



FICHTNER

2 x 660 MW Maitree STPP

Health & Safety Management Manual



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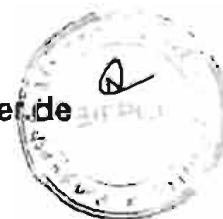


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Disclaimer

Fichtner GmbH & Co. KG has prepared this document for the Project on behalf of the Bangladesh-India Friendship Power Company (PVT.) Limited ("BIFPCL") based on the current knowledge of the Project and the assumptions with respect to the later construction execution to be developed by the Contractor.

The Health & Safety Management Manual should not be used for any other project without prior written approval of Fichtner.

Fichtner accepts no responsibility or liability for the consequences of the use of this manual. The Health & Safety Management Manual provides a framework for the application of Health & Safety Requirement for the Maitree-STPP Project. The suitability and applicability must be finally evaluated and assessed by the Contractor.



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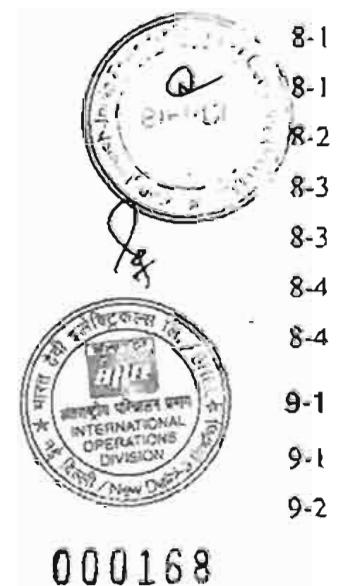
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Definitions and Abbreviations

Employer	Bangladesh India Friendship Power Company (PVT) Limited (BIFPCL)
Consultant	Fichtner GmbH & Co. KG
JVC	Joint Venture Corporation between Bangladesh Power Development Board (BPDB) and National Thermal Power Corporation, India (NTPC)
Contractor	Company contractually appointed for the Engineering, Procurement Construction and Commissioning (EPC) of the works.
PIC	Project Implementation Consultant
MSDS	Material Safety Data Sheet
IFC	International Finance Corporation, Member of the World Bank Group
PS	IFC-Performance Standard
Hazard	A hazard is anything with the potential to cause harm.
ERP	Emergency Response Plan
H&S	Health & Safety
LEAV	Lower Exposure Action Value
JSA	Job Safety Analysis
RDC	Residual Current Device
SAR	Safe and rescue team
STI	Sexual Transmitted Infections
PPE	Personal Protective Equipment
PTW	Permit to Work
GPS	Global Positioning System



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1. Introduction

1.1 Project Background

BIFPCL, a 50:50 Joint Venture Company of the BPDB and NTPC, intends to set up a 2x 660 MW coal based Thermal Power Project at Rampal (Maitree-STPP) in the Bagerghat district of the Khulna Division in Bangladesh.

The parameters of the facility are based on the super critical combustion technology and shall be operated as Base Load Plant. The fuel will be import coal transported by waterways to the facility.

The Maitree-STPP consists mainly of:

- Jetty with coal and ash handling facilities
- Power Island consisting of boiler, turbine systems and power generators
- Flue gas treatment system
- Power export facilities.

BIFPCL mandated the Consultant (Fichtner GmbH & Co.KG) to perform consulting services during the planning, execution and implementation phases of the Project.

The duration of the project is envisaged to be 72 months from the Effective Date of Contract.

The scope of work for the above mentioned consulting contract requires among others the development and preparation of a Health & Safety Management Manual.

1.2 Definition of Occupational Health & Safety

Since 1950, the International Labour Organization (ILO) and the World Health Organization (WHO) have shared a common definition of occupational health. It was adopted by the Joint ILO/WHO Committee on Occupational Health at its first session in 1950 and revised at its twelfth session in 1995 and is defined as follows:

Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention amongst workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities; and, to summarize, the adaptation of work to man and of each man to his job.

"The main focus in occupational health is on three different objectives:

- the maintenance and promotion of workers' health and working capacity;
- the improvement of working environment and work to become conducive to safety and health and
- the development of work organizations and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings.

The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the undertaking concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies and quality management of the undertaking."

Workers safety has to be understood as the practice of an employer using preventative measures to prevent hazards to the employees' personal safety. This practice includes creating plans and procedures for employees and managers in the workplace. In addition, workplace safety involves creating policies and keeping emergency materials available for employee and manager use while at a work site.

1.3 Purpose of the H&S Management Manual

The present H&S Management Manual shall delineate the H&S Requirements, incl. policies and guidelines, and outline the roles and responsibilities of the different parties involved in the implementation and oversight of H&S Measures to ensure community, worker and public health and safety during construction.

The H&S Management Manual considers the applicable national occupational health, safety and welfare legislation as well as guidelines and standards established by the relevant Ministries and Authorities.

The H&S Management Manual takes the following applicable IFC Performance Standards (PS) into account:

- PS 2: Labour and Working Conditions, dated January 1, 2012
- PS 3: Resource Efficiency and Pollution Prevention, dated January 1, 2012
- PS 4: Community, Health, Safety and Security, dated January 1, 2012

The H&S Management Manual includes the Occupational Health & Safety Requirements and arrangements that are mandatory for the Contractor for consideration and implementation.

The defined H&S Standards are part of the contractual obligations and no changes are possible without a prior written approval by BIFPCL.

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1.4 Content of the H&S Management Manual

The H&S Management Manual contains an outline of the required H&S Organization at site and to be implemented by BIFPCL and the Contractor.

It describes the overall H&S Management required for the organization of a safe and healthy working environment for the workers and to ensure that the public will not be affected by the construction activities. In addition to the organizational arrangements roles and responsibilities of the required H&S Staff of BIFPCL and the Contractor are defined.

Attention was paid to the need for training to be implemented by the Contractor. It starts with the evaluation of training needs and defines the requirement of developing a training schedule as well as workers and visitor induction.

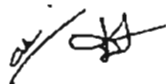
Communication procedures are addressed and needed H&S Reporting is specified for the entire construction period.

As one of the most important subjects, the entire risk management process is comprehensively described, specifying the risk management process, the hierarchy of control and the safe system of work.

Reporting and monitoring procedures are developed for the fulfillment by the Contractor and the standards for PPE are included.

Chapter 13, as one of the most relevant chapters of this report, explains the H&S Requirements extracted and summarized from the applicable international and national legislation as well as guidelines and standards.

The H&S Management Manual shall highlight the entire H&S Management System and also provide information on the H&S Standards to be included in the tender documents as a reference to be followed by the Contractor.



2. Health & Safety Management System

An H&S Management System is implemented for the Project. The management system comprises of different components to be developed by the Contractor.

The structure of the H&S Management System is show below and the content of the components are defined in the following chapters.

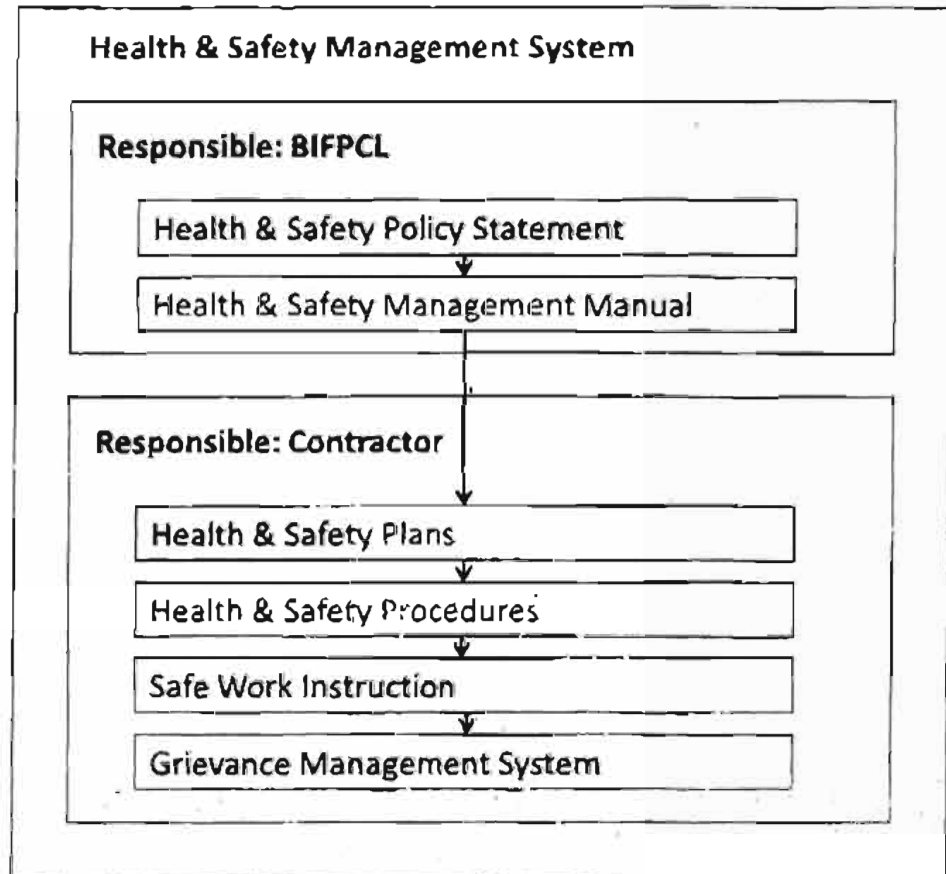


Figure 2-1: Structure of Project Health Safety Management System

Considering an effective H&S Management System, it should be highlighted that the Contractor must implement human resource policies and procedures that set out the approach to manage workers consistent with the requirements of IFC PS 2 as well as the applicable national laws and standards.

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2.1 BIFPCL's Health & Safety Policy Statement

The statement of policy on health and safety at work sets out the commitment of BIFPCL to manage health and safety effectively, and what shall be achieved by BIFPCL, the Contractor and any appointed sub-contractor.

BIFPCL, the Contractor and any appointed sub-contractor is committed to provide and maintain a safe and healthy workplace for all staff, and to provide the information, training and supervision needed to achieve this.

All involved parties are committed to protect the fundamental rights of all appointed workers and feel obliged to create a sound worker-management relationship as a key ingredient in a sustainable and successful project execution.

All involved parties will have to assume the responsibility for H&S procedures, and need to be made aware of their responsibilities and to comply with BIFPCL's H&S Policy.

The following requirements are mandatory for each worker in maintaining a safe and healthy workplace through:

- Being involved in the workplace H&S System;
- Sticking to correct procedures and equipment;
- Wearing protective clothing and equipment whenever required;
- Reporting any pain or discomfort as soon as possible;
- Ensuring that all accidents and incidents are reported;
- Helping new workers, trainees and visitors to the workplace understand the right safety procedures and why they exist;
- Telling the responsible managers immediately of any H&S concerns;
- Keeping the work place tidy to minimise the risk of any accidents.

The H&S Policy Statement is implemented to achieve the following goals:

- Zero fatalities of workers, visitors or the public;
- Zero accidents and incidents of workers, visitors or the public;
- Zero harmful, hazardous or dangerous situations or occurrences;
- Zero environmental concerns or impacts;
- Continuous improvement of the health & safety performance at site under practical conditions.

2.2 BIFPCL's Health & Safety Management Manual

BIFPCL implements this H&S Management Manual in order to delineate the Project's H&S Requirements, Policies and Guidelines as well as to outline the roles and responsibilities of the different parties involved in the implementation and oversight of measures to ensure community, worker and public health and safety during construction.



2.3 Contractor's H&S Plans

All Contractors shall establish an effective project specific H&S Plan. The H&S Plan will be subject of BIFPCL's written approval. The H&S Plan shall be submitted by the Contractor not later than 4 weeks prior to any commencement of works at site.

Any work at site, incl. mobilization to the site will not be allowed to commence until BIFPCL deems the Contractor's H&S plan to be suitable and sufficient.

The H&S Plan shall describe how health and safety will be managed at site, incl. mobilization and transport to the site, and how the specified H&S Standards will be applied in practice. In addition the Contractor shall ensure adequate communication of these requirements throughout the supply chain, its supervision, and the workers themselves.

The H&S Plan shall specify the management arrangements for carrying out the work including but not limited to:

- Overview of the project;
- Clearly identified risks associated with the scope of works;
- Program and milestones;
- Site management and organization;
- Key contractors and sub-contractors;
- Communication, Cooperation and Co-ordination;
- Site security;
- Traffic management;
- Welfare facilities and provision;
- Arrangements for supervision of contractors on site;
- Arrangements for information, instruction and training including induction;
- Management of hazards on site;
- Arrangements for identification of hazards, assessment of risk and production of Method Statements;
- Arrangements for hazardous undertakings e.g. confined space, work at height, hot work, excavations, cofferdams etc.;
- Permit to work system;
- Site rules;
- Arrangements for managing plant and equipment;
- Management of lifting operations;
- Management of temporary works;
- Arrangements for monitoring and auditing etc.;
- Requirements as defined by relevant statutory planning authorities e.g. traffic, noise, working hours etc.;
- Incident & accident investigation.





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The H&S Plan shall also consider the site rules outlining the H&S Requirements for all workers. The site rules shall include but should not be limited to:

- Site access;
- Access to and transport on the site;
- Entering and leaving the site;
- Use of mobile phones;
- Smoking;
- PPE requirements;
- General behaviour;
- Transport to the site;
- Vehicle traffic within the site area;
- Access to the site and Working Areas;
- Restricted areas.

The H&S Plan shall consider related plans and the corresponding direct and indirect H&S Requirements. This refers especially to the following related plans and assessments:

- Assessment of trafficking in persons;
- Hazardous materials and waste management plan;
- Environmental and social impact management manual.

A checklist for the review and approval of project specific H&S Plans shall be developed prior to the construction contract. The checklist shall define the minimum requirements to be met by the Contractor.

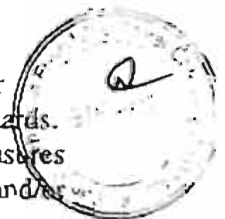
2.4 Contractor's H&S Procedures

The Contractor is requested to develop workplace specific H&S Procedures. In this matter, it should be noted that procedures are similar to method statements probably better known by Contractors. The required content of H&S Procedures is described below.

H&S Procedures are part of the Project framework for effective H&S Management. The H&S Policy states the intention to provide a safe and healthy workplace, and states the H&S goals of a workplace.

Specific health & safety workplace procedures shall address particular issues or hazards and the measures how to control those identified hazards. The procedures should be used together with other hazard control measures to eliminate or reduce the risks of accidents and incidents and illness and injuries at the working place.

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H&S Procedures shall be developed for the following activities expected to apply during construction:

- Site access control and site security procedure;
- Health & safety protection at transmission line worksites;
- Isolation and lock-out;
- Use of hazardous chemicals;
- Simultaneous activities;
- Live line work;
- Shift work, shift rotation and fatigue;
- X-ray and NDT;
- Risk assessment;
- Job Safety Analysis;
- Working at height;
- Working in confined spaces;
- Use of personal protective equipment;
- Excavation works;
- Hot works;
- Welding;
- Emergency response procedure;
- Evacuation procedure (if applicable);
- First aid;
- Working in water (if applicable);
- Use of electrical equipment;
- Work on high voltage.

This checklist shall define the minimum requirements to be met by the Contractor.

2.5 Contractor's Safe Work Instructions

Safe work instructions shall be developed by the Contractor identifying the health and safety issues that may arise from use of the machinery and equipment. The safe work instruction must be based on the H&S Plan.

A safe work instruction should identify:

- the hazard associated with the use of a specific tool or equipment;
- the required control measures to be checked to ensure a safe use of a specific tool or piece of equipment;
- the specific training and/or qualification required;
- the personal protective equipment to be worn.

Safe work instructions do not replace the requirement for a risk assessment, preparation of a workplace procedure, the need of a permit to work or the need for training.





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A risk assessment of the equipment must be performed before developing safe work instruction procedures to identify the hazards and risk controls.

A checklist for the review and approval of project specific Safety Work Instructions will be developed by the PIC prior to the first construction contract. The checklist will define the minimum requirements to be met by the Contractor.

2.6 Contractor's H&S Forms

The Contractor must develop forms like checklists for risk assessment etc. to support the use of workplace procedures, instructions, audits etc.

These forms must be attached to the respective documents, and must be read in closed conjunction with the corresponding document(s).

The checklists shall be subject of an update and revision in case improvements or needed changes were found suitable and required.

The checklists must be subject of project documentation, in the same way and considering the same procedure that is applicable for the project documentation in general.

H&S Forms have to comprise the following subjects as a minimum:

- Contractor Audit Questionnaire
- Basic Risk Assessment
- Permit to Work
- Workplace Inspection Checklist
- Accident/Incident Report/Investigation
- Fire Risk Assessment
- Hazardous Substance Risk Assessment
- Ladder Inspection Checklist.

The forms to be used by the Contractor must include all pertinent information. Additional forms like inspection checklists, workplace inspection checklists might be necessary and should be prepared by the Contractor and are subject of approval by BIFPCL.



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2.7 Contractor's Grievance Management System

2.7.1 Workers Grievance Management System

The Contractor must implement a grievance management system to enable the workers to raise complaints and to inform about non-compliances with the implemented H&S Management System. The grievance management system should provide the possibility to issues complaints in case of discrimination and/or the non-consideration of equal opportunities.

The grievance management system shall consider the possibility to contact directly a member of the H&S Staff. The contacted staff members must take a note of the reported complaint or non-compliance and must report it to the site manager and the H&S Manager.

The H&S Management is requested to solve a complaint or non-compliance within 3 working days. In case the problem could not be solved an action procedure specifying the needed activities together with a final deadline until the problem is expected to be solved must be prepared and submitted to BIFPCL.

The Contractor is requested to provide the possibility for the workers to notify a complaint or non-compliance in a confidential way.

2.7.2 Public Grievance Management System

The grievance management system shall also be open for public complaints.

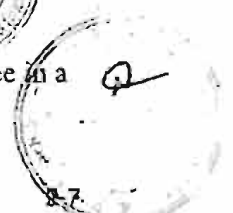
A respective procedure must be developed by the Contractor for review and approval. The grievance management system for the public must consider a reporting procedure to the local authority to demonstrate to the administrative body that the complaint was identified, noted, managed and solved.

The responsible authorities at the community level must be identified by the Contractor 4 weeks prior to the start of the construction activities or 4 weeks prior to the mobilization to the site.

The reporting procedure should be discussed and agreed upon together with the administrative body and specific attention should be paid to any specific requirements to be announced by the authority. The contact with the authority should be established by having a face-to-face meeting. This meeting should be attended by an H&S Representative of the Contractor and by the Project Implementation Consultant.

2.8 H&S Committee

It shall be the duty of each Project Party to establish a H&S Committee in a workplace employing more than fifty employees.



The committee should agree on the following principles:

- the principles;
- who the members will be;
- how often the committee will meet;
- what the committee will do;
- how decisions will be made and how disagreements will be dealt with; and
- what resources representatives will need as committee members.

The points mentioned above have to be agreed upon in written form.

