage all project employees of CONTRACTOR and its subcontractors to comply with all site HSE requirements.

This will also discourage them to think, do unsafe act or contribute in creating in unsafe condition. The focus of this system is to achieve a safety culture with a behavioral climate within a company that promotes, rewards, and controls safety in such a way to make safety as a part of business rather than of a condition of business.

Project Incentive Program

The following HSE Incentives scheme can be adopted in promoting safety awareness and recognition. Prizes / certificates shall be awarded by project management to winners on a monthly basis;

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- (1) Safety employees of the Month - given to workers who are chosen by HSE section based on their HSE compliance and cooperation. Workers shall be nominated from each section. One employee will be selected from each section or as per ratio of section's manpower.
- (2) Best Safety Supervision of the Month – given to supervisor (foreman, supervisor, and engineer or manager level) who shows an exemplary attitude towards safety, by leading his crew to a safe working attitude through exemplary leadership, planning, provision of materials, equipment and appropriate PPE. He must comply with HSE rules & regulations and lead by example. The supervisor shall be nominated by each section and will be evaluated by HSE section.
- (3) Best Section of the Month - given to section that has shown overall safety compliance and support to HSE program. HSE section shall select the Best Section of the Month through daily assessment submitted by HSE personnel regarding the section HSE performance and this will be tallied every end of the month. This scheme is recommended for a big project with multi-discipline section.
- (4) On the Spot HSE Recognition – especial award will be given on the spot to individual or a group who shows an extra ordinary safety attitudes or performance. The action should have a very positive impact in the implementation of the HSE programs.

Project Disciplinary Program

Any employee condoning, supporting or instructing any employee to commit an unsafe act, work in an unsafe environment or work with unsafe equipment or any employee committing unsafe act will be given disciplinary action up to and including termination.

Violators will be issued verbal or written citations by supervisors, HSE section personnel or management personnel. These citations are intended to attempt to change unsafe behaviour and attitude towards safety and prevent subsequent injury to self or fellow employees, or damage to property due to negligence or careless acts.

Any employee cited repeatedly committing an unsafe act or being subject to multiple disciplinary actions will be given termination. CONTRACTOR will issue 2 warnings followed by a final written warning, then finally termination of contract. All warnings will be controlled on a database capturing the workers details and nature of transgression.

Depending on the nature of the offence and/or the attitude expressed by the employee, at the discretion of management a suspension up to termination may be imposed by the management.

Records of safety violations will be kept in file with the employee's personal records for the project. These records of safety violations will be given a weigh during re-hiring or re-assignment of employee

7.5 HSE Reports

Weekly Report

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The HSE Manager shall submit to the Head Office and COMPANY HSE Manager the HSE Weekly report. The period will covered starting Sunday to Saturday and report shall be submitted not later than Tuesday of the following week.

In case of any incident happened within this period, a detailed incident report with relevant attachment, photos must be submitted together with the weekly report.

Monthly Report

The HSE Manager will regularly monitor HSE performances and prepare a Monthly HSE Report which will include Incidents, Occupational Illnesses and Environment statistics to ensure that Project Manager, Head Office and COMPANY management are fully aware of the overall HSE performances, achievements, and future aspects of HSE plan.

This document will be reviewed monthly by the HSE Committee to make all members recognize the reality of their performances and to highlight any areas requiring improvement or commendation for good performance.

This report will include the following items and form a part of the overall Monthly Construction Report.

- (1) Project details.
- (2) Project Incident Statistics.
- (3) Performance Indicators.
- (4) HSE Audit/Inspection.
- (5) HSE meetings & Drills.
- (6) Awards & Infringements.

Annual Report

At the end of each year, every site must submit their annual summary of work related incident within ten (10) calendar days of the following year. Annual Report Form shall be approved by the clients attaching the client's signature. Regardless of whether the site doesn't have any incident they must submit an annual report using CONTRACTOR official annual reporting form.

All the necessary information should be provided based on the actual records on the site.

The Site HSE Office will retain an electronic database of the report throughout the Project.

8. REPORTING INCIDENT

8.1 Recording & Reporting An Incident

CONTRACTOR is to use the COMPANY Incident form.

CONTRACTOR has established a written procedure about incident investigation and reporting. This procedure clearly defines the authorities & responsibilities on reporting an incident within project units.

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In the event of an occurrence of any serious incident, a verbal report will be given to COMPANY and the Head Office and Incident Initial Report should to be submitted within 24 hours. Some of the serious incidents are but not limited to

- (1) Fatality or multiple hospitalizations (more than 3 people).
- (2) Injuries requiring medical attention which results in lost time.
- (3) Huge Property Damage.
- (4) Serious Security Incident (e.g. kidnapping, sabotage, etc.).
- (5) Environmental incidents reportable to local authorities.
- (6) When requested by COMPANY for formal investigation.

CONTRACTOR shall file and report a written report of all nearmisses, first aid case, medical treatment cases, fire, environment related incident and other incidents that affect the HSE performance of site personnel and property.

8.2 Incident Investigation

All recordable injuries, spills, motor vehicle accidents, fires, and near misses shall be investigated in accordance with Incident Investigation & Reporting Procedure and COMPANY Requirements. The primary objective of these investigations is to determine root causes and to develop measures to prevent recurrence. The purpose of incident investigation will be to identify ways to prevent similar occurrences and not to place blame. Disciplinary procedures will be used to reinforce accountability and may be applied to accident repeater cases, in case of blatant disregard for safety procedures or failure to follow supervisor instructions. Incidents requiring more detailed investigations shall be examined by an investigation team of experienced individuals.

The report and investigation procedures are as follows;

- (1) Determine the scope of the investigation.
- (2) Select the investigators and assign specific tasks to each member.
- (3) Present a preliminary briefing to the investigating team, including.
 - Description of the accident, with damage estimates.
 - Normal operating procedures.
 - Maps and layout (local and general).
 - Location of the accident site.
 - List of witnesses.
 - Event that preceded the accident.
- (4) Visit the accident site to get updated information.
- (5) Inspect the accident site.

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- (6) Interview each victim and witness.
- (7) Determine what was not normal before the accident, where the abnormality occurred, when it was first noted, and how it occurred.
- (8) Analyze the data obtained in step 7.
- (9) Determine why the accident occurred, a likely sequence of events and problems causes, and alternative sequences.
- (10) Check each sequence against the data from step 7.
- (11) Determine the most likely sequence of events and the most probable causes.
- (12) Conduct a post-investigation briefing.
- (13) Prepare the summary report.

8.3 Feedback From Incident

The report of incident investigation shall be reviewed in a weekly HSE meeting with COMPANY representation, and the findings and recurrence prevention measures shall be educated to employees as well as field engineers, supervisors and foremen.

All accidents, incidents and dangerous occurrences including the preventive actions, recommendations by the investigation team and lesson learned from them shall be effectively channeled down to all levels of workforce through group meetings. The communication line shall be as follows: Accident/Incident Investigation Team → HSE Committee → Section Managers → Senior Managers of Sub-contractors → Site Engineers → Site Supervisors → Workforce.

An incident bulletin will be prepared and distributed to COMPANY, CONTRACTOR and Sub Contractors.

9. PLANNING SAFETY FOR PEOPLE

9.1 Physical Qualification Of Employees

CONTRACTOR shall confirm that all employees are physically and mentally qualified to perform the duties to which they are assigned. CONTRACTOR shall prepare the Physical Qualification Plan for Employees which shall include the following activities as a minimum;

- (1) CONTRACTOR shall ban any employees while using or under are the influence of alcohol, narcotics, drugs, and similar mind-altering substances while on duty. CONTRACTOR shall immediately remove them from the job site.
- (2) Operators of any equipments or drivers shall be able to read and understand the signs, signals, and operating instructions in use, CONTRACTOR shall provide appropriate training according to their assigned work. A color blind test shall be mandatory to site operator, driver and some personnel who will require color identification in their activity.
- (3) Operators of hoisting equipment, mobile construction equipments, draglines, and vehicles shall not be permitted to exceed 10 hours of duty time without documented permission.

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9.2 Medical Examination & Fitness

CONTRACTOR shall conduct pre-employment medical checkup for all employees. A medical certificate stating physically and mentally qualified to perform the duties to which they are assigned shall be provided prior to site mobilization. An accredited medical institution shall be contracted to perform medical examination.

Workers fitness shall be assessed by the Doctor after prolonged absence from work due to sickness or injury.

No personnel who was diagnosed as a carrier of a disease transmittable through food, or whilst afflicted with infections, sores and the like, shall work in food handling areas or living quarters.

All food handler personnel shall be supervised, instructed and trained in food hygiene. In addition to pre-employment medical examination, food handlers and cleaning personnel shall be medically examined every six months and require vaccination against Hepatitis A and B (Twinrex Vaccine).

9.3 Licensing of Equipment Operators

To prevent inexperienced and unqualified operators from working on the construction site, CONTRACTOR shall examine and document each operator's qualification to include the following if applicable;

- (1) Summary of operating experience on the construction site.
- (2) List of injuries or property damage resulting from past personal operation (if available).
- (3) Training related to the equipment operating.
- (4) Doctor's current physical examination results.
- (5) Oral test on the knowledge of all safety requirements applicable to equipments.
- (6) Demonstration of various modes of equipment operation.
- (7) Knowledge on the appropriate signals to communicate with flagmen or signalers.

9.4 Intoxicating Liquor, Drugs & Smoking

CONTRACTOR is committed to a safe, healthy, and productive workplace for all employees. CONTRACTOR recognizes that alcohol, drug, or other substance abuse by employees impairs their ability to perform properly and has serious adverse effects on the safety, efficiency, and productivity of other employees and on CONTRACTOR as a whole. The misuse of legitimate drugs, or the use, possession, distribution, or sale of illicit or not prescribed controlled drugs on CONTRACTOR business or premises is strictly prohibited and is grounds for termination. Being unfit for work because of use of drugs or alcohol is strictly prohibited and is grounds for termination of employment. While this procedure refers specifically to alcohol and drugs, it also applies to inhalants and all other forms of substance abuse.

CONTRACTOR will conduct random testing to his employee and for those person who obviously under influence of drugs or alcohol. Driver and operators are subject to testing before starting his daily job.

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Smoking at work places should be banned except in designated smoking areas which are equipped with the smoking signs and trash cans. While working in live plant or where presence of flammable or highly combustible; possession of lighters and matches should be prohibited.

10. PLANNING FOR SAFE WORK PRACTICES

CONTRACTOR shall comply with the Local Occupational Health & Safety Legislation, International Standards and COMPANY requirements. CONTRACTOR shall implement project HSE Plan and Procedures in order to prevent potential job hazards and ensure safe work practices.

The followings are summary of safe work practices that will be implemented during the execution of the project;

10.1 Personal Protective Equipment (PPE)

Besides the proper accident prevention methods implemented to protect the injury and possibilities of accidents, personnel protective equipment provides a barrier between the person at risk and the potential instrument of injury. CONTRACTOR and subcontractor shall adopt generally the international standards of PPE during the execution of its activity which is subject to the approval of COMPANY standards.

