

# **Kolkata Metro Rail Corporation Limited**

## **EAST WEST CORRIDOR PROJECT SAFETY HEALTH AND ENVIRONMENTAL MANUAL**

### **PART - 1**

#### **Policy and Procedures**

**Part 1 – Safety and Health**

**Part 2 – Environmental and Health**

**(August 2009)**

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## **1.0 STATEMENT OF INTENT**

It is the intention of the Kolkata Metro Rail Corporation to build the East West Corridor for Kolkata in a way that will further raise the standards of health and safety on construction sites to a level that will be recognised as the best in India and comparable to the highest standards achieved worldwide.

This can only be achieved if there is a commitment from all parties involved in the construction and management of the Project, from the most senior level of managers within the KMRC and the Contractors, to the workers on the sites.

This document shall have the full support of all of the KMRC Project Team and any officer failing to give support to it shall be subject to internal discipline.

The Kolkata Metro Rail Corporation shall actively support the efforts and initiatives that are instigated by the Contractors and sub-contractors in their efforts for achieving high standards of health and safety on the Project.

The ingredients that are needed to make and achieve a high standard of health and safety, are well known to most of us, it is however the level of commitment that is demonstrated that shall determine whether or not we succeed.

This manual represents the minimum standards that the Kolkata Metro Rail Corporation will accept on matters of Safety and Health. The Corporation will use its best endeavours to ensure that all of the Contractors employed on the Project achieve these Standards

(Sumantra Choudhury)  
Managing Director/KMRC

## **2.0 REFERENCES AND DISTRIBUTION OF THIS MANUAL**

### **2.0 References**

2.1.1 The procedures in this manual should be read in conjunction with;

- (a) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996.
- (b) The Factories Act, 1948
- (c) Other Laws of India, Regulations, Rules and Codes of Practice on Safety Health and the Environment that may be applicable.
- (d) The Conditions of Contract in respect of Health and Safety, that apply to the specific Contract under which the Contractor is employed.
- (e) The important Indian Standards and British Standards as applicable to the work of this contract.

### **2.1 Distribution of this Manual**

2.2.1 Copies of this Health and Safety Manual are distributed to all Tenderers for Contracts where this has been shown as a referenced document for the Conditions of Contract, Safety Health and Environment. It will also be issued to all appropriate staff of KMRC and all other persons who have need of it.

### 3.0 DEFINITION OF TERMS

#### 3.1 Introduction

3.1.1 The following terms used in this manual are defined as follows and shall be construed accordingly.

- (a) **Safety** means the freedom from unacceptable risks of personal harm, i.e. the avoidance of accidents and incidents.
- (b) **Health** means the physical wellbeing of a person and the freedom from any illness caused working conditions.
- (c) **Hazard** means a situation with the potential to cause harm including human injury, damage to property, plant or equipment, damage to the environment, or economic loss.
- (d) **Risk** means the chance of something adverse happening and its severity. It is a combination of the probability, or frequency, of the occurrence of a defined hazard and the magnitude of the consequences of the occurrence.
- (e) **Foreseeable** means that which is likely or possible.
- (f) **Chief Safety Officer** means an officer nominated by KMRC as Chief Safety Officer
- (g) **Site Safety Plan** means the contract specific safety plan that the Contractor has produced from his Outline Safety Plan.
- (h) **Outline Safety Plan** means the contract specific outline safety plan that the Contractor will prepare as part of his tender submission.
- (i) **Reportable Accident / Incident** means an Accident or Incident that is reportable to the Employer's Representative. It shall include all fatalities, major injury accidents, dangerous occurrences and all accidents, which result in incapacity for more than Forty Eight hours or more immediately following the accident.
- (j) **Major Injury Accident** is defined as:
  - (1) any fracture, other than to the fingers or toes;
  - (2) any loss of a limb or part of a limb;
  - (3) dislocation of the shoulder, hip, knee or spine;
  - (4) loss of sight (whether temporary or permanent);
  - (5) penetrating injury to the eye; or
  - (6) any other injury that:
    - leads to unconsciousness
    - requires resuscitation;
    - requires admittance to hospital for more than 24 hours;
    - or which causes more than 10 days absence from work.

- (i) **Dangerous Occurrence** is defined as:
- (1) collapse or failure of lifting appliances or hoist or conveyors or other similar ;
  - (2) collapse or failure of a crane, derrick, winch, hoist or other appliance used in raising or lowering persons or goods or any part thereof (except the breakage of chain or rope slings), or the overturning of a crane;
  - (3) explosion or fire causing damage to the structure of any room or place in which persons are employed, or to any machine or plant, resulting in the complete suspension of ordinary work;
  - (4) electrical short circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire, causing structural damage involving its stoppage or disuse;
  - (5) explosion of a receiver or container used for the storage at a pressure greater than atmospheric pressure of any gas or gases (including air) or any liquid or solid resulting from the compression of gas;
  - (6) collapse in whole or part from any cause whatsoever of any roof, wall, floor, structure or foundation forming part of the construction site in which persons are employed;
  - (7) total or partial collapse of any overburden, face, tip or embankment on the construction site;
  - (8) the overturning of, or collision with any object by any bulldozer, dumper, excavator, grader, lorry or shovel loader, or any mobile machine used for the handling of any substance on the construction site.

## **4.0 GENERAL**

### **4.1 Introduction**

- 4.1.1 It is the objective of the KMRC to ensure that the Contract is completed on time, within budget, and to conforming standards of Health and Safety.
- 4.1.2 This manual has system wide application, and therefore not all of the sections will apply to all Contractors. Each Contractor shall develop his own contract specific Site Safety Plan, which will represent his approach to the management of safety on his work, sites under the Contract with KMRC.
- 4.1.3 It is the intention of KMRC to levy fines against contractors who do not comply with the requirements of this Manual. The fines levied will be donated to the KMRC Welfare Fund to assist those who have suffered as a result of this Project. The level of fines to be levied will set out in the General Conditions of Contract.

### **4.2 Purpose of the Manual**

- 4.2.1 This manual has been produced in order to outline the minimum health and safety, standards that shall be required by KMRC during the second phase of construction of the East West corridor of Kolkata. Furthermore the manual has been developed to give guidance and assistance to the respective Contractors in the development and production of their Site Safety Plans, to satisfy the required health and safety standards established by the Contract Conditions and the Employer's Requirements. This manual represents the minimum standards required and each Contractor is encouraged to expand and improve upon it.
- 4.2.2 This manual is not intended to replace existing standards that are currently in force in India. However, it is intended to support the standards and to highlight to Contractors the areas of concern that shall be addressed in their respective Site Safety Plans in order to establish good health and safety practices.
- 4.2.3 This document is intended to supplement the Section on Safety Measures as is contained in the Employers Requirements
- 4.2.4 The obligations and requirements for Health and Safety set out within this document are entirely without prejudice and do not derogate from the Contractor's obligations with respect to the Contract and his statutory obligations with respect to Health and Safety.

### **4.3 Scope of the Manual**

- 4.3.1 The Contractor is fully responsible for the safety of the Works, his personnel, subcontractors' personnel, the public and all persons directly or indirectly associated with the Works or on or in the vicinity of the Site.
- 4.3.2 This manual provides relevant information and procedures to assist the Contractor to ensure that his employees and sub contractors work within a safety-conscious and safety-regulated environment. Compliance with the procedures set out in this manual shall not relieve the Contractor of any of his Statutory Duties or his responsibilities under the Contract.

#### **4.4 Policy Objectives**

- 4.4.1 Every Contract should aim at zero fatal accidents.
- 4.4.2 Every Contract should aim at zero dangerous occurrences (see section 3.1.1.(i) for the definition of 'dangerous occurrence').
- 4.4.3 Every Contract should aim at an Accident Frequency Rate ( AFR ) of less than 0.5 per 100,000 hours worked on the Contract.

#### **4.5 Implementation of Policy Objectives**

- 4.5.1 The following general approach has been adopted by KMRC with a view to achieving the policy objectives set out above
  - (a) Secure a commitment to safe and healthy working practices by all parties involved in the construction process, including consultants, Contractors, sub-contractors, workers' unions, and utility providers.
  - (b) Develop contract provisions that require Contractors to prepare, implement and monitor safety plans, and ensure that sub-contractors are also obliged to comply with the same. (Copies of the provisions relating to Health and Safety are contained in the Conditions of Contract).
  - (c) Arrange accident prevention, safety management training for all site staff supervising Contracts.
  - (d) Establish Site Safety Management Committees to monitor the implementation of safety plans and keep a record of the Meetings of the Committees.
  - (e) Build up a database of accidents and dangerous occurrences, as defined in Section 9 of this manual, for the purpose of monitoring trends, analysing data, and formulating measures for accident prevention.
  - (f) Publish this Manual to assist in the administration of construction safety matters of the Employer's contracts.
  - (g) Oversee the safety performance of the Contractors and sub-contractors to ensure that their duties and responsibilities on health and safety under the Contract, this Manual, and other relevant Employer and Government requirements are fully discharged.
  - (h) To publish and issue any further instruction / appendices needed for any specific requirement of the Contract

#### **4.6 Responsibility for the Manual**

- 4.6.1 The Directors Electrical and Projects are responsible for ensuring that the contents of this Manual continue to meet the requirements of the KMRC and that they are implemented rigorously.

## **5.0 GENERAL DUTIES OF CONTRACTORS AND OTHERS**

### **5.1 Introduction**

- 5.1.1 Securing safe, healthy places of work requires the full co-operation of Contractors and sub-contractors and the persons employed by them. It is imperative that there is no ambiguity with regard to the responsibilities of any individuals in connection with duties relating to health and safety.
- 5.1.2 The responsibilities shall be clearly detailed in the Site Safety Plan from the level of the most Senior Manager downwards, these duties shall be explained to the individuals concerned in order to ensure that they clearly and concisely understand them.
- 5.1.3 Responsibilities for safety, health and the environment shall be allocated amongst others to the following personnel of the contractors and sub-contractors:
- (a) CEO / Managing Director:
  - (b): Project Manager:
  - (b) Site Agent/Manager:
  - (c) Engineers:
  - (d) Safety Officer:
  - (e) Supervisors:
  - (f) General Workers

### **5.2 General Duties of Persons Employed**

- 5.2.1 Every person employed by Contractors and sub-contractors on construction sites are obliged to comply with the general duties imposed on them under the Contract. Every person employed should, not only avoid careless or reckless behaviour, but should also take positive steps to understand workplace hazards. They must follow all necessary safety and environment rules and procedures, and ensure that their acts or omissions at work do not put the health and safety of self or others at risk.