The participation of worker representatives in the safety committee is mandatory as well as the participation of the H&S Manager. The safety committee should not exceed more than 5 members.

Records and meeting notes must be taken from each safety committee meeting. Copies of the meeting notes must be submitted to the H&S Manager of BFPCL for information and record purposes.





3. Legislative & Legal Background

The selection of international standards and guidelines was performed by considering the fact that the stipulated requirements were found most adequate and suitable for the prevailing conditions in the Rampal area.

The Contractor is requested to evaluate before start of any design or construction activities if the below listed acts, standards and guidelines have been subject of any updates or changes.

3.1 International Guidelines and Standards

International Finance Corporation (IFC)

- Performance Standard 2: Labour and Working Conditions, dated January 1, 2012;
- Performance Standard 3: Resource Efficiency and Pollution Prevention, dated January 1, 2012 referring specifically to the hazardous waste sections of the PS;
- Performance Standard 4: Community, Health, Safety and Security, dated January 1, 2012.

The PS specific Guidance Notes are to be considered as well:

- Health and Safety in Construction Guide, HSG150, 3rd revision, 2006, by Health and Safety Executive (online);
- Workplace Transport Safety: An Employers' Guide, HSG136, 2nd revision, 2005, by Health and Safety Executive (online);
- Reclamation Safety and Health Standards, Section 10: Fire Prevention and Protection, October 2009, U.S. Department of the Interior Bureau of Reclamation (online);
- Occupational Safety and Health Administration (OSHA) Standard 1910 Subpart I - Personal Protective Equipment (online).

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4. Roles, Responsibilities and Accountability

4.1 BIFPCL's Roles & Responsibilities

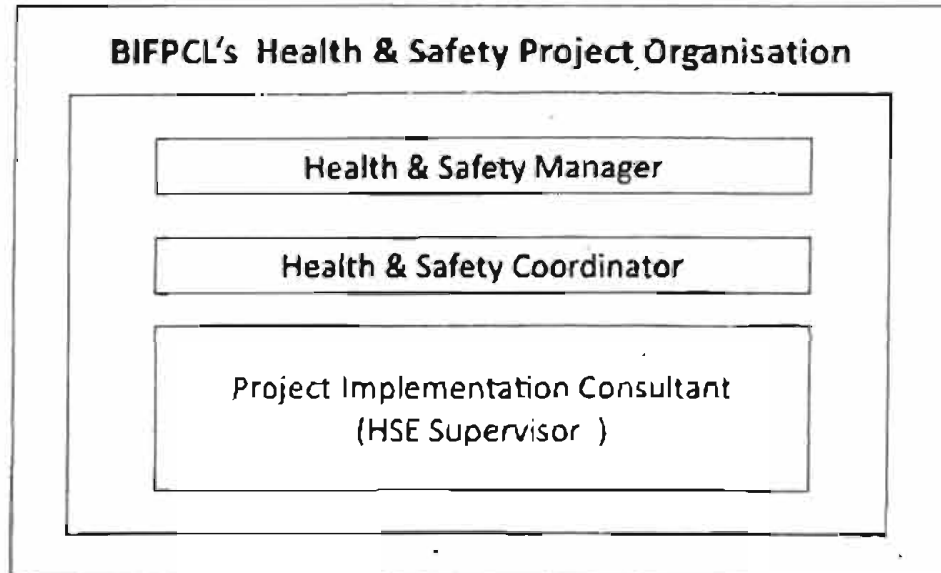


Figure 4-1: BIFPCL's H&S Project Organization

The following chapters define the roles and responsibilities of BIFPCL's H&S Staff. The defined responsibilities are indicative and have to be finalized before start of the first construction activities and/or updated according to the requirements of the Project.

4.1.1 H&S Manager

BIFPCL will appoint an H&S Manager for the entire duration of the Project.

He will have the overall responsibility with respect to the supervision of the H&S organisation, arrangements and installations of the Contractor. He shall be the focal point and has to be contacted by the Contractor in case of major and severe injuries or fatalities at site.

He will be the person to decide on the approval of the deliverables outlined in Chapter 14 of this manual.

The H&S Manager is responsible for:

- the implementation, monitoring and supervision of BIFPCL's; H&S Staff, inc. the PIC;
- the communication and reporting with all related authorities and administrative bodies, if not delegated to the H&S Coordinator;
- the review and approval of the operation schedule of the PIC;
- making arrangements for the execution of unannounced H&S Audits, workplace inspections, etc.

- participation in project progress meetings and/or management meetings;
- approval of updates of the H&S Management Manual;
- approval of updates of the H&S Policy Statement;
- approval of monthly H&S Reports.

The H&S Manager reports to the BIFPCL's Project Manager.

4.1.2 H&S Coordinator

BIFPCL will appoint an H&S Coordinator who will be responsible to coordinate in close cooperation with the Contractor all H&S Management activities to be undertaken at site, such as H&S Audits. He will be the focal point for the Contractor for the submission of progress and investigation reports. The H&S Coordinator will report to the H&S Manager.

The duties of the H&S Coordinator are at least as follows:

- Representation of the H&S Manager in case of his absence;
- Development and continuation of the operation schedule of the Project Implementation Consultant;
- Management of overtime announcements;
- Review and documentation of list of workers below 18 years;
- Communication with the appointed Contractor(s);
- Participation in H&S Audits;
- Review of monthly reports;
- Review of weekly reports.

The H&S Coordinator reports to the H&S Manager.

4.1.3 Project Implementation Consultant (PIC)

The PIC will supervise the implementation of the H&S Requirements through H&S Supervisors to be employed for the total project implementation period.

The H&S Supervisors will conduct regular site visits (audits) and assist BIFPCL in their reporting duty by preparing bi-annually monitoring reports for the relevant Ministries. Based on these site visits and on the monthly reports to be submitted by the Contractor, the PIC will report monthly to BIFPCL on progress of implementation of the H&S Management Manual requirements.

The H&S Supervisors will be responsible for the review and commenting of all required H&S reports outlined in Chapter 14.

In general, the duties of the PIC are at least as follow:

- Monitoring and supervision of all H&S related tasks, works, etc. to be executed and undertaken by the Contractor;

- Review and comment of H&S Plans and corresponding revisions, if any;
- Review and comment of H&S Procedures and corresponding revisions, if any;
- Review and comment of grievance management system and any updates, if any;
- Review and comment of Safe Work instructions and corresponding revisions, if any;
- Review and comment of risk register;
- Review and comment of all H&S forms, in case changes to the existing forms are suggested;
- Monitoring and supervision of the working time regulation, incl. the monitoring and supervision of overtime announcements;
- Review and comment of training schedule;
- Review and comment of Emergency Response Plan;
- Execution of Health & Safety Audits, Inspections and H&S Tours;
- Review and comment of HTV/AIDS Awareness Plan;
- Review and comment of Malaria prevention Plan;
- Review and comment of Yellow fever Prevention Plan;
- Review and comment of risk assessments;
- Preparation of H&S Reports;
- Review and comment of Accident /Incident Investigation Reports.

The PIC reports to the H&S Manager and to the H&S Coordinator.

4.2 Contractors' Roles & Responsibilities

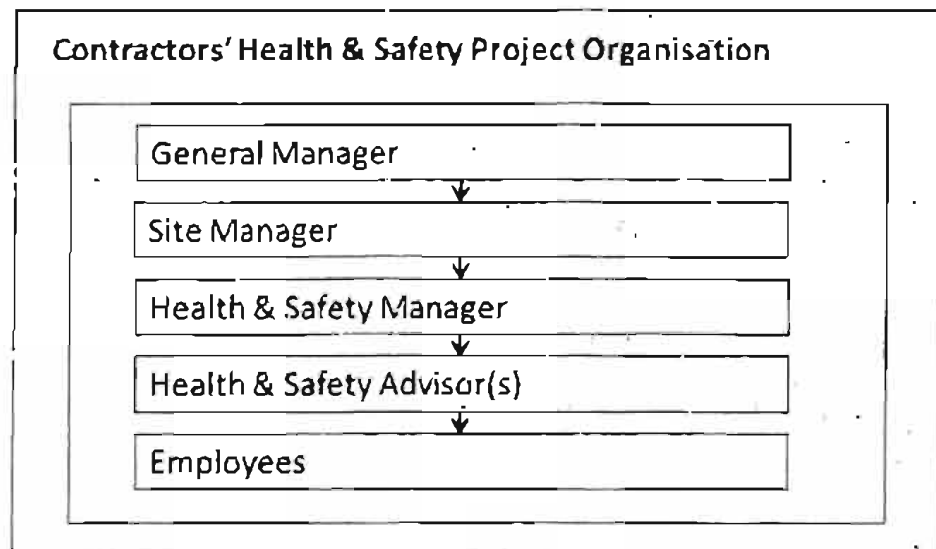


Figure 4-2: Contractors' Health & Safety Project Organization

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4.2.1 General Manager

The General Manager will be responsible for the entire H&S Performance during the project execution. He is the person in charge for the unconditional implementation and consideration of the H&S Policy defined by BIFPCL.

The General Manager shall actively participate in the supervision of the Health & Safety at site as part of the management commitment of the Contractor.

The general manager or an appointed representative of the management level of the Contractor shall participate in the execution of H&S Audits. He will be responsible for the follow up of prevention measures resulting from accident investigation reports and shall sign every accident investigation report.

4.2.2 Site Manager

The site manager has the overall responsibility at the construction site. In addition to his duties as the site manager of the project he shall be responsible to ensure that:

- the H&S Plan is issued;
- the H&S Plan is implemented and updated.

The site manager is responsible to review and approve risk assessments and work procedures. He approves H&S reports and is authorized to provide instructions to the H&S Staff. He reports to the general manager.

4.2.3 H&S Manager(s)

The Contractor shall appoint an H&S Manager for the site. The H&S Manager will be authorised to issue instructions to all persons working at site. The H&S Manager shall ensure an effective H&S Management within the scope of his duties.

The H&S Manager shall commensurate with the number of operatives, possible risks and the applicable legislative requirements. The following minimum requirements are listed below. The H&S Manager should have at least the following qualifications at a Minimum:

- a formal H&S qualification at degree or diploma level;
- at least 5 years experience as an H&S professional;
- at least 3 years experience in major construction engineering projects.

The H&S Manager to be appointed shall be subject of approval by BIFPCL prior to the commencement of his work.

Similar H&S Managers employed by sub- contractors will be assessed by BIFPCL as well.

Where small sub-contractors with less than 20 workers will be appointed, it is the duty of the Contractor to manage these workers with respect to all applicable H&S Requirements.

Prior to and during the execution of the Project, dependent on the Contractors performance to be measured by H&S Performance data and results of H&S Audits, BIFPCL reserves the right to instruct the Contractor to provide additional H&S Resources to the site at the Contractors own cost.

The H&S Manager is responsible:

- to implement the measures of the H&S Plan;
- to undertake risk assessments;
- to approve permits to work;
- to approve safe job analysis;
- to prepare work procedures and instructions;
- to provide training and induction on H&S issues;
- to undertake H&S Audits and workplace inspections;
- to prepare H&S Reports;
- to prepare and revise the emergency response plan;
- to investigate incidents and accidents.

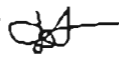
The H&S Manager is authorized to instruct the workers to follow the implemented H&S Requirements and is authorized to stop any activities in case of non-compliance with the permit to work.

4.2.4 H&S Advisor(s)

The Contractor has to appoint H&S Advisor to support the H&S Manager in case that the number of workers at a construction site exceeds 50 workers.

The H&S Advisor has the same duties and responsibilities as the H&S Manager and he has the same authorization but he will be lead by the H&S Manager.

It is recommended that the Contractor appoints the following number of H&S Advisors at/for each construction site. The recommendation is based on the number of workers working at the particular construction site:

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Total no. of workers	Minimum no. of full-time H&S Advisors
1 to (20 ¹)50	1
51 to 200	2
201 to 300	3
301 to 400	4

¹ up to 20 workers 1 part-time H&S Supervisor seems to be adequate considering a presence of 12 working hours per week at the particular site.

Table 4-1: Recommended No. of H&S Supervisors

Part-time H&S Supervisors working on different construction sites should not exceed a workload of 40 working hours per week considering the execution of their duties at site and considering respective travel times between the different construction sites.

4.2.5 Workers

The workers must follow any implemented H&S Instructions implemented at site independent if the instructions are provided as a written or verbal instruction.

The workers must report any non-compliances with the H&S Management System to the site manager, the H&S Manager or his representative(s).

The workers shall keep their workplace and their accommodation tidy and clean.

The workers are requested to inform the H&S Manager or his representative(s) in case they feel uncomfortable to execute any work instructions. They have to contact the medical staff at site in case of any injuries or diseases.

4.2.6 Child Labour

The Contractor shall not employ children in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.

The Contractor must identify the presence of all persons under the age of 18 in his workforce. A respective record of all identified workers must be submitted to the H&S Coordinator for documentation purposes. The list must be subject to a continuous update. An updated list must be submitted to the H&S Coordinator of BIFPCL on a bi-weekly basis.

It is prohibited to employ children under the age of 18 for hazardous works or works assessed to be of a medium or higher risk resulting from a particular risk assessment.

Independent from the fact that the minimum age for an employment of child labour is 14 years, all work of persons under the age of 18 must be subject to an appropriate risk assessment and regular monitoring of health, working conditions and hours of work.

4.2.7 Pregnant Woman

Pregnant employees have the following four major prerogatives:

- paid time off for antenatal care
- maternity leave
- maternity pay
- protection against unfair treatment, discrimination or dismissal.

In addition, the employer must not change a pregnant employee's contract terms and conditions without agreement. If this will be done by a employer, it has to be handled as a breach of contract.

It's illegal for employers to refuse to give pregnant employees time off for antenatal care or refuse to pay their normal rate for this time off.

The following rights shall be considered:

- Pregnancy-related illnesses
If the employee is off work for a pregnancy-related illness in the 4 weeks before the expected date of birth of the child, maternity leave and statutory maternity pay by the employer has to start automatically. Independent from the act if this has been previously agreed.
- Compulsory maternity leave
In case the employee does not take statutory maternity leave, they must take 4 weeks off after the child is born.
- Telling the employer about the pregnancy
Employees are obliged to inform their employer about the pregnancy at least 15 weeks before the beginning of the week of the expected date of birth or, in case of unawareness of the pregnancy during this timeframe, the employer must be told as soon as possible.
Employees must also tell the employer when they want to start their statutory maternity leave and pay.
- Health and safety for pregnant employees
After the receipt of information about the pregnancy of an employee, the employer should assess the risks to the woman and her baby.

Risks could be caused by:

- heavy lifting or carrying
- standing or sitting for long periods without adequate breaks
- exposure to toxic substances
- long working hours

- vibration and mechanical shocks
- extreme heat
- noise
- ionising radiation
- non-ionising (electromagnetic) radiation
- carbon monoxide
- lead
- polychlorinated Biphenyls
- organic solvents
- pesticides and herbicides
- tobacco smoke.

The MSDS to be provided together with each chemical substance to be in use or to be delivered at the construction site, storage area etc. should highlight the category.

Where there are risks, the employer should take reasonable steps to remove the risks or by offering the employee different work or work places or by changing the working hours by the adaption of sufficient breaks.

In case the employer can't remove any risks, the employer must suspend the employee on full pay and without any reduction.

Pregnant employees who think they're at risk but their employer disagrees should report to BIFPCL's H&S Manager during a site audit.

The employer is obliged to inform every pregnant employee about their rights in writing and this information must be recorded.

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5. Training

5.1 Training Needs Analysis

The Contractor shall develop and implement a mechanism for the assessment of competence of the workforce.

The needed qualification of key individuals shall be identified together with a mechanism of confirmation of the availability of suitable qualified and experienced managers, engineers and workers, incl. support staff for the health & safety sector, medical staff etc.

5.2 Training Schedule

The analysis of training needs shall result in a training schedule for the staff team members and workforce. The training schedule shall especially highlight:

- Training requirements for identified workers in conjunction with the activities and tasks that are needed prior to the commencement of work at site;
- Training requirements for identified workers in conjunction with the activities and tasks that could be provided by training on the job.

No.	Training Unit	Date/ Timeframe	Responsible	Completed Yes/No	Month 1		Month 2		Month 3				Month 4				Month 5			
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Fire and Escape Drill - All Employees																			
2	Use of Personal Protective Equipment - Team 01																			
3	- Team 02																			
4	- Team 03																			
5	Working at Height - Team 02																			
6	- Team 01																			
7	Confined Spaces and Excavation - Team 01																			
8	Welding - Team 03																			

Figure 5-1: Indicative Training Schedule

In case of training on the job, the Contractor has to ensure that a suitable number of qualified and competent foremen and supervisors are available at site for the provision of training, induction and instructions.

It must be considered by the Contractor that no staff team member or worker appointed for the execution of activities and tasks is allowed to enter the site without having received required training and instructions or without having been especially nominated for training on the job (together) without the introduction of the nominated foreman or supervisor.

The training schedule should consider the overall project schedule and the planned construction activities and progress.

The schedule must consider the entire project duration and shall be subject of an update or revision if identified to be needed, especially in case of an update of the project execution schedule.

The update of the training schedule and the particular training requirements shall take into account the results of construction site audits, permits to work procedures and incident investigation reports.

The training schedule shall be provided to BIFPCL for information purposes.

5.3 Inductions

5.3.1 Worker Induction

Prior to any personnel commencing work or entering site as a visitor, the Contractor shall ensure that all personnel undergo an H&S Induction course which stresses the need for the highest standards of health and safety on the project and conveys the requirement to fulfil the requirement of this document and applicable H&S Plans.

The induction course shall be tailored to include: all relevant information relating to the known hazards and potential risks arising from the site activities; the actions to be taken in the event of incidents/emergencies; clearly description of the mechanism for hazard observation/near miss reporting system; a short introduction from a senior member of the Contractors' site management team (usually Site Manager, Construction Manager level).

The Contractor shall provide the necessary communication resources to induct workers in an understandable language, and to set up a procedure to ensure that they understand the inductions fully.

All inductions shall be supported by a formal evaluation of individuals understanding of the induction information. Records shall be kept and available for inspection by BIFPCL on request.

5.3.2 Visitor Induction

In case of site visits by visitors, the Contractor shall ensure that all visitors undergo an H&S Induction which informs about the risks at site and any implemented H&S Measures.

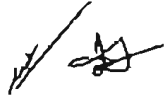
Visitors must get familiar with the use of any needed PPE to be worn during the entire stay at site. No visitor is allowed to enter the site without the H&S Induction and without proper sized and adequate PPE.



Visitors are requested to confirm the receipt of the induction and of PPE by signature in the construction site visitor register (guestbook).

5.4 Toolbox Talks

The Contractor should implement toolbox talks as an informal group discussion that focuses on a particular safety issue. These toolbox talks should be used on a daily basis daily to promote an H&S Culture. Toolbox talks should consider lessons learned from incident and accident investigation, audits, workplace inspections etc.



6. Health & Safety Reporting

6.1 Contractors Reporting Obligations

Independent from the general requirement and contractual obligations to implement a reporting scheme with respect to the progress, construction schedule and project reporting in general, the Contractor will be obliged to implement an H&S Reporting.