The HSE Manager shall ensure that the following PPE are used in order to protect all employees from job hazards:

- (1) Hard Hat – shall be wear to prevent head injury from impact, flying or falling object, or electrical shock and burn. Chin straps shall be worn while working at elevated area to prevent helmet from falling, Helmet suspensions and shell must be always inspected.
- (2) Eye and Face protection – Suitable eye protection with side shield shall be used to protect from hazard of flying object or direct impact. It must provide adequate protection for which he is designed. An additional goggles or face shield to protect eye & face must be used during grinding handling chemicals or hazardous liquids. Welders mask with appropriate filter lenses must be used during welding jobs.
- (3) Safety shoes – steel toe safety shoes must be used to protect feet from impact of falling object.
- (4) Hand protection – A wide variety of safety gloves is used in site depends on the nature of work. Safety gloves is use primarily to protect hand from cut, burns, electrical shock or chemical contact.
- (5) Full body harness – A device use to restraint people from falling if used correctly. It must be used when working 1.8 meters above the ground or there is chance of falling from higher elevation. It must have double lanyards to ensure 100% tie-off.
- (6) Respiratory protection – is used to control people from inhaling harmful dust, fumes, mist, gases, smoke vapors or spray. From a simple dust mask to Self Contain Breathing Apparatus shall be used depending on the situation. Workers must be certified medically fit for use and require annual fit testing.

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(7) Ear plug / Ear muff – when engineering or administrative control is not feasible to control the noise to protect the employee against sound level in excess of 85 dB(A) based on a 8 hour exposure or 83dBA for 12 hour shift. Ear protection must be used, Permissible Noise Exposure must be considered.

(8) Life jacket – or other buoyancy equipment must be used when working above water.

All Employees exposed to potential hazards shall be provided with those PPE depending on their working circumstances and they should wear them at all times.

Other than these general items, special PPEs will be organized for tasks of a more hazardous nature like:

- (1) Confined space entry.
- (2) Tank cleaning.
- (3) H2S contamination.
- (4) Handling of asbestos type of material.

More details are stipulated in PPE Management Procedure.

10.2 Fall Prevention & Protection

CONTRACTOR shall provide and execute the followings to prevent and protect falls from more than 1.8 meter height elevation such as scaffolding, platforms, and openings, etc.

- Safe Access to work areas including provision for stairways, ladders, and openings, etc.
- Overhead Protection for workers exposed to falling objects.
- Daily Access Way Inspection .
- Standard Guard Rail Systems that should have top rails, mid rails, toe boards and posts.
- Personal Fall Protection Devices such as Full body Harness with double lanyards and life line or Proper Anchorage Points capable of supporting over 2,500kg (22.4kN) shall be used for various types of work from an elevated location.
- Safety Net System for use in grounded workplace over water, machinery, or dangerous operations, or more than 7.5 meter above the ground.
- Personal Fall Arrest Systems such as Retractable Life Line.

Fall prevention devices (i.e. – lifelines, safety harnesses/lanyards, etc); shall be inspected daily by user and every 6 months by a competent inspector as designated by the CONTRACTOR for damage and/or deterioration. Defective equipment and equipment which has experienced a fall shall be immediately removed from service and destroyed or, if possible, restored to its original condition. 100% tie-off will be observed while working in the platform 1.8 meters above the ground or there is a chance of falling to a lower level.

10.3 Working At Height

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The following guidelines shall be applied to prevent injuries and eliminate the hazards from the working at height.

Personnel shall be adequately trained and experienced in their work, specifically as applied to operating above ground level. Supervisors, adequate in number, training and experience shall be provided for the control of work above ground level. In order to minimize exposure to risk, the minimum practical number of personnel shall be assigned to the job. The operations above ground level shall be carried out in such a way that persons not involved in the activity, are not at risk.

All personnel working above ground level shall be provided with, and shall use, appropriate personal protection including, but not limited to Full body harness, fall prevention equipment (e.g. guardrails), according to the relevant requirements of CONTRACTOR Fall Protection and Prevention Procedure, PPE Management and COMPANY Requirements.

Means of access to elevated areas shall be of an approved type, of sound construction, suitable for the purpose and shall be used in a safe manner. Where the means of access is of a mobile or portable type, it shall not be moved either mechanically or manually, while personnel are upon it, unless it is specifically designed and approved for the carriage of persons. All access shall be kept clear of any loose articles (e.g. tools, equipment, scaffold boards, etc.) and they shall be removed or securely lashed down, prior to the means of access being moved. Where personnel must transfer from/to the means of access or from/to the high structure, the arrangements at the point of transfer shall be such that personnel are not at risk while transferring. The means of access shall adequately provide safe means of egress, for all personnel, from the high structure.

Personnel shall not be permitted to climb while carrying tools or equipment, a waist belt designed specifically for carrying tools shall be used for this purpose. Where necessary, tools shall be hauled up and lowered in a suitable container, using a handling of suitable size and condition. Electrical, pneumatic and hydraulic tools shall not be hauled up or lowered by power lines or hoses. Where no catchments means is located below the workplace, safety lines shall be attached to tools and similar equipment to prevent it from falling. All overhead work shall cease when wind speed reaches 10 m/s. Any overhead work which is authorized to be carried out during the hours of darkness shall be subject to written permission from the Project Manager. Such authorization shall be inclusive of the required standard of illumination.

Floor openings, gangways, elevated workplace and other areas where personnel could fall a distance of 1.8 meters or over must be provided with guard rails and toe-boards. If suitable working platforms and guardrails cannot be installed, safety nets or safety harnesses must be used.

The Project HSE Manager shall ensure that Rescue equipment for working at height has inspected and maintained in accordance with manufacturers specifications and the standard practice. He shall prepare a rescue plan and execute it in the event a worker falls and becomes suspended.

10.4 Structural Erection

The hazards most commonly associated with steel erection work include working under loads; hoisting, landing, and placing decking and steel joists; column stability; double connections; and falling to lower levels. Steel Erection shall not begin until HSE Manager authorizes it in written after reviewing a site lay-out plan, including the pre-planning routes for hoisting loads.

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During skeleton steel erection of buildings and structures and where scaffoldings is not in used, safety nets shall be installed whenever the potential fall distance exceeds 7.5m. Any horizontal life line must be certified by a qualified engineer including design specifications. The exception is for pre designed systems certified by an approved supplier. Erectors shall be trained to follow 100% tie-off procedure. Proper access will be established going up to elevated area. All newly erected structural column members shall be secured as soon as it erected by guy wire, from at least two sides to maintain the integrity and to prevent it from collapse in case of strong wind.

The hoisting and rigging requirements also apply to steel erection. Crane used in steel erection must undergo a thorough visual inspection before each shift to ensure that all controls and mechanisms are in proper and safe working order as per Crane and Lifting Work Procedure. CONTRACTOR shall also take special precautions to eliminate or at least minimize tripping and slipping hazards.

10.5 Scaffolding

CONTRACTOR shall provide and use scaffolding, platforms or temporary floors for all work places which cannot be done safely from ground level. Scaffolding shall be erected, dismantled or altered in accordance with BS 5973 "Code of Practice for Access and Working Scaffolds and Special Scaffold Structures in Steel" and COMPANY Requirement.

Personnel erecting or dismantling scaffolding shall be trained tested and certified by a qualified trainer before the commencement of the work (ONLY CERTIFIED SCAFFOLDER). All scaffolding and work platforms must be in accordance with jobsite specifications.

All scaffolding must be erected, altered or dismantled by, or under the close supervision of a competent and experienced person.

Scaffolds shall be inspected by Competent Scaffolding Inspector before they are handed over for use. The Scaffolding Inspector shall inspect every seven days (weekly), or after inclement weather to see that they remain in compliance with the statutory regulations. The Inspector should also re-inspect the scaffold after modifications have been made. They must sign the report of weekly inspections to record his findings and initial the current Scaffolding tag.

There are three major types of scaffolds: (1) tower scaffolds, (2) mobile scaffolds: (3) suspended/hanging scaffolds. Scaffolding is also categorized by the maximum safe load it can support in terms of platform area; (1) Very light-duty scaffolds, designed to support a maximum load of 0.75 kN per square meter; (2) Light-duty scaffolds, designed to support a maximum load of 1.5 kN per square meter; (3) General purpose scaffolds, designed to support a maximum working load of 2.0 kN per square meter; and (4) Heavy-duty scaffolds, designed to support a maximum working load of 2.5 kN per square meter

Light-duty scaffolds are intended to support workmen only with no material stored thereon other that the weight of hand tools. Working on all scaffolds requires extra care to avoid overloading.

Scaffolds and their components must be capable of supporting at least four times their maximum intended load. Whether light, medium or heavy-duty, it is imperative that an even load distribution be maintained.

10.6 Ladders, Ramps & Stairways

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All ladders are to be color coded, given an identification number and be inspected by a competent person and should be entered in a register of ladders. Damaged ladders or ladders not having the appropriate color coding or identification are to be removed from service immediately or destroyed if necessary. The general use of ladders will be for the purpose for which they are intended. Ladders shall be secured at the top to a stable part of a structure and bottom; if possible, is should be also secured at an intermediate position. When giving access to a platform or another alighting position, ladders shall always extend a minimum of 1 meter above the level of the platform. While using ladders “three body parts contact” rule should be followed. Do not use metal ladders if working or near electrically induced equipments.

All temporary or permanent stairways will be constructed to be safe and fit for the purpose giving full consideration to the movement of employees and materials and providing suitable and safe evacuation in the case of an emergency.

Stairways and ramps intended for permanent use for more than 3 months will be inspected regularly by a competent person and logged in a register. Ramps and stairs will have fall protection measures designed in the structure, such as continuous flooring without opening, a complete and secured handrail and notice indicating any safety restrictions that are necessary.

If by the nature of the function and the design of the stairway it is not possible to eliminate opening, temporary covers, barriers or handrails must be installed to ensure the integrity of the structure for the safety of the users.

A grating management system will be utilized by all departments Supervisors carrying out activities relating to the removal or installation of steel grating. The PTW coordinator will ensure that this type of activity will require a PTW and will ensure site verification in terms of area secured and temporary signs posted before releasing any grating related PTW. A checklist will be developed ensuring that the area where the grating will be installed/removed have all necessary controls in place which will be attached to the PTW prior to commencement of work.

10.7 Electric Work System

Before launching this project, The HSE Manager and Electrical Engineer shall plan Electrical Work System that includes all types of planning for electrical safety activities such as;

- Electrical Wiring and Apparatus .
- Disconnect and Over Current Protection.
- Temporary Wiring & Facility.
- Lighting at the work areas.
- Lockout and Tagout Procedures.

Ground Fault Circuit Interrupters (GFCI) or ELCB (Earth Leak Circuit Breaker) shall be used with all electrical appliances and tools. Equipment grounding conductors shall be installed. Only explosion-proof hand lamps, floodlights, and extension cords/leads are permitted in confined spaces of the work site.

Each cord/lead, and any tools or equipment connected by cords/leads and a plug shall be visually inspected for external evidence of defects, by the intended user, before beginning of work. Sufficient sockets will be provided for computers & other equipments to avoid use of multiple sockets. Such defects

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include plug damage, deformed or missing pins, exposed cores and breaks in cable or other insulation. Damaged or defective tools and equipment shall not be used until repaired, inspected, tested and certified safe for use.

Equipment grounding conductors shall be tested for continuity and shall be electrically continuous. Each receptacle, attachment cap, and plug and receptacle of cord sets shall be tested for correct attachment of the equipment grounding conductor. All equipment shall be labeled with the date of the most recent test. All testing procedures shall be subject for COMPANY Approval.

Contact with energized electrical parts is the principal hazard to be guarded when dealing with electrically powered equipment. Consequently, all energized parts must be guarded in such a way as to prevent workers from accidentally making contact. Guarding of energized parts shall be accomplished in a number of ways, including the following:

- Locating the equipment in a protected, enclosed environment that limits access. This enclosed environment shall be a designated room, vault, cabinet, or some other enclosure that limits access.
- Locating the equipment in an area enclosed by permanent barriers, such as partitions or screens that can effectively limit access.
- Locating the equipment on an elevated platform, balcony, or gallery that can effectively limit access.
- Elevating the equipment 2.5m or more above the floor.
- A proper warning signs shall be posted around electrical equipment.