### **5.3 Contractors and Sub-contractors: Responsibilities**

- 5.3.1 Contractors and sub-contractors are responsible for complying with all statutory and contractual requirements on construction safety, health and environment including the general duties imposed on them under the Laws and Regulations of the Government of India, Government of West Bengal State.
- 5.3.2 The KMRC shall only deal with health and safety matters through the Contractor and shall hold the Contractor responsible for all his, and his Sub-contractors, actions. All Sub-contractors shall be responsible to the Contractor.

- 5.3.3 Not Used.
- 5.3.4 All Contractors and Sub-contractors shall ensure that an adequate level of competent supervision is maintained at the workplace at all times with all supervisory staff having the relevant knowledge, training, and experience to enable them to supervise the work in a proper manner.
- 5.3.5 Contractors shall ensure that all sub-contractors are able to demonstrate a successful track record with regard to the management of health and safety. The type of information that shall be requested from the sub-contractors during the tendering process in order to determine their suitability shall include amongst other things the following information relating to their activities over the last five years
  - (a) Fatal accidents
  - (b) Major lost time accidents
  - (c) Accidents involving members of the public
  - (d) Dangerous Occurrences
- 5.3.6 Contractors and sub-contractors are responsible for submitting written statements on their policies relating to construction safety within fourteen days of a requirement to do so by KMRC.
- 5.3.7 Contractors and sub-contractors are responsible for providing comprehensive safety and environment plans for the review by KMRC, and for subsequent implementation of the measures detailed in the safety and environment plans.
- 5.3.8 Contractors and sub-contractors are responsible for the provision of suitably trained and qualified safety staff to carry out regular safety inspections, safety promotion, and safety audits and for retention of records of all such activities for inspection by KMRC.
- 5.3.9 Contractors and sub-contractors are responsible for providing safety and environment training to all workers and supervisors on site, and for retention of records of such activities for inspection by the KMRC.
- 5.3.10 Contractors and sub-contractors are responsible for organising site safety committees which shall meet at least monthly.
- 5.3.11 Contractors and sub-contractors are responsible for reporting dangerous occurrences and accidents to the Employers Representative by the quickest practicable means.

#### **5.4 Discipline**

- 5.4.1 Any major breaches of the Site Safety Plan, relevant Statutory Provisions and Safety Codes, or any other blatant disregard for the health and safety by any person directly or indirectly associated with the works may result in the KMRC exercising their authority in requiring the removal from the Site of the Contractor's Site Manager and/or other personnel.

- 5.4.2 The Contractors shall develop a system of disciplinary measures and procedures, which shall be implemented immediately that the site activities commence. These measures and procedures should include amongst other things:
- (a) The issue of Warning Notices.
  - (b) The removal from site of personnel who disregard safety instructions.
- 5.4.3 Any person who is removed from the site for breach of safety measures shall not be allowed to be re-employed on any other KMRC worksite.

## 6.0 SAFETY TRAINING AND SAFETY PROMOTION

### 6.1 Safety Training

- 6.1.1 Safety Training is an important factor in managing safety on construction sites. All contractors shall provide as a minimum the following types of training:
- 6.1.2 **Induction Training** shall be given to all persons prior to permitting them to go to the worksite. The workers ID Card should not be issued until this training has been given. This training should include at least the following:
- (a) General safety awareness
  - (b) First aid
  - (c) Emergency procedures
  - (d) Use of personal protective equipment
  - (e) Specific site hazards
- 6.1.3 **Refresher Training** shall be conducted at least every three months to ensure that all workers on site are kept up to date with safety requirements on site.
- 6.1.4 **Specific Training** shall be provided to persons with safety related tasks, such as Crane Operators, Banksmen, Slings and Plant Operators etc.
- 6.1.5 **Toolbox Talks** shall be conducted so that every worker on site receives at least two toolbox talks every week. These talks should be designed to highlight relevant safety and industrial health issues to the workforce on a regular basis in order to raise their level of awareness. These should be prepared so that they can be presented by the Site Supervisors. Examples of Toolbox Talks are given in Schedule 2 of this Manual.
- 6.1.6 All training that is carried out shall be formally recorded on dated and signed attendance records, with copies of the records being kept on the sites for inspection by the Employer's Representative. Details of the respective training course programmes shall be produced, on demand or as per intervals prescribed, which include the following information:
- (a) Course Title.
  - (b) Course Duration.
  - (c) Course Content.
  - (d) Target Audience.
  - (e) Actual Audience with record of attendance. ( Use form SAF 031 )
- 6.1.7 The Contractor shall keep detailed records of all training undertaken, and shall keep such records available for inspection by the Employer's Representative.

### 6.2 Safety Promotion

- 6.2.1 The Contractors at each of their sites in the interests of promoting safety awareness amongst the workforce shall devise and implement practical Safety Promotion schemes. The objective of these schemes should be to recognise and reward individuals who continually endeavour to work in a safe manner.
- 6.2.2 Suggestions for such promotions may include such items as the issue of the following as rewards to

individuals for good safety performance:

- (a) Key Rings.
- (b) T-Shirts
- (c) Holdall Bags

6.2.3 Other safety award and safety incentive schemes should be considered

6.2.4 Regular Safety and Industrial Health Poster Campaigns / Billboards / Banners / Glowsigns should be devised, with posters displaying safety and industrial health related issues being displayed around the worksites as part of the effort to raise Safety Awareness amongst the workforce. Posters should be in Hindi, English and other suitable language deemed appropriate. Posters / Billboards / Banners / Glowsigns should be changed at least once a month to maintain their impact.

## **7.0 SAFETY INSPECTIONS AND FOLLOW UP ACTION**

### **7.1 Inspections by Contractor's Safety Supervisory Staff**

- 7.1.1 The Contractor's Project Manager and supervisory staff are required to carry out weekly site safety inspections and prepare reports of such inspections. Copies of the completed inspection reports shall be kept on site and available for inspection by the Employer's Representative.
- 7.1.2 The frequency of the inspections shall be determined by site activities and general conditions. However the inspections should be conducted at a minimum of once a week. Where high-risk activities are being carried out inspections should be carried at least once daily.
- 7.1.3 The inspection reports should be discussed with the relevant Site Managers. These shall also be discussed with the sub-contractors and other levels of site management in the Site Safety Meetings as detailed in Section 8 of this Manual.
- 7.1.4 For each Contract the Contractor shall prepare a comprehensive safety inspection checklist, as a requirement of the Safety Plan. This check-list can then be used for:
  - (a) inspections by the Contractor's Safety Officers;
  - (b) monitoring of the Contractors' safety inspections by the Site Safety Management Committee.
- 7.1.5 The Employer's Representative Staff may carry out site safety inspections, which shall be attended by the Contractors' Site Manager and Safety Manager.
- 7.1.6 In relation to Works Contracts, the insurers providing insurance cover for Contractor's All Risks and Third Party liability may visit the sites with a view to checking whether the Contractors have taken adequate safety precautions against damage to the works.

### **7.2 Follow up actions**

- 7.2.1 Remedial action to rectify any deficiency identified or unsafe practices discovered during the safety inspections should be implemented immediately. Until the remedial action is taken the task may be discontinued.
- 7.2.2 In cases where the Employer's Representative believe that the Contractor's or sub-contractors' workmen are using unsafe working methods, the Contractor's Representative should be informed by them as soon as possible. If the unsafe activity continues, it shall be reported to the Employer's Chief Safety Officer.
- 7.2.3 If the Contractor's working method is deemed so unsafe as to represent a risk to life, the Employer's Representative may require specific actions by the Contractor, such as proposals on preventive/remedial measures, or suspension of relevant portions of the works, and introduction of measures deemed necessary. All such instructions shall be confirmed in writing and shall include a proviso that the issue of the instruction shall not relieve the Contractor of his responsibilities under the Contract or Statutory obligations. The Employer's Representative may also invoke a fine on the Contractor in accordance with Section 4.1.3.

## **8.0 CONTACTOR’S SITE SAFETY COMMITTEES**

### **8.1 General**

8.1.1 All employees should be able to participate in the making and monitoring of arrangements for safety and health at their place of work. The establishment of site safety committees in which employees and Contractor and sub-contractor management are represented can increase the involvement and commitment of employees. The Contractor shall set up such site safety committees to promote and monitor safety and health on their worksites. A copy of the agenda shall be forwarded to the Employer’s Representative seven days prior to the meeting date, in order that they can decide if it is necessary for them to attend.

### **8.2 Composition and Functions of Contractor’s Safety Committees**

8.2.1 The Contractor should form a safety committee for each contract, however should the situation require more than one committee, or the Employer’s Representative so requires, additional committees shall be created.

8.2.2 The Terms of Reference for the committee should be as follows;

- (a) to monitor the adequacy of the Contractor's Site Safety Plan and ensure its implementation;
- (b) to monitor safety inspection reports;
- (c) to study accident and incident reports;
- (d) to study accident statistics and trends so as to identify unsafe practices and conditions;
- (e) to review the emergency and rescue procedures;
- (f) to review site safety training;
- (g) to promote safety and industrial health on site;
- (h) to discuss the Contractor's monthly safety report;
- (i) to take follow up actions on minutes of meeting.

8.2.3 The Membership of the committee should be as follows;

Chairman:	The Contractor’s most Senior Manager for the Contract.
Secretary:	The Contractor’s Safety Officer
Members:	Contractor's and Sub-contractors management representatives and safety staff.

In attendance as and when they wish,

Representatives of the Employer and the Employer’s Representative

8.2.3 Meetings should be held at least once every month

8.2.4 Minutes of the Site Safety Committee shall be sent to all members within two working days of the meeting. Copies of the minutes should be displayed on notice boards so that employees are kept informed of the Site Safety Committee's activities and decisions.