The H&S Reporting should provide an overview of the H&S Performance within a particular timeframe and with specific topics as mentioned in the following chapters.

The H&S Reports should be submitted to BIFPCL and to the responsible authorities.

6.1.1 Health & Safety Performance

6.1.1.1 Weekly Reports

The Contractor shall prepare weekly H&S reports. The weekly reports shall be submitted by close of business on the first working day after a completed working week, e.g. the reporting timeframe is from Sunday to Thursday and the respective following working day is the upcoming Monday, if not a public holiday.

The weekly reports shall comprise of the following information with respect to the reporting timeframe:

- Originator
- Name of the project
- Activities performed
- Health occurrences
- Safety occurrences
- Resulting accidents, incidents or dangerous situations
- Undertaken measures.



6.1.1.2 Monthly Reports

The Contractor shall prepare monthly H&S reports. The monthly reports shall be submitted by close of business of the last working day of the first working week after the reporting timeframe, e.g. the reporting timeframe is from 1st of January until 31 of January and the due day of the submission of the report is the Friday of the first working week in February, if not a public holiday.

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The weekly reports shall comprise of the following information with respect to the reporting timeframe:

- Originator
- Name of the project
- Activities performed
- Health occurrences
- Safety occurrences
- Resulting accidents, incidents or dangerous situations
- Investigation results
- Undertaken measures
- Lessons learned
- Informed authorities and resulting obligations/conditions
- Results of workplace inspections.

6.1.2 Hazards Reporting

The H&S Staff of the contractor is requested to undertake workplace inspections. In case that hazards and risks are identified during workplace inspection it is needed that the identified hazard or risk has to be solved immediately and without delay during the inspection.

In case that the problem could not be solved, a written report has to be prepared and issued to the H&S Manager or site manager highlighting:

- a description of the problem;
- the reason why it could not be solved during the inspection;
- the needed action;
- the responsible person;
- the associated hazards and risks;
- the deadline until the problem must be solved.

The occurrence must be reported in the monthly H&S Report.

Any other reporting requirements with respect to H&S, e.g. audit reports, weekly and monthly H&S Reports, remain unchanged.

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7. Health & Safety Risk Management

The risk management process with specifically requested forms requires a careful document administration and control. The Contractor should be aware that the documents resulting from the risk management process, in particular, the risk assessments, permits to work and job safety analysis, will not be specifically subject of review and approval by BIFPCL but must be available for review upon request during construction site audits and/or exemplary as part of a monthly report.

7.1 Risk Management Process

Risk management is the identification, assessment and prioritization of risks to avoid impacts on workers and the public.

The Contractor has to implement a suitable and appropriate risk management process to enable his site staff to prevent any non-compliances resulting in critical, harmful or dangerous situations followed by incidents, accidents or fatalities.

Alternatively suggested risk management processes shall be provided in the H&S Plan. The alternative risk management process will be subject of review and approval by BIFPCL.

7.2 Hierarchy of Control

The first part of evaluating the risk stage, consideration must be given how likely each hazard could cause harm. When the potential for harm has been decided, the existing control measures should be identified. In this course, each step of the activity has to determine what control measures might already in place. When evaluating a risk it is imperative to check the applicable legislation and to ensure that everything required by law is in place or has to be done.

When considering current controls and further required control measures the general principles of control should be applied:

Eliminate

- It has to be checked if the risk associated with the hazard could be eliminated.

Reduce

- It has to be assessed if the possible amount of the hazard or the exposure to the hazard could be reduced.

Isolate

- It must be evaluated if the hazard could be isolated. Isolating is the principle of preventing the contact with the hazard.



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Control

- It must be assessed if a safe system of work, permit to work and/or procedures are in place to control the hazard to prevent that somebody becomes injured.

Personal Protective Equipment

- As a final result of running through the hierarchy of control, the supply of personal protective equipment is the final result of controlling the hazard. The provision of PPE must not be the first and final stage of risk mitigation.

7.3 Safe System of Work

7.3.1 Risk Register

The Contractor is requested to develop and prepare a risk register. A risk register is a document that summarizes and defines the possible risks resulting from a particular activity, in the present case from particular construction or construction related activities. The concept of a risk register recognises that risk elements arising from proposed or actual activities fall into one of following three categories:

- Risks which are deemed to have a low risk and do not need to be managed;
- Risks that have a medium or high risk and will need to be managed;
- Risks which have an extreme risk and therefore the activity should probably not proceed.

The risk register records details all the risks identified for the construction phase and associates them in terms of likelihood of occurring and seriousness of impact.

The risk register to be prepared should identify:

- a description of each risk and its potential consequences;
- factors that may impact upon the likelihood and severity of the risk;
- an assessed risk ranking, such as
 - low,
 - medium
 - high or
 - very high;
- whether the risk ranking is acceptable or not;
- actions and controls that currently exist to mitigate risks.



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The definition of the risks from low to very high is explained in the following risk ranking table:

Likelihood	4	4	8	
	3		6	9
	2			6
	1			
		1	2	3
	Severity			
				4

Table 7-1: Risk ranking table

It is recommended to develop the risk register at the beginning stage before start of a construction site by following the following steps:

- Identification of potential risks;
- Identification of the consequences;
- Identification of the likelihood and severity that the risk would result in adverse consequences;

Where risks have been ranked as medium, high or very high, mitigation measures must be addressed:

- **Medium (Risk ranking 3 to 4):** Mitigation actions to reduce the likelihood and severity should be identified and appropriate actions must be endorsed.
- **High (Risk ranking 6 to 9):** If uncontrolled, a risk event at this level may have a significant impact for the actions and tasks at a construction site as a whole. Mitigating actions need to be very reliable and should be approved and monitored by the Contractor. Even with mitigating actions in place, the construction site staff potentially exposed to that risk should be advised of identified or potential risks which have been graded at this level.
- **Very High (Risk ranking 12 to 16):** Activities and projects with unmitigated risks at this level should be avoided or terminated. Mitigation actions of these types of risks may outweigh the benefits of the execution method. This is because risk events graded at this level have the potential to have significant adverse effects with the potential to cause serious accidents and incidents resulting in fatalities.

It needs to be identified if any risk mitigation procedures are in place.

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If it is found that there are none, procedures must be developed considering the following:

- **Planned actions:**
Reduction the likelihood a negative risk will occur and/or reduce the seriousness should it occur (What should you do now?)
- **Contingency actions:**
Planned actions to reduce the immediate seriousness of a negative risk when it does occur. (What should you do when?)
- **Recovery actions:**
Planned actions taken once a negative risk has occurred to allow you to move on. (What should you do after?)
- **Risk Transfer:**
e.g. through assignment of contractual responsibilities or insurance.
- **Actions:**
Necessary to ensure the realisation of opportunities (positive risks).

A risk register for every single construction site must be developed by the responsible Contractor considering as well the tasks and activities to be undertaken and execute by sub-contractors. The risk register has to be prepared by a competent and experienced group of engineers and workers approx. 4 weeks before mobilization to the site and start of any works at site even if they deemed to be of general nature and without having a risk potential. The risk register has to consider as well every transportation activity to the construction site.

The risk register will be subject of review and approval by BIFPCL.

7.3.2 Risk Assessment

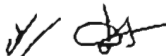
The Contractor is requested to undertake a risk assessment for all activities assessed to be of a medium, high or very high risk.

The risk assessment has to be carried out with the participation of the staff experienced with the tasks and activities and the equipment:

- the responsible H&S Manager or a H&S Advisor
- the foreman for the execution of the activity
- the worker(s) asked to undertake the activity.

The risk assessment has to be performed prior to the execution of the activity and it must be done in written. The written risk assessment must be documented and stored in the project file.

The risk assessment has to be undertaken in a simple and comprehensive way, understandable by each participant.



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Already conducted risk assessment could be subject of review and comment by the PIC. Provided comments must be considered in further risk assessments, wherever applicable.

A specific risk assessment must be undertaken for tasks where children between the age of 14 and 18 will get appointed. This specific part of the risk assessment must be done independent from fact if the work will have the potential of a very high, high, medium or less than medium risk.

7.3.3 Permit to Work

A permit to work system has to be implemented by the Contractor. The permit to work system has to be organized considering the following approach. The following figure shows the detailed permit to work process.

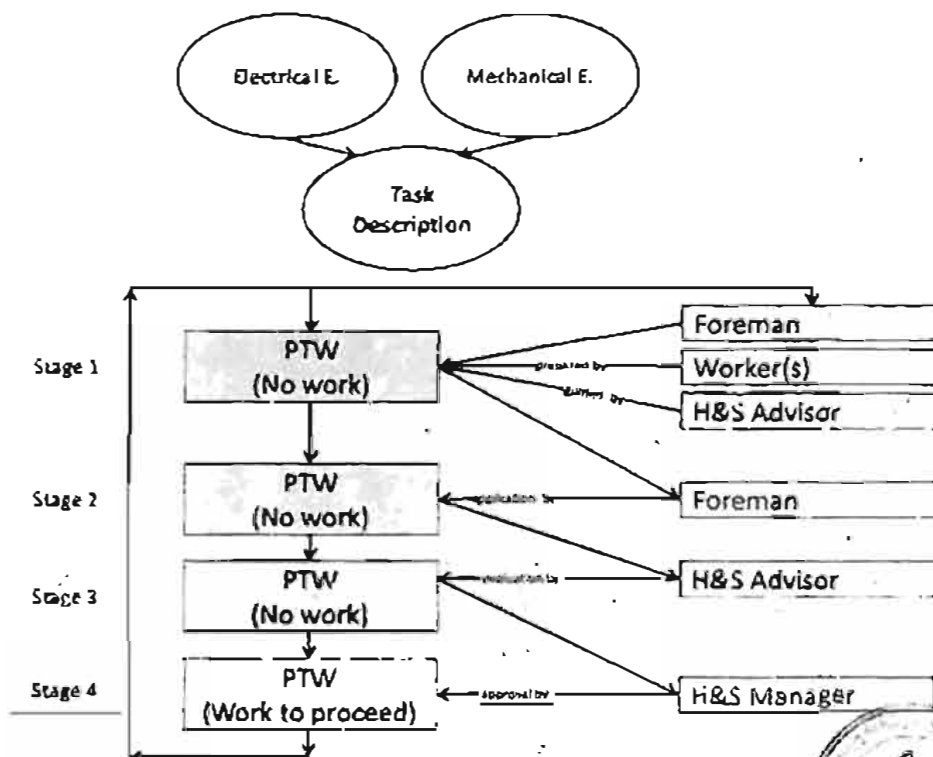


Figure 7-1: Permit to Work Flow Chart

Stage 1- Highlight Potential Hazards:

Worker(s) and the foreman guided by the H&S Advisor highlight potential hazards of a task and identify all necessary safety measures. The hazard identification must consider all required electrical and mechanical equipment. Stage 1 has to be carried out in writing. Work is not permitted to commence until Stage 4.

Stage 2-Application of Permit:

The Foreman applies for permission to start work on a prescribed form and submit the application to the H&S Advisor only when all requirements and

conditions described in the permit to work have been fulfilled. The Foreman has to indicate in the written permit to work that risk assessment was conducted. The risk assessment must be attached to the permit to work.

Stage 3-Evaluation of Permit:

The H&S Advisor will evaluate and verify that all safety conditions specified in the permit to work have been fulfilled and are adequate described. He may also recommend additional measures in the permit to work when necessary. He will need to inspect the location of work where the permit to work has been applied for, with the Foreman during this process.

Only when all safety requirements and conditions stated in the permit to work are fulfilled, the H&S Advisor will then endorse the permit to work form and forward to the Health & Safety Manager.

Stage 4-Approval of Permit:

The H&S Manager may approve and issue the permit to work only when he is satisfied that:

- Proper evaluation of risk and hazards for the work concerned has been conducted;
- No incompatible work will be carried out in the same time and location of the permit to work, which may pose a risk to the persons at work;
- All reasonably practicable safety measures have been taken and all persons involved in the work have been informed of the work hazards under the PTW;
- All electrical and mechanical equipment is demonstrably checked and in safe conditions.

A work permit is valid for one working day and for the specified working time. In case the tasks could not be finalised within the validity of the permit to work, the permit to work must be renewed before commencement of work on the day the work may continue.

The permit to work form must include at least the following information:

- Originator
- Date
- Description of task activity
- Duration of the task
- Needed equipment
- Security certificates of equipment
- Risk Assessment
- Already implemented mitigation measures
- Further mitigation measures
- Needed training or induction
- Approved by
- Date and time of approval.

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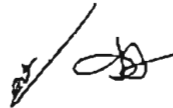
7.3.4 Job Safety Analysis (JSA)

The Contractor has to undertake a JSA which is a procedure to integrate safety and health principles and practices into a particular job operation. In a JSA, each basic step of the job related hazards has to be identified and recommendations have to be provided to choose the safest way to do the job

For conducting a JSA four main steps have to be considered:

- selecting the job to be analyzed
- breaking the job down into a sequence of steps
- identifying potential hazards
- determining preventive measures to overcome these hazards.

The Contractor must provide a specific methodology for conducting a JSA which shall be subject of review and approval by BIFPCL.



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8. Emergency Response

8.1 Emergency Response Procedures

An emergency is a serious, unexpected, often dangerous situation that requires immediate action. The emergency procedure is the strategy of actions to be outlined in the emergency response plan to response to an emergency event.

This could include, but not limited to rescue:

- from working at height;
- in confined spaces, shafts and tunnels;
- from fire & smoke, etc.

8.2 Emergency Response Plan (ERP)

The Contractor has to develop an ERP for review and approval by BIFPCL.

The ERP has to consider at least the following information and instruction for an adequate management of emergency situations:

- Result of a risk assessment to determine the most probably emergency situation;
- Identification of suitable emergency response procedures, such as:
 - Determination of safe evacuation areas;
 - Determination of safe evacuation routes;
 - Determination of accurate and suitable fire fighting equipment;
 - Determination of fire brigade;
 - Training and induction of emergency response procedure.

Note: Specific attention should be paid to the investigation of the nearest hospital or first aid station. The contact numbers of the hospital or first aid station together with at least one contact of a medically examined staff team member of the hospital or first aid station must be included in the ERP in case of injuries at night-time hours or during weekends or during bank holidays.

8.3 First Aid at Site

The Contractor shall deploy personnel formally trained in first aid, and to provide sufficient resources (at least 1 qualified paramedic per 25 workers). These paramedics shall be identified in writing to the Contractor and be competent in their duties by attendance at a recognised training course carried out by a formal training service provider.

The Contractor deploying more than 50 workers (including those of his subcontractors), shall set up a first aid room. When the construction work



force reaches 100 persons the First aid room shall be manned full time by a qualified and competent site nurse.

Notwithstanding the above, adequate numbers of first aiders and first aid equipment shall be deployed so that first aid can be administered within a reasonable time period.

First aid rooms/points shall be clearly marked and adequately stocked. Medicines, tablets etc are only to be issued by a medically qualified person.

8.3.1 First Aid in Remote Areas

In case construction sites will be located in remote areas far away from the next fully equipped hospital or first aid station, the Contractor is requested to consider the following additional requirements:

- A examined medical staff team member should be appointed and full-time available at site;
- First aiders should have finished a specific training course with respect to the provision of first aid and medical treatment in remote areas.

It must be ensured to take care of the following health problems or injuries at site without having direct access to a hospital or first aid station:

- | | |
|---|-------------------------------|
| • Respiratory distress & arrest; | • Foreign body; |
| • Cardiac arrest; | • Corneal abrasion; |
| • Severe bleeding; | • Corneal ulcer; |
| • Vomiting; | • Chemicals; |
| • Unstable spine; | • Photokeratitis; |
| • Stable & unstable extremity injuries; | • Conjunctivitis; |
| • Friction blisters; | • External ear infection; |
| • Superficial & partial-thickness wounds; | • Middle/inner ear infection; |
| • Full-thickness wounds; | • Ruptured ear drum; |
| • Hypothermia; | • Broken teeth; |
| • Heat illnesses; | • Avulsed teeth; |
| • Sun exposure; | • Lost fillings and crowns; |
| • Allergic reactions; | • Infected teeth and gums; |
| • Poison ivy, oak & sumac; | • Urinary tract infection; |
| • Disease; | • etc. |
| • Angina & heart attack; | |
| • Diabetes; | |
| • Asthma; | |
| • Pain; | |
| • Nosebleed, broken nose; | |



Beside the first aid and medical equipment is recommend to have at least one cell phone and one satellite phone with the construction site staff team

together with the contact details of the nearest hospital to get further first aid and medical treatment instructions until the arrival of the SAR team or until the injured person could be transferred to the next hospital or first aid station.

The decision to transport an injured person to the next hospital or first aid station must be done between the medical staff team member at site together with medical professionals but first aid treatment has always priority to the transport of the injured person.

In addition to the cell phone and satellite phone a GPS must be available with the team to ensure that the accurate position of the injured person could be impart to the hospital, first aid station or SAR team.

8.4 Fire Protection and Control

The Contractor shall undertake a suitable and adequate fire risk assessment for whatever is applicable under the scope of work of the respective construction contract.

The Contractor shall ensure that the necessary fire prevention, protection and control measures are installed and maintained. This shall commence during mobilisation and updated accordingly.

The Contractor shall nominate certain of his employees who shall be trained in fire fighting duties. Nominated fire fighting personnel shall be available at all times during ongoing works on site.

8.4.1 Fire Prevention, Protection & Control

The following requirements apply with respect to fire prevention, protection & control and must be considered wherever applicable:

- Adequate and suitable means for extinguishing fire shall be provided and maintained.
- All stocks of inflammable substances shall be kept in a fire resisting store or in a safe place outside any occupied building.
- Provided that no such store shall be so situated as to endanger the means of escape from the workplace or from any part thereof in the event of a fire occurring in the store.
- Chemical fire-extinguishers shall be freshly charged at intervals not greater than those specified by the manufacturers, or otherwise once annually, and tested by the application of such hydraulic pressure thereto as shall be suited to the type of extinguisher tested, at intervals of not more than four years; and the dates of recharging the extinguisher and the last hydraulic test shall be clearly marked on the body of the extinguisher or on a tab securely attached thereto.
- Install a temporary or permanent water supply with sufficient flow volume and duration to supply the standpipes, hose stations, and



sprinkler systems, before the construction of the facility to be protected. In permanent structures under contract in which standpipes are installed, connect the standpipe to the water supply, install the standpipe concurrently with construction of the structure, and maintain the standpipe in operable condition for fire protection use. Provide the standpipes with fire department connections on the outside of the structure, conspicuously marked, and located in an accessible location at street or road level.