Moreover, electrical conductors shall not be connected to a power source, without approval from a designated representative.

10.8 Power Hand Tools

All portable electrical and pneumatically powered hand tools shall comply fully with CONTRACTOR Machine, Power & Hand Tools Safety Procedure requirements of COMPANY procedure. Regular inspections by a competent person and the color coding system shall be utilized on all construction sites. All power hand tools used in site must comply with manufacturer's standards, Dead man's switched shall be installed to all power and electrically driven tools (when appropriate), and safety guards should not be removed or modified. Cords must be inspected regularly.

Regular non power hand tools will be inspected on a weekly basis by all HSE personnel on site. All tools that are handmade or in that are in sub standard condition will be removed from site. If there is an evident problem regarding these types of tools, a comprehensive inspection will be conducted to identify the extent of the issue. The findings will be actioned by management and tracked accordingly.

10.9 Abrasive Wheels

Injuries involving the mounting and use of Abrasive Wheels fall into three main types as follows;

- Particles being thrown out during a grinding process.
- Grinding wheels bursting and disintegrating.

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- Contact between a revolving wheel and a person's hand or other part of the body.

The Abrasive Wheel can cause serious injuries and in some cases have proved fatal. The most serious injury involving abrasive wheels is when wheels burst and flying particles strike the user or people in the vicinity. This has caused fatalities when people have had an artery severed by a flying piece of the wheel.

The three main causes for these incidents are;

- Speed capacity of disc is not design for the speed of the grinder.
- Incorrect mounting of the discs on the grinding machine.
- Damage or broken disc.

The user must wear safety goggles, face shield and ear plug during the work. Abrasive cutters behave as local ignition sources and a Hot Work Permit shall be obtained before they are used in restricted areas.

10.10 Welding & Cutting

CONTRACTOR shall inspect and check with the COMPANY representatives to obtain Work Permits with regard to hot works when performing any welding, cutting, grinding, drilling or any other operation producing source of ignition within the confined areas or inside the existing plant. All permit documents & procedures shall be carefully reviewed by Foremen, Supervisors and HSE Manager, and workers performing hot works should wear the appropriate PPE provided by CONTRACTOR.

The following general precautions shall be observed by site HSE personnel regardless of the type of welding or cutting operation at a site.

- (1) No construction personnel should be allowed to undertake welding, cutting, or brazing tasks without proper training and proper level of qualification.
- (2) Before beginning any welding or related task, construction personnel should inspect the work area to identify and eliminate fire hazards.
- (3) Before beginning any welding or related task, construction personnel should make sure that provisions have been made for ventilation.
- (4) Construction personnel should wear proper eye, face, hand, torso, and foot protection and take every precaution to avoid contact with sparks, hot, slag, and hot surfaces. Fire blankets shall be used for 100% sparks containment.
- (5) Compressed gas cylinders should be placed and secured in an upright position, handled with extreme care, and stored at least 6 m away from flammable materials and heat sources with caps attached. Gas cylinders shall be stored outside the confined space.
- (6) When storing Flammable & oxygen cylinders, keep them at least 6 m away from each other. When this is not possible, isolate the oxygen cylinders from flammable cylinders using a barrier at least 1.5 m high made of noncombustible material that has at least a one (1) hour and thirty (30) minutes fire-resistance rating. A warning signs shall be place in the storage area; Empty & Full cylinders shall be separated and properly marked. Fire extinguisher cylinders shall be provided.

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- (7) Before beginning welding or cutting tasks, remove all combustible materials from the area. If this is not possible, cover the combustible items with a noncombustible material (fire blanket); when combustible items cannot be removed from the area-or protected by noncombustible material, a trained fire watch should be posted with fire extinguisher.
- (8) Construction personnel other than the welder who are working in the vicinity should wear proper eye protection with dark visors or should install welding screen around the area. Welder's helpers must comply with PPE requirements of the welder.
- (9) When opening valve regulator on tanks, construction personnel should stand away from regulator (to the rear or side, never in front). An internal failure could cause the adjustment screw to fly off under high pressure, creating an impact hazard.
- (10) All regulators must be removed and caps placed on bottles when unit is not in use.

10.11 Fire Prevention & Protection

The job site shall be adequately protected from the risk of involvement in the event of fire, both in terms of distances from surrounding areas and distances used in internal layouts. Every confined space, workshop or warehouse shall be equipped with inspected fire extinguishers compatible with the types of danger. Storage areas for flammable or explosive substances shall be placed far from offices, trafficked and accommodation areas, and equipped with adequate fire prevention systems.

All personnel on the site shall be aware of the location and use of extinguisher, and CONTRACTOR shall regularly provide training and information to deal with typical emergency situations.

CONTRACTOR shall ensure that all employees and lower tier subcontractors are thoroughly familiar with the procedures. Fire Emergency reporting procedure shall be displayed at Notice boards, Accommodation areas and various locations at site with Fire Emergency contact numbers.

10.12 Warning Signs & Barriers

The warning signs and symbols required in work places shall be visible at all times when a work is being performed, and shall be removed or covered promptly when the hazards no longer exist. The warning signs shall be written in English and any appropriate language. The following signs and signaling shall be basically installed;

- (1) **Danger Signs;** Danger signs shall be used only where an immediate hazards exists, and shall have red as predominating color for the upper panel, black outline on the borders, and a white lower panel for additional sign wording.
- (2) **Caution Signs;** Caution signs shall be used only to warn against potential hazards or to caution against practices. The signs shall have yellow as the predominating color, black upper panel and borders, yellow lettering of "caution" on the black panel, and the lower yellow panel for additional sign wording. Black lettering shall be used for additional wording.
- (3) **Exit Signs;** Exit signs, if required, shall be in legible red letters, not less than 150mm high, on a white field and the principal stroke of the letters shall be at least 18mm in width.

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- (4) **Safety Instruction Signs;** Safety instruction signs shall be white with green upper panel with white letters to convey the principal message. Any additional wording on sign shall be black in letters on white background.
- (5) **Directional Signs;** Directional signs shall be white with a black panel and a white directional symbol. Any additional wording on the sign shall be in black letters on white background.
- (6) **Traffic Signs;** Construction areas shall be posted with legible traffic signs at points of hazard. It should be written using luminous paint for proper visibility during night time.
- (7) **Accident Prevention Tag;** Accident prevention tags shall be used as a temporary means of warning employees of an existing hazard such as defective tools, equipments, etc. They shall not be used in place of, or as a substitute for, accident prevention signs.
- (8) **Flagmen;** when signs, signals and barricades do not provide necessary protection on or adjacent to a highway / street, flagmen or other traffic control shall be provided. Flagmen shall wear red or orange warning garment while flagging, highly visible clothing material shall be used at night.

10.13 Crane Operations

All CONTRACTOR's owned or contracted cranes will be certified by an independent third party company through inspection and load testing before being allowed to operate on the site. Competent crane operators shall be trained and certified.

Each crane shall carry an updated manufacturer's load chart. All crane hooks are to be fitted with operable safety latches. All rigging tackles (wire ropes, slings, shackles and chains) allocated to each crane shall be inspected regularly and color coded by a competent person quarterly to check any wear and damage. The competent person shall maintain record of all shackles inspections. Competent riggers shall be assigned to assist during lifting operation and shall wear identification vest with whistle.

Crane operators shall extended outriggers on pads at all times when lifting loads to ensure its stability, the crane shall travel with withdrawn outriggers. Taglines shall be used on all lifting operations. All critical lifts requires a rigging study approved by the COMPANY before the operation is started.

Critical Lifts: Critical lifts should meet following criteria

- (1) Any lift above 40 Tons.
- (2) Crane lifts performed in 'high risk' work environments. High risk work environments include the following examples:
 - All cranes working around energized electrical lines.
 - All cranes working around hydrocarbons and pressurized piping areas. Cranes working in close proximity to, or having to suspend a load over vessels, piping, and equipment containing hydrocarbons, steam, or other pressurized liquids.
 - All cranes working around populated/traffic areas. Cranes working in close proximity to, or having to suspend a load over: pedestrians, vehicle traffic, occupied construction equipment, and occupied buildings.

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- Cranes working from barges, hydrocarbon product loading piers, and onboard other marine vessels.
 - Special critical crane lifts which are hazardous by their nature and require special training, rigging, and/or boom attachments.
- (3) Tandem, Multiple or Tailing Lift: This lift is when two or more cranes are required to lift one load.
- (4) In the case wherein 85% of the Crane Safe Working Load (SWL) was utilized (Crane outriggers are fully extended).
- (5) When the size of the load to be lifted will create a considerable hazard during lifting operation. (Width, length or shape must be considered carefully)
- (6) When working from a crane suspended man basket, the CONTRACTOR's Crane & Lifting Work Procedure - DTMS-HSE-PS007 will be referenced. This includes details on what the mandatory requirements and control measures are in order for the man basket to be utilized safely. Items such as man basket certification, specifications, rigging, slinging, lifting, SWL etc will be complied with.

10.14 Lifting Operation

Accidents involving the failure and damage of lifting equipment are frequent on construction sites and the consequences are usually very severe when they do occur. Causation factors leading to such accidents include;

- Operator error.
- Inadequate inspections and maintenance of equipment.
- Failure to plan the operation and take precautions against overhead power lines, other obstructions and poor ground conditions.
- Overloading and misuse of equipment.
- Miscommunication between the operator and signalman.

The safe work practices must be adhered to for all lifting operations and will assist in reducing the risks associated with such hazardous operations. CONTRACTOR shall comply with the COMPANY Requirements as well as CONTRACTOR Lifting Instruction which cover the Cranes, Lifting Gear, Hoist, and Forklifts Operations.

10.15 Confined Space

A confined space means any enclosed or partially enclosed space located either above or below ground or deck level where entry is possible and where there is a risk of oxygen deficiency/enrichment, or the accumulation of dust or gases which are flammable or hazardous to a person(s) health. Entry into these or any other, confined spaces refers not only to complete body entry but also too partial entry when the head is inserted into the confined space via a manhole and or opening.

The three criteria needed to define a confined space are;

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- Limited openings for entry and exit.
- Unfavorable natural ventilation.
- Not designed for continuous human occupancy.

The confined space openings are limited primarily by size or location. Therefore, openings are usually small in size, and it is difficult to move through easily. Small openings may make it very difficult to get the necessary equipment in or out of the spaces, especially protective equipment such as respirators, lifesaving equipments, etc.

As the natural ventilation in the confined space was not considered generally when being designed, the atmosphere inside a confined space can very different from the atmosphere out-side, deadly gases may be trapped inside, and there may not be enough oxygen inside the confined space to support life.

Because most confined space are NOT designed for workers to enter and work in them on a routine basis but are designed to store products, enclose materials and processes, or transport products, or substances, occasional workers entry for inspection, maintenance, repair, cleanup, or similar tasks is often difficult and dangerous to chemical or physical hazards within the space.

CONTRACTOR shall make every effort to eliminate hazards and danger from the confined space found in the workplaces.