## **9.0 REPORTING OF ACCIDENTS AND DANGEROUS OCCURRENCES**

### **9.1 Contractors Responsibility**

- 9.1.1 All accidents and dangerous occurrences shall be recorded, regardless of whether or not personnel injury occurs.
- 9.1.2 The Employer and the Employer's Representative shall be notified by the quickest possible means, for example by telephone of the following classifications of accidents and incidents and by subsequent written notification within twenty four hours on the Contractors Accident and Incident Reporting Form (for example of form see Schedule 3) :
- (a) Fatal Accident
  - (b) Major Injury Accident ( see definition in 3.1.1 )
  - (c) Dangerous Occurrence ( see definition in 3.1.1 )
  - (d) Any Incident Involving A Member Of The Public
- 9.1.3 The Site Safety Officer shall conduct in depth investigations into all fatal accidents, major injury accidents, incidents involving a member of the public, dangerous occurrences, and selected over three-day lost time injury accidents. Copies of these investigations shall be forwarded to the Employer's Representative within seven days of the incident.
- 9.1.4 The Contractor shall report immediately, orally and in writing, all fatal accidents, and other occurrences requiring reporting, to the police, at the police station in whose jurisdiction the accident occurred.

### **9.2 Reportable Accidents**

- 9.2.1 An accident shall also become reportable to the Employer's Representative if it causes incapacity for more than three days excluding the day of the accident. The Contractor must submit a report on form SAF 001 to the Employer's Representative within seven days of the incident.
- 9.2.2 The following information is required in reporting an accident to the Employer's Representative.
- (a) particulars of the Contractor or Sub-contractor employing the injured person;
  - (b) particulars of the deceased or injured person: name, address, occupation, sex, and age;
  - (c) the date, cause or circumstances of the accident; and
  - (d) the nature of the injury, stating whether death or incapacity was caused by the injury.

### **9.3 Dangerous Occurrences**

- 9.3.1 The Employer's Representative requires that all dangerous occurrences on site must be reported in writing to him within 24 hours, irrespective of whether there are casualties or not. The following information has to be provided:
- (a) the time of the occurrence;
  - (b) damage to any building, machinery or plant; and
  - (c) the circumstances in which the accident occurred.

A copy of the standard 'Dangerous Occurrence Report form' SAF 001(as attached to this Manual) may be used.

- 9.3.2 If no one is injured, the above notification is sufficient. In the case of death or serious injury, the accident reporting procedure outlined in Section 9.1.2 must also be followed.

**9.4 Reporting of Fires by Contractor**

9.4.1 The Contractor shall report to the Employer's Representative all fires which occur on site including any fires that have been extinguished by the Contractor himself, and the Employer's Representative may send staff to investigate such fires. The following information should be provided:

- (a) time of fire;
- (b) location of fire;
- (c) means of extinguishing the fire;
- (d) injury to any person/damage to any property; and
- (e) the probable cause of fire.

This action is in addition to reporting the incident to the Chief Fire Officer, and Police in accordance with local regulations.

**9.5 Reporting to the Employer's Representative**

9.5.1 The Contractor shall duly complete standard forms on dangerous occurrences and accidents as required by the Employer's Representative to enable the Employer's Representative to prepare a database on accident statistics. The Contractor shall deliver to the Employer's Representative a copy of any statutory reports he submits to the Relevant Authorities.

9.5.2 The Contractor shall send a monthly report to the Employer's Representative of all accidents and dangerous occurrences whether they are of a serious nature or not.

## **10.0 ACCIDENT INVESTIGATION**

### **10.1 General**

- 10.1.1 Investigations should be conducted in an open and positive atmosphere that encourages the witnesses to talk freely. The primary objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences. Accidents are rarely just the fault of the worker. If the worker has not been trained, instructed or properly supervised then the fault may well lie with management.
- 10.1.2 Accidents and Dangerous Occurrences which result in death, serious injury or serious damage must be investigated by the Contractor immediately to find out the cause of the accident/occurrence so that measures can be formulated to prevent any recurrence. (Refer to the advice contained in 10.2.1 below.)
- 10.1.3 Near misses and minor accidents should also be recorded and investigated by the Contractor as soon as possible as they are signals that there are inadequacies in the safety management system.

### **10.2 Recommended actions in incident investigation**

- 10.2.1 It is important after any Accident or Dangerous Occurrence that information relating to the incident is gathered in an organised way. The following steps are recommended;
- (a) take photographs and make sketches
  - (b) examine involved equipment, workpiece or material and the environmental conditions
  - (c) interview the injured, eye-witnesses and other involved parties
  - (d) consult expert opinion where necessary
  - (e) identify the specific Contractor or Sub-contractor involved.
- 10.2.2 Having gathered information, it is then necessary to make an Analysis of Incident
- (a) establish the chain of events leading to the accident or incident
  - (b) find out at what stage the accident took place
  - (c) consider all possible causes and the interaction of different factors that led up to the accident, and identify the most probable cause

Note: The cause of an accident should never be classified as carelessness. The specific act or omission that caused the accident must be identified.

- 10.2.3 The next stage is to proceed with the Follow-up Action
- (a) report on the findings and conclusions
  - (b) formulate preventive measures to avoid recurrence
  - (c) publicise the findings and the remedial actions taken

## 11.0 ACCIDENT STATISTICS

### 11.1 Introduction

11.1.1 Accident data, if properly collected and analysed, indicates trends, and can show where and how problems arise. Comprehensive accident information enables accident prevention efforts to be targeted at problem areas.

### 11.2 Collection of Accident Statistics

11.2.1 The procedures that apply for the reporting and collation of data in respect of accident statistics are set out below.

11.2.2 The Contractors' safety officers are required to send duly completed Report Forms (Refer to Schedule 3 – SAF 002 and SAF 003), to the Employer's Representative **within five days after the end of each month**. The Construction Accident Statistics Monthly Report Form must be submitted even if there are no injuries or dangerous occurrences within the current month.

11.2.3 'Man-hours' is defined as the man-hours worked by all persons employed on site. (including site supervisory staff, management staff and clerical staff).

11.2.4 'Man-days' is defined as the man-days worked by all persons employed on site. (including site supervisory staff, management staff and clerical staff).

### 11.3 Calculation of man-days lost - Construction Accident Statistics

11.3.1 When calculating the man-days lost for the Construction Accident Statistics Summary Sheet, the following applies:

The number of man-days lost refers to the total number of man-days lost during the reported month due to :

- (a) non-fatal reportable accidents which happened within the reported month
- (b) non-fatal reportable accidents which occurred in previous months.

the day on which the reportable accident occurred should be excluded in calculating man-days lost but public holidays within the injured period should be counted.

### 11.4 Calculation of Accident Frequency Rate (AFR)

The Accident Frequency Rate (AFR) per 100,000 man-hours worked shall be calculated using the following formula

$$\left\{ \frac{\text{No. of reportable accidents}}{\text{Man-hours worked}} \right\} \times 100,000$$

A reportable accident is a Fatality, a Major Injury Accident as defined in 9.4.1, and reportable accidents as defined in 9.2.1

## **12.0 HAZARD IDENTIFICATION AND RISK ASSESSMENT**

### **12.1 General**

- 12.1.1 The purpose of Hazard Identification and Risk Assessment is to identify all the significant hazards, which may occur during the construction phase, and to rank them according to their severity. Having ranked the risks by severity the Contractor shall then introduce measures to mitigate the effects of that risk.
- 12.1.2 Prior to the commencement of any potential High-Risk operations the Contractor shall conduct a detailed hazard analysis and risk assessment of the task and shall record his findings on appropriate worksheets. Examples of worksheets SAF 020 may be found in Schedule 2.
- 12.1.3 The worksheets should then show what measures the Contractor is going to take to reduce the level of risk to acceptable levels.

### **12.2 Method Statements**

- 12.2.1 As a result of the Hazard Identification and Risk Assessment detailed method statements shall need to be produced for medium and high risk activities including amongst others the following:

- (a) Craneage of items in excess of 1 tonne
- (b) Erection of steel structures.
- (c) Excavations deeper than 2m.
- (d) Erection and loading of formwork
- (e) Demolition.
- (f) Tunnelling operations.
- (g) Inflammable materials – the use and storage
- (h) Use and storage of explosives

A component part of the detailed method statement shall be the inclusion of the completed Hazard and Risk Worksheet as discussed in Section 12.1 above.

- 12.2.2 Method Statements will usually be attached to Design Submissions but should be cross-referenced to the Contractor's Site Safety Plan.
- 12.2.3 A method statement should contain sufficient information to enable the task to be undertaken safely and should contain as a minimum the following information
- (a) Introduction – A brief outline of the Task
  - (b) Details of the Risks involved
  - (c) A step by step description of how the task is to be undertaken detailing
    - what needs to be done;
    - the order in which the task will be carried out;
    - what plant or equipment is required;
    - who the task will be done by;
    - who will supervise the task;
    - where will the task take place;
    - when will the task take place;
    - the precautions which must be taken before the task is undertaken;
    - what to do if things go wrong;

### 12.3 Permits to Work

- 12.3.1 The Contractor shall develop a permit-to-work system, which is a formal written system used to control certain types of work that are potentially hazardous. A permit-to-work is a document, which specifies the work to be done, and the precautions to be taken. Permits-to-work form an essential part of safe systems of work for many construction activities. They allow work to start only after safe procedures have been defined and they provide a clear record that all foreseeable hazards have been considered. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.
- 12.3.2 A permit is needed when construction work can only be carried out if normal safeguards are dropped or when new hazards are introduced by the work. Examples of high risk activities include but are not limited to:
- (a) Work close to 25kV overhead Catenery
  - (b) Entry into Confined Spaces. (SAF 010)
  - (c) Work In Close Proximity to Overhead Power lines and Telecommunication Cables.
  - (d) Hot Work. (SAF 012)
  - (e) To Dig—where underground services may be located.
  - (f) Work with moving construction locomotives.
  - (g) Working On Electrical Apparatus. (SAF 011)
  - (h) Work with Radioactive isotopes.
- 12.3.3 The permit-to-work system should be fully documented, laying down:
- (a) how the system works;
  - (b) the jobs it is to be used for;
  - (c) the responsibilities and training of those involved; and
  - (d) how to check its operation;
- 12.3.4 The permit-to-work form must help communication between everyone involved. It should be designed by the Contractor issuing the permit, taking into account individual site conditions and requirements. Separate permit forms may be required for different tasks, such as hot work and entry into confined spaces, so that sufficient emphasis can be given to the particular hazards present and precautions required.
- 12.3.5 The permit to work form should contain:
- (a) clear identification of who may authorise particular jobs (and any limits to their authority);
  - (b) clear identification of who is responsible for specifying the necessary precautions (e.g. isolation, emergency arrangements, etc);
  - (c) a detailed description of the task clearly identifying the work to be done and the associated hazards;
  - (d) plans and diagrams be used if appropriate to assist in the description of the work to be done, its location and limitations;
  - (e) identity of the hazards and the precautions to be taken;
  - (f) clear rules about how the job should be controlled or abandoned in the case of an emergency;