- No fire, flame, open light or other agent likely to ignite volatile and inflammable substances shall be allowed or used in any part of a workplace in which volatile and inflammable substances are used.
- No person shall smoke in any part of a workplace where volatile and inflammable substances are used, and a notice prohibiting smoking shall be posted in a conspicuous place in every such part of the workplace.
- Inform workers of the fire hazards of the materials and processes to which they are exposed. Brief new workers on the parts of the plan that is essential for their protection and emergency evacuations.
- Provide additional training for personnel assigned tasks that require them to remain in a facility during a fire emergency.
- When working in potentially explosive atmospheres, safe non-electric tools and apparatus suitable for the use in such areas shall be employed.
- No plant, tank or vessel which contains or has contained any explosive or inflammable substance shall be subjected to any welding, brazing or soldering operation, or to any cutting operation which involves the application of heat, until all practicable steps have been taken to remove the explosive or inflammable substance and any fumes arising therefrom, or to render them non-explosive or non-inflammable; and if any plant, tank or vessel has been subjected to any such operation as aforesaid, no explosive or inflammable substance shall be allowed to enter the plant, tank or vessel until the metal has cooled sufficiently to prevent any risk of igniting the substance.

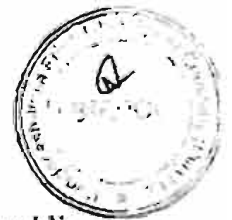
8.4.2 Means of Fire Escape

Every workplace shall have adequate means of escape in case of fire, and must be properly maintained and kept free from obstruction.

8.4.3 Fire Alerts

The Contractor has to set up a system to alert workers on site and the public in the neighbourhood. This should be a permanent installed fire alarm (which must be tested on a weekly basis), a klaxon, an air horn or a whistle, depending on the size and complexity of the site.

Any warning needs to be distinctive, audible above other noise and recognizable by everyone.
people in case of fire.



9. Health, Safety Management & Measurement

9.1 Noise Management

The Contractor is requested to develop a working noise monitoring plan to identify those areas at site where noise levels are occurring in a harmful range.

Generally, a reasonable mitigation measure, of more importance than wearing hearing protection devices, is the reduction of noise levels to a level as low as reasonable possible. Avoidance has always the priority in comparison to passive reduction.

Noise levels must be kept below 80 dB (A) wherever possible. In case of exceeding this value, hearing protections must be provided to the workers and warning signs must be installed.

The noise monitoring must be repeated every week in case that the location of the construction site remains unchanged. In case of a change of the site, the noise monitoring has to be undertaken after implementation of site arrangements.

In case that a construction site could not be demarked in detail, the noise monitoring has to be done for different activities.

The following table provides the standards, exposure times and need for personal protective equipment.

dB(A)	Exposure time ¹⁾		Need for PPE	Comment
	hours	minutes		
80	25	24	No	Suitable hearing protection must be provided. The hearing protection must be able to insulate the noise level to a value of 89 dB(A) or below.
85	8	0	No	
86	6	21	Yes	
87	5	2	Yes	
88	4	0	Yes	
89	3	10	Yes	
90	2	31	Yes	
95	0	47	Yes	
100	0	15	Yes	
105	0	4	Yes	
110	0	1	Yes	

Table 9-1: Noise standards, exposure times and need for PPE

1) Applicable to a 8h-working-shift

Source: US Department of Health and Human Services, Occupational Noise Exposure, page 18, dated June 1998

9.2 Air Quality Management

The air quality at site could be affected by different emissions resulting from combustion engines or resulting from the generation of dust during dry weather conditions.

Emissions from combustion engines are difficult to reduce. Some efforts not to affect the air quality are the switch-off of machines whenever possible and to limit the number of machines and equipment to a level as low as reasonable possible. The Contractor is requested to consider these recommendations during the construction phase.

Considering this requirement, the Contractor must undertake all necessary actions to reduce the generation of dust to the lowest possible levels. Project specific measures shall be included in the H&S Plan.

Mitigation measures to prevent increased dust generation include using dust-suppressing water spray in areas of active earthmoving and on unpaved roads, using aggregate-covered access roads to minimize dust emissions and minimizing the areas of exposed soil or cleared of vegetation. Truck beds should be covered with a tarp or similar material to minimize dust during the transport.

Mitigation measures during project activities to prevent increased air emissions would include using requiring emission control devices on equipment, maintaining properly tuned engines, avoiding unnecessary idling, using electric motors instead of internal combustion engines, using low-sulfur diesel fuel where available, preparing asphalt away from populated areas.

9.3 Pre-employment Health Assessment

Pre-employment health checks for construction site workers shall be mandatory. These checks shall ensure that in no case the state of health of employed workers can be impaired by possible pre-existing diseases. The Contractor shall deploy a suitable experienced medic and appropriate materials and premises for these checks.

Workers shall be checked, and all the results shall be analysed, before his first workday, in order to mitigate any risk.

Therefore, the Contractor shall provide the abovementioned medical staff and material during the entire year. Usage of hospital capacities is an often used option to fulfil these requirements, where those capacities are available. Only personnel with appropriate health condition with respect to their particular job shall be employed.

All workers who are subject to an exposure to occupational health risks shall undergo periodic medical surveillance. This would be required for workers:

- exposed to noise levels exceeding 85dB(A);
- exposed to hazardous materials, e.g. chemicals;
- carrying heavy loads.

It is recommended to offer such periodic examinations every 3 months.

In addition to the pre-employment health checks and periodic medical surveillance, the Contractor shall enable the site workers to pass an exit medical check after finishing their jobs on site. The exit medical check shall be provided to all workers who worked more than 3 months constantly on the construction site.

All pre-employment, periodic or exit health checks must be documented for each worker. The assessment records must be kept confidential and for the use by the project management only. The workers will have the right to ask for the results of the health checks.

The workers will have the right to decline any pre-employment, periodic or exit medical checks. In this case they will not have the possibility to apply for any compensation in case of health interferences resulting from their work activities in connection to existing diseases.

All pre-employment, periodic or exit health checks must be provided to the workers free of charge. The application for a health check must not result in a negative treatment of the respective worker.

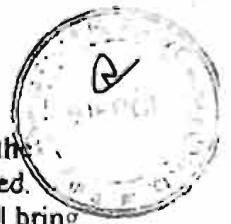
The Contractor must ensure that any health checks requiring specific facilities, equipment or medical staff will be available at the construction site or in a reachable distance to travel.

9.4 HIV/AIDS Prevention

Theoretically, workers appointed during the construction phase have the financial background to get easy access to sex, most often not protected. There is a clear awareness that the construction phase of a Project will bring a significant increase in manpower both locally and outside the project area, and an increased flow of capital, which is presumed to potentiate the increased incidence of diseases, including the spread of HIV/AIDS.

Therefore, the Contractor must generally undertake preventive actions:

- Raising awareness of workers regarding transmission modes of HIV/AIDS and other STIs, including the consequences of risky behaviours.
- Recruitment of a specialized organization to implement activities to raise the awareness about HIV/AIDS and other STIs at community level. Special attention will be given to sex workers, local women and girls in general.



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- Provision of free condoms in the project area.
- Encouraging workers to do HIV testing (outside the scope of work duties); encouraging workers to submit themselves to treatment of STIs in the early stages of infection/diagnosis, to minimize the risk of HIV infection and create conditions for this purpose. Such conditions include the granting of license for workers to go to the hospital and create internal mechanisms to avoid hesitation from seeking health care due to lack of funds.
- Forward workers to health units for early treatment and monitoring of secondary infections/opportunistic such as coughs, flu and pneumonia.

A HIV/AIDS Awareness Plan should be developed by the Contractor to induct all appointed workers regarding the infection risk for themselves and for others.

9.4.1 HIV/AIDS Awareness Programme

To the extent that local workers are employed for construction of the proposed projects, minimal increase in exposure to health risks would be expected from project implementation. Some workers, however, might not be local and could be exposed to an increased likelihood of contracting HIV/AIDS found in mobile populations. For example, the workforce would consist exclusively of men who could approach potential partners in the communities near construction sites, or who could be approached by sex workers or others in the communities.

The Contractor should liaise with the local health administration and discuss which nongovernmental agency is most effective in the project area and could support and benefit most likely best to the awareness programme.

However, the Contractor must institute HIV/AIDS awareness programmes and distribute condoms to the community and workers, both men and women for an effective AIDS/HIV prevention.

9.5 Malaria Prevention

It is recommended that the Contractor take actions to minimize the number of infected workers and avoid an increase on the infection rate.

An effective Malaria Control Program can be based on the ABCD Model:

- A Awareness and Public Education.
- B Bite Prevention (using mosquito nets, clothing, insect-repellents, and modification to accommodation and housing).
- C Chemoprophylaxis (the use of preventive medication).
- D Diagnosis and Treatment (including the identification of access to treatment).

Awareness

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Raising awareness of the workers regarding the key points of information that should be communicated:

- Malaria kills.
- It is estimated that malaria kills over 1 million people each year, and that over 500 million fall seriously ill.
- Malaria is a parasite spread by mosquitoes.
- There are four malaria parasites that cause disease in humans. They are spread by one species of mosquito, Anopheles.
- One mosquito bite is enough to give you malaria.
- Anopheles bites are not necessarily large or itchy, and may go unnoticed.
- Malaria causes fever and flu-like illness.
- Initial symptoms of malaria are a fever with headache, fatigue, body aches and other general signs of illness. The illness may progress very rapidly (within 24 hours) to coma and death.
- Ex-pats will never develop any protective immunity.
- Some people who have lived continuously since early childhood in highly malaria prone areas may develop protective semi-immunity. Ex-pats will not develop any protection. Even with semi-immunity, you can still die of malaria.
- Malaria mosquitoes mainly bite at night.
- Dusk and dawn are particularly risky. You should stay indoors if possible, and wear proper clothing if you must go out. You should sleep under a bed net.

Bite Prevention

Part of the program should focus on the prevention of bites, through action like the distribution on mosquito nets to the workers; the procedure of long-sleeves and the distribution of skin repellent should there be night shifts; and accommodation and housing concepts that include nets on windows and doors (if applicable to the project).

Chemoprophylaxis

Although no ant malarial drug gives complete protection against malaria, prophylactic drugs taken correctly and consistently can greatly reduce the risk of contracting the disease. Most regimes provide 75 - 95% protection against malaria if taken correctly. This should be taken into consideration especially with workers coming from malaria-free countries. A doctor must be consulted before the use of Chemoprophylaxis.

Diagnosis

Suspected malaria is a medical emergency. Severe malaria is almost always fatal if untreated. Even with the best treatment available, 15 - 20% of people die. For this reason, it is essential not to ignore the initial minor symptoms.

The diagnosis of malaria is based upon:

- The clinical signs and symptoms of the patient
- Detection of malaria parasites in a sample of the patient's blood.

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Workers should be encouraged to get tested and treated as soon as first symptoms are felt. Rapid Diagnosis Tests may be incorporated to the Program, after analysing the level of healthcare available locally and therefore appropriate diagnostic and treatment protocols.

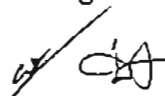
9.6 Yellow Fever Prevention

A yellow fever vaccine is generally recommended for persons aged ≥ 9 months who are living in areas at risk for yellow fever virus transmission before travelling to Bangladesh.

The Contractor is requested to evaluate in close cooperation with the responsible health authority the risk for a yellow fever infection in the Project area.

The Contractor should initiate, together with the local health authorities, a suitable prevention plan against Mosquito bites. The following measures are recommended but should be subject of an assessment if the measures are state of the art:

- **Use insect repellent.**
When going outdoor, an EPA-registered insect repellent should be used.
- **Wear proper clothing to reduce mosquito bites.**
When weather permits, wear long-sleeves, long pants and socks while staying outdoors. Mosquitoes may bite through thin clothing, so spraying clothes with repellent containing an EPA-registered repellent will give extra protection.
- **Be aware of peak mosquito hours.** The peak biting times for many mosquito species is dusk to dawn. However, *Aedes aegypti*, one of the mosquitoes that transmits yellow fever virus, feeds during the daytime. Take extra care to use repellent and protective clothing during daytime as well as during the evening and early morning. Staying in accommodations with screened or air-conditioned rooms, particularly during peak biting times, will also reduce risk of mosquito bites.





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9.7 Health Surveillance

9.7.1 Management of Alcohol and Drugs

Smoking shall be prohibited at all times at the construction site, at worker's camp and at storage and fabrication areas. This includes the operating or use of all electrical or manual work equipment.

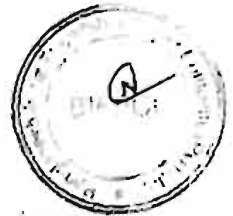
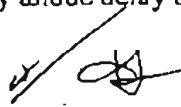
Smoking shall be restricted to clearly defined and highly visible areas, only.

The presence and consumption of non prescription drugs and alcohol is strictly prohibited at all areas.

Drug and, especially, alcohol testing shall be arranged after weekends and especially for workers appointed for works consisting of potentially high-risk activities. The drug and alcohol test shall be undertaken in case of indications of a respective consumption.

Until the result of the test is public, the worker(s) must refrain from any work at site.

In case of a positive test result, the worker has to be expelled from the site without any undue delay until the completion of the project.



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10. Personal Protective Equipment

10.1 PPE Requirements

The following sub-chapter describes the standards to be considered for the provision of PPE.

The following requirements with respect to PPE and the use of it shall apply:

- Where in any workplace workers are employed in any process involving excessive exposure to heat, cold, noise, wet or to any injurious or offensive substance or any welding process, suitable protective clothing and appliances, including, where necessary suitable gloves, footwear, screens, goggles, ear muffs and head covering, shall be provided and maintained at no cost to the worker for the use of such workers.
- Where in any workplace workers are employed in any process involving dry grinding of metals, welding or cutting of metals by means of an electrical, oxy-acetylene or similar process or in any other process likely to entail injury to the eyes, suitable goggles or effective screens shall be provided to protect the eyes of workers.
- Where in any workplace electric arc welding is carried on, effective provision shall be made, by screening or otherwise, to prevent workers (other than persons employed in the welding process) being exposed to the electric arc flash.
- BIFPCL shall ensure that each affected worker wears a protective helmet when working in areas where there is a potential for injury to the head from falling objects.
- BIFPCL shall ensure that a protective helmet designed to reduce electrical shock hazard is worn by each such affected worker when near exposed electrical conductors which could contact the head.
- BIFPCL shall ensure that each affected worker uses protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects or objects piercing the sole, and where such worker's feet are exposed to electrical hazards.
- BIFPCL shall select and require workers to use appropriate hand protection when workers' hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes.
- Where workers regularly work outdoors and they cannot be sheltered from the weather, wind and waterproof clothing will be needed. There should be facilities for storing clothing not worn on site and protective clothing as well as for drying wet clothing.

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- A major hazard to the skin is exposure to ultraviolet rays from the sun. The effects can vary from sunburn (blistering and peeling of the skin) to permanent damage and increased risk of skin cancer. Construction workers who are outdoors for long periods of time are at the greatest risk and should take steps to protect their skin by:
 - wearing a long-sleeved top and covering their legs;
 - regularly applying high-protection sun cream to exposed skin.
- Many accidents happen when people in hazardous positions cannot be seen. It is important to plan work to avoid placing people in these positions. Where this is not possible, provide high-visibility clothing. High-visibility clothing will be needed wherever workers:
 - could be run down by vehicles, e.g. signallers assisting with vehicles being manoeuvred and anyone engaged in road works;
 - need to be seen by others to allow them to work safely, e.g. signallers assisting in lifting operations need to be clearly visible to the crane driver.
- Dust masks should be provided for earth plant machine operators and the workers should be trained to wear them.
- Ear protection to be supplied for workers working with load machinery.
- All persons who are at work on towers, poles and high structures shall wear and make proper use of a suitable safety belt or harness and no man shall work alone at any tower or high structure.
- No person shall climb any pole or tower unless he is wearing and making proper use of an efficient safety belt and is under observation by a second person who is in attendance, preferably at the base of the tower or pole on which work is to be done.
- Before any wood pole is climbed it shall be sounded and no pole the condition of which is doubtful shall be climbed without the permission of the Competent Person in charge.
- Gates and devices to prevent climbing of towers and gantries shall always be kept locked except when opened under the instruction of an authorized person.
- The Contractor must ensure that all provided PPE, especially for eye protection and regarding respiratory equipment, fits to the ergonomics of the individual worker.

The Contractor shall train all workers in the use of their specifically needed PPE.

The Contractor and all appointed sub-contractors must provide the PPE resulting from the different risk assessments are provided to the workers subject of an exposure to occupational health risks without an undue delay and free of charge.

The Contractor is requested to install any needed mechanism that workers will be encouraged to pass their individual PPE to third persons.

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10.2 PPE Selection Guide

10.2.1 Eye and Face Protection

Workers can be exposed to a large number of hazards that pose danger to their eyes and face. Examples of potential eye or face injuries include:

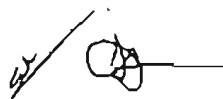
- Dust, dirt, metal or wood chips entering the eye from activities such as chipping, grinding, sawing, hammering, the use of power tools or even strong wind forces.
- Chemical splashes from corrosive substances, hot liquids, solvents or other hazardous solutions.
- Objects swinging into the eye or face, such as tree limbs, chains, tools or ropes.
- Radiant energy from welding, harmful rays from the use of lasers or other radiant light (as well as heat, glare, sparks, splash and flying particles).

The tables below provide a guideline for the selection of proper eye and face protection.