CONTRACTOR and its subcontractors shall maintain a system of authority and responsibility for establishing written procedures covering work in confined spaces in order to:

- (1) Create an Entry Permit System.
- (2) Familiarize personnel with the hazards that may be present in confined spaces.
- (3) Train personnel to employ the appropriate safeguards for controlling such hazards.
- (4) Train personnel in the use of test equipment for monitoring those hazards.
- (5) Ensure the provision of qualified and authorized supervision of work in confined spaces to ensure that work is conducted safely.
- (6) Establish emergency plans with the appropriate level of training including emergency rescue, injury management, basic first aid and use of self contained breathing apparatus.
- (7) Audit and verify subcontractor's compliance with the provisions of CONTRACTOR confined space entry procedures.

The CONTRACTOR HSE Manager and Subcontractors' HSE Managers will verify compliance with the project's confined spaces procedure and the associated training requirements.

- (1) The atmosphere in the confined space should be tested before starting works related to the confined space. If testing reveals oxygen-deficiency, or the presence of toxic gases or vapors, the space must be purged, ventilated and re-tested before workers enter. Continuous monitoring may be required due to the nature of the hazards. All confined spaces are to be retested after any breaks in the work.
- (2) The ventilation methods and devices are determined depending on the characteristics of the confined space.

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- (3) Where necessary, employees working in confined space should be provided with life-saving devices (respirators, i.e. SCBA) that can allow workers to safely breathe without inhaling toxic gases or particles.
- (4) Training in the use and limitations of respirators, and for emergency situations.
- (5) Emergency rescue procedures, Standby person, entry log, Permit to Work, and etc.

10.16 Excavation, Trenching & Shoring

Before any excavation or ground works is commenced, the COMPANY Representative shall be consulted as to whether an Excavation Permit is required since a lot of buried underground facilities may be present. Prior to any excavation commencing, the supervisor in-charge of the work shall ensure that all required equipment is on site before authorizing the work to begin. The excavation shall be carried out in strict accordance with the conditions stated on the Permit. If any marker, pipe, cable or foundation not identified on the excavation permit is uncovered, work shall stop immediately and a report shall be made to the person issuing the Permit. All trenches, slopes or pits, in excess of 1.2m in depth, into which personnel may be required to enter, shall be suitably shored to prevent cave-ins or sliding materials. The use of a trench cage or trench box may also be permitted. In all cases the protection shall be designed by an engineer qualified for such work. All underground services to be verified by the cable/metal detector. Excavation deeper than 1.2m and close to the existing petro-chemical plant is considered as confined space (since the toxic gases heavier than air accumulated at the lower level) required to be tested for acceptable safe atmosphere in side, where applicable Confined Space Entry work permit need to be completed.

All sides of the excavation, trench or pit in excess of 1.2m in depth may be sloped/benched back to a safe angle of repose to prevent earth slides. This can vary in soil conditions from vertical in rock, to 1:1 for sand. In such cases, the angle of repose shall be determined by an engineer qualified for such work.

In the event that an Excavation Permit is required, the design of the cave-in protection shall be attached to the Permit.

Soils (excavated earth) shall not be stored close to the trench edges. Where practical, a one meter wide strip on both sides of the trench shall be leveled and cleared of loose items/materials. Storing materials inside barricaded areas next to excavation causes other problems. Personnel accessing this material may be exposed to a fall hazard. This is a poor practice and should be avoided. CONTRACTOR will have an external lay down are for these materials.

Where any equipment (e.g. power shovel, digger, rock breaker, etc.) is working around, or in an excavation, no person shall be permitted to work in the excavations within 5m of the machine, or within 2m of the maximum reach of the machine. Where personnel are required to hand trim excavations within 5m of the machine, it shall be stopped from operating until the hand trimming is complete.

All equipment exhaust gases shall be directed away from the excavation to avoid accumulation of toxic gases in the excavation. For excavations or pits where natural oxygen supply might be hampered, tests shall be made to check oxygen levels and air supply blowers may have to be installed.

Access to and egresses from all excavations undertaken during the construction of the project are to be constructed in a manner and from material that will provide safe and unhindered access to and egress

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from the excavation. For any excavation over 1.2 meter deep, safe access/egress shall be provided by ladders, stairs or ramps at intervals not to exceed 15 meters of travel.

In areas of heavy vehicular or pedestrian traffic, rigid guardrails fitted with high visibility tape, which shall be not less than 900mm in height from the ground, shall be erected around the excavation. "DANGER - EXCAVATION" signs must be placed to give warning.

All excavations will require hard barricading

Starter bars and rebar up-stands shall be covered with a suitable cover approved by CONTRACTOR in order to protect workers who may fall against or on them.

Excavations left open for longer than one day shift will be clearly identified by flashing lights at night where the excavation is located near vehicle or pedestrian access ways or is in a position which could cause danger to personnel working after dark.

Barricades with warning devices and flashing lights as needs shall be installed alongside of excavations wherever people or vehicles are exposed. Stop logs shall be used in areas where mobile equipment is being manoeuvred.

10.17 Painting

CONTRACTOR has deep considerations that spray painting and paint removal present hazards requiring effective controls. Hazards include exposure to toxic materials and flammable or explosive mists, particulates, and vapors. Inhalation of mists and vapors from nearly all paints, solvents, thinners, cleaning chemicals, strippers, and epoxies can be injurious depending upon the toxic characteristics and the amount and method of exposure. Furthermore, many can physically injure the skin and eyes, or be absorbed through the skin. During this project, potential physical and health hazards shall be effectively controlled by appropriate work procedures, controls, facility design, protective clothing, and equipment.

Pressure equipment used in painting operations is hazardous because of the compressed air component; the supervisor shall assure that spray painting equipment is in serviceable condition. On all air-type spraying equipment a pressure regulator valve shall be installed in the air line between the compressor and painting equipment. A pressure relief valve and a pressure gauge shall be installed between the pressure regulator and pressurized paint containers and/or spray guns. Pressure relief valves shall be set to the required working pressure.

Painter's ladders, scaffolds, and other equipment shall be inspected before using to ensure that they are in safe condition.

Paint mixing shall be done in designated, adequately ventilated rooms constructed of fire-resistant materials. All sources of ignition shall be prohibited in mixing areas.

Personnel engaged in painting and paint removal shall wear protective clothing, respiratory devices if required and appropriate face, eye, and hand protection. Eye or face protection is required during scraping or paint preparation. Clothing shall be changed, as needed, to minimize body contamination.

The respiratory protection shall be implemented when necessary and will be specific to the nature of the hazard. Adequate ventilation will also be used when required.

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All spills of flammable or combustible liquids shall be cleaned up promptly by qualified personnel. With major spills, remove ignition sources, evacuate, and ventilate the area, and provide appropriate protective equipment to clean up personnel. These liquids shall not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

Painting operations of particular concern are those having a fire potential; i.e., paint removal, solvent wipe and paint application by means of spray apparatus. Certain paints, lacquers, varnishes, shellacs, solvents, and thinners are very flammable. Others, under certain conditions, will burn violently. These, for the purpose of control, are classified as being flammable.

Spray painting presents varying degrees of fire hazards, depending on the materials used. Any material having a flash point below 60 °C should be handled very carefully, and precautions are in order even for those having a flash point higher than this. All hot work shall be prohibited in the vicinity of paint stores and work areas

Portable fire extinguishers shall be installed near all paint spraying areas. Suitable safety signage to be displayed in the painting areas

10.18 Work Permits

A Permit to Work is a communication aid to ensure that all parties involved in carrying out the work are consulted on the mitigation to be carried out before the work is to start until such time that the place of work is left in a safe state upon completion.

The object of the Permit to Work system is to ensure that written permission and authorization is given to carry out the defined work which is potentially hazardous and that all possible measures are taken to maintain the safety of the personnel and equipment in all areas of operation.

CONTRACTOR shall prepare all testing equipment and training required to meet the Permit to Work requirements. The work permit is to be signed by authorized persons and posted or be available at the work location. The purpose of work permit is to ensure that;

- The work is authorized by an adequate level of responsibility.
- The work has been completely studied and planned.
- That adjacent work will not interfere with planned work.
- Suitable safety measures are listed and people who must use them are named.
- Personnel involved have been completely informed about the work to be carried out, the related risks and safety measures to be used.
- Working conditions and times when work maybe done have been specified and declared.
- To authorize the work to start was signed by the qualified personnel.

CONTRACTOR shall adequately provide work permits to be needed for the specific works such as;

- Hot Work such as welding, flame cutting, grinding, sandblasting, etc.
- Cold Work (activities without ignition source) such as scaffolding, shifting material, etc.

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- Works in the Confined Space.
- Excavation Works.
- Crane Operations requiring Rigging study.
- Use of Radiation.
- Electrical Works requiring de-energizing or isolation of electrical apparatus.
- Explosive Devices.
- Pressurized Testing.
- Working over water and Diving.
- Man Basket Operations.
- Grating Removal.
- Other specific work that's needs COMPANY's Permission.

10.19 Respiratory Protection

CONTRACTOR shall prepare the respiratory protection program to meet the COMPANY's requirements. The primary objective of the respiratory protection program is to prevent exposure to air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, vapors, or sprays, and thus to prevent occupational illness. The program administrator (HSE personnel, Field Supervisors and foremen) should be responsible for the program. They must have reasonable knowledge about respirators to be able to supervise the program well for the workers. Employers and employees shall be given specialized training to understand the respirator's purpose and limitations. Users must be instructed not to alter or take off the respirator even for a short time during works, in case of existence of hazardous materials, even if it is uncomfortable.

10.20 Hearing Conservation Program

CONTRACTOR shall provide hearing loss protective equipment such as ear plugs & ear muffs to all workers exposed to 8 hours TWA noise levels of 85 dB(A) and 12 hours TWA noise levels of 83dB(A) or above. This can afford to ensure that employees have access to protectors before they experience any hearing loss. The written Hearing Conservation Programs shall be prepared. The programs shall include the following factors.

- (1) Noise Surveys.
- (2) Engineering controls.
- (3) The procurement and use of low noise equipments.
- (4) Posting of signs and warning.
- (5) Training how to use hearing protection devices properly.

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10.21 Heat Stress Prevention

Heat stress may occur any time that work is being performed at elevated temperatures or when protective clothing is worn. The main cause is the loss of water and valuable minerals from body which release due to high temperature and humidity conditions.

Heat stress symptoms include fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement. If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild to fatal. Because heat stress is one of the most common and potentially serious problems that workers encounter, regular monitoring and preventive measures are vital.

CONTRACTOR will ensure that all field employees, especially front line supervisors, are trained on the warning signs/symptoms of early heat related disorders. They shall be instructed on the clothing and work methods best suited to avoid heat and/or cold stress. Stay times shall be developed to reduce the possibility of heat related disorders, if necessary. Work rest tables will be utilized based on ambient heat and humidity levels.

CONTRACTOR will provide an immediate accessible, adequate, and sanitary potable water supply during all periods of the day and have available electrolyte replacement drinks or tablets during seasons of the year when heat stress occur.

The following general preventive measures will be adopted by CONTRACTOR:

- (1) Urged that employees drink plenty of water every day.
- (2) Provide disposable cups or individual cups to all employees.
- (3) Training for employee regarding Heat Stress awareness.
- (4) Monitor employees for signs of heat stress. An employee with high blood pressure must be monitored often, and extra precautions should be taken.
- (5) Familiarize employees to work conditions by slowly increasing their workloads (i.e., under normal circumstances, do not begin work activities with extremely demanding tasks).
- (6) Provide cooling devices to aid natural body ventilation.
- (7) Ensure that adequate shelter is available to protect personnel from heat, as well as rain, which can decrease physical efficiency and increase the probability of both heat and cold stress.
- (8) Maintain good hygienic standards by changing clothing and showering as appropriate. Clothing should be permitted to dry during rest periods. Employees should immediately report any skin problems to their supervisor.