- (g) the time limitations should be stated;
  - (h) job specific toolbox talk conducted by the supervisor
- 12.3.6 A Permit To Work authorisation form shall be completed with the maximum duration period not exceeding twenty four hours ( for example of a Permit To Work authorisation form see Schedule 2)
- 12.3.7 A copy of each Permit To Work shall be displayed, during its validity, in a conspicuous location in close proximity to the actual works location to which it applies.
- 12.3.8 A pre-permit activation job specific toolbox talk shall be conducted by the supervisor including amongst others the following.
- (a) All identified hazards are explained;
  - (b) Risk mitigation process clarified;
  - (c) Method of work explained stressing points (a) and (b) above;
  - (d) Emergency response procedure is clarified and persons assigned tasks in the event of an emergency;
  - (e) PPE requirements including PPE serviceability checks and training if required;

All workers and supervision shall attend the toolbox talk and sign the toolbox attendance register. Any person/s coming late to the work site shall be given the toolbox talk and sign the attendance register  
A copy of the toolbox talk and attendance register shall be displayed as per section 12.3.7 of this manual.

## 13.0 EMERGENCY PREPAREDNESS PLANS

### 13.1 Emergency Situations

13.1.1 Every Contractor shall formulate an Emergency Preparedness Plan for each of his sites. These plans will address foreseeable emergencies that may arise during the construction activities. Examples of activities for which plans should be prepared include amongst other things:

- (a) An Accident Which Results In Death or Major Injury. ( Major Injury as defined in Section 9.1.7)
- (b) A Serious Fire That Threatens Life.
- (c) A Flood That Threatens Life.
- (d) Leakage of Any Dangerous Materials or Chemicals.
- (e) Leakage / Short Circuit of any Electrical supply.
- (f) Major Engineering Failures such as:
  - collapse of tunnels or structures
  - major utility collapse
  - unintended explosions
  - subsidence causing damage to structures or services

13.1.2 An Emergency Preparedness plan should include details of the following;

- (a) The name, location and phone number of the Emergency Co-ordinator;
- (b) Designated Personnel with locations and phone numbers;
- (c) Details of the Emergency Response Team with locations and phone numbers;
- (d) Functions of the Emergency response Team;
- (e) The means of Escape;
- (f) Communication with the Emergency Services;
  - Police
  - Fire Services
  - Ambulance and Hospital Services
- (g) First-Aid Facilities;
- (h) Site plans;
- (i) Suppliers of emergency equipment such as sump pumps, lighting, craneage, etc.

13.1.3 Copies of the emergency procedures and the Contractor's rescue organisation (reviewed without objection by the Employer's Representative) should be displayed at each place of work and notice boards. This information should be reviewed and updated as often as is required, but at least once annually. Drills should be arranged to test the efficiency in mobilising the necessary personnel and equipment. These Drills should be carried out at least every three months.

13.1.4 Regular joint exercises between the Contractor's rescue teams and the Fire and Emergency Services should also be carried out for the major contracts.

## 14.0 SAFETY SIGNAGE

### 14.1 Safety Signs

14.1.1 All safety signage that is displayed in and around the sites shall be in both Hindi and English, examples of signs that shall be required shall include amongst others the following:

- (a) Wear Safety Helmets.
- (b) Permit to Work areas
- (c) Wear Safety Footwear.
- (d) Wear Hearing Protection.
- (e) Wear Eye Protection.
- (f) Danger Electricity.
- (g) Danger Crane Overhead.
- (h) Stop Look and Listen
- (i) No Smoking.
- (j) First Aid.
- (k) No Entry signs
- (l) Fire precautions.
- (m) Emergency Exit from underground works

14.1.2 All safety signs shall comply with the Internationally recognised Safety Colours as indicated below:

- Blue Mandatory.
- Yellow Danger.
- Red Prohibition.
- Green Safe Condition.

### 14.2 References

#### Indian Standards

IS 9457 Standard for colours of Safety Signs

IS 12349 : 1988 Fire Protection - Safety Signs

## **15.0 INDUSTRIAL HEALTH AND WELFARE**

### **15.1 Introduction**

- 15.1.1 Hazards to Health on a construction site can arise from the use of a number of materials, substances and processes if they are not properly controlled. Some of the more serious risks are caused by the inhalation of dusts, fibres, toxic fumes, by the misuse of chemicals, lasers and radioactive isotopes. Excessive vibration and excessive noise can also cause ill health. Many man-days are lost as a result of dermatitis, tenosynovitis, bronchitis and rheumatism.
- 15.1.2 The Contractor shall be responsible for maintaining healthy working conditions for all his, and his sub-contractors, workers. In particular he shall pay attention to the effects of noise, dust, air pollution and the use of chemicals. If it is not possible to remove the cause of harm then suitable and sufficient Personal Protective Equipment (PPE) should be provided to those workers who could be affected.
- 15.1.3 If the use of PPE is the only means of providing protection the Contractor shall ensure that all the workers affected are properly trained in the use of the PPE and that adequate supervision is provided to ensure its proper use.

### **15.2 Hazardous Substances**

- 15.2.1 The Contractor shall obtain Material Safety Data Sheets (MSDS) for all substances that are deemed to be hazardous to be used on site. An inventory shall be kept of all such materials with the relevant MSDS and shall be available for inspection by the Employer's Representative who may require further MSDS's to be obtained.
- 15.2.2 The Contractor shall conduct an assessment of the substance in relation to its intended usage on site. Particular attention must be given to the actual location of usage as a substance, which is safe for use in the open air, may be extremely hazardous in a confined space. The results of all assessments shall be recorded and method statements produced.( For an example of a Hazardous Substance Assessment Form see Schedule 1).
- 15.2.3 The objective of the assessment is to establish what precautions and control measures shall be implemented in order that a safe system of work can be established for the use of the substance on site.

### **15.3 Noise**

- 15.3.1 Industrial deafness is caused by over exposure to high levels of noise from plant, machinery or construction processes. Once a part of a persons hearing has been lost it can never be recovered. Deafness can also lead to further accidents on site with workers being unable to hear warnings and other instructions.
- 15.3.2 For continuous exposure, i.e. for eight hours in any one-day, the sound level should not exceed 90dB(A). For non-continuous exposure a calculated equivalent continuous sound level (Leq) should not exceed 90dB(A). Workers should not be exposed to sound levels exceeding 90dB(A) unless they are wearing suitable hearing protectors, which effectively reduce the sound level at the user's ear to, or below, 90dB(A).
- 15.3.3 If Peak noise levels exceed 120dB(A) then the wearing of suitable hearing protectors shall be Mandatory.
- 15.3.4 The Contractor shall carry out noise assessments to establish what noise levels his workers are being exposed to. If excessive noise levels above 90dB(A) are found then the contractor shall introduce a

noise control programme to protect his workers.

15.3.5 Consideration should always be given first to reducing the noise level at source. Examples of noise reduction methods include;

- (a) More efficient silencers on compressors and maintenance of exhaust systems;
- (b) Fitting acoustic lining to machinery panels;
- (c) Use of Acoustic screens and sheds to protect other workers;
- (d) Using noise reduced tools;
- (e) Sighting of noisy plant away from the workplace

15.3.6 Where it is not possible to reduce the noise level to which the worker is exposed the Contractor shall provide the workers with suitable and sufficient hearing protection to protect them. The Contractor shall ensure that all the workers affected are properly trained in the use of the Hearing Protection and that adequate supervision is provided to ensure its proper use.

#### **15.4 Ventilation in Shafts and Tunnels**

15.4.1 The contractor shall assign a Competent Person to perform all air monitoring required to determine proper ventilation and quantitative measurement of potentially hazardous gases. The atmosphere in all underground areas shall be tested quantitatively by the contractor for toxic gases, dust, vapour, mist, and fumes as often as necessary to ensure that prescribed limits given at 15.4.3 below are met. Quantitative tests for methane shall also be performed in order to determine whether an operation is potentially hazardous. For every test carried out the contractor shall maintain a record of the air quality the location, date, time, substances and amount monitored. These records shall be made available to the Employer's Representative on demand.

15.4.2 The ventilation system shall be adequate to maintain circulation of air in all parts of tunnels and shafts and following conditions shall be taken care of:

15.4.3 Air shall be considered unfit for workmen to breathe if it contains any of the following :

- (a) Less than 19.5% oxygen by volume.
- (b) More than 0.005% carbon dioxide by volume.
- (c) More than 0.01% carbon monoxide by volume.
- (d) More than 0.001% hydrogen sulphide by volume.
- (e) More than 0.005% oxides of nitrogen.
- (f) More than 0.5% of methane at any place in the tunnel.
- (g) More than 0.0002% of aldehyde.
- (h) Any other poisonous gas in harmful amounts.

In addition to the requirements given above, 2 m<sup>3</sup> of fresh air per minute shall be furnished for each brake horsepower of diesel engine used in the tunnel.

15.4.4 The Contractor will ensure the supply of fresh air to all underground work areas in sufficient amount to prevent any harmful accumulation of dust, vapour or gases. The contractor shall provide at least 4.25 m<sup>3</sup> of fresh air per minute per employee underground.

15.4.5 No inflammable materials or oil and grease shall be stored inside or near the tunnels or shafts and all combustible rubbish from the tunnel or shaft shall be promptly removed. A regular analysis of the gases inside the tunnel should be done with advance of the tunnel.