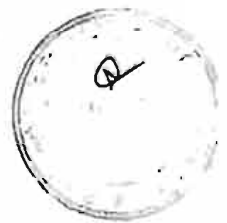
Operation	Hazards	Recommended Protection ¹⁾
Acetylene-burning, Acetylene-cutting, Acetylene-welding	Sparks, harmful rays, molten metal, flying particles	7,8,9
Chemical handling	Splash, acid burns, fumes	2,10 (for severe exposure add 10 over 2)
Chipping	Flying particles	1,3,4,5,6,7A,8A
Electric (arc) welding	Sparks, intense rays, molten metal	9,11 (11 in combination with 4,5,6 in tinted lenses advisable)
Grinding (light)	Flying particles	1,3,4,5,6,10
Grinding (heavy)	Flying particles	1,3,7A,8A (for severe exposure add 10)
Machining	Flying particles	1,3,4,5,6,10
Molten metals	Heat, glare, sparks, splash	7,8 (10 in combination with 4,5,6 in tinted lenses)
Spot welding	Flying particles, sparks	1,3,4,5,6,10

¹⁾ see Figure 10-1 for reference purposes

Table 10-1: Eye and face Protector Selection Guide



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Welding Operation	Shade Number
Shielded metal-arc welding 1/18-, 3/32-, 1/8-, 5/32-inch-diameter electrodes	10
Gas-shielded arc welding (nonferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	11
Gas-shielded arc welding (ferrous) 1/16-, 3/32-, 1/8-, 5/32-inch diameter electrodes	12
Shielded metal-arc welding 3/16-, 7/32-, 1/4-inch diameter electrodes	12
5/16-, 3/8-inch diameter electrodes	12
Atomic hydrogen welding	10-14
Carbon-arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, over 6 inches	5 or 6
Gas welding (light), up to 1/8 inch	4 or 5
Gas welding (medium), 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy), over 1/2 inch	6 or 8

Table 10-2: Construction Industry Requirements for Filter Lens Shade Numbers for Protection Against Radiation Energy

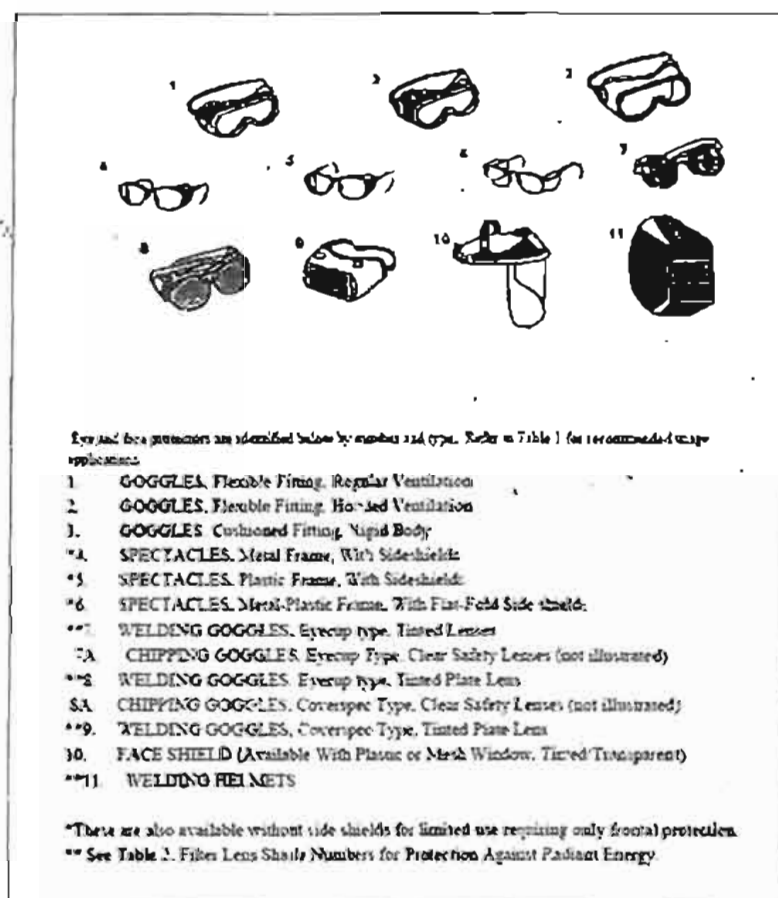


Figure 10-1: Recommended Eye and Face Protectors

10.2.2 Head Protection

The Contractor must ensure that their workers wear head protection if any of the following apply:

- Objects might fall from above and strike them on the head;
- They might bump their heads against fixed objects, such as exposed pipes or beams; or
- There is a possibility of accidental head contact with electrical hazards.

The table below summarizes the hard hat selection.

Operation	Hazards	Recommended Protectors
General services e.g. mining, building and construction, shipbuilding, lumbering, manufacturing	Falling objects	Class A*
Electrical work	Falling objects, high voltage -shock, burns (up to 20,000 volts)	Class B
Limited protection	Hitting fixed objects	Class C**

Table 10-3: Hard hat Selection Guide

*Provides good impact protection but limited voltage protection (up to 2,200 volts)

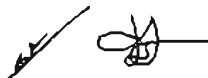
**Does not protect against falling objects or electrical shock

The hat should not bind, slip, fall off or irritate the skin.

10.2.3 Safety Gloves

The following are examples of some factors that may influence the selection of protective gloves for a workplace:

- Type of chemicals handled;
- Nature of contact (total immersion, splash, etc.);
- Duration of contact;
- Area requiring protection (hand only, forearm, arm);
- Grip requirements (dry, wet, oily);
- Thermal protection;
- Size and comfort;
- Abrasion/resistance requirements.



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Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups as shown in the table below.

Glove Group	Glove Type	Hazards	Recommended for
Group 1 Leather, Canvas or Metal Mesh Gloves	Metal Mesh Gloves	Cuts and burns	Welding, furnace and foundry work
	Leather, Canvas	Sparks, moderate heat, blows, chips and rough objects	Welding
	Aramid fiber gloves	heat and cold, cut, abrasion	
	Synthetic gloves	heat and cold, cut- and abrasion	
Group 2 Fabric and Coated Fabric gloves	Fabric Gloves	dirt, slivers, chaffing and abrasions*	
	Coated Fabric Gloves	General purpose	Handling bricks and wire rope
Group 3 Chemical and Liquid- Resistant Gloves	Rubber made, e.g. Latex, Nitrile, Butyl, Neoprene Plastic made, e.g. PVC, Polyethylene	Burns, Irritation, dermatitis caused by contact with oil, greases, solvents and other chemicals	Chemical/Liquid Handling
Group 4 Insulating Rubber Gloves	Class 00, 0, 1, 2, 3, 4	Electrical Shock	Electrical work**

Table 10-4: Glove Selection Guide

*Does not provide sufficient protection for use with rough, sharp or heavy materials.

**Protector gloves shall be worn over insulating gloves, but protector gloves need not be used with Class 0 gloves, under limited-use conditions, where small equipment and parts manipulation necessitate unusually high finger dexterity.

Any other class of glove may be used for similar work without protector gloves if BIFPCL can demonstrate that the possibility of physical damage to the gloves is small and if the class of glove is one class higher than that required for the voltage involved. Insulating gloves that have been used without protector gloves may not be used at a higher voltage until they have been tested under the provisions of Occupational Safety and Health Standards.

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Note: Extra care is needed in the visual examination of the glove and in the avoidance of handling sharp objects.

10.2.4 Body Protection

Workers who face possible bodily injury of any kind that cannot be eliminated through engineering, work practice or administrative controls, must wear appropriate body protection while performing their jobs. In addition to cuts and radiation, the following are examples of workplace hazards that could cause bodily injury:

- Temperature extremes;
- Hot splashes from molten metals and other hot liquids;
- Potential impacts from tools, machinery and materials;
- Hazardous chemicals.

There are many varieties of protective clothing available for specific hazards. Contractors are required to ensure that their workers wear personal protective equipment only for the parts of the body exposed to possible injury. Examples of body protection include coveralls, vests, jackets and aprons.

Protective clothing comes in a variety of materials, each effective against particular hazards, such as:

- **Paper-like fiber**
used for disposable suits provide protection against dust and splashes.
- **Treated wool and cotton**
adapts well to changing temperatures, is comfortable and fire-resistant and protects against dust, abrasions and rough and irritating surfaces.
- **Duck**
is a closely woven cotton fabric that protects against cuts and bruises when handling heavy, sharp or rough materials.
- **Leather**
is often used to protect against dry heat and flames.
- **Rubber, rubberized fabrics, neoprene and plastics**
protect against certain chemicals and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to ensure that the material selected will provide protection against the specific hazard.



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Operation	Hazard	Recommended Protection
Construction, Traffic control	Accidents caused by low visibility	High visibility garments
Welding	Hot splashes from molten metals, burns caused by sparks, spatter or radiation	Welding apron, sleeves, bibs, coats
Cutting	Cut	No standard

Table 10-5: Specialized Body Protection

10.2.5 Foot and Leg Protection

Workers, who face possible foot or leg injuries from falling or rolling objects or from crushing or penetrating materials, should wear protective footwear. Also, workers whose work involves exposure to hot substances or corrosive or poisonous materials must have protective gear to cover exposed body parts, including legs and feet. If an worker's feet may be exposed to electrical hazards, non-conductive footwear should be worn. On the other hand, workplace exposure to static electricity may necessitate the use of conductive footwear.

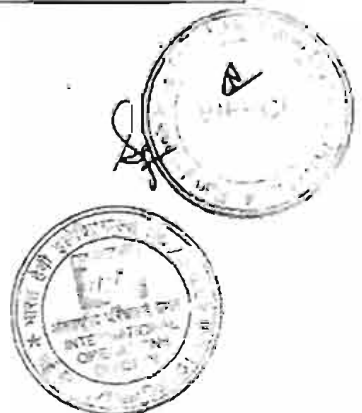
The table below provides an overview regarding appropriate and proper foot and leg protection.

Recommended Protection	Hazard	Operation/Protecting
Leggings	Heat from molten metal or welding sparks, puncture	Welding, chain sawing
Metatarsal guards	Falling objects	General, toe and foot
Toe guards	Falling or rolling objects	General, toe and foot
Combination foot and shin guard	Falling or rolling objects, puncture	General, lower leg and foot
Safety Shoes*	electrical, explosive, heat, puncture	Roofing, paving, foot

Table 10-6: Foot and Leg Protection Guide

* Special purpose safety shoes are classified in the following table.

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Recommended Protectors	Hazards	Operation
Electrically conductive shoes	static electricity buildup on the body	working in hazardous
Electrical hazard, safety-toe shoes	completing an electrical circuit to the ground	Electrical work

Table 10-7: Special Purpose Safety Shoe Selection Guide

Foot powder should not be used in conjunction with protective conductive footwear because it provides insulation, reducing the conductive ability of the shoes. Silk, wool and nylon socks can produce static electricity and should not be worn with conductive footwear. Conductive shoes must be removed when the task requiring their use is completed.

Note: Workers exposed to electrical hazards must never wear conductive shoes.

Electrical hazard, safety-toe shoes can protect against open circuits of up to 600 volts in dry conditions and should be used in conjunction with other insulating equipment and additional precautions to reduce the risk of a worker becoming a path for hazardous electrical energy. The insulating protection of electrical hazard, safety-toe shoes may be compromised if the shoes become wet, the soles are worn through, metal particles become embedded in the sole or heel, or workers touch conductive, grounded items.

10.2.6 Fall Protection

Two types of fall protection equipment are used in power transmission and distribution work, work positioning and fall arrest equipment. Workers must use this fall protection if they are working at elevated locations more than 4 feet above the ground on poles, towers, or similar structures if other fall protection (for example, railings) has not been provided.

Protection Type	Components	Recommended for
Work positioning equipment	Body belt and pole strap	overhead line poles and towers
Fall arrest equipment*	Body harness with a shock-absorbing lanyard	power generation, transmission, and distribution work **

Table 10-8: Fall Protection Equipment

- * The equipment must be rigged so that a worker cannot fall more than 6 feet or contact any lower level.
- ** When working at elevations of 6 feet or more above the next lower level (such as on station transformers), workers engaged in construction work must also wear fall arrest equipment with the lanyard attached to a proper anchor point, unless the edges of the surface are protected by a guardrail or safety net.

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11. Incident & Accident Management

11.1 Investigation & Reporting

The Contractor shall notify BIFPCL within 24 hours or as soon as reasonably possible after the occurrence of any accident which has resulted in damage or loss of property, disability or loss of human life, or which has or which could reasonably be foreseen to have a material impact on the environment and shall submit to BIFPCL no later than 7 days after the occurrence of such an event, a summary report thereof.

The following instructions are intended to be a general advice for the H&S Staff.

When accidents are investigated, the emphasis should be concentrated on finding the root cause of the accident rather than the investigation procedure itself. This will prevent that the occurrence will happen again. The purpose is to find facts that can lead to actions, not to find fault. It is needed to look for the deeper causes.

Reasons to investigate a workplace accident include:

- Finding out the cause of accidents and to prevent similar accidents in the future
- Fulfilment of any legal requirements
- Determination of the cost of an accident
- Determination compliance with applicable safety regulations
- Processing workers' compensation claims.

Incidents that involve no injury or property damage must be investigated as well to determine the hazards that should be corrected. The same principles apply to a quick inquiry of a minor incident and to the more formal investigation of a serious event.

Ideally, an investigation would be conducted by someone experienced in accident causation, experienced in investigative techniques, fully knowledgeable of the work processes, procedures, persons, and industrial relations environment of a particular situation.

Some jurisdictions provide guidance such as requiring that it must be conducted jointly, with both management and labor represented, or that the investigators must be knowledgeable about the work processes involved.

It is recommended that the following team members will be part of the investigation team:

- Workers with knowledge of the work
- H&S Manager.

In case of severe accidents resulting in major injuries or fatalities, the Site Manager is requested to inform the local police and BIFPCL for further investigations.

11.2 Incident & Accident Investigation Process

The accident investigation process should involve the following steps:

- Report the accident occurrence to the H&S Manager or H&S Advisor;
- Provide first aid and medical care to injured person(s) and prevent further injuries or damage;
- Investigate the accident;
- Identify the causes;
- Report the findings;
- Develop a plan for corrective action;
- Implement the plan;
- Evaluate the effectiveness of the corrective action.

As little time as possible should be lost between the moment of an incident or accident and the beginning of the investigation. In this way, one is most likely to be able to observe the conditions as they were at the time, prevent disturbance of evidence, and identify witnesses.

The tools that members of the investigating team may need (pencil, paper, camera, film, camera flash, tape measure, etc.) should be immediately available so that no time is wasted.

The detailed steps and content of the incident & accident investigation process must be described by the Contractor in the H&S Plan.

11.3 Corrective Actions

During the accident investigation, it is assumed that corrective actions will be identified to prevent the occurrence of further accidents. The accident report must include the need for corrective actions. The list corrective actions must include the following information:

- Identified risks and non-compliances;
- Needed corrective actions;
- Needed personal and material resources;
- Responsible person;
- Date for latest finalisation.

The effectiveness of the corrective actions will be subject of BIFPCL's H&S Audits.



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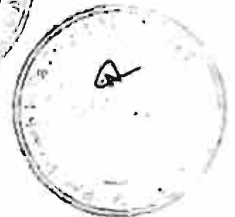
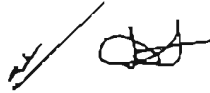


11.4 Compliance Reviews

One week after the implementation of the corrective actions, the H&S Manager is requested to undertake a compliance review. After observation of the full compliance of the corrective actions, the H&S Manager has to report the finalisation to BIFPCL.

11.5 Lessons Learned

Identified needed changes in the H&S Management Program at site resulting from the incident & Accident investigation must be communicated to the workers. It is recommended to implement the lessons learned (ask during the toolbox talks).



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12. Health & Safety Reviews

12.1 MCA H&S Audits and Reviews

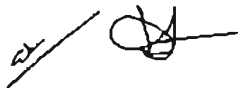
Prior to commencement of the main construction phase, BIFPCL will conduct a pre-construction phase H&S Review to ensure that all the necessary arrangements are in place and suitable for the work being undertaken at that time. This will include compliance with this H&S Standards document, the project H&S Plan and country specific legislation.

BIFPCL will conduct site specific H&S Reviews on a regular basis and formal H&S Audits of the Contractor and its supply chain. Formal H&S Audits will be conducted at least, every 6 months. The duration of this audit will be a minimum of 1 day and will require the full co-operation of the Contractors project management team.

In addition to H&S Reviews to be undertaken by BIFPCL, it is possible that further H&S Audits and Reviews will be carried out by relevant stakeholders i.e. Ministry of Labour or Ministry of Health etc.

The Contractor is obliged to provide any necessary support to the stakeholders to enable them to undertake their tasks and duties and to allow the access to the sites for undertaking the audits and reviews.

BIFPCL will spend specific focus on construction sites and their conditions where children between the age of 14 and 18 are employed.



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12.2 Contractors Health & Safety Review Programme

The Contractor shall implement an H&S Review Programme applicable for his construction site(s) that shall include a systematic evaluation of the implemented management system, compliance with this H&S Standards document, and the project H&S Plan and local legislative requirements.

The H&S Review Programme shall consist of the following tools:

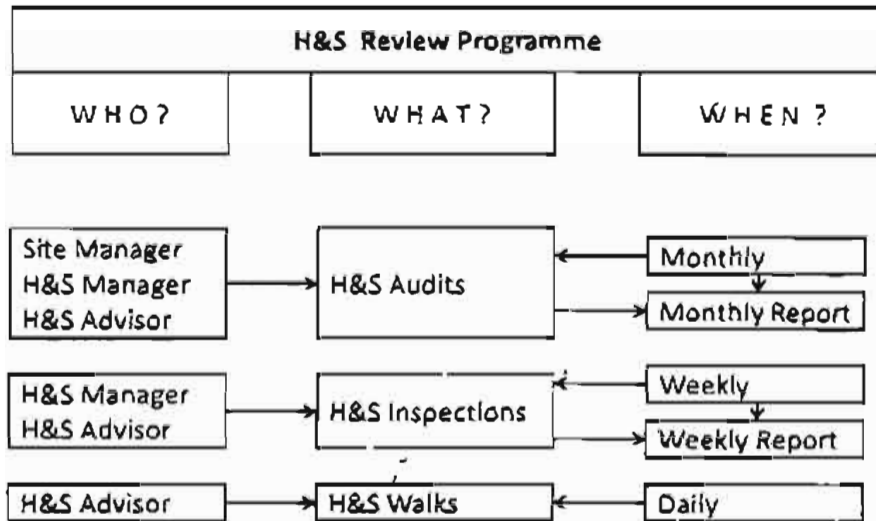


Figure 12-1: H&S Review Programme

12.2.1 Contractors H&S Audits

H&S Construction Site Audits must be undertaken on a monthly basis. The audits should be performed by the Site Manager, the H&S Manager and the H&S Advisor.

The audits should comprise the construction site itself, material and equipment storage areas, workshop areas and accommodation areas (Worker's camp area).

These audits shall be recorded and the results should be slipped into the monthly H&S Reports. A copy of the audit report must be attached to the monthly report.

12.2.2 Contractors H&S Inspections

H & S Inspections must be carried out on specific work areas and work places associated with the project on a weekly basis but independent thereof if they are assessed as medium or high risk areas or workplaces according to the risk register. The results of the inspections must be considered in the weekly H&S reports to be submitted to BIFPCL. A copy of the H&S Inspection report must be attached to the weekly report. The H&S

Inspections shall be executed by the H&S Manager together with the H&S Advisor.

12.2.3 Contractors Health & Safety Surveys

H & S Surveys shall be conducted by the Contractors' H&S Advisor on a daily basis. The date and time of the surveys must be documented but the results must not be recorded in a written report but significant findings must be communicated to the H&S Manager.

12.2.4 Contractors Management Surveys

Management surveys to be undertaken by the Contractors General Manager or his representatives shall be conducted at least every 3 months. The surveys must not be done by the responsible Site Manager, H&S Manager or H&S Advisor of the particular construction site. The results shall be recorded.

12.3 Reporting

The results of H&S Audits and H&S Inspections must be recorded and the reports must be submitted to BIFPCL within 3 working days after finalisation of the audit or inspection respectively. Forms to be used for the audits and audit reports respectively, inspections and surveys will be provided by BIFPCL.

The reports must include all relevant subjects according to the purpose of the H&S Reviews, but at least the results and the needed corrective actions.

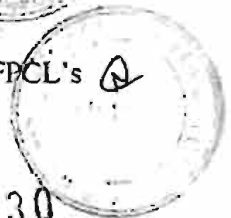
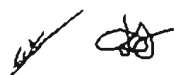
An reporting schedule for each particular construction site must be developed by the Contractor and should be submitted to BIFPCL for review and approval.