10.22 Working over Water

Working on, over, or in the vicinity of water creates a number of problems, with the ever-present risk of personnel falling into the water. Any workplace on, over or near water constitutes a danger that a person or persons could possibly slip, trip, fall or be knocked off their feet by a sudden rise in the tide, current or swell from passing water traffic. It is possible, that a person(s) may not be injured as a result of the fall,

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however, the main risk could be drowning and also being carried away by the current. Risk assessments must be made and hazards eliminated, or reduced to prevent such occurrences.

Risk assessments must also include the provision of suitable rescue equipments to ensure that persons are rescued in the shortest possible time before any further harm is caused (Refer to CONTRACTOR, Risk Assessment & Registration Procedures). Safe working methods and emergency rescue procedures must be developed in the HSE Plan and all persons involved must be provided with adequate instruction, training and supervision.

All workers whose jobs require working over or adjacent to, water more than 20% of the time, or in emergency conditions shall receive water survival training prior to start of work at the workplace. The Personal Floatation Devices (PFD) approved by US Coast Guard, UK, or Korea shall be used by CONTRACTOR, subcontractors, and third party personnel while traveling off-shore, while on any boat/or vessel, transferring to or from any watercraft, and when working over, or adjacent to, water locations. All vessels shall be equipped with at least one PFD for each person. All other life saving equipments shall be provided as per the SOLAS (Safety of Life At Sea) standards. CONTRACTOR and subcontractors shall prepare and implement the diving safety program in accordance with COMPANY Requirements

10.23 Storage & Use of Compressed Gas

Gas cylinders, either full or empty, will be segregated and stored in all upright secured position. Storage area should be covered to protect from direct sunlight and there must be proper ventilation all around storage area. Flammable gases and oxygen shall be separated by at least 6m or by using 1.5m high non-combustible materials with a fire rating of 1 hour and 30 minutes. Damaged or corroded gas cylinders, or cylinders with damaged valves will not be used but returned to the vendor, and a record will be kept.

Gas cylinders will be transported in the upright position and moved securely in a cylinder trolley. All gas cylinders will be identified by standard international color coding. When gas cylinders are not in use, valve protection caps will be replaced. Warning signs must be clearly displayed indicating the presence of flammable substance and prohibiting smoking or naked flame near the area

All gas cylinders used on site must have approved flash-back arrestors fitted to the gauges and torch of the gas cylinders and hoses will be inspected regularly for cracks or wrinkles. Those fit for use will also be color-coded by competent personnel.

Where compressed gas cylinders are in used or stored; a general purpose Fire Extinguishers, 9 kg size ABC Dry Powder will be placed in strategic locations in the fabrication shops and on the worksite.

10.24 Road and Traffic Safety

Roads are statistically one of the more hazardous areas in which we normally operate. Driving has the highest contribution to incidents both in frequency and severity. Accordingly, it is the policy of CONTRACTOR to reduce as far as possible unacceptable risks to their own employees, Subcontractors and other persons who could be affected during its transportation activities, by maintaining an efficient Road Safety Management System complete with a program of continuous control measures, maintenance and training.

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(1) Guidelines

All personnel who intend to drive must hold an appropriate and valid driving license for the vehicles, plant or equipment to be driven. The following general guidance applies to the qualifications and requirements for driving on the project;

- Professional drivers shall pass a medical examination and be certified fit before taking up a driver's job. Subsequently they shall receive an annual medical and eyesight examination by a qualified doctor.
- Maximum driving time must be as according to local laws and regulations.
- After continuous driving of about 2 hours, a minimum of 15 minutes rest is needed.

(2) Vehicle Register Requirements

All vehicle movements shall be recorded in a register stating the vehicle type. Registration number, driver's name, number of passengers.

(3) Driver Induction

All drivers must attend a Defensive Driving Training before being allowed to operate or drive on company business. The general content shall include the followings;

- (3.1) Local driving conditions and attitude to driving.
- (3.2) Traffic regulations, site speed limits, road signs and markings.
- (3.3) Government restrictions.
- (3.4) Risks of driving and common causes of accidents.
- (3.5) Accident black spots.
- (3.6) Emergency procedures and accident reporting.
- (3.7) Defensive driving.
 - Journey management systems.
 - Fatigue and the effects of tiredness.
 - Medication/drugs.
 - Vehicle design and limitations.
 - Safety features.
 - Security of cargo and the transportation of goods.
 - Responsibility for the care and maintenance of the vehicle.

10.25 Radiation

(1) General

- Non destructive testing is a technique widely used in the Construction industry to ensure high degrees of quality control and is generally carried out using a radioactive isotope.

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- X-ray machines operated by electrical power have a main advantage of being safe when disconnected from the power supply and not in use.
- Radioactive isotope have the disadvantage in that, they continuously emit harmful rays and need to be carefully shielded at all times and stored correctly when not in use.
- All personnel involved in the use, maintenance and storage of radiography equipment must be trained, certified and fully informed of the safety procedures adopted to prevent over exposure.
- No person under 18 years of age shall be assigned as radiography workers.
- All radiography jobs shall be controlled by PTW System.

(2) Permit to Work

- Permit to Work application will initially be made to the HSE section 24 hours in advance for carry out radiographic operations. They will review and authorize any work as necessary on the performance described.
- Authorization will be contingent on the exact location, start and finish time, and adjacent operations.
- When authorization has been granted the Welding Supervisor / Inspector / QAS will notify all contractors that will be affected by the activity, giving them at least 12 hours notification.
- Radiography workers shall ensure that they understand all precautions to be observed prior to commencement of radiography.
- Radiography workers shall barrier off the area and check to ensure that all personnel have been vacated from inside the barriers.
- A wind out test may be required at the discretion of the HSE section to ensure that barriers have been erected at a safe distance.
- On completion of the work the Radiography workers shall return the source to its storage area and remove all barriers and equipment.
- The Radiography Permit (PTW) will be returned to the Welding Supervisor / Inspector who will keep a file of all Radiography Permits, copy to be given for the HSE section.

(3) Emergency response

All Section/Sub-contractors involved in the use of ionizing radiations shall prepare formal contingency plans to deal with any emergency which might arise from the storage, transportation or use of ionizing radiation. The plans shall include, but not be limited to dealing with the following emergencies;

- Accidental overexposure to ionizing radiation.
- Loss or theft of a source of ionizing radiation.
- Vehicular accident involving transport of sources of ionizing radiation.
- Accidental separation of a chemical source from its shielding.

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- Physical damage to a sealed source, causing possible leakage of radioactive material.
- Contamination of the environment with radioactive material.

10.26 Hazardous Chemicals & Substances

Control of Substances Hazardous to Health (COSHH)

The control of substances hazardous to health is recognized as a critical element of the safety program and shall be achieved through a combination of hazard communication, establishment of HSE systems of work and controlled handling and disposal of such substances.

All activities within the Site will be carefully and systematically evaluated for potential health hazards to provide comfortable working circumstance and the preservation of good Health and Hygiene Practices.

Methods such as systematic inspections, interviews and questionnaires, and follow up by technical sampling of the employees on location will assist in identifying and assessing hazards.

All chemicals and substances, whether of a high or low risk, are to be covered by the requirements of this procedure. The requirements of Material Safety Data Sheet (MSDS) will be used as a common reference point in the implementation of this procedure.

- Chemicals, dust and fumes can enter the body in three ways:-
 - By inhalation
 - By swallowing
 - Through the skin
- The effects of such may be immediate but can also appear several years later.
- Hazardous substances include but are not limited to; Solvents, Cement, Glues, Lead-Cadmium, Plaster, Weed-killer, Bitumen, Epoxy resins, Fillers, Brick dust, Silica dust, Isocyanides, Toxic substances in the ground, e.g. PCBs
- The Hazardous Chemicals & Substances Procedure requires six steps to be taken by Project Team.
 - (1) Know the substance that persons may be exposed to.
 - (2) Assess the hazards to health that they can cause.
 - The level of risk.
 - The degree of exposure
 - (3) Eliminate or control the hazard.
 - Use a non-hazardous alternative.
 - Limit the number of persons exposed to the substance.
 - (4) Inform, instruct and train personnel in;
 - The nature of the risk.




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- The control measure(s) to adopt.
 - The reason for issue and use of Personal Protective Equipment
 - The monitoring to be carried out
- (5) Monitor the effectiveness of controls and initiate health surveillance where appropriate
- (6) Keep records



Hazardous Warning Symbols

The following diagrams depict hazardous warning symbols that should appear on packaging and containers to warn of the hazards associated with their contents.

Symbols are in black on an orange yellow background.

Meanings	Diagram	Safety Precautions and Medical Action.
<p>Toxic/Very Toxic</p> <p>May cause serious health risk or even death if inhaled, ingested or Penetrates the skin.</p>		<p>Wear suitable protective clothing, gloves and eye, face protection.</p> <p>After contact with skin, wash immediately with plenty of water.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</p> <p>In case of accident or if you feel unwell, seek medical advice immediately.</p>
<p>Corrosive</p> <p>On contact may cause destruction of living tissue or burns.</p>		<p>Wear Suitable gloves and eye face protection.</p> <p>Take off immediately all contaminated clothing.</p> <p>In case of contact with skin, wash immediately with plenty of water.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.</p>
<p>Harmful</p> <p>May cause limited health risk if inhaled, ingested or Penetrates the skin.</p>		<p>Do not breathe vapor/spray/dust.</p> <p>Avoid contact with skin.</p> <p>Wash thoroughly before you eat, drink or smoke.</p> <p>In case of contact with eyes, rinse immediately with plenty of water and seek</p>

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		medical advice.
Irritant May cause inflammation or irritation on immediate, repeated or prolonged contact with the skin, or if inhaled.		Do not breathe vapor//spray/dust. Avoid contact with skin. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. In case of contact with skin, rinse immediately with plenty of water.
Highly flammable May become hot or catch fire in contact with air or is gaseous and will ignite at any ignition source.		Protect from source of ignition. Have fire precautions at hand.

10.27 MSDS Tracking

CONTRACTOR shall maintain Material Safety Data Sheet (MSDS) for all chemical and other hazardous materials used in performance of work, and shall perform all work consistent with the use specifications and other information in such MSDS. These data sheets shall be dispatched to the site prior to shipment of the material. Copy of all MSDS shall be given to HSE Office, Clinic, Materials Storage office and to end users; a register of all hazardous substances on site shall be held by the HSE section, and be easily available for inspection by COMPANY Representatives. CONTRACTOR shall ensure that any workers handling such substances have received instructions and training regarding the hazards, the system of work to be adopted and the action required in the event of spillage. CONTRACTOR will set up a system, if practicable, on sending MSDS information to the hospital in the event of an emergency where a worker has encountered hazardous chemicals. Employees will be provided with information and training on hazardous chemicals in their work area at the time of their initial assignment and whenever a new hazard is introduced into their work area. The training and information will cover the followings;

- (1) Chemical/physical hazards in the work place.
- (2) How to lessen or prevent exposure to these hazardous chemicals.
- (3) Procedures to follow if employees are exposed to these chemicals.
- (4) How to use a Material Safety Data Sheet.
- (5) Methods and observations employees may use to detect the presence of a hazardous chemical they may be exposed to.
- (6) The health hazards, symptoms, first aid and emergency procedures, in case of overexposure.
- (7) Spill or leak procedures.
- (8) Personal protective equipment requirements and use.

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(9) Special precautions to follow when handling these chemicals.