- 15.4.6 Tools made of light alloys (such as Al and Mg) are not to be used inside the tunnel. They may cause sparks.
- 15.4.7 Regular checking of gas (referred at 15.4.3) at the faces shall be done before each shift. This should be carried out using a multi gas detector.
- 15.4.8 Motive power other than electric, shall not be used without prior authorisation from the employer's representative. No petrol engines shall be used underground. Diesel locomotives shall only be used with the prior consent of the Employer's Representative. Diesel engines shall not be used underground unless equipped with a filter that will remove all carbon monoxide and oxides of nitrogen. Such filters shall be tested by the Contractor's chief mechanic and more frequently by the plant operator.

### 15.5 Toilets

- 15.5.1 The Contractors shall ensure that an adequate number of toilets are made available at the work sites with the ratio being no less than one toilet for every 50 workers or part thereof. The toilets shall be located so that persons do not have to walk more than five hundred metres to use them.
- 15.5.2 The toilets shall have adequate water supply and be kept in a clean and tidy condition at all times.

### 15.6 Drinking Water

- 15.6.1 The Contractors shall ensure that effective arrangements are made to provide and maintain at suitable points a sufficient supply of wholesome drinking water.
- 15.6.2 All such points shall be legibly marked "Drinking Water" in Hindi and English and no such point shall be situated within six metres of any washing place, urinal or latrine.

### 15.7 Lifting and Carrying of Excessive Weights

- 15.7.1 All contractors shall ensure that no worker lifts by hand or carries overhead or over his back or shoulders any material, article, tool or appliances exceeding in weight the maximum limits set out below unless aided by another worker or a mechanical device.

Adult – man                      55kg

Adult – female                    30kg

### 15.8 References

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

##### **Indian Standards**

IS 4756 : 1978      Safety Code for Tunnelling works

IS 1179 : 1967      Specification for equipment for eye and face protection during welding

IS 2925 : 1984      Specification for Industrial Safety Helmets

##### **British Standards**

BS EN 352:                      Hearing protectors. Safety requirements and testing

352-1: 1993: Ear muffs

352-2: 1993: Ear plugs

352-3: 1997: Earmuffs attached to an industrial safety helmet.

## **16.0 WORKING AT HEIGHT**

### **16.1 General**

- 16.1.1 Working at height is the largest single cause of serious accidents in the construction industry and therefore the Contractor shall carry out risk assessments for all work where workers or materials can fall more than two metres.
- 16.1.2 Where work is being carried out above areas where there is public access such as roads footpaths etc. particular care must be taken to ensure that no materials can fall from the working area.
- 16.1.3 Edge protection shall be provided at all leading edges or openings where workers or materials can fall more than two metres. Edge protection shall meet the minimum standard of;
  - a) a main guardrail at least 1 metre above the edge
  - b) a toe board at least 200 mm high; and
  - c) an intermediate guard rail or other barrier so that there is no gap more than 470 mm.

### **16.2 Use of Scaffolds**

- 16.2.1 All scaffolds should be erected and dismantled by workmen who are thoroughly experienced in the erection and dismantling of scaffolding.
- 16.2.2 All scaffolds should be inspected by a competent person at least every three days after erection and the results of inspections recorded and the records shall be kept available for checking by the Employer's Representative.
- 16.2.3 Tags shall be fitted to all scaffolds to show whether they are safe for use or not. All Safe for Use tags shall be signed by a senior site engineer from the contractor.
- 16.2.4 All scaffolds shall be constructed of sound materials free from patent defect.
- 16.2.5 The following measures shall be taken;
  - (a) the scaffold shall be constructed for the correct use ( Light or Heavy Duty )
  - (b) securely fixed to existing structures or adequately buttressed;
  - (c) the use of barrels, boxes, loose tiles or other unsuitable material shall not be used as supports for working platforms;
  - (d) all working platforms shall be fully boarded;
  - (e) all working platforms shall have guard rails at one metre height and shall also have an intermediate rail at half height;
  - (f) all working platforms shall be provided with toe boards;
  - (g) all working platforms shall be kept free of unnecessary obstruction or rubbish
  - (h) secure ladder access shall be provided;

### **16.3 Use of Ladders**

- 16.3.1 All ladders shall be of sound construction and shall be free from patent defect.
- 16.3.2 Ladders should be checked weekly and defective ladders shall be promptly and properly repaired or replaced.
- 16.3.3 Ladders shall not be used as working platforms but may be used for work of short duration of up to thirty minutes.

16.3.4 Metal ladders shall not be used near or adjacent to overhead power lines unless they have been certified dead under a permit to work system.

16.3.5 Ladders shall;

- (a) be secured at the top or footed at the bottom to prevent slippage;
- (b) not be used if any rung is missing;
- (c) not be used for any other purpose than to provide access;
- (d) be set at an angle of seventy five degrees unless designed for vertical access;
- (e) all vertical ladders shall be fitted with hoops to prevent falls;

#### **16.4 Safety Harnesses / Fall Arresters**

Where it is not possible to provide a safe working platform then the use of safety harnesses may be considered. If safety harnesses are used they should be of the full body type and secure anchorage points shall be provided and used. Workers must be instructed in the proper use of harnesses.

#### **16.5 References**

##### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

###### **Chapters: XV and XIX**

###### **Indian Standards;**

IS 3696 (Part 1) : 1987 Safety Code for Scaffolds and Ladders, Part 1, Scaffolds

IS 3696 (Part 2) : 1991 Safety Code for Scaffolds and Ladders, Part 2, Ladders

IS 13416 ( Part 1):1992 Recommendations for preventive measures against hazards in the workplace, Part 1, Falling material hazards protection

IS 13416 ( Part 2):1992 Recommendations for preventive measures against hazards in the workplace, Part 2, Fall protection

###### **British Standards**

BS EN 354: 1993: Personal protective equipment against falls from a height. Lanyards

BS EN 355: 1993: Personal protective equipment against falls from a height. Energy absorbers

BS EN 358: 1993: Personal equipment for work positioning and prevention of falls from a height. Work positioning systems

BS EN 360: 1993: Personal protective equipment against falls from a height. Retractable type fall arresters

BS EN 361: 1993: Personal protective equipment against falls from a height. Full body harnesses

BS EN 362: 1993: Personal protective equipment against falls from a height. Connectors

BS EN 363: 1993: Personal protective equipment against falls from a height. Fall arrest systems

BS EN 364: 1993: Personal protective equipment against falls from a height. Test methods

BS EN 365: 1993: Personal protective equipment against falls from a height. General requirements for instructions for use and for marking

BS EN 795: 1997: Protection against falls from a height. Anchor devices. Requirement and testing

## **17.0 EXCAVATIONS**

### **17.1 General**

- 17.1.1 Excavation is one of the important phases of any construction activity. Due to insufficient attention to the safety aspects it frequently becomes the cause of many accidents. Contractors are therefore required to plan and execute all excavations in a safe manner.
- 17.1.2 The contractor shall ensure that all excavations are supervised by workers with thorough knowledge and experience of excavation work.
- 17.1.3 The integrity of the excavation and the support system shall be inspected prior to the commencement of any works on a daily basis with the results of the inspections being formally recorded. All such records shall be kept available for inspection by the Employer's Representative.
- 17.1.4 Where there is the possibility of any ingress of water then pumping sumps shall be established with pumps being readily available for use and additional ladders placed for use in the event of an emergency evacuation.

### **17.2 Planning**

- 17.2.1 The correct planning of excavations is essential for safety and before digging any excavations Contractors should plan against the following;
- (a) collapse of the sides;
  - (b) materials falling onto people working in the excavation;
  - (c) people and vehicles falling into the excavation;
  - (d) people being struck by plant;
  - (e) undermining nearby structures;
  - (f) contact with underground services;
  - (g) fumes; and
  - (h) Make sure the necessary equipment needed such as trench sheets, props, etc, are available on site before work starts.

### **17.3 General Precautions**

- 17.3.1 The following precautions should be observed;
- (a) Prevent the sides and the ends from collapsing by battering them to a safe angle or supporting them with timber, sheeting or proprietary support systems.
  - (b) Do not go into unsupported excavations.
  - (c) Never work ahead of the support.
  - (d) Remember that even work in shallow trenches can be dangerous. You may need to provide support if the work involves bending or kneeling in the trench.
  - (e) Prevention of materials falling into excavations
  - (f) Do not store spoil or other materials within one metre of the sides of excavations. The spoil may fall into the excavation and the extra loading will make the sides more prone to collapse.
  - (g) Make sure the edges of the excavation are protected against falling materials. Provide toe boards where necessary.
  - (h) Wear a hard hat when working in excavations.
  - (i) Take steps to prevent people falling into excavations. If the excavation is 2 m or more deep, provide substantial barriers, e.g. guard rails and toe boards.

- (j) Keep vehicles away from excavations wherever possible. Use brightly painted baulks or barriers where necessary.
- (k) Where vehicles have to tip materials into excavations, use stop blocks to prevent them from over-running. Remember that the sides of the excavation may need extra support.

#### **17.4 Undermining nearby structures**

17.4.1 The following precautions should be taken to prevent the undermining of nearby structures;

- (a) Make sure excavations do not affect the footings of scaffolds or the foundations of nearby structures. Walls may have very shallow foundations, which can be undermined by even small trenches.
- (b) Decide if the structure needs temporary support before digging starts. Surveys of the foundations and the advice of a structural engineer may be needed.

#### **17.5 Avoiding underground services**

17.5.1 The following precautions should be taken to avoid underground services;

- (a) Look around for obvious signs of underground services, e.g. valve covers or patching of the road surface.
- (b) Use locators to trace any services. Mark the ground accordingly.
- (c) Make sure that the person supervising excavation work has service plans and knows how to use them. Everyone carrying out the work should know about safe digging practices and emergency procedures.
- (d) Operate a “Permit to Dig” system.

#### **17.6 References**

### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

#### **Chapter: XIII**

##### **Indian Standards**

IS 3764 : 1992 Excavation Work – Code of Safety

IS 13430 : 1992 Safety during additional construction to existing buildings – Code of Practice.