12.4 Corrective Actions

The H&S Review reports must include the need for corrective actions. The list corrective actions must include the following information:

- Identified risks and non-compliances;
- Needed corrective actions;
- Needed personal and material resources;
- Responsible person;
- Date for latest finalisation.

The effectiveness of the corrective actions will be subject of BIFPCL's H&S Audits.



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12.5 Compliance Reviews

One week after the implementation of the corrective actions, the H&S Manager is requested to undertake a compliance review. After observation of the full compliance of the corrective actions, the H&S Manager has to report the finalisation to BIFPCL.

12.6 Enforcement of Non-compliance

In case those audits, inspections, H&S Tours and the assessment of the implementation of corrective actions are identifying In-compliance with Health & Safety Obligations, BIFPCL's Health & Safety Staff is enforced to make use of the following warning system:

Warning of workers

Non-compliance with no possible risk for others

Level 1: Verbal reprimands

Level 2: Written reprimand with notice to supervisor

Level 3: Stop of work for one week without payment

Level 4: Stop of work and permanent removal from the construction site

Non-compliance with possible minor risk for others

Level 1: Written reprimand with notice to supervisor

Level 2: Stop of work for one week without payment

Level 3: Stop of work and permanent removal from the construction site

Non-compliance with possible major risk for others

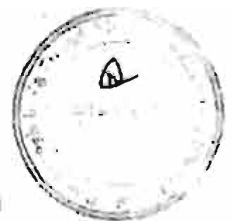
Level 1: Written reprimand with notice to supervisor

Level 2: Stop of work and permanent removal from the construction site

Penalties for construction companies

In case that audits and inspections are showing that companies represented by members of the management or supervisory level are not complying with the contractual agreed H&S Requirements, e.g. provision of PPE, introductions and training of workers, provision of adequate technical and electrical equipment, contractual stipulated penalties will apply.





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13. Site H&S Requirements

The following chapters are including specific H&S Requirements to be considered by the Contractor. These H&S Requirements are mandatory for consideration in case they found needed as a result of a risk assessment, H&S Audit, inspections, job safety analysis.

In case that no specific requirements were found in the national legislation and administration respectively, international guidelines, e.g. NFPA, were used to provide a comprehensive set of requirements.

13.1 Construction Activities

13.1.1 Working Hours

The Contractor shall consider for the appointment of direct and contracted workers a working time regulation that is in compliance with the national requirements. If not otherwise regulated, the working time for each worker will be 8 hours per day between Sunday and Thursday excluding breaks.

The Contractor must implement working hour monitoring measures at every site access control point. The monitoring shall record the following details:

- Access time;
- Egress time;
- Any meantime leave of the construction site (log-out and log-in time).

The working times of child labour must be especially highlighted in the site access control register. Independent if the working time will be monitored by an electronic register or by a hand-written register.

Breaks must be provided to all workers. This should include two breaks during the course of a working shift consisting of a 30 minutes break and a 45 minutes break.

Working on the weekend is generally not allowed but could be agreed for a single working shift on Saturday not exceeding a working time of 8 hours excluding breaks. Working on Saturday must be announced to the H&S Coordinator of BIFPCL working days in advance and by written notice. The receipt of the announcement must be confirmed by the H&S Coordinator of BIFPCL.

An announcement without a confirmation of receipt is generally not valid. It is the sole responsibility of the Contractor to submit the overtime announcement well in advance and to ensure the confirmation statement. The announcement must include:

- Date of work;
- Working time (start and end of work);



- Reason for the announced overtime;
- Names of staff team members affected.

Overtime on a regular working day and during weekend times must be compensated by the provision of leisure time and in a proportion of 1 hour overtime to 1 hour leisure time. A financial compensation is generally excluded.

Announced overtimes could be refused by BIFPCL in case of identified breaches of the above mentioned stipulations.

A total working time of more than 48 hours per week is generally not allowed and must not be repeated during two subsequent working weeks.

Working on Sunday or national holidays is strictly prohibited.

The Contractor is requested to maintain a working time file for each worker highlighting the daily, weekly and monthly working times, overtimes and leisure times.

13.1.2 Confined Space Precautions

Where work is done inside any chamber, tank, vat, pit, tunnel or other confined space in which dangerous fumes are liable to be present:

- The confined space shall be provided with adequate means of egress for persons entering or working therein; and
- No person shall enter the confined space for any purpose unless:
 - a risk assessment has been carried out;
 - all practicable steps shall have been taken to remove any fumes which may be present and to prevent any ingress of fumes, and it has been ascertained, by a suitable test, that the space is free from dangerous fumes;
 - the person entering wears a belt to which there is securely attached a rope of which the free end is held by a person outside, and the person entering shall wear a suitable breathing apparatus; and
 - a permit to work shall have been issued by the HS&E Manager to facilitate safe completion of the work.

13.1.3 Work Areas

The requirements as mentioned below are in the same way applicable for static or moving construction sites.

- Construction sites should be fenced off and suitably signed. This will protect people from site dangers and the site from vandalism and theft.

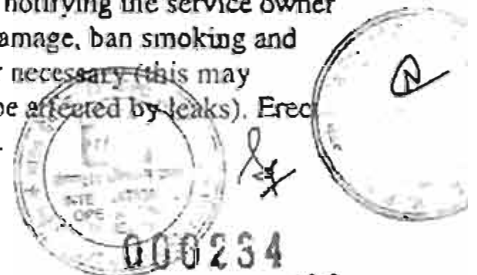



- The risks from working plant must be controlled:
 - protect any temporary structures, such as scaffolds or false work, which might be damaged and made unsafe if struck by a vehicle;
 - protect any excavations and alongside any areas of water if vehicles may approach close by;
 - take precautions, such as stop blocks, where vehicles tip materials into excavations;
 - make sure vehicles are not overloaded as it may obstruct the driver's view and they may become unstable, difficult to steer or the brakes may be inadequate to stop the vehicle;
 - segregate the area around plant that slews (e.g. 360° excavators and mobile cranes). Do not rely on the driver using mirrors, cameras etc to check that the slewing area is clear, as their attention will typically be concentrated on the machine boom or jib;
 - if slewing plant is being used in a confined area where there is a risk of workers being trapped against adjacent obstructions (i.e. less than 0.5 m clearance), consider using a different type of machine that has zero or minimal tail swing. If alternative machines are not practicable, then secure fencing should be used to segregate the area and prevent access into the danger zone.

13.1.4 Ground Work

- If excavations are required the work must be properly planned and carried out to prevent accidents.
- Before digging any trenches, pits, tunnels, or other excavations, decide what temporary support will be required and plan the precautions that are going to be taken against.
- Make sure the equipment and precautions needed (such as trench sheets, props, baulks etc.) are available on site before work starts. If information such as results of soil tests or trial holes is available, it may provide useful data on conditions likely to be found on site, which can assist planning.
- Before excavation work starts, check with all public and private utilities (such as electricity, gas, water, telecommunication and cable TV companies) and the landowner for the existence of services, and obtain service plans.
- Service plans should not be considered as completely accurate and serve only to indicate the likely presence of services. Use them as a guide to see whether the place intended for digging may involve working near buried underground services. Look out for signs of services such as manholes, valve covers, street lights etc.;
- Before digging, make sure that there is an emergency plan to deal with damage to cables or pipes. Have a system for notifying the service owner in all circumstances. In the case of gas pipe damage, ban smoking and naked flames. Carry out evacuation whenever necessary (this may include people in nearby properties likely to be affected by leaks). Erect suitable signs to warn everyone of the danger.

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13.2 Working at Height

13.2.1 Fall Protection

- Guard rails, toe boards and other similar barriers should be provided to prevent falls whenever practicable.
- Guard rails, toe boards and other similar barriers should be strong and rigid enough to prevent people from falling and be able to withstand other loads likely to be placed on them. Also they be fixed to a structure or part of a structure capable of supporting them;
- Brick guards should always be used in addition to the required fall protection consisting of guard rails and toe boards or other similar barriers.
- Safety nets and soft landing systems (e.g. fire-retarded polystyrene-filled bags, air bags etc) can be used as leading edge protection to mitigate the consequences and distance should a fall occur. They are not a substitute for the use of fall prevention measures but can be used in conjunction with them if the risk of a fall cannot be eliminated.
- Safety nets are a complex energy-absorbing system, which should only be installed by trained and competent people.
- Safety net systems should be inspected by a competent person after installation and a handover certificate prepared to confirm their safety. They should then be inspected on a weekly basis to ensure they are still fixed correctly and will arrest a fall. When a person falls into a net, the material deforms as it absorbs the load and it is therefore essential to provide adequate clearance below the net to allow deformation to occur without the person striking the ground or another object. The net installer should be consulted when the net has been used to arrest a fall.

13.2.2 Scaffolds

Suitable precautions must be taken to prevent falls. General access scaffolds provide a means of working at height while preventing falls and should be provided whenever practicable.

13.2.3 Ladders

Ladders and stepladders are among the most commonly used pieces of access equipment on site and perhaps the most misused. Where work at height is necessary it is needed to justify whether a ladder or stepladder is the most suitable equipment compared to other access equipment.



13.3 Electrical Precautions

- It is essential that the electricity power supply requirements are established before any work takes place. Arrangements for the electricity supply should be completed with the local electricity supplier and the supply system installed.
- Cordless tools or tools which operate from a 110V supply system, which is centre-tapped to earth so that the maximum voltage to earth should not exceed 55V, will effectively eliminate the risk of death and greatly reduce injury in the event of an electrical accident. For other purposes such as lighting, particularly in confined and wet locations, still lower voltages can be used and are even safer.
- If mains voltage has to be used, the risk of injury is high if equipment, tools, leads etc are damaged, or there is a fault. RCDs or trip devices with a rated tripping current not greater than 30 mA with no time delay will be needed to ensure that the current is promptly cut off if contact is made with any live part.
- RCDs must be installed and treated with great care if they are to save life in an accident. They have to be kept free of moisture and dirt and protected against vibration and mechanical damage. They need to be properly installed and enclosed, including sealing of all cable entries. They should be checked daily by operating the test button. If mains voltage is to be used, make sure that tools can only be connected to sockets protected by RCDs. By installing an RCD at the start of the work, immediate protection can be provided. Even so, RCDs cannot give the assurance of safety that cordless equipment or a reduced low-voltage (such as 110V) system provides.
- Electrical systems should be regularly checked and maintained. Everyone using electrical equipment should know what to look out for. A visual inspection can detect about 95% of faults or damage. Before any lead or RCD is used, check that:
 - no bare wires are visible;
 - the cable covering is not damaged and is free from cuts and abrasions (apart from light scuffing);
 - the plug is in good condition, e.g. the casing is not cracked, the pins are not bent and the key way is not blocked with loose material;
 - there are no taped or other non-standard joints in the cable;
 - the outer covering (sheath) of the cable is gripped where it enters the plug or the equipment. The colored insulation of the internal wires should not be visible;
 - the equipment outer casing is not damaged and all screws are in place;
 - there are no overheating or burn marks on the plug, cable or the equipment;
 - RCDs are working effectively, by pressing the 'test' button every day. Workers should be instructed to report any of these faults immediately and stop using the tool or cable as soon as any damage is seen.
- Damaged equipment should be taken out of service as soon as the damage is noticed.
- Some faults, such as the loss of earth continuity due to wires breaking or coming loose within the equipment, the breakdown of insulation and

internal contamination (e.g. dust containing metal particles may cause shorting if it gets inside the tool), will not be spotted by visual inspections. To identify these problems, a program of testing and inspection is necessary. This testing and inspection should be carried out by someone trained to do this. As well as testing as part of the planned maintenance program, combined inspection and testing should also be carried out:

- if there is reason to suspect the equipment may be faulty, damaged or contaminated, but this cannot be confirmed by visual inspection; and
- after any repair, modification or similar work to the equipment, which could have affected its electrical safety.
- With lighting systems, provide protection for cabling in the same way as for tools. Protect bulbs against breakage. If breakage does occur, the exposed filaments may present a hazard. Make sure there is a system for checking bulbs to maintain electrical safety and also to keep the site well lit.
- Tools and equipment should be suitable for site conditions. DIY tools and domestic plugs and cables are not designed to stand up to everyday construction work. Also observe other restrictions on use imposed by manufacturers.

13.4 Precautions for Overhead Lines

Contact with overhead power lines is a regular cause of death and injury. So any work near electric distribution cables or railway power lines must be carefully planned to avoid accidental contact.

- Where possible all work likely to lead to contact with the overhead line should be done in an area well clear of the line itself. Where this is not feasible, either the power line must be made dead or suitable precautions must be taken to prevent any danger. For some jobs, it may be necessary for the electricity supplier to isolate or re-route overhead lines to enable work to proceed.
- If plant is working in the vicinity of an overhead power line, the distance between the plant and the overhead line should be at least:
 - 1.5 m (plus the length of the jib) if the lines are suspended from steel towers; or
 - 9 m (plus the length of the jib) if the lines are supported on wooden poles.
- In cases where approach is likely, stout, distinctive barriers should be erected at ground level to prevent access. Where work is to take place close to overhead lines, detailed precautions should be discussed with the owner of the lines (any work next to any railway where the work is likely to encroach onto railway land should in any case be discussed with the railway operator before work begins). However, the responsibility for ensuring that precautions are adequate remains with the contractors undertaking the work, not with the owner of the power lines.
- In addition to the specific precautions required when working in the vicinity of overhead power lines, you should also:

- erect high-visibility barriers at least 6 m away, to prevent inadvertent approach by other site vehicles
- install clearly marked crossing points beneath the lines at a height specified by the electricity supplier;
- Prohibit the storage of materials in the area between the overhead lines and the ground-level barriers.
- Safety rules (electrical and mechanical) implemented by BPDB are representing detailed specific requirements for work on overhead line.

13.5 Movement of People and Vehicles

Accidents involving workplace transport are often caused by failures in several different areas. The following three areas in particular are of high importance to be considered.

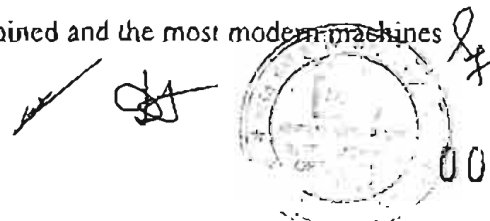
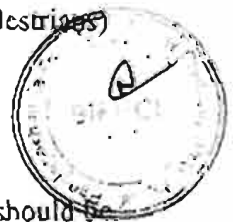
It should be noted that it is the sole responsibility of the Contractor and every appointed sub-contractor to provide adequate and suitable vehicles for the transport of the workers.

13.5.1 Safety at Site

- A smooth road surface without grooves and cracks has to be maintained in order to keep the noise level to minimum;
- Management of the traffic must be done in a way that vehicles operate efficiently at peak hours in case that populated areas are affected;
- Well-defined traffic routes have to be chosen free from obstructions, and that have firm and even surfaces;
- Separate pedestrians routes from vehicles;
- Safe road crossing places must be implemented for pedestrians to get across vehicle routes;
- Implementation of an effective one-way system, in case that large goods vehicles will be used;
- Speed limits must be set on vehicle routes or road-humps in order to make sure that speed limits are considered;
- Route signs have to be implemented to inform drivers (and pedestrians) about the routes to be used.

13.5.2 Safety of Vehicles

- An effective inspection and maintenance management system should be in place for vehicles with respect to the steering and braking systems, and for vehicle lights;
- Reversing aids and/or 'roll-over protection systems have to be considered' where appropriate;
- Machinery should be well maintained and the most modern machines should be used.



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13.5.3 Safe Drivers/Passengers

- The use of seatbelts is mandatory;
- The training and testing of drivers is compulsory;
- Prohibition and punishment of driving while impaired with drugs and alcohol;
- Check that drivers' behaviour is supervised.
- No passengers are allowed to stand on moving vehicles. It is strictly prohibited to transport workers on the load bay of trucks.
- It is prohibited to exceed the seat capacity of the vehicle and corresponding number of passenger respectively.

13.6 Manual and Mechanical Handling

13.6.1 Hoists and Lifts

- Every hoist and lift at a workplace shall be of good mechanical construction, sound material and adequate strength, and shall, together with all gates, interlocking or other devices required by this section to be fitted, be properly maintained.
- Every hoist or lift shall be thoroughly examined at least once in every period of 12 months by a competent person, and a report of the result of such examination shall be signed by the person making the examination.
- Where any examination shows that the hoist or lift cannot continue to be used with safety unless certain repairs are carried out immediately or within a specified time, the hoist or lift must not be used until a clearance certificate is issued.
- Every hoist way or lift way shall be efficiently protected by a substantial enclosure fitted with gates, being such an enclosure as to prevent, when the gates are shut, any person falling down the way or coming into contact with any moving part of the hoist or lift.
- Every gate shall be fitted with efficient interlocking or other devices to ensure that the gate cannot be opened except when the cage or platform is at the landing and that the cage or platform cannot be moved away from the landing until the gate is closed.
- Every hoist or lift and every enclosure shall be so constructed as to prevent any part of any person or any goods carried in the hoist or lift being trapped between any part of the hoist or lift and any fixed structure or between the counter balance weight and any other moving part of the hoist or lift.
- The following information shall be displayed in a conspicuous place on every hoist or lift:
 - the maximum working load;
 - the maximum number of persons which the hoist or lift is designed to carry;
 - no load greater than the maximum working load, including goods and persons, shall be carried on any hoist or lift.

13.6.2 Cranes and other Lifting Machines

- All parts and working gear whether fixed or moveable, including the anchorage and fixing appliances, of every crane or other lifting machine shall be of good construction, sound material and adequate strength and free from patent defect, and shall be properly maintained.
- All parts and working gear of a crane or other lifting machine shall be thoroughly examined by a competent person at least once every twelve months and also after every substantial alteration or repair.
- No lifting machine shall be taken into use in any workplace for the first time in that workplace unless it has been tested, and all such parts and working gear of the machine have been thoroughly examined by a competent person and that person has issued a signed certificate specifying the safe working load or loads of the machine.
- All rails on which a travelling crane moves and every track on which the carriage of a transporter or runway moves shall be of proper size and adequate strength, and have an even running surface; and any such rails or track shall be properly laid, adequately supported or suspended, and properly maintained.
- There shall be conspicuously displayed on every lifting machine the safe working load or loads thereof, except that, in the case of a jib crane so constructed that the safe working load may be varied by the raising or lowering of the jib, there shall be attached either an automatic indicator of safe working loads or a table indicating the safe working loads at corresponding inclinations of the jib or corresponding radii of the load.
- No lifting machine shall, except for the purpose of a test, be loaded beyond the safe working load as marked or indicated in accordance with this section.
- If any person is employed or working on or near the wheel track of a self-propelled overhead travelling crane in any place where he would be liable to be struck by the crane, effective measures shall be taken to ensure that the crane does not approach within six meters of that place.
- A lifting machine shall not be operated except by a person trained and competent to operate that machine.
- Provided that it shall be permissible for such machine to be operated by a person who is under the direct supervision of a qualified person for the purpose of training; and no person under eighteen years of age shall be employed to operate any lifting machine driven by mechanical power or to give signals to the operator of any such machine.