10.28 Blood Borne Pathogens

CONTRACTOR and Subcontractors employees who are exposed to blood-borne pathogens shall be properly trained regarding their responsibilities, required control measures, and personal safety. Proper personal protective equipment shall be used when exposure hazards exists. Required vaccinations are offered to employees and documentations of vaccination or declination shall be maintained and made available to COMPANY. All food handlers should be vaccinated against hepatitis A and B.

10.29 Wood Working Machinery

The list below highlights the main risks to Health and Safety for persons involved in the operation and maintenance of woodworking machines. The safe working practices featured in the Machine, Power & Hand Tools safety Procedure will help reduce such risks to prevent accidents and occupational illness during the use of these hazardous machines.

- (1) Contact with rotating blade.
- (2) Jamming of the work piece resulting in a 'kick back' to the operator.
- (3) Slipping and tripping in the vicinity of the machine(s).
- (4) Injuries to the eyes.
- (5) Lockout / Tagout.

10.30 Lockout & Tagout System

Sometimes work must be performed on equipments, pipelines, and machinery that may contain moving parts, pressurized gases or liquids, electrical energy, or other hazards. Contact with any of these may result in injury or death.

Lockout means to install a locking device that keeps the switch, valve, or other mechanism from being turned on or opened.

Tag out means to put a tag on the locking device. The tag indicates DANGER or WARNING, along with a brief message. It has a place to put the date and person's name that locked out the equipment so that he may be easily found or notified.

The following are some of the steps to be follow in applying Lockout / Tagout;

- Train employees in the purpose and methods of lockout/tagout.
- Inform the job supervisor about the purposed work, and obtain permission to lockout and tag out the equipment.
- Shut down the equipment.
- Place locks and tags on the switches and valves to prevent their use.

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- Have the operator try to start the equipment or open the valves. If the equipment and valves are not operable, proceed to the next step. If they are operable check where the locks should be placed or, if needed, place additional locks to ensure that equipment or valves are not operable. Check the equipment or valves for operation again.
- Start the work. If the employees' shift ends before the work is completed, they must remove their locks and next shift's employees must install their locks before continuing the work and before the previous shift's locks are removed. Equipment shall be proved again by operator on attempt to start the locked out equipment.
- When the work is completed, ensure that all employees are clear before removing the locks and tags, energizing equipment, or opening valves.

10.31 Mechanical Activities

(1) General (Mechanical, Plant and Equipment)

Mechanical equipment, whether power driven or operated by hand, presents a potential hazard to personnel and plant. Injuries to personnel may be minor, extensive or even fatal. Equipment damage could prove expensive or cause down time and loss of production.

Awareness of the potential hazards and their possible consequences is therefore of prime importance to everyone coming into contact with mechanical equipment of any kind.

In addition to knowing the correct and safe method of operating such equipment, it is important that the operator wear correct dress and protective equipment.

Plant and equipment, subject to statutory regulations, must be inspected and certified within the required inspection period and a register maintained. These registers shall be produced at the request of any COMPANY or Government Inspector.

All machinery shall be securely guarded in accordance with statutory and COMPANY requirements.

Machinery will not be operated without guards, except during certain specified inspection, maintenance or repair operations when written permission of the supervisor and a work permit was accomplished.

Where permanent handrails, gratings or machinery fencings have been removed temporarily, barriers of suitable construction shall be erected. These permanent items shall be replaced upon completion of work.

(2) Machine Tool Operations

It is the duty of all employees who are supervising or operating machines, plant and equipment, to be vigilant, check all dangerous operating practices being performed by persons under their control and encourage the practice of safety precautions, such as the use, maintenance and proper adjustment, of safety guards.

Machine operators shall never wear rings, loose clothing, necklaces, long hair or bracelets, which could be caught up in the moving parts of a machine.

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The working area must be maintained free from loose materials and kept dry and free from oil, grease or spillage.

(3) Guarding Machinery

There are four types of guards; fixed, interlocking, automatic and adjustable. The fixed guard provides the highest standard of protection and must be fitted wherever practicable.

No person is allowed to remove a recognized guard without authorization and a work permit. The guard must be replaced before the machinery, plant or equipment is re-commissioned.

(4) Isolation of Machinery

A work permit must be obtained, giving the detailed condition and precautions to be taken in the isolation procedure of the machinery or equipment.

Adjustment repairs or cleaning operations must not be carried out until the machine is isolated from any source of power.

10.32 Blasting & Explosive

(1) Blaster Qualification

The blaster shall be required by reasonable training, knowledge, or experience in the field of transporting, storing, handling and use of explosive, and have a working knowledge of state and local laws, regulations and COMPANY Requirements.

The blaster shall be competent in the use of each type of blasting method used, able to understand and give written orders, and be in good physical condition and NOT be addicted to narcotics, intoxicants, or similar types of drugs. CONTRACTOR shall ensure to resolve this potential problem through the physical examination and screening of illegal drugs.

The blaster shall be required to furnish satisfactory evidence of competency in handling explosives and performing in a safe manner the type of blasting that will be required.

(2) Storage Of Explosives & Blasting Agents

Explosive and related materials shall be stored in approved facilities required under the applicable provisions of state and local laws. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents. No explosives or blasting agents shall be permanently stored in any underground operation until the operation has been developed to the point where at least two modes of exit have been provided.

Smoking and open flames shall not be permitted within 165m of explosives and detonator storage magazine.

(3) Blasting Machine

- Blasting machines shall be operated, maintained, tested, and inspected as prescribed by the manufacturer.

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- Blasting machines shall be tested prior to use and periodically thereafter as prescribed by the manufacturer.
- Blasting machines shall be secured and accessible only to the blaster; only the blaster shall connect the leading wire to the machine.

(4) Transportation Of Explosive Materials

Transportation of explosives by the following modes shall be in accordance with the prescribed regulations and applicable country requirements.

- Transportation of explosive materials over public highways shall be in accordance with local requirements.
- Marine transportation of explosive materials shall be in accordance with coast guard requirements.
- Transportation of explosive materials by aircraft shall be in accordance with State or local requirements.

Vehicles used for transportation of explosive materials shall not be loaded beyond their rated capacity and the explosive materials shall be secured to prevent shifting of load or dislodgment from the vehicle; when explosive materials are transported by a vehicle with an open body, a magazine or closed container shall be securely mounted on the bed to contain the cargo.

All vehicles transporting explosive materials shall display all placards, lettering, and/or numbering required by relevant organizations.

Explosive materials and blasting supplies shall not be transported with other materials or cargoes; blasting caps (including electric) shall not be transported in the vehicle or conveyance with other explosives.

All vehicles for transportation of explosive materials shall be in the charge of and operated by a person who is physically fit, careful, reliable, able to read and understand safety instructions, and not under the influence of intoxicants or narcotics.

Only the authorized driver and helper shall be permitted to ride on any conveyance transporting explosive materials or detonators.

Vehicles used in the transportation of explosives shall be substantially constructed, in good repair and shall have tight beds to prevent explosives from falling from the vehicle; the ends and sides of vehicles shall be high enough to prevent containers from falling off.

Explosives shall not be exposed to sparking metal during transportation materials and all electric wiring completely protected and securely fastened to prevent short circuits; a written record of such inspection shall be kept on file.

Vehicles transporting explosive materials shall be operated with extreme care; full stops shall be made at approaches to all railroad crossing and main highways and the vehicles shall not proceed until it is known that the way is clear.

No vehicle shall be refueled while explosive materials are on the motor vehicle except in an emergency.

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Persons employed in the transportation, handling or other use of explosive materials shall not smoke or carry on their persons or in the vehicle, matches, firearms, ammunition or flame-producing devices.

Provision shall be made for safe transfer of explosive materials to magazine vessels including substantial ramps or walkways free of tripping hazards. Vehicles transporting explosive materials shall not be left unattended.

The hoist operator shall be notified before explosive materials are transported in a shaft conveyance. Explosive materials shall be hoisted, lowered or conveyed in a powder car, no other materials, supplies or equipment shall be transported in the same conveyance at the same time.

No person shall ride in any shaft conveyance transporting explosive materials; loading and unloading shall be accomplished only when the conveyance is stationary.

No explosive materials shall be transported on any locomotive; at least two car lengths shall separate the locomotive from the powder car. No explosive materials shall be transported on a man haul trip. The car or conveyance containing explosive materials shall be pulled, not pushed, whenever possible.

The powder car or conveyance built for transporting explosive materials shall bear a reflectorized sign with a sharply contrasting background on each side with the word, "**EXPLOSIVES**" in letters not less than 10cm in height.

(5) Under Water Blasting

- A blaster shall conduct all blasting operations and no shot shall be fired without his or her approval.
- Loading tubes and casings of dissimilar metals shall not be used because of possible electric transient currents from galvanic action of the metals and water.
- Only water-resistant blasting caps and detonating cords shall be used for all marine blasting; loading shall be done through a non-sparking metal loading tube when necessary.

10.33 Pressure Testing

Only essential personnel shall be in the vicinity of systems being tested. Testing personnel shall ensure they understand testing operation and safety criteria. Pressure testing personnel shall have proper identification to ensure only essential and qualified personnel are within test exclusion areas.

An exclusion zone is an area that is evacuated of unauthorized personnel during the testing operation. Exclusion zones shall be positively identified by placing of clear, concise warning signs at all vehicle and pedestrian access points. Exclusion zone should be barricaded.

CONTRACTOR shall calibrate the relief valves to be used for kinds of pressure testing.

Prior to commencement of testing the Testing Supervisor shall verify proper calibration and operation of pressure gauges, recorders, temperature gauges and relief valves. As a minimum CONTRACTOR shall use two certified pressure gauges, one located at the test manifold and a second at the highest point of the system under test.

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If a leak is detected at any stage during the test, the Testing Supervisor shall consult with the COMPANY's Testing Supervisor regarding the requirement to partially or fully depressurize prior to undertaking further examination, tightening or repair.

The stored energy at test conditions for a pneumatic test is many times greater than for a hydrostatic test on the same system, this makes much more significant the potential hazards during a pneumatic test from the following four principal effects of a major failure.

- (1) The blast effect of the high-intensity pressure wave created by a sudden rupture in the system.
- (2) The destructive effect of parts, such as valves, nozzles, perhaps sections of pipe, and the like becoming high-velocity missiles.
- (3) The destructive effect due to high reaction forces at the point of rupture causing structural support failure and pipe-whip.
- (4) The destructive effect of the emergent jet from the point of rupture.

The first three effects, above, are primarily dependent on the intensity of the failure, the fourth on its duration, which, in turn, is influenced by the volume of the system under test. The first three effects are the most devastating.

11. WASTE MANAGEMENT

11.1 Introduction

CONTRACTOR shall, in line with the Environmental Policy, strive at all times to comply with all relevant regulations applied on the project and requirement from client, the specific guidelines on Environmental Management shall be checked by CONTRACTOR.

Effort shall be geared towards waste management practices that meet the provisions of guidelines with the objective of minimizing the impact of CONTRACTOR activities on the environment.

11.2 Waste Classification

CONTRACTOR shall classify and define the wastes as follows.

- (1) **Hazardous Wastes:** This is any gaseous liquid or solid waste, which due to its physical, chemical or infectious characteristics have the potentials to harm human health or the environment when improperly handled. This waste category include paints, thinners, organic solvent, sewage sludge lead acid batteries, Medical waste, blasting grit, empty oil / chemical drums and used oil (lube / engine).
- (2) **Non-Hazardous Wastes:** Non-hazardous-wastes are all wastes that are not hazardous wastes and are not inert construction wastes. This includes common garbage, office wastes, construction wastes that are burnable such as boxes, and treated sewage effluent and sewage sludge.