IS 2314 : 1986 Steel Sheet Piling sections

IS 5121 : 1969 Safety Code for Piling and Other Deep Foundations

## **18.0 LIFTING OPERATIONS**

### **18.1 Lifting Appliances:**

- 18.1.1 The Contractor shall ensure that all lifting appliances, including synchronised mobile jacks, pit jacks, mobile cranes, tower cranes, gantry cranes, launching beams and lorry mounted cranes, prior to being allowed to work on site shall have available for inspection by the Employer's Representative a current Certificate of Inspection issued by a Competent Person approved by KMRC.
- 18.1.2 All lifting appliances with a lifting capacity of more than one tonne shall, where practicable, be fitted with Automatic Safe Load Indicators and Audible Warning Devices which shall be kept in an operable condition at all times the lifting appliance is in use. Checks should be made to ensure that the Automatic Safe Load Indicator is properly calibrated and is functioning properly.
- 18.1.3 All lifting appliances shall be maintained in accordance with the manufacturer's instructions and shall be subject to a regular preventative maintenance programme.
- 18.1.4 All lifting appliances shall be inspected every three months by a third party competent person approved by KMRC. Certificates of Inspection shall be available with the lifting appliance and a copy shall also be sent to the Employers Representative.
- 18.1.5 The operators of lifting appliances shall conduct daily inspections of their respective lifting appliances with the results of the inspections being recorded and kept available for inspection by the Employer's Representative.
- 18.1.6 The Contractor shall ensure that only thoroughly trained and experienced persons aged twenty-one years and over are allowed to operate lifting appliances.

### **18.2 Lifting Gear:**

- 18.2.1 Lifting Gear includes chain slings, rope slings, or similar gear and a ring, link, hook, plate clamp, shackle, swivel or eye bolt.
- 18.2.2 The Contractor shall ensure that all lifting gear shall be in good condition and shall be tested and certified every six months, with the Safe Working Load being stamped or clearly displayed upon it. Records of test shall be kept available for inspection by the Employer's Representative.
- 18.2.3 All lifting gear shall be visually inspected before any use and if any defects are found then it shall be removed from site or dismantled / disabled in order to ensure that it is not used in a defective state.
- 18.2.4 All lifting gear shall be properly stored and not left lying on the ground where it could be damaged or used in an unsafe manner.

### **18.3 Lifting Operations:**

- 18.3.1 The Contractor shall ensure that during the course of any lifting operations the following minimum requirements shall be followed:
  - (a) All lifting operations shall be under the control of a competent "Lifting Supervisor" appointed by the contractor.
  - (b) Only thoroughly trained and experienced crane drivers shall be allowed to operate cranes.
  - (c) Only thoroughly trained and experienced slingers and riggers shall be allowed to sling loads and give directions to crane operators.
  - (d) A standard code of hand signals shall be adopted for controlling the movements of the crane and both the driver and the signaller shall be thoroughly familiar with the signals.
  - (e) The driver of the crane shall respond to signals from only the appointed signaller but shall obey the stop signal at any time no matter who gives it.

- (f) Before commencing any lifting operations the ground conditions on which the crane is to stand shall be investigated in order to ensure that the load bearing capabilities are adequate.
- (g) The weight of the load must be known to the crane driver and the slinger/rigger before lifting commences.
- (h) No loads are to be slewed over public areas without stopping pedestrians and vehicles first.
- (i) No unauthorised persons are allowed into the lifting zone.
- (j) No person is allowed to ride the hook of the crane or the loads being lifted.
- (k) Any areas where a minimum clearance of six hundred millimetres from the rear of the slewing kentledge of the crane cannot be achieved and where persons could be trapped against obstacles then a fence shall be erected to prevent access.
- (l) All crane hooks shall be fitted with an operable safety catch.
- (m) Wherever practicable all loads shall have tag-lines attached in order to ensure that the load can be controlled at all times.
- (n) Provision shall be made to ensure that the lifting slings or chains can be safely removed from the loads once they have been landed.
- (o) All lifted loads and stacked materials shall be left in a secure and stable condition at all times.
- (p) Whenever working close to isolated overhead power-lines the lifting appliances shall be grounded to earth as a secondary precaution against accidental energisation.
- (q) No close working to any live overhead power-lines is permitted without the operation of a strict Permit to Work system being in place.

### **18.3 References**

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

##### **Chapter: VII**

##### **Indian Standards**

- IS 807 : 1976 Code of Practice for the design, manufacture and testing of cranes
- IS 7293 : 1974 Safety Code for working with Construction Machinery;
- IS 13583 : 1993 Code of Practice for training of Crane Drivers Part 1 General

##### **British Standards**

- BS 7121: Code of practice for safe use of cranes
- BS 7262: 1990: Specification for automatic safe load indicators

## **19.0 WORK IN CONFINED SPACES**

### **19.1 General**

- 19.1.1 The term 'confined space' has two defining features. Firstly, it is a place which is substantially (though not always entirely) enclosed and, secondly, there will be a reasonably foreseeable risk of serious injury from hazardous substances or conditions within the space or nearby.
- 19.1.2 Some confined spaces are fairly easy to identify, for example, closed tanks and sewers. Others are less obvious but may be equally dangerous, for example closed and unventilated or inadequately ventilated rooms and silos, ducts, culverts, tunnels, boreholes, bored piles, manholes, shafts, excavations, sumps, inspection pits, cofferdams, and building voids.

### **19.2 The hazards**

- 19.2.1 The most likely hazards are as follows:
- (a) Flammable Substances and Oxygen Enrichment;
  - (b) Toxic Gas, Fume or Vapour;
  - (c) Oxygen deficiency;
  - (d) The Ingress or Presence of Liquids;
  - (e) Presence of Excessive Heat,
  - (f) Excessive Humidity.

### **19.2 Entry Procedures**

- 19.2.1 Contractors will ensure that no work will be undertaken in Confined Spaces unless a Permit to Work, see Section 12.3, has been prepared and issued.
- 19.2.2 Only persons who have been thoroughly trained, experienced and are physically fit shall be allowed to work in Confined Spaces.
- 19.2.3 Persons with any of the following medical conditions shall not be allowed to work in confined spaces:
- (a) a history of fits, blackouts or fainting attacks,
  - (b) a history of heart disease or disorder,
  - (c) high blood pressure,
  - (d) asthma bronchitis, or shortness of breath on exertion,
  - (e) deafness
  - (f) meniers disease or disease involving giddiness or loss of balance,
  - (g) claustrophobia or nervous or mental disorder,
  - (h) back pain or joint trouble that would limit mobility in confined spaces,
  - (i) deformity or disease of the lower limbs limiting movement.
  - (j) Chronic skin disease,
  - (k) Serious defects in eye sight or lack of sense of smell
- 19.2.4 No smoking shall be allowed in or within 2 metres of the opening to any confined space and suitable warning signs shall be positioned.
- 19.2.5 Before any confined space work commences the following equipment shall be available for use:
- (a) Multi Gas Monitor; or other suitable gas monitoring equipment.

- (b) Sufficient sets of Self Contained Breathing Apparatus to enable rescue to be carried out;
- (c) Full Body Type Harness for each worker;
- (d) Tripod and Lifeline Hoist Rope; for work in situations where a vertical exit from the confined space is required.
- (e) Flame-proof lighting. ( Hand lamps not more than 24 volts. );
- (f) Resuscitation Equipment;
- (g) Ventilation Equipment.

The persons involved in the confined space working operations shall need to be thoroughly trained and certified as being competent in the use of the above detailed item of equipment.

### **19.3 References**

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

##### **Chapter: XIII**

##### **Indian Standards**

IS 11972 : 1987                      Code of Practice for safety precautions to be taken when entering a sewerage system

## **20.0 SITE ELECTRICITY**

### **20.1 General**

- 20.1.1 The Contractor shall nominate a representative whose name and qualifications shall be submitted in writing to the Employer's Representative for review not later than 4 weeks before the appointment and who shall be solely responsible for ensuring the safety of all temporary electrical equipment on Site. The Contractor shall not install or operate any temporary Site electrical systems until this representative is appointed and has commenced duties.
- 20.1.2 The name and contact telephone number of the representative having been reviewed without objection by the Employer's Representative shall be displayed at the main distribution board for the temporary electrical supply so that he can be contacted in case of an emergency.
- 20.1.3 The Contractor shall submit schematic diagrams and the details of the equipment for all temporary electrical installations, and these diagrams together with the temporary electrical equipment shall be submitted to the Employer's Representative for review.
- 20.1.4 All electrical installation work on Site shall be carried out in accordance with the requirements laid down in the Specification. All work shall be supervised or executed by qualified and suitably categorised electricians.
- 20.1.5 All Temporary Electrical Site installations and distribution systems shall as a minimum meet IP44 standards and be in accordance with:-
- (a) Indian Electrical Regulations;
  - (b) The Power Companies' Supply Rules;
  - (c) BS 7671 Requirements for electrical installation, the IEE Wiring Regulations (16<sup>th</sup> Edition);
  - (d) BS 7375 Distribution of Electricity on Construction and Building Sites;
  - (e) BS 4363 Distribution Assemblies for Electricity Supplies for Construction and Building Sites; and
  - (f) BS 6164 Safety in Tunnelling in the Construction Industry.

### **20.2 Design Considerations**

- 20.2.1 Distribution equipment utilised within the temporary electrical distribution system shall incorporate the following features:-
- (a) flexibility in application for repeated use;
  - (b) suitability for transport and storage;
  - (c) robust construction to resist moisture and damage; and
  - (d) safety in use.
- 20.2.2 All cabling shall be run at high level whenever possible and firmly secured to ensure it does not present a hazard or obstruction to people and equipment.
- 20.2.3 The installation on Site shall allow convenient access to authorised and competent operatives to work on the apparatus contained within.

### **20.3 Distribution of supply**

- 20.3.1 The Site mains voltage shall be as the Electricity Utility supplies, 415V 3-phase 4-wire system.