13.6.3 Chains, Ropes and Lifting Tackle

- Every occupier shall comply with the following provisions in relation to every chain, rope or lifting tackle used in a workplace for the purpose of raising or lowering persons, goods or materials:
 - no chain, rope or lifting tackle shall be used unless it is of good construction, sound material, adequate strength and free from patent defect;

- a table showing the safe working loads of every kind and size of chain, rope, or lifting tackle in use and, in the case of a multiple sling, the safe working loads at different angles of the legs shall be prominently displayed on the premises, or alternatively in relation to any lifting tackle the safe working load thereof, or in the case of multiple sling, the safe working load at different angles of the legs, shall be plainly marked upon it;
- no chain, rope or lifting tackle shall be used for any load exceeding the safe working load;
- all chains, ropes and lifting tackle in use shall be thoroughly examined by a competent person at least once every period of six months or at such greater intervals as the Director may direct;
- no chain, rope or lifting tackle, except a fiber rope or fiber sling, shall be taken into use in any workplace for the first time unless it has been tested and thoroughly examined by a competent person, who shall determine the safe working load;
- wrought iron chains or lifting tackle in use in any workplace shall be annealed or otherwise treated by heat at suitable intervals.
- For purposes of this section the expression "lifting tackle" includes chain, slings, rope, rope slings, hooks, shackles and swivels.

13.7 Hazards and Hazard Control

13.7.1 Fencing and Guarding of Machinery

- Every dangerous part of any moving machinery or component thereof shall be securely fenced, unless it is of such construction as to be safe to every person working on the premises as it would be if securely fenced;
- Any part of stock-bar which projects beyond the headstock of a lathe shall be securely fenced, unless it is in such a position as to be as safe to every person employed or working on the premises as it would be if securely fenced.
- Every part of any transmission machinery shall be securely fenced, unless it is in such a position or of such construction as to be safe to every person employed or working on the premises as it would be if securely fenced.

13.7.2 Construction and Maintenance of Fencing

All fencing and other safeguard shall be substantial constructed and shall be constantly maintained and kept in a position while the parts required to be fenced or safeguarded are in motion or in use, except when any such parts are necessarily exposed for examination and for any lubrication or adjustment.



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13.8 Materials

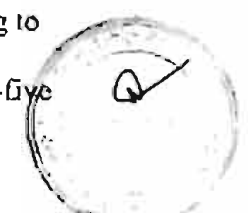
13.8.1 Hazardous Material Handling

A Hazardous Waste Management Plan must be prepared by the Contractor and shall address the following concerns as a minimum:

- Manufacturers and suppliers of hazardous substances used at workplaces shall provide sufficient information on such substances with the precautions to be taken. Appropriate information is the provision of MSDS.
- Hazardous substances shall be clearly labelled giving their relevant characteristics and instruction on their use.
- Containers of hazardous substances shall carry, or be accompanied by, instructions for the safe handling of the contents and procedures to be followed in case of spillage.
- In application of hazardous substances preference shall be given to means other than spraying, such as by brush or, where feasible roller.
- Where the use of toxic substances or other volatile chemical substances, including thinners and paints cannot be avoided, special control measures, including local exhaust ventilation, shall be instituted.
- Where the use of hazardous chemicals is likely to penetrate the skin and cause rash, skin contact with hazardous chemical shall be avoided and personal hygiene and the type of clothing worn shall be such as to enable rapid removal of any chemical from skin contact.
- Where it is necessary to deal with proven carcinogenic substances, particularly in work involving bituminous tar, asphalt, asbestos fibres, pitch, heavy oils, and aromatic solvents, strict measures shall be taken to avoid inhalation and skin contact.

13.8.2 Bulk Storage of Dangerous Substances

- Bulk storage of dangerous substances shall only be located at a suitable site;
- Every area for the bulk storage of dangerous substances shall:
 - be constructed and maintained with suitable material;
 - be adequately ventilated;
 - have adequate storage space;
 - be capable of containing not less than seventy-five per cent of spillage;
 - have an inventory of the substances in storage maintained and prominently displayed.
- Storage tanks for the bulk storage of dangerous substances shall:
 - be constructed and maintained with suitable material according to approved standards;
 - have suitable containment for spillage of not less than seventy-five percentage; and have suitable venting facilities.



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13.8.3 Gas Cylinders

The Contractor shall make adequate arrangements for the safe storage (including appropriate warning notices) and handling of all industrial gases.

In detail, cylinders for compressed, dissolved or liquefied gases shall be:

- of sound material and good construction, and free from patent defects;
- distinctively identified as to their contents;
- fitted with a suitable pressure gauge;
- protected against excessive variation of temperature, direct rays of sun light and continuous dampness while in storage;
- whether charged or empty, maintained in an upright position;
- handled with care to avoid violent shocks;
- transported on suitably designed carriers.

13.9 Accommodation & Sanitation

13.9.1 Lighting

Workplaces should, to the degree feasible, receive natural light and be supplemented with sufficient artificial illumination to promote workers' safety and health.

Emergency lighting of adequate intensity must be installed and automatically activated upon failure of the artificial light source to ensure safe shut-down, evacuation, etc.

Work area light intensity must be adequate for the general purpose of the location and type of activity and must be supplemented with dedicated work station illumination as needed. All light sources should be energy efficient with minimum heat emission.

The employer shall take measures to eliminate reflections and flickering of lights. The minimum limits for illumination intensity for a range of locations/activities are shown in the following table:

Location / activity	Light intensity
Emergency light	10 lux
Outdoor non working areas	20 lux
Simple orientation and temporary visits (e.g. machine storage, garage, warehouse)	50 lux
Workspace with occasional visual tasks only (e.g. corridors, stairways)	100 lux
Medium precision work (e.g. rough machine works,	200 lux

Location / activity	Light intensity
welding)	
Precision work (e.g. reading, medium bench and machine works)	500 lux

Table 13-1: Minimum Illumination Intensity on Objects of Work

13.9.2 Malaria Prevention

In workers camps as well as at long lasting construction sites, the accumulation of precipitation in small paddles and ponds should be avoided to reduce the possibility for Mosquito breeding.

13.9.3 Cleanliness

The accommodation for the workers and the work place shall be kept clean and free from effluvia arising from any drain sanitary convenience or nuisance:

- Accumulation of dirt and refuse shall be removed daily by a suitable method from the floors and benches and from stair cases and passages;
- Effective arrangements shall be made for the treatment of wastes and effluent;
- The floor of every room shall be cleaned once per day by washing the floor, or if this is not possible, by sweeping or other method.

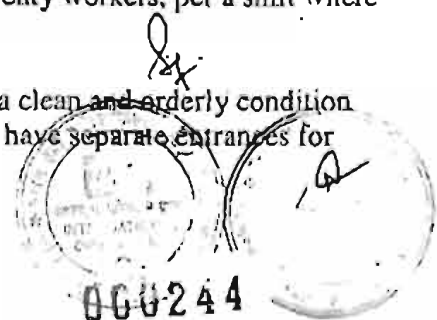
13.9.4 Sanitary Conveniences

Every occupier shall provide sufficient and suitable sanitary conveniences for persons employed in the workplace, which shall be maintained and kept clean, and effective provision shall be made for lighting the conveniences and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation with a distinct approach for persons of each sex.

13.9.5 Washing Facilities

Every occupier shall provide at a workplace separate washing facilities for male and female workers, easily accessible, in the proportion of at least one wash hand basin and one shower for every twenty workers, per a shift where shifts are operational.

The washing facilities shall be maintained in a clean and orderly condition for the use of all persons employed, and shall have separate entrances for each sex.



13.9.6 Drinking Water

The following requirements are to be kept as a minimum:

- A minimum of 50 litres of potable water per day must be made available to every worker at the construction site and workplace respectively. The amount of 50 litres is based on a UN recommendation and consists of the need to prepare meals and to have enough for personal hygiene. 50 litres of water per day are necessary in order to avoid diseases and to retain efficiency.
- Every employer shall provide at a workplace an adequate drinking supply of clean and potable drinking water, maintained at suitable water points conveniently accessible to all persons employed.
- Every supply of drinking water shall be contained in suitable containers, and shall be replenished at least daily and shall be clearly marked with "DRINKING WATER" in English and in Bengali language.

13.9.7 Eating Facilities

Every occupier shall provide and maintain in good condition, suitable facilities where workers may prepare and consume their meals.

No person shall be permitted to consume food or drink in any room where any poisonous or otherwise injurious substance is so used as to give rise to any dust or fume.

13.10 Signposts

The Contractor is requested to install appropriate signposts on the site. The signposts must consider:

- mandatory signs;
- prohibition signs;
- danger signs.

All signs must be of a suitable size, coloured and resistant with respect wind and weather.

The selection of the location for signposts must be based on H&S Surveys and the results of a risk assessment. The location for signposts must be reviewed and checked at least one per week and corrected in case of changes of the construction and work activities.

The meaning of signposts has to be introduced to the workers during tool box talks and H&S Induction.

13.10.1 Examples of Signposts

a) mandatory signs



Use safety glasses



Use ear protection



Use safety helmet

b) prohibition signs



No fire or open flames



Access denied

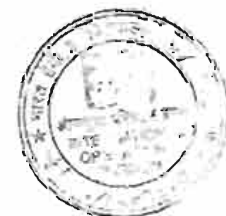
c) danger signs



Flammable products



electrical voltage



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14. Deliverables by the Contractor

Document	Issued for	Latest date for submission
H&S Plan	Approval	6 weeks prior to start of construction
H&S Procedures	Approval	4 weeks prior to the specific activity
Grievance Management System	Approval	4 weeks prior to start of construction
Traffic Management Plan	Approval	4 weeks prior to start of mobilization
Safe Work Instructions (based on the H&S Plan)	Information	Start of construction
Risk Register	Approval	4 weeks prior to start of construction
Permit to Work Form	Approval	2 weeks prior to start of construction
H&S Forms		
H&S Organization Chart	Approval	4 weeks prior to start of construction
Training Schedule	Information	with start of construction
H&S Weekly Report	Information	as specified
H&S Monthly Report	Approval	as specified
H&S Audit Reports, Inspections and H&S Tours	Information	3 days after finalisation
Emergency Response Plan	Approval	2 weeks prior to start of construction
HIV/AIDS Awareness Plan ¹¹	Approval	6 weeks prior to start of construction
Malaria Prevention Plan ¹¹	Approval	6 weeks prior to start of construction
Yellow Fever Prevention Plan ¹¹	Approval	6 weeks prior to start of construction

Table 14-1: List of Deliverables

¹¹ The specified plans will be reviewed in close cooperation with the Ministry of Health or a nominated local/regional authority.





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ANNEXURE-X-ELECTRICAL**1.0 LT MOTOR**

Product Standard
EDC / ELECTRICAL, C & I
RANIPET 632406

TECI: MAIT: LTM: REV 00
PAGE 2 OF 8
Effective date: 08.08.2017

CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
1.0	<u>SITE CONDITIONS</u>		
1.1	Altitude above mean sea level	➤ 1000 m.	
1.2	Ambient temperature condition	6 to 50°C.	
1.3	Relative humidity	100 %	
1.4	Atmosphere	Tropical, Dusty, salty, corrosive & highly polluted in a coal based Thermal power plant.	
2.0	<u>GENERAL</u>		
2.1	Reference standards	IEC 60034 Part-01, 03, 05, 06, 07, 09 &14, IEC 60072. Shall be energy efficient as per IEC 60034	
2.2	Design ambient	50 Deg C	
2.3	Application/ Type(Normal/ Energy efficient)	As per Enquiry & PO.	
2.4	Duty cycle	Continuous S1	
2.5	Rated voltage, frequency & Phases	415 V AC $\pm 10\%$; 50 Hz $\pm 5\%$; (PI check enquiry for voltage) 10% absolute sum - 3 phase	
2.6	Minimum starting voltage	80% of the rated voltage	
2.7	Minimum voltage under which motor will run satisfactorily	75% of the rated voltage for 5 minutes	
	Capacity to restart (at voltage specified in point No. 2.4)	i. TWO successive starts from cold condition ii. Two HOT restarts starts from Hot condition iii. Three equally spread start per hour	
2.8	High speed bus transfer withstand capability	Suitable to withstand 150 % of rated voltage	
2.9	Type of balancing for rotor	Dynamic balancing	
2.10	Direction of rotation	Suitable for both direction	
2.11	Direction of cooling air	Non-drive end to driving end	
2.12	Class of insulation	Class F with temperature rise limited to Class B.	
2.13	Winding treatment	The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid & tropical climate.	
2.14	Allowed winding temperature rise at continuous full load	60°C by thermometer method & 70°C by resistance method	

CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
2.15	Starting current	Less than or equal to 600% full load current subject to tolerance as per IS.(Normal motor) Less than or equal to 700% full load current subject to tolerance as per IS.(Energy efficient)	
2.16	Starting time & locked rotor withstand time	The locked rotor withstand time (LRWT) at 110% rated voltage (RV) under HOT condition shall be at least 3 sec more than the starting time at 80% of rated voltage for motors with acceleration time upto 20 sec at RV and 5 sec where the accelerating time is more than 20 sec at RV.	
2.17	Vibration	The peak amplitude of vibration shall be as per IEC 60034-14	
2.18	Noise level	Within the limits specified by IEC 60034-09. (<80 db at full load condition) @ 1 metre distance.	
2.19	Type of enclosure	TEFC, IP 55 as per IEC 60034-05.	
2.20	Type of mounting	Horizontal foot mounted.	
2.21	Bearings	Ball or roller type / bearings effectively sealed against ingress of dust. The bearing shall be so constructed that the loss of lubricating grease is kept to minimum. Sealed bearings are also acceptable.	
2.22	Lubricant Type	Grease	
2.23	Bearing life	Bearings shall have a minimum life of 40000 Working hours.	
2.24	Shaft extension	Motors shall be provided with key slotted bare shaft extension with key at the driving end.	
2.25	Terminal box Type	Weather proof IP 55 as per IEC60034-05, Capable of being turned through 360° in steps of 90°.	
2.26	Cable gland and lugs	Double compression type nickel plated brass cable glands and insulated tinned copper crimping lugs to suit the cable size shall be supplied along with the motor. i) Size of power cables will be intimated after PO. ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided Stud / screw type with plain washers, spring washers /	

CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
2..27	Type of terminals	check nuts & lugs	
2.28	Fault level	40 KA for 0.25 Sec (Suitable HRC fuse backup will be provided by BHEL in MCC/switchgear)	
2.29	Painting	Epoxy based paint (RAL 5012). This will be confirmed after PO.	
30.0	Space heaters	Separate space heater suitable for 240V, I Phase, AC ,50 Hz shall be provided	
30.0.A	Motors above 30 kW	Winding shall be suitable for heating continuously at 24 V, Single phase, AC,50 Hz	
30.0.B	Motors below 30 kW	Separately terminated with clear identification in main terminal box.	
30.0.C	Terminals for space heater	Two numbers of Thermistors / RTD for each phase as below are to be provided	
31.0	RTD for winding	A. Motors above 37 Kw shall have thermistors Or RTD if specifically called for in enquiry. B. Motor rated 160kW and above shall have RTDs	
32.0	Bearing RTD	For motors 132 Kw and above bearing temperature detectors (RTD) shall also be offered.	
33.0	Terminals for RTD/ Thermistor	Thermistors/ RTDs shall be terminated in an auxiliary terminal box. Details shall be furnished in TB diagram.	
34.0	Earthing	Two no of earthing provisions on terminal box and on motor body	
35.0	Name plate	As per IEC 60034 and Addl data on name plate:: a. Bearing DE/ NDE details. b. Year of manufacture	

CI No.	CHARACTERISTICS	REQUIREMENT	VENDOR COMPLIANCE (Refer Note: 2)
36.0	Lifting Device	Eye bolt or lugs to facilitate safe lifting	
37.0	<u>INSPECTION & TESTING</u>	As per applicable quality plan	
38.0	<u>DOCUMENTS</u> a) Along with offer: b) After placement of Purchase order (within 15 days)	One set of technical data sheet as per the enclosed format and Motor general arrangement drawing giving foundation details, shaft details. Three sets of the following for approval: Technical Data sheet as per the enclosed format of TECI: MAIT: LTM: REV 00- sh 6 to 8 Motor general arrangement drawing giving foundation details, shaft details and weight Motor Terminal box arrangement drawing Motor characteristic curves. Steel crate packing drawing. The following shall be submitted 1. Guarantee certificate. 2. O & M manuals. 6. Acceleration time and LRWT calculation shall be submitted for review.	
39.0	<u>PACKING</u>	a) Seaworthy packing to be done b) The packing shall meet the Transport, Environment & Storage hazards. c) As per Packing Procedure PE: TS: 888:100:A001 or as per Manufacturer's Standard Seaworthy packing Practice subject to approval. Vendor shall check the applicable rated voltage in enquiry.	

NOTE:

1. Refer current valid list for revision status of Quality Plan & Packing Procedure.
2. In 'Vendor compliance' column Vendor to indicate 'YES', 'NO' or 'NOT APPLICABLE'. Clarification, if any, in this column will not be considered.

PO no:

DATA SHEET - Cust No: Project:

CL. NO	CHARACTERISTICS	Vendor data (To be filled by vendor)
1.0	Application	Normal / Energy efficient Frame size: IP55 • 415 V AC $\pm 10\%$; 50 Hz $\pm 5\%$; (Check voltage as per enqy), 10% absolute sum - 3 phase Amps As per IEC 60034 Eff-- PF-- Eff-- PF-- Eff-- PF-- S1 - Continuous 700% of full load current @ RV and Frequency a. Hot b. Cold a. Hot b. Cold a. Hot b. Cold Minutes
1.1	Fan / Load Curve referred	
2.0	Manufacturer	
3.0	Type & frame size	
3.1	Degree of Protection	
4.0	Rated output in kW	
4.1	Rated speed	
5.0	Rated voltage , frequency & phases	
6.0	Full load current	
7.0	Energy efficient	
8.0	Efficiency & power factor at Full load	
9.0	Efficiency & power factor at 75 % load	
10.0	Efficiency & power factor at 50 % load	
11.0	Duty Cycle	
12.0	Rated torque	
13.0	Starting current	
14.0	No load current (with mechanism coupled)	
15.0	Starting torque in % of full load torque	
16.0	Pull up torque in % of full load torque	
17.0	Pull out torque in % of full load torque	
18.0	No load starting time (without mechanism coupled)	
19.0	Locked rotor withstand time at rated voltage	
20.0	Locked rotor withstand time at minimum starting voltage	
21.0	Locked rotor withstand time at 110% rated voltage	
22.0	Starting time at minimum starting voltage with mechanism coupled	
23.0	Starting time at rated voltage with mechanism coupled	
24.0	Maximum permissible starting time	
25.0	Stator thermal time constant	
26.0	Type & No of terminals brought out	

Cl no	CHARACTERISTICS	Vendor Data (To be filled by vendor)
27.0	Stator winding connection	Delta / star
28.0	Class of insulation & temperature rise	Class F; 60°C by thermometer method / 70°C by resistance method.
29.0	Minimum permissible starting voltage	Volts
30.0	Resistance per phase @20 Deg C (Indicative)	Ohms
31.0	No of successive starts in Hot condition	ONE / TWO
32.0	Quantity and power consumption of space heater	Qty== Watts==
33.0	Direction of rotation	Bi-Directional.
34.0	Bearing make & type	Make:: Drive End; Non Drive End;
35.0	Lubricant quantity , grade & recommended interval of lubrication	
36.0	Type of mounting & shaft orientation <u>Terminal Box</u>	Foot mounting; Horizontal.
37.0	Location & angle of rotation	
38.0	Gland size for stator winding	
39.0	Gland size for space heater	Suitable for 2CX2.5 sq.mm (armoured), if applicable.
40.0	Cable entry	
41.0	GD ² of motor (kg-m ²)	
42.0	Total weight of motor (kg).	
43.0	Weight of stator (kg)	
44.0	Weight of rotor (kg)	
45.0	Anticipated bearing life in Hours	
46.0	Method of connection to driven equipment	
47.0	Limiting rotor temperature for determining safe stall time	☐
48.0	RTD for winding/ Bearing	Applicable YES NO
49.0	Grade of balance of motor	
50.0	Standard continuous rating at 40 Deg C ambient.	
51.0	De-rated rating of motor at 50 Deg C.	
52.0	a. Locked Rotor KVA b. Ratio of Locked rotor KVA / Rated KW	
53.0	a. Motor Dynamic Load b. Motor Static load	Upward/ Downward— Upward / Downward—
54.0	PAINT SHADE	

Vendor's signature and seal

Rev No:

Date:

The following curves are to be enclosed during datasheet approval.