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- (3) **Inert Construction Wastes:** Inert construction wastes are wastes that are solid and on disposal in a landfill are not reasonably expected to undergo physical, chemical, or biological changes to such an extent as to produce substances that may cause an adverse effect. Such wastes include but are not limited to demolition debris, concrete, asphalt, glass, ceramic materials, unpainted scrap metal, and dry timber or wood that has not been chemically treated, but does not include hazardous wastes.

Note that wastes contaminated with hazardous substances are hazardous by definition.

11.3 Waste Management Principle

The principles of waste management which include options of source reduction, waste material reuse in its original form, recycling / recovery by converting waste into usable materials shall be practiced whenever possible. The destruction or neutralization of residues through biological or thermal methods shall also be adopted in treating wastes. Generally, waste disposal shall be contracted to Environmental Authority approved contractors.

11.4 Waste Handling & Transportation

The following shall be complied with, while handling, storing or transporting wastes;

- (1) Use of appropriate Personal Protective Equipment (PPE)
- (2) Reference to the Safe Handling of Chemical card or MSDS for handling chemical and solvents.
- (3) Use of trolleys and carts for transportation of hazardous waste.
- (4) Use of waste manifest in waste handling.

11.5 General Waste Management Plan

(1) Introduction

CONTRACTOR is committed to sustainable development and environmental protection Effective waste Management forms an integral part of our project operations.

Wastes should be segregated in color-coded bins at source. The segregated waste will be stored in a designated segregated waste storage facility located at the site. Segregated wastes shall be transferred to Base Camp, Fabrication Yards, and Construction Areas depot for proper disposal. Recyclable wastes bin: batteries, plastics, metals, glass and fluorescent tubes are to be sent to designate collection point for recyclable materials. While inert (general) wastes are to be disposed by waste disposal contractors at appropriate sites.

Medical wastes are to be disposed by incineration at an approved medical incinerator.

Wastewater is the liquid sanitary waste that has been fouled by a variety of uses in and around CONTRACTOR construction camps. Wastewater originates from kitchen and laundry washings, and discharges from washbasins, bathrooms, toilets, etc.

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The waste will be chemically treated to render it acceptable for discharge. Chemically treated toilets will be used for construction camps. Sanitary wastes generated within Shell compounds will be diverted through the sanitary sewer and drains to client's waste disposal facilities.

Wastes shall be tracked through the use of duly signed waste consignment Form. Chemical/Hazardous Waste Disposal Form shall be used to transfer hazardous chemicals. Chemicals are to be managed on site in line with COMPANY Requirements. Waste transfer from the place of wastes produced to Depot shall be through the use of containerized waste carriers.

(2) Waste Categories & Definition

The classifications of waste streams in CONTRACTOR operation are based on the physical nature of waste i.e. gaseous, liquid or solid and also on sources of generation

(2.1) Gaseous Wastes

These are wastes generated from four main sources namely; combustion equipment, vents and fugitive emission. The emission components are CO₂, CO, N₂O, N₂ unburned hydrocarbon (CH₄ & VOC's).

(2.2) Liquid Wastes

These comprise streams of wastes which are liquid in nature such as:

- **Process Drains & Leakages**

These involve crude and contaminated water leakages from pipe flanges, pump glands, compressor, packing, valve stems etc generated due to equipment malfunction or operational errors.

- **Storm / Surface Water Drainage**

The roofing of all workshops will ensure no wash down of oily stains during periods of heavy rains. The impacts of storm water runoff will result in accumulation of pollutants in the collection system and could have an unacceptable impact on the receiving water body.

General guidelines are as follows:

- Environmental Supervisor shall monitor potentially contaminated storm water and skim free oil;
- Contaminated storm waters which run off from areas within the project shall be directed through appropriate treatment facilities
- Runoff water's solid particle shall be allowed to subside before discharged
- **Spent Lubricating Oils**
These are derived from routing maintenance activities on the running equipment, power generations, diesel engines, vehicles etc. These shall be drained from the equipment sumps into a container and later sent to for disposal by waste management contractor Depot.
- **Liquid Additive Spills & Leakages**

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These include fuel oils (diesel) from storage tank, which are spilled during equipment refueling due to accidents and poor handling. This category also includes lubricating oils and fluids (e.g. Engine oils dispersants, demulsifiers) and detergents for cleaning soiled equipment during maintenance activities.

Any spill of the liquid chemicals in an unpaved area, which are environmentally unfriendly, shall be absorbed with sand and the contaminated sand collected and stored in temporary storage drums whose contents will be transported at predetermined intervals to an approved site for incineration. The drums shall be made of plastic and be clearly labeled as '**Chemical Contaminated Soil**'.

- **Chemical Additive Residues**

Residues of the various chemical additives to process fluids – e.g. Eposand, obsolete dispersants shall be retained in their containers and stored under suitable conditions until a suitable disposal method has been decided.

- **Domestic Sewage**

Sewage drains shall be routed to septic tanks. These tanks shall be evacuated for appropriate disposal through a Government approved waste contractor wherever necessary. The waste contractor before disposal shall treat the Sewage. A sewage waste consignment note and record of chemicals used for the sewage treatment shall be kept in the base office.

(2.3) Solid Wastes

These are waste materials of solid physical nature. They are generated from various sources and activities, and include:

- **Empty Drums**

Empty drums used to package lubricating oils, corrosion inhibition chemicals (Servo), Power fuel oils (diesel) will be stored according to type at the locations and back-loaded to Base at regular intervals for disposal or recycling. The responsible party shall be the waste management contractor.

- **Maintenance**

These include oil and fuel filter cartridge, air cleaner element, scrap metals, metal fillings chipping, spend electrodes, scrap cables, oily rags etc. Non-oil contaminated items among these shall be segregated in special covered black-colored steel bins for evacuation and disposal.

The filters shall be rinsed with diesel and dried before transferred with general wastes for disposal by waste management contractor.

- **Medical Wastes**

All medical wastes shall be collected in a separate bin and be made available for collection by the waste management contractor.

- **Food Wastes**

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Waste and left over food items shall be collected in green covered bins lined with polythene sheets prior to disposal. The wastes shall be bagged according to waste types, into appropriate disposal bags and transported to Base under the cover of a waste consignment note. The bags should be such that their content shall not leak during transportation. All bags shall be properly labeled in accordance with the color coding.

- **Glass Wastes**

All types of broken glassware, bottles shall be collected in blue bins, to Base or nearest collection area via consignment note for the waste disposal contractor to collect.

- **Plastic Wastes**

Plastic containers and other plastic wastes shall be collected in brown bins, sent to waste storage area via waste consignment note for the waste disposal contractor to collect.

- **Paper Wastes**

Paper wastes generated from office activities and other sources shall be contained in black bins and later burnt in the combustion chamber at site if available.

- **Contaminated Soils**

Spill and leakages of liquid additives like dispersants and chemicals shall be absorbed with sand and collected in appropriately labeled plastic containers. The contaminated sand shall be bagged and stored at the oily sludge concrete slab with the type of chemical specified on the bin liner.

- **Batteries**

Spent batteries shall be transferred for the waste disposal contractor to collect. A waste consignment note shall accompany them.

- **Construction Waste**

All waste and scrap materials from construction activities shall be stored in a scrap yard, which shall be created on site. The scrap yard shall be completely fenced and shall be managed by waste consignment contractor. All waste to be stored in the scrap yard shall be quantified and recorded.

(3) Waste Inventory, Segregation, Disposal and Strategies

The management of waste provides a baseline for identification of opportunities to improve practices and maintain waste record. All waste streams shall therefore, be quantified using appropriate forms prior to transportation and effective disposal. This process ensures the prevention of future liabilities.

Gaseous and liquid wastes generated from CONTRACTOR shall be disposed off on site. The bulk of the solid waste cannot be conveniently disposed off on site, and therefore have to be contained and then transported for disposal on-land through the Waste disposal Contractor.

- All solid wastes shall be segregated and be stored in approved containers for disposal by the waste management contractor.

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- All waste shall be quantified in CONTRACTOR of weight/volume.
- Record shall be kept to provide auditable trace as to its management and disposal
- All environmental incidents shall be promptly reported.
- All hydrocarbon or chemical spilled shall be cleaned up in a timely and efficient manner.

CONTRACTOR is committed to continuous waste reductions at source. Waste reduction options would be implemented as much as possible. Good housekeeping shall also be enforced on site.

12. ENVIRONMENTAL MANAGEMENT

The Project Environmental Management Procedure shall be prepared with regarding specific condition and take approval from client, if required. Procedure shall be prepared according to the regulation and contractual requirements.

12.1 Dust Pollution during Construction Phase

- (1) CONTRACTOR shall adequately water the area under construction to prevent dust
- (2) Water spraying construction areas shall be done twice a day, morning and afternoon regularly.

12.2 Body of Water

CONTRACTOR shall protect all forms of body of water around the site that will be affected during the construction period this includes river, sea, swamp or lakes.

HSE Supervisor shall conduct regular inspection and waste water sampling & analysis in all waste water collection and temporary storage area; all finding shall be documented and to be reported to HSE Manager. No waste water coming from the construction site will be discharge to this body of water without proper treatment or tested to be safe and will not harm any form of living things living in the environment.

Waste water that does not classified as safe to disposed to environment shall be collected by designated waste subcontractor and to be treated according to local environmental procedure. Waste subcontractor shall be monitored by HSE Manager if it is complying with the environmental standard by regular audit and inspection of its waste water treatment facilities and dumping area (Subcontractors Safety Management Procedure).

Lack of culverts across road, lack drainage along the road, road junction and slit sedimentation will result to flooding. CONTRACTOR will provide proper culverts and drainage systems to continuously allow free movement of water across the road. To prevent siltation, properly designed silt trap shall be provided. The drainage shall go along gentle slope so as to avoid erosion and siltation at the inlets and shall be linked to the existing drainage system.

The impacts of storm water runoff will result in accumulation of pollutants in the collection system and

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could have an unacceptable impact on the receiving water body.

General guidelines are as follows:

- Environmental Supervisor shall monitor potentially contaminated storm water and skim free oil;
- Contaminated storm waters which run off from areas within the project shall be directed through appropriate treatment facilities
- Runoff water's solid particle shall be allowed to subside before discharged.

12.3 Noise Control

(1) General

- The action level for noise on CONTRACTOR Projects 85 dB(A) TWA 8 hour TWA, 83 dB(A) for 12 hours and over will require the provision of signs, mandatory hearing protection and an analysis of the noise emissions.
- The maximum noise levels to which anyone may be exposed to are 85 dB(A) 8 hour TWA, 83 dB(A) for 12 hours continuous and 130 dB impulse or short duration. This includes personnel wearing hearing protection.
- Instances where personnel are exposed to high levels of noise may require screening to assess if any impairment has occurred.
- In areas where noise may interfere with communications, suitable alternative arrangements shall be in place for alerting the work parties in the event of an emergency.

(2) Assessments

- Assessments and noise survey must be carried out in order to identify all persons likely to be exposed at, or above the action level and provide enough information to enable appropriate action to be taken.
- The exposure of persons to noise must be reduced, as far as is reasonably practical, without the use of hearing protection.
- As with any item of personnel protective equipment, the use of it should be the last resort. Determined efforts should be made to 'engineer out' the noise.