- (a) Single-phase voltage shall be as the Electricity Utility supplies, 240V supply.
  - (b) Reduced voltages shall conform to BS 7375.
- 20.3.2 The following voltages shall be adhered to for typical applications throughout the distribution systems:
- (a) fixed plant - 415V 3 phase;
  - (b) movable plant fed by trailing cable - 415V 3 phase;
  - (c) installations in Site buildings - 240V 1 phase;
  - (d) fixed flood lighting - 240V 1 phase;
  - (e) portable and hand held tools - 110V 1 phase;
  - (f) Site lighting (other than flood lighting) - 110V 1 phase; and
  - (g) portable hand-lamps (general use) - 110V 1 phase.
- 20.3.3 When the low voltage supply is energised via the Employer's transformer, any power utilised from that source shall be either 415V 3 phase or / 240V. 1 phase as appropriate. The Contractor shall carry out any conversion that may be necessary to enable him to use power from that source.
- 20.3.4 Protection shall be provided for all main and sub-circuits against excess current, residual current and earth faults. The protective devices shall be capable of interrupting (without damage to any equipment or the mains or sub-circuits) any short circuit current that may occur.
- 20.3.5 Earthing and bonding shall be provided for all electrical installations and equipment to prevent the possibility of dangerous voltage rises and to ensure that faults are rapidly cleared by installed circuit protection.
- 20.3.6 Only plugs and fittings of the weatherproof type shall be used and they should be colour coded in accordance with the Internationally recognised standards for example as detailed as follows:
- (a) 110 volts Yellow.
  - (b) 240 volts Blue.
  - (c) 415 volts Red.

#### **20.4 Cables**

- 20.4.1 Cables shall be selected after full consideration of the conditions to which they will be exposed and the duties for which they are required. For supply cables up to 3.3kV the cable armouring shall be used as the earth return in conditions where the cable is continuously extended and not subject to continuous movement after installation.
- 20.4.2 For supplies to mobile or transportable equipment where operation of the equipment subjects the cable to flexing, the cable shall conform to one of the following specifications appropriate to the duties imposed on it:
- (a) BS 6708 flexible cables for use at mines and quarries;
  - (b) BS 6007 rubber insulated cables for electric power and lighting; and
  - (c) BS 6500 insulated flexible cords and cables.

## **20.5 Maintenance**

- 20.5.1 Strict maintenance and weekly checks of control apparatus and wiring distribution systems shall be carried out by an electrician (duly qualified to carry out the said checks) to ensure safe and efficient operation of the systems. The Contractor shall submit for review by the Employer's Representative details of his maintenance schedule and maintenance works record.
- 20.5.2 All portable electrical appliances shall be permanently numbered (scarf tag labels or similar) and a record kept of the date of issue, date of the last inspection carried out and the recommended inspection period.

## **20.6 References**

### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

#### **Chapter: VI**

- (a) Indian Electrical Regulations;
- (b) BS EN 60529 Degrees of protection provided by enclosures (IP Code)
- (c) The Power Companies' Supply Rules;
- (d) BS 7671 Requirements for electrical installation the IEE Wiring Regulations (16<sup>th</sup> Edition);
- (e) BS 7375 Distribution of Electricity on Construction and Building Sites;
- (f) BS 4363 Distribution Assemblies for Electricity Supplies for Construction and Building Sites; and
- (g) BS 6164 Safety in Tunnelling in the Construction Industry.

## **21.0 WELDING AND CUTTING**

### **21.1 General**

- 21.1.1 Contractors shall ensure that all welding, cutting and gouging is carried out so that the risks are kept at a minimum. There will be some circumstances when Permits to Work will need to be issued, such as
- (a) working in tunnels;
  - (b) welding over areas where others are working;
  - (c) working in areas with increased fire risks or hazardous environments;
- 21.1.2 All equipment must be in good condition, properly installed and routinely inspected by a competent person, and records must be kept available for inspection by the Employer's Representative.
- 21.1.3 Flexible hoses, cables and connections must be free from damage or risk of damage in service. Cables and hoses shall have adequate carrying capacity.
- 21.1.4 Welders shall wear the correct personal protective equipment which includes the following;
- (a) face and eye protection with correct grade of shield;
  - (b) gauntlet gloves;
  - (c) safety footwear
  - (d) welders apron or fire retardant overalls;
  - (e) The atmosphere in the vicinity of work must be known to be safe to breathe and free from flammable gases.
- 21.1.5 Adequate ventilation and fume extraction must be provided and used as required by the risk assessment and especially in enclosed areas and pits.
- 21.1.6 Surfaces to be heated by the process must be cleaned of contaminants that may be degraded by heat or give off noxious fumes (e.g. paints, plastics, zinc coating).
- 21.1.7 Naked flames or high temperature surfaces must not be allowed in the vicinity of volatile solvents.
- 21.1.8 All moveable flammable materials must be removed from the vicinity of work and fireproof covers placed over all flammable materials that cannot be removed.
- 21.1.9 During all welding the work piece and any access equipment must be safely secured.

### **21.2 Oxy-fuel Gas Processes**

- 21.2.1 Handle cylinders carefully, keep outside enclosed areas and secure in an upright position. Keep oxygen cylinders away from fuel gas cylinders where possible.
- 21.2.2 Flash back arresters shall be fitted to both the fuel gas and oxygen cylinders;
- 21.2.3 Non return valves shall be fitted to the torch or cutting torch;
- 21.2.4 Ensure screwed fittings and hoses are correct and keep screwed and sealed surfaces free of contaminants, such as oil and grease.
- 21.2.5 Close cylinder valves when flame is extinguished.
- 21.2.6 Ensure any vessel, drum or tank that has contained flammable or toxic substances has been properly cleaned and inspected before subjecting it to hot work.
- 21.2.7 Checks for gas leaks should carried out using soapy water.

- 21.2.8 Remove all torches from enclosed areas when not in use.
- 21.2.9 Suitable fire extinguisher to be available at all places where hot work is being carried out.
- 21.2.10 Use firewatchers if there is a possibility of ignition unobserved by the operator (e.g. on the other side of bulkheads).

**21.3 Arc Cutting, Gouging and Welding Processes**

- 21.3.1 Connect the welding current return cable to the workpiece close to the arc point or to a well electrically conductive support structure in good contact with the workpiece. Also, connect the workpiece or the support structure to a separate earth terminal.
- 21.3.2 Take precautions against the risk of increased fume hazards when welding with chrome containing fluxed consumables or high current metal inert gas (MIG) or tungsten inert gas (TIG) processes.
- 21.3.3 Avoid being in contact with water or wet floors when welding. Use duckboards or rubber protection.
- 21.3.4 Provide screens to limit exposure of others to glare from arcs.
- 21.3.5 Use the correct eye and face protection with the correct filter glass.
- 21.3.6 Use a low voltage open circuit relay device if welding with alternating current in constricted or damp places.

**21.4 References**

**Indian Standards.**

- IS 818 : 1961 Code of Practice for safety and health requirements in electric, gas welding and cutting operations.
- IS 1179 : 1967 Specification for equipment for eye and face protection during welding
- IS 5983 : 1967 Specification for protective filters for welding, cutting and similar operations.
- IS 13416 (Part 5) : 1994 Preventative measures against hazards at workplaces – Recommendations Part 5 Fire Protection

**British Standards**

- BS EN 166: 1996: Personal eye-protection. Specifications
- BS EN 169: 1992: Specification for filters for personal eye protection equipment used in welding and similar operations
- BS EN 175: 1997: Personal protection. Equipment for eye and face protection during welding and allied processes

## **22.0 COMPRESSED GASES**

### **22.1 Storage**

- 22.1.1 The Contractor shall ensure that all compressed gases, such as oxygen and fuel gases, are stored in a safe manner in keeping with the following requirements.
- 22.1.2 When not in use compressed gas cylinders should preferably be stored in the open air in a well ventilated area at ground level on a firm level surface at least 3m away from any cellars, drains, excavations or other hollows where vapour may collect. There should be good access to the area, which should be kept clean and clear of combustible material, including wood, packing materials and vegetation. If any protection is provided to prevent cylinders being exposed to the weather, it should be of non-combustible material and should not inhibit ventilation. The area should not be close to any source of heat.
- 22.1.3 If storage in the open air is not reasonably practicable, compressed cylinders must be stored in adequately ventilated storerooms. The storeroom must be constructed of non-combustible material
- 22.1.4 Liquefied Petroleum Gas (LPG) cylinders should be stored separately from oxygen cylinders, other flammable liquids, oxidising materials such as sodium chlorate, and toxic or corrosive substances. Such materials should be kept at least 3 metres away from LPG cylinders.
- 22.1.5 It is important that the valves of so-called 'empty' cylinders are kept closed as well as those of full cylinders and that plugs, shrouds and caps are kept in place on all cylinders. This is necessary not only to prevent the escape of any residual compressed gas into the atmosphere but also to ensure that air is not sucked into the cylinder to form an explosive mixture inside it. All cylinders should be stored with their valves uppermost. Storage of LPG cylinders on their sides is particularly hazardous as in the event of a leaking or inadequately closed valve there is the possibility of leakage of liquid and a consequential release into the atmosphere of far greater quantities of flammable vapour.
- 22.1.6 The storage area should be enclosed by a fence approximately 2 metres in height. The fence should be made of non-combustible material and should not inhibit natural ventilation, particularly at low level - a wire mesh fence is particularly suitable for this purpose. The fence should have at least two means of exit, which should not be adjacent to each other. The gates should open outwards and not be self-locking. Both exits should be unlocked when persons are within the storage compound. At all times when the site is unattended the storage area should be secured.
- 22.1.7 On sites where only small quantities of compressed gas are stored (i.e. less than 300 kg) and it is practicable neither to provide an open air storage compound as described in para 21.1.6 nor a properly constructed storage building cylinders may be kept in a lockable wire cage in a safe place in the open air. Only one exit will be necessary providing there is no risk of a person being trapped in the enclosure. The cage should be clearly marked "Highly Flammable and notices prohibiting smoking and naked lights should be displayed.
- 22.1.8 Suitable portable first aid fire extinguishers shall be positioned in close proximity to the storage area for use in an emergency.

### **22.2 Handling Compressed Gas cylinders**

- 22.2.1 Cylinders should be handled with care and wherever practicable moved on specially designed trolleys. The valve on a cylinder should not be used for lifting or to lever the cylinder into position. Damage to the valve can result in highly dangerous situations following the escape of gas. For the same reason throwing or dropping cylinders should be prohibited as in such circumstances damage to the valve is even more likely.
- 22.2.2 Before connecting any cylinder or container of compressed gas to equipment it is essential that all

fires, flames or other sources of ignition in the vicinity, including cigarettes and pilot lights, are extinguished. Where practicable cylinders should be changed in the open air. The cylinder should be examined and any damaged or faulty cylinder should NOT be used. No attempt should be made to rectify any fault or damage. The cylinder should be put in a safe place away from other cylinders or combustible materials until returned to the supplier.