1. GA drawing , Terminal box arrangement
2. Torque Vs Speed with load curve superimposed.
3. Speed Vs Current
4. Time Vs Current
5. Thermal with stand curve
6. Load Vs Efficiency
7. Load Vs Slip
8. Load Vs Power factor
9. Speed Vs Time
10. Load Vs Current.

The following information shall be specifically provided for motors suitable for VFD drive (if called for in enquiry during datasheet approval in addition to datasheet.

1. Stator RESISTANCE
2. Stator leakage reactance
3. Magnetising reactance
4. Rotor resistance referred to stator
5. Rotor reactance referred to stator

Vendor's signature and seal.

Date:

Electrical features for LT Motor:

1. Motors shall be designed as 3 phase squirrel cage motors suitable for direct online starting.
2. Motor rating shall be at least 110 % of the maximum electric power consumption of the driven machine.
3. Continuous delivery of rated power at voltages of 90 – 110 % of the rated voltage and allowable frequency range within the limits of thermal class F.
4. Motor starting current must not exceed 7.0 times rated current.
5. Anti condensing heating shall be considered for motors above 55 kw.

Construction:

1. Motor parts made of iron internally and externally shall be sandblasted and surface protected.
2. Paint finish shall be resistant to chemicals and seawater.
3. Bolts shall be with adequate corrosion protection.
4. All joint faces and gaps shall be sealed.
5. Special treatment of windings with resin impregnation plus immersion in varnish
6. Varnish – insulated laminations
7. Design and construction of the motors shall comply with IEC 60034-1, 60034-5 or VDE 0530 and DIN 40050.

PROJECT: MAITREE STPP(2 X 660MW)) CONTRACTOR: BHEL - RANIPET CONTRACT NO: BIFPCL/EPC-MAIN PLANT/NOA/2016/215		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTOR MAITREE STPP(2 X 660MW)) EPC PACKAGE (BHEL CUST No: R 676, R677 & R4N2)	DOC.NO: BAP/QR/ R 676, R677 & R4N2 LTM007 Rev NO.: 02 PAGE : Page 1 of 2 DATE : 02 12 2017	##Enquiry No: ##Supplier Name: ##Offer reference: ##Date:
Sl. NO.	DESCRIPTION	BHEL/BIFPCL/FITCHNER Requirements		## Specific confirmations by the vendor

ITEM: LT Motor

01	Type Test Requirements	1. Vendor shall submit the type test reports of all the type tests as listed in SL NO:4 and carried out with in 5 years from the data of BIFPCL bid opening (22.09.2015). These reports should be for the test conducted on the similar motor to those proposed to be supplied under this enquiry and test(s) should have been either conducted at an independent laboratory (or) should have been witnessed by TPI/BHEL/BIFPCL/FITCHNER	
		2. However, if vendor is not able to submit the similar type test report as per above condition (or) in the case of type test reports are not found to be meeting the specification requirement, the vendor shall conduct all the tests at no additional cost to BHEL/BIFPCL/FITCHNER either at third party lab (or) own lab in the presence of TPI/BHEL/ BIFPCL/FITCHNER and submit the reports for approval.	
		3. Type Test reports review and approval by BHEL/BIFPCL/FITCHNER is a must.	
		4. Type tests (each motor type) shall be in line with IEC 60034 and following Type tests are to be ensured. <u>Type tests</u> - Dimensions measurements as per approved Drawing. - Measurement of resistance of winding of stator. - No load test to determine input current, Power and speed. - Reduced Voltage running up test at no load (Up to 37 KW) - Locked rotor readings Voltage, Current, Power input at torque at suitable reduced voltage. - Full load test to determine the efficiency, Power factor and slip. - Temperature rise test. - Momentary over load test. - Insulation resistance test. - High voltage test. - Test for vibration severity of Motor. - Test for Noise level of Motor. - Degree of Protection (IP 55). - Over speed test for Motor.	
		5. The type Test reports shall also be given as PDF file with index sheet & page control through Email (The attached File size is to be lesser than 6MB due to E'mail server limitation).	

PROJECT: MAITREE STPP(2 X 660MW)) CONTRACTOR: BHEL - RANIPET CONTRACT NO: BIFPCL/EPC-MAIN PLANT/NOA/2016/215		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTOR MAITREE STPP(2 X 660MW)) EPC PACKAGE (BHEL CUST No: R 676, R677 & R4N2)	DOC.NO: BAP/QR/ R 676, R677 & R4N2 LTM007 Rev NO.: 02 PAGE : Page 2 of 2 DATE : 02 12 2017	##Enquiry No: ##Supplier Name: ##Offer reference: ##Date:
Sl. NO.	DESCRIPTION	BHEL/BIFPCL/FITCHNER Requirements		## Specific confirmations by the vendor
ITEM: LT Motor				
02	Quality Plan Requirements	1. Being an export order, <i>MQP shall be submitted by the vendor in Customer/BIFPCL MQP format only (Copy attached)</i> in line with specifications/approved data sheet/Drgs meeting various international standards / codes for BHEL/BIFPCL/Fichtner for <i>review and approval</i>. 2. All routine tests Including oscillographic measurement for starting current, , over speed and Vibration test shall be clearly indicated in MQP and <i>reference standard</i> shall be relevant IEC. This is in addition to reference documents of Specification, approved drawings and Data sheet. 3. During review and approval of MQP, in case BIFCL/Fitchner raises any clarification/Query on MQP, Vendor shall agree to visit BIFPCL/Consultant office for finalization and approval of MQP. 4. Submission of all Internal inspection report for BHEL/Third party Inspector review before undertaking inspection. 5. BHEL/Third party inspection agency (TPI) and Customer/BIFPCL inspection is applicable at vendor works 6. Inspection clearance for dispatch is to be obtained from BHEL Quality department prior to dispatch of Motors.		
		Specific confirmation for Document Package in the event of an order (2 hard copies + 2 CDs in Pdf file) is to be given containing the following with proper linkages (.) a. Index Sheet b. Approved MQP c. Final Inspection Report issued by BHEL/TPI d. Compliance certificate/report for any Nonconformance or observation made by BHEL/TPI agencies during inspection at vendor works. e. Test certificates/internal reports for Verification portion as given in MQP. f. Approved Data sheet, Spec & Drg g. BHEL Inspection clearance for dispatch. h. BOM with actual make used with customer approved drgs.		
03	Painting Requirements	1) Surface preparation: SA 2.5 2) Thickness of painting for Outdoor Application Motors: Zinc-Epoxy primer, 1 Coat, DFT 80 µm. Intermediate 1 coat of Epoxy high solid, DFT 110 µm. Finish 1 coat, 2-Comp.Polyurethane, DFT 50 µm. Total thickness = 240 µm. 3) Colour shade: Shall be as per BHEL/BIFPCL/FICHTNER approved specifications, Drgs and Data sheet.		
04	Packing	Sea Worthy Packing shall be ensured as per Sea Worthy Packing specification No.PE-TS-888-100-A001 which is referred in Enquiry Specifications/ Drgs and Data sheet.		
05	Important Note	No Chinese Material are to be used in this Items/Assy of export contract		

Supplier signature with seal

Necessarily to be filled up by the vendor at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirements being customer specific requirements and also being an EXPORT ORDER.

2.0 FRP JUNCTION BOX

1.0 SCOPE OF SUPPLY:

The scope of supply of Junction box includes manufacturing, inspection, testing, packing and delivery of junction Boxes (FRP) as per this specification and attached drawings.

2.0 APPLICATION:

The junction boxes are used in power station to interconnect various field-mounted electrical equipment's pertaining to boiler auxiliaries.

3.0 APPLICABLE STANDARDS:

The Junction boxes shall be manufactured and tested as per the following standards.

IEC 60947-1&2, 7-1 - Low voltage Switchgear and Control Gear specification.

IEC 60227-1&2 - PVC insulated Cables for working voltages up to and including 1100 specification

4.0 SITE CONDITIONS:

- | | | | |
|-----|-----------------------|---|--|
| 4.1 | Ambient temperature | : | 1 Deg.C to 50 Deg.C |
| 4.2 | Relative humidity | : | 100% RH |
| 4.3 | Atmospheric condition | : | Highly dusty, abrasive and polluted, conducive to fungus growth, climate is tropical. Environment is as prevalent in a coal fired thermal power station. |
| 4.4 | Design temperature | : | 50 Deg.C |
| 4.5 | Location | : | Out door |

5.0 GENERAL REQUIREMENTS:

- | | | | |
|-----|------------------------------------|---|---|
| 5.1 | Enclosure material & gland plate | : | 4 mm FRP sheet steel |
| 5.2 | Enclosure protection | : | IP 65 as per IEC 60529 |
| 5.3 | Terminal block type & arrangement | : | ELMEX or equivalent type of BHEL approved make mounted on DIN rail. |
| 5.4 | Terminal block insulating material | : | Melamine |
| 5.5 | Terminal block voltage grade | : | 650 V (Minimum) |

- 5.6 Door Gasketing : Neoprene gasket 6 mm thick of shore hardness 20 to 30 & density 0.4 gm/cc shall be provided on all mating surfaces.
- 5.7 Door Opening : Removable door
- 5.8 Lug type : Annealed tinned solder less crimping type copper lugs shall be provided for all the terminals on both sides. Lug type shall be as mentioned in attached drawing.
- 5.9 Cable Gland type : Nickel chromium plated Brass Double Compression type cable glands fixed on the gland plate, with dummy plugs.
- 5.10 Number of earthing terminals : Two as per attached drawing.
- 5.11 Location of earthing symbol : Just above the earthing terminal. Symbol to be black lines on yellow background.
- 5.12 Rated voltage grade of junction box : 415V
- 5.13 Mounting fasteners : 4 sets of chromium plated bolts, nuts and spring washers for mounting the JB shall be supplied.
- 5.14 Suitable DIN rails along with clamps and screws shall be provided for terminal block mounting. All terminals are to be numbered serially by suitable identification label of PVC material in white background with black numbers. Terminal blocks shall be fixed to TB supporting DIN rail by means of suitable end plates with screws.
- 5.15 Stickers have to be fixed over the cable glands to indicate the cable size.
- 5.16 Non rusting name plate of 2 ply lamicoid in white colour with the following inscription in black letters shall be fixed to the name plate mounting bracket on top of the junction box with plated screws.

EP JUNCTION BOX (POWER) VAR*
BHEL/BAP/RANIPET

* - As applicable in the enquiry drawing

The name plate indicating the name of the supplier shall be provided on the door. name plate shall contain vendor details like year of manufacture, weight of the job, BHEL PO number & date.

- 5.17 The un -toleranced dimensions shall be as per IS 2102.

- 5.18 For cable glands, lugs & TBs, the type reference indicated in above table is that of a particular manufacturer. Equivalent type of cable glands, lugs & TBs of other BHEL approved makes given in this specification can also be used.
- 5.19 Terminal block to supplied and mounted by vendor. Terminal block shall be of NTPC approved make and rating as recommended in the table. Terminal blocks are to be mounted horizontally. Suitable din rail/base for mounting terminal shall be provided. All terminals are to be identified by suitable identified label. The strip shall be of PVC white background with black letters.
- 5.20 Bolts and nuts required for mounting the junction boxes and fitting are to be electro galvanised and supplied by the vendor.
- 5.21 Internal looping shall be made with 1100v grade PVC insulated stranded copper conductor cable and termination with crimping type annealed tinned copper lugs of dowels make.
- 5.22 Earthing bolts and nuts with rose Courtney washer shall be provided at opposite points on outside of the junction box body with earth symbol made of aluminium.
- 5.23 For external cable termination, two numbers in as shall be fitted and supplied in each terminal. The TB shall be suitable for terminating two in a single block for both incoming and outgoing cables.

6.0 MAKE OF COMPONENTS

- | | | | |
|-----|-------------------|---|---|
| 6.1 | Terminal block | : | ELMEX |
| 6.2 | Crimping type lug | : | DOWELL |
| 6.3 | Cable glands | : | COMET / BRACCO / ARUP ENGG. / QPIE/ SUNIL & Co. |
| 6.4 | PVC wires | : | IEC STANDARD/CERTIFIED MAKES |

7.0 PACKING

Packing shall be as per relevant clause of product packing specification PE: TS: 888:100:A001 (Sea worthy packing)

8.0 DRAWING

Manufacturing drawings prepared in AUTO CAD shall be submitted in SOFT MEDIA in addition to **4 sets of** hard copies for approval by BHEL, (prior to start of manufacture) within 10 days from the date of purchase order.

3.0 LOCAL CONTROL SPECIFICATION

1.0 SCOPE OF SUPPLY

- 1.1 The following equipment shall be furnished with all accessories:
 - (a) Complete set of Local control panels: as required.
 - (b) Local push button stations: as required.
- 1.2 Furnishing, mounting, and wiring of all equipments, devices and accessories.
- 1.3 Floor channel sill, vibration damping pad, and kick plates for all floor- mounted control boards/panels, complete with holding down bolts and nuts.
- 1.4 Mounting hardware for all control panels and local push button stations.

2.0 CODES AND STANDARDS

- 2.1 All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable IEC Standards where modified and/or supplemented by this specification.
- 2.2 Equipment and material conforming to any other standards, which ensure equal or better quality, may be accepted. In such case, copies of the English version of the standard adopted shall be submitted along with the bid.

3.0 CONSTRUCTION

Local control panel

- (a) Local Control Boards may consist of a number of vertical panels mounted side by side, in which case, they shall be bolted together to form a compact unit. Where two panels meet, the joints shall be smooth, close fitting, and unobtrusive.
 - (b) The control panels shall be totally enclosed type, conforming to degree of protection IP-54 or better.
 - (c) Generally, the local control panels shall be free-standing, floor-mounted, dead-front assemblies.
 - (d) Floor- mounted control panels shall be assembled on channel/angle base plates with anti-vibration mountings and stainless steel kickplates.
 - (e) Control panels shall be of folded sheet steel construction, minimum 2 mm thick, and free from all surface defects.
The panels shall have sufficient structural reinforcement to ensure a plane surface, to limit vibration, and to provide rigidity during shipment and installation.
 - (f) All floor mounted panels shall have rear door.
 - (g) Doors shall have concealed type hinges and padlocking arrangement. Doors shall be grounded by flexible copper braid.
 - (h) All doors and removable covers shall be provided with neoprene rubber gaskets all round and latches sufficiently strong to hold them in alignment when closed.
 - (i) Working height of the panels shall be limited between 750 mm and 1800 mm above floor level.
 - (j) Local control panel shall be provided with two (2) nos. control transformer for control supply (1*100% standby)
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CONTROL CUBICLE DATA	
Panel Type	Free standing vertical type
Construction	WELDED
Material	CRCA Sheet Enclosure: 2mm Door:2mm Mounting Plate: 3mm Gasket: Neoprene
Cable entry	From Bottom through Removal Gland plate
Standard	IEC 62271 PART 200
Protection	IP54
Type of Paint	Powder coated
Paint shade	As per Painting Specification
Bus Bar	Copper

Following minimum requirements shall be taken care for Local control panel.

- Local control cabinets with plastic casings resistant to impact, sand, light of water, mounted on wall or hot dip galvanized supporting constructions. Hot dip galvanized casings shall also be acceptable.
- Necessary earthing terminals must be provided for earthing proposes.
- The cabinet must be equipped with the necessary mini circuit breakers, fuses, auxiliary relays, power contactors, T.B & cable attachment components.

Following controls shall be provided as minimum.

- ON button
- OFF button
- Running lamp
- Fault lamp
- Trip healthy indication
- Lamp test
- When 2 motors are installed, serving as operation & stand by unit, then in addition to a double set of the above items, the following empty has to be installed as the minimum requirement.
- Motor 1- motor-2 (running/standby) pre-selection switch.
- Automatic transfer to the standby motor in case of failure of the running motor.
- Attached Power and control scheme (3 –FW-000-00467) shall be followed as minimum.
- Additional requirements if any for satisfactory operation shall be provided by the vendor

4.0 LIGHTING, SPACE HEATING AND RECEPTACLES

- a) Each panel shall be provided with interior fluorescent tube with door switch, space

heater with thermostat and 5A, 3-pin receptacle with plug. Third pin of the socket shall be effectively grounded through the metallic structure.

- b) Tube, heater and receptacle circuits shall be suitable for available A.C. supply and furnished with individual ON-OFF switch.
- c) The lamp shall be located at the ceiling and guarded with protective cage. Space heater shall be located near the floor so as not to pose any hazard to service personnel.

5.0 GROUNDING

- a) 50 x 6 mm G.S. ground bus shall be provided in each control panel extending along the entire length of the assembly.
- b) The ground bus shall have two-bolt drilling with G.S. bolts and nuts at each end and shall be suitable for connection to 50 x 6 mm G.S. flat.
- c) The ground bus shall be bolted to the panel structures and shall effectively ground the entire assembly. The cases of meters, relays and switching devices shall be grounded through the steel structure.
- d) Whenever a circuit is grounded, a single wire from the circuit shall be run independently to the ground bus and connected to it.

6.0 PUSH BUTTON

- a) All push buttons shall be oil tight, heavy duty, push to actuate type, with coloured button and inscription plate marked with its function. The colour of "ON" and "OFF" push buttons shall be RED and GREEN respectively. RESET push buttons shall be coloured black.
 - b) Each push button shall have minimum 2 NO + 2NC contacts, rated 10A at 240V AC and 2A at 220V DC.
 - c) Push buttons shall be shrouded type except for emergency trip button, which shall be mushroom type for easy identification.
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