(3) Methods of noise reduction

Limiting Exposure to noise can be reduced by:

- Engineering and control methods (e.g. installation of silencer, sound controlled equipment enclosure, sound barrier, replacing equipment with a low noise producing equipment if possible)
- Job rotation
- Providing rest rooms or acoustic refuges
- Re-arranging work locations

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- PPE (ear plug, ear muffs)

The below table - Guidance on Sources of Noise in Construction Industry - provides guidance on sources of noise in the construction industry and possible remedies to reduce noise levels.

Machine	Source of noise	Possible remedies		Other Options
Piling equipment	Pneumatic/diesel hammer or steam winch vibrator driver	Enclose hammer head and top of pile in acoustic screen, acoustically dampen sheet steel piles to reduce vibration and resonance		(1) Quieter method of piling. (2) Other methods of soil retention and ground improvement e.g. diaphragm walls, ground anchors, shafts formed of pre-cast concrete segments sunk into the ground under kentledge, use of pre-treatment prior to excavation such as de-watering, freezing soil injection etc
	Impact on pile	Use resilient pad (dolly) between pile and hammer head, e.g. 2 layers of non-flammable cloth stuffed with glass fibre or mineral wool and protected by plywood. Packing should be kept in good condition		
	Crane cables, pile guides and attachment	Careful alignment of the pile and rig		
	Power units or base machine	Fit more efficient silencer or exhaust. Acoustically dampen panels and covers. When intended by the manufacturers' engine panels should be kept closed. Use acoustic screens where possible		
Crane, Dumpers, Earth-moving plant	Engine	Fit more efficient silencer or exhaust Enclosure panels, when fitted, should be kept closed		
Compressor Generator	Engine	Fit more efficient exhaust silencer	Screen the compressor or	Use electric motor in preference to diesel or petrol engine for

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	Compressor or generator	Acoustically dampen metal casing. Enclosure panels should be kept closed	generator	compressors. If there is no mains supply, a sound reduced compressor or generator can be used to supply several pieces of plant. Use centralized generator system.
Pneumatic concrete breaker and tools	Tool	Fit a muffler or silencer, this will reduce the noise without impairing efficiency	Use the breaker inside a portable acoustic enclosure (increased noise levels for operator are likely)	Use rotary drill and buster. Hydraulic and electric tools are also available. A thermic lance can be used to burn holes in concrete and to cut through large sections of concrete; any reinforcement helps the burning process. For breaking large areas of concrete, equipment which breaks concrete in bending could be used
	Bit	Use dampened bit to eliminate 'ringing'		
	Air line	Leaks in air should be sealed		
	Motor	Fit muffler to pneumatic saws		
	Vibration of blade or material being cut	Keep saw sharp. Use a damped blade. Clamp materials while cutting with packing if necessary		
Rotary drills diamond drilling and boring	Drive motor and bit	Use machine inside an acoustic cover		Thermic lance
Riveters	Impact on rivet	Enclose working area in acoustic screen		Design for high tensile steel bolts instead of rivets
Explosive powered tools	Explosive of cartridge	Use a sound reduced gun		Drilled fixings
Pump	Engine pulsing	Enclosure in acoustic screen (allow for engine cooling and exhaust)		

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Batching plant	Engine	Fit more efficient silencer on diesel or petrol engine. Enclose engine	Locate static mixing plant as far as possible from those likely to be inconvenienced by the noise
	Filling	Do not let aggregates fall from an excessive height	Use electric motor in preference to diesel or petrol engine
	Cleaning	Do not hammer the drums	
Grinder	Disc cutting	Worker rotation Conduct work in suitable habitat Ensure correct disc for job	Gas cutting torch

(4) Information instruction and training

Where persons are likely to be exposed to noise levels of 85 dB(A) and above they must be provided with the following :

- Information on the risk to hearing.
- Provision of suitable hearing protection.
- Instruction and training on the correct use and maintenance of the hearing protection.
- Circumstances where ear protection needs to be worn.
- Information supported by suitable warning signs in ear protection zones.

(5) Noise Values associated with Construction Equipment

The below table - Noise Level of Construction Equipments - features approximate noise levels associated with general construction equipment.

Sound pressure level in dB(A)	Situation
140	Jet aircraft at 30 meters
130	Pain threshold / impact noise /riveting hammer
125	Pneumatic breaker un-silenced

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120	Dozer normal operation Pneumatic rock drills Scrapers
115	Dozer ripping Hand held disc cutter
110	Tracked loaders Tripper truck unloading and levelling hardcore Graders levelling ground
105	Wheeled excavator/loader(Trenching) Compressors(3.5m ³ /min) Road roller(rolling gravel/Brick) Drilling into a concrete beam(Electric percussion drills) Diesel driven generator for arc welding Circular saws
100	Batching plant
95	Concrete mixer Loading/unloading scaffold materials
90	Electric drill under normal loading / heavy vehicle
85	The action point for mandatory hearing protection and signs
80	Very busy traffic
70	Private car / Noise limit for workshops and machinery buildings
60	Ordinary conversation

(6) Environmental Noise

Working well together in the vicinity of the site operations are of particular importance.

Early establishment of relations and liaison throughout the site operations will go a long way in identifying and resolving problems associated with noise impact on the local environment.

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All available techniques should be used to minimize, the level of noise to which site personnel and others in the area of site operations will be exposed. Measures which could be taken include the followings;

- Restrictions on hours of work for high noise activities.
- Control of noise at source for example :
- Substitution of noisy equipment with quieter machinery.
- Enclosure of machinery on sites i.e. using plywood hoardings or earth bunds.
- Sitting of static plant i.e. crushers, batching plant etc away from noise-sensitive boundaries if possible.
- Regular and effective maintenance to plant and other equipment will result in quieter and more efficient running of plant and equipment. Such reduced plant noise will assist in the control of environmental noise.

12.4 Soil Erosion

The excavated or embanked area, shoulder on side slopes or borrow pits are the area where soil erosion are likely to occur during heavy rain. To avoid soil erosion, all exposed surface shall be regressed or covered by stone pitching, lining concrete, spill way and the embankment area shall be carried out well compaction.

13. ENVIRONMENTAL SPILL RESPONSE

Various environmental regulations and good management practices require that storage facilities for chemicals, petroleum products and wastes be provided with secondary containment to prevent releases of stored materials. Good safety practices will assist personnel working with these chemicals and products to prevent occurrence of spill and in the event of a spill, how to contain it.

The following steps will be taken in the event of a spill:

The supervisor or in-charge person will:

- (1) Minimize the area of contamination by containing the spill. Under no circumstances should the safety of the personnel be jeopardized in securing the area. Secure the area and avoid spreading of spilled hazardous materials.
- (2) Notify the HSE Manager immediately and organize the Environmental Response Team.
- (3) Start spill cleanup, by using approved absorbing pad materials. Assess the materials characteristics by using the MSDS. Wear the appropriate PPE (e.g. Rubber gloves, Rubber boots, Safety goggles, face shield etc.) All personnel employed in spill response shall be adequately trained.
- (4) Where possible, take photographs of the spill. The photographs may assist the spill investigation team.

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- (5) Assess the quantity of product spilled and damage done to the environment using proper Environmental Incident Report Form.
- (6) Disposed the spilled hazardous waste as per Waste Management Plan.
- (7) All Environmental Spill Incidents shall be reported to the COMPANY and to Head Office. Depending on the severity of the spills; CONTRACTOR will report to relevant Local Environmental Authority through COMPANY representative.
- (8) In the case of worst environmental incident, CONTRACTOR shall seek the assistance of the local environmental group in containing and controlling the spill.

14. HEALTH, SAFETY AND ENVIRONMENTAL IMPACT ASSESSMENT (HSEIA)

A Health, Safety & Environmental Impact Assessment (HSEIA) shall be carried out and may be linked to the cost-benefit analysis. The objective of the HSEIA is to ensure that health, safety & environmental aspects are addressed and potential problems are foreseen at the appropriate stage of project design and construction. EIA shall be envisaged as an integral part of the planning process and initiated at the project level from the start.

Daewoo E&C shall utilize ALARP system that reduces the risk to a level which is as low as reasonably practicable and involves balancing reduction in risk against the time, difficulty and cost achieving it.

Daewoo will focused in controlling major accident hazards, occupational health hazards & environmental impact by analyzing the risk through measuring the likelihood of occurrence and the potential adverse consequences which may have affect the people, asset, environment and reputation.

Various guidelines on HSEIA are available. The following main steps will be applied;

- (1) Preliminary activities include the selection of a consultant that will conduct the HSEIA and the collection of background information. This should be undertaken as soon as a project has been identified. The consultant to be selected should be approved by the COMPANY as per project requirements.
- (2) Impact identification involves a broad analysis of the impacts of project activities with a view to identifying those which are worthy of a detailed study.
- (3) Baseline study entails the collection of detailed information and data on the condition of the project area prior to the project's implementation.
- (4) Impact evaluation should be done whenever possible in quantitative terms and should include the working-out of potential mitigation measures. Impact evaluation cannot proceed until project alternative has been defined, but should be completed early enough to permit decisions to be made in a timely fashion.
- (5) Assessment involves combining HSE losses and gains with economic costs and benefits to procedure a complete account to each project alternative. Cost-benefit analysis should include HSE impacts where these can be evaluated in monetary terms.

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- (6) Documentation is prepared to describe to the work done in the HSEIA. A working document is prepared to provide clearly stated and argued recommendations for immediate action. The working document should contain a list of project alternative with comments on the HSE and economic impacts of each.
- (7) Decision-making begins when the working document reaches the decision maker, who will either accept one of the project alternatives, request further study or reject the proposed action altogether.
- (8) Post audits are made to determine how close to reality the HSEIA predictions were.

The HSEIA Reports will demonstrate in relation to the subject project, facility, site or activities:

- 1) That all HSE hazards have been systematically identified in the Hazards & Effects Register, inclusive of relevant risk classification (e.g. High, Medium and Low).
- 2) That all Significant (adverse) Environmental Impacts have been identified, suitably analyzed and assessed for significance. It must be demonstrated that relevant control, mitigation and recovery measures are proposed (for projects), are implemented (for existing facilities or operations) or an implementation plan exists for implementation.
- 3) That all Major Accident Hazards have been identified and suitable control, mitigation and recovery measures are proposed (for projects) or are implemented (for existing facilities or operations). It must be demonstrated that operation can be achieved within the quantitative criteria for risk tolerability and ALARP must be demonstrated in accordance with principles that are compatible with those provided in Risk Assessment & Management Procedure.
- 4) That all High Occupational Health Risks have been systematically identified and suitable action to mitigate these risks and to protect employees from these risks have been or will be taken.
- 5) That there is an implementation plan that shows how the control, mitigation and recovery measures for Significant Environmental Impacts, Major Accident Hazards and High Occupational Health Risks will be implemented and managed throughout the facility lifecycle.
- 6) How all HSE risk - including that resulting from Medium and Low Risk Hazards - will be managed and controlled via project specific HSE Management System.
- 7) That Emergency Response Plans (on-site and off-site where necessary) in relation to Major Accident Hazards have or will be prepared based on credible emergency scenarios, with the necessary stakeholder consultation.

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15. CAMPS

CONTRACTOR will implement their Camp Management Procedure - DTMS-HSE-PG002 to ensure that all HSE requirements are met with regards to inspections, cooking in rooms, facilities, hygiene, food, activities, Management, roles and responsibilities and emergency response and training.

15. ATTACHMENTS

ATTACHMENT 1 : OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM CERTIFICATE

ATTACHMENT 2 : HSE POLICY

ATTACHMENT 3 : ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14001:2004