- 22.2.3 If a cylinder is found to be leaking and the leak cannot be stopped, the cylinder should be carefully removed to a well-ventilated open space free from sources of ignition. It should be left with the leak, usually at the valve, uppermost, marked faulty and notices displayed prohibiting smoking or other naked lights. General access should be prevented by barriers or otherwise. The supplier of the cylinder should be informed immediately. Under no circumstances should users attempt to dismantle or repair defective cylinders.

### **22.3 Regulators**

- 22.3.1 Regulators should be suitable for the gas and pressure in use. Checks for leaks at the regulator nuts should be made only by using soapy water. In the event of a defect or of any damage to a regulator, no attempt should be made to repair it. Such repairs should only be carried out by specialists.

### **22.4 Hoses**

- 22.4.1 Flexible tubing should only be used for final connections to appliances. Flexible hoses should comply with BS 3212, BS 5120 or other nationally recognised standard. They should be additionally protected or of steel braid reinforced construction wherever they might be subject to damage by abrasion and so sited that they are not exposed to excessive heat. The length of hoses should be kept as short as practicable

### **22.5 Training and Instruction**

- 22.5.1 Many accidents involving compressed gas are due to ignorance of simple basic precautions. It is essential that all persons using compressed gas are suitably instructed about the hazards and the precautions to be taken in its use

### **22.6 References**

**Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

#### **Chapter: VI**

**Indian Standards:** IS 2190 : 1979 Code of Practice for the selection installation and maintenance of portable first aid fire extinguishers.

## **23.0 MACHINERY**

### **23.1 Machinery Fencing**

- 23.1.1 The Contractor shall ensure that all gears, revolving shafts, flywheels, couplings and other dangerous parts of machinery shall be effectively guarded unless they are so constructed, installed or placed as to be safe as if they were guarded.
- 23.1.2 Fencing of dangerous parts of machinery shall not be removed while the machinery is in use or in motion. If the fencing is required to be removed for maintenance purposes it shall be replaced before the machine is taken into use.

### **23.2 Maintenance**

- 23.2.1 The Contractor shall ensure that all machinery used on site is in safe condition and is properly maintained and repaired by duly authorised, thoroughly trained and experienced persons.
- 23.2.2 No repair to machinery shall be carried out whilst it is in motion unless it is unavoidable.
- 23.2.3 Maintenance records shall be kept available for inspection by the Employer's Representative.

### **23.3 Air Receivers**

- 23.3.1 All Air receivers shall be fitted with a pressure relief valve and shall have the safe working pressure clearly marked upon them.
- 23.3.2 Every air receiver shall be subject to an annual test, which shall be carried out by a duly authorised person. The results of all tests shall be recorded and the records shall be kept available for inspection by the Employer's Representative.
- 23.3.3 The connection couplers on compressed airlines shall be securely fixed together and have safety chains or be wired at the joints in order to ensure that the joints do not come apart when charged with compressed air.

### **23.4 Woodworking Machines**

- 23.4.1 All woodworking machines shall be fitted with the following guards and devices;
  - (a) Top Guard;
  - (b) Riving Knife;
  - (c) Guards to protect all drive belts etc.;
  - (d) An emergency stop switch easily accessible by the operator;
  - (e) A push stick;
- 23.4.2 Woodworking machines shall be operated only by thoroughly trained and experienced operators.

### **23.5 Abrasive Wheels**

- 23.5.1 All Abrasive wheel machines shall be fitted with appropriate guards which shall be kept in place at all times the machine is in use.
- 23.5.2 All abrasive wheel machines shall have the spindle speed clearly marked upon them in revolutions per minute.
- 23.5.3 Only thoroughly trained and experienced persons are allowed to change the wheels on the machines. Wheels must be inspected and ring tested before mounting to ensure that wheels are free from cracks or defects.
- 23.5.4 Safety Goggles or Face shields must be worn when grinding or cutting with abrasive wheels.

### **23.6 References**

**Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

**Chapter: X**

**Indian Standards**

IS 7293 :. 1974 Safety Code for Working with Construction Machinery

## **24.0 HEAVY PLANT OPERATIONS**

### **24.1 General**

- 24.1.1 The contractor shall ensure that only safe and well-maintained plant and equipment shall be allowed to operate on any of the sites.
- 24.1.2 All operators of heavy plant such as, earth movers, piling rigs, etc. shall be medically fit, over eighteen years of age and be thoroughly trained and experienced to operate the equipment.
- 24.1.3 No unauthorised person shall be permitted to ride on plant.
- 24.1.4 The operators shall conduct daily inspections of their respective items of plant with the results of these inspections being recorded and the records kept available for inspection by the Employer's Representative.
- 24.1.5 All mobile heavy plant shall be equipped with at least one 5kg Dry Powder Fire Extinguisher, carried at a suitable position so as to ensure its easy availability.
- 24.1.6 Whenever heavy plant is operating in congested areas, thoroughly trained and experienced banksmen shall be deployed to control the plant and personnel movement and interface.
- 24.1.7 Any waste engine oil and filters following any on site servicing and maintenance shall be removed from the sites and disposed of in an environmentally conscious manner at authorised disposal locations.
- 24.1.8 All drums of fuel oil shall be stored on drip trays or the fuel shall be kept in bunded bulk storage fuel tanks, with quantities stored being kept to a minimum.
- 24.1.9 The storage areas shall have dry powder fire extinguishers positioned in close proximity to their location for use in an emergency.

### **24.2 References**

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

##### **Chapter: X**

##### **Indian Standards**

IS 7293 : 1974 Safety Code for Working with Construction Machinery

IS 2190 : 1979 Code of Practice for the selection, installation and maintenance of portable first aid fire extinguishers.

## **25.0 TUNNELLING OPERATIONS**

### **25.1 Procedures**

25.1.1 The Contractor shall develop safety procedures and methods of working to be adopted during the course of tunnelling operations. These procedures shall include but not be limited to;

- (a) Shafts and Tunnels Entry Procedure. ( Including visitors. )
- (b) Blasting operations.
- (c) Atmosphere Monitoring.( Oxygen Levels, Explosive Gases, Carbon Monoxide, Hydrogen Sulphide, Oxides of Nitrogen, temperature , humidity, dust etc.) See also Section 15.4 of this Manual.
- (d) Portal Gantry Crane Operating Procedures.
- (e) Emergency Preparedness Plan for the Shaft and Tunnels. (Including liaison with the Emergency Services.)
- (f) Work Train Operating Procedure.
- (g) Tunnel Boring Machine Cutter Head Chamber Entry procedure.

A detailed method statement as outlined in Section 12.2 METHOD STATEMENTS must be produced by the Contractor, and approved by the Employer's Representative before the commencement of any tunnelling operations.

### **25.2 Sanitation and Drinking Water**

25.2.1 Unless the worksite is within 500 metres of the portal of the tunnel, sanitation facilities shall be provided. Suitable toilets shall be provided on the scale of one unit for every 50 men on the shift. Toilets shall be effectively and regularly cleaned and disinfectants provided.

25.2.2 At least 5 litres of clean drinking water shall be provided per person employed on the shift. The water shall be sited near the portal and also inside tunnels over 500 metres in length. The water shall be contained in a clean container with a tight fitting lid.

25.2.3 Washing and cleaning facilities shall be provided for all workers near the portal.

### **25.3 Lighting**

25.3.1 The Contractor shall provide adequate lighting at the face and at any other point where work is in progress. A minimum of 50 lux shall be provided at the face, walkways and similar work areas. When mucking is done by tipping wagons running on trolley tracks a minimum of 30 lux shall be maintained. In all other areas the level of lighting shall not be less than 10 lux.

25.3.2 Emergency lighting shall be installed at the working faces and at 100m intervals along the tunnel to help escape workmen in case of accidents.

### **25.4 Ventilation**

25.4.1 The Contractor shall make provision for adequate ventilation of all shafts and tunnels. The ventilation shall be sufficient to ensure proper dispersal of any dust or fume.( see also Section 15.4 )

### **25.4 Protection Against Fire**

25.4.1 As far as practicable, combustible materials shall not be used in the construction of any room or recess containing electrical apparatus.

25.4.2 No flammable material shall be stored in any part of the tunnel unless it is contained in suitable flameproof containers.

25.4.3 An adequate supply of suitable first aid fire fighting equipment shall be kept at convenient locations throughout the tunnel. This equipment shall be tested at least once a month and records kept available for inspection by the Employer's Representative.

**25.6 Warning Signals**

25.6.1 The contractor shall install a suitable system of warning signals for the movement of plant and materials within shafts and tunnels.

25.6.2 The system shall be checked daily immediately prior to the commencement of tunnelling work under the supervision of a responsible person.

25.6.3 The Contractor shall make detailed emergency warning signals for cases of fire, tunnel collapse etc.

**25.7 References**

**Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

**Chapter: XIII**

**Indian Standards**

IS 4756 : 1978 Safety Code for Tunnelling Work.

IS 2190 : 1979 Code of Practice for the selection, installation and maintenance of portable first aid fire extinguishers.

**British Standard**

BS 6164 : 2001 Code of Practice for safety in tunnelling in the construction industry

## **26.0 BLASTING OPERATIONS**

### **26.1 Authorisation for Blasting**

- 26.1.1 The Contractor shall ensure that all blasting operations will only be permitted following consultations with the relevant authorities and subsequent issuing of the permission to blast permits. The Employer's Representative must also give his consent in writing before any blasting operations take place.
- 26.1.2 All blasting shall be conducted under the direct supervision of a Licensed Shotfirer.

### **26.2 Risk Assessment and Method Statements**

- 26.2.1 The Contractor shall produce a detailed hazard and risk assessment and an in depth method statement for amongst others the following elements:
- (a) Type of explosives to be used.
  - (b) Anticipated effects of vibration on nearby structures.
  - (c) Blasting patterns.
  - (d) Delivery of the explosives.
  - (e) Transportation and storage of explosives on site.
  - (f) Drilling and charging of holes.
  - (g) Warning sirens.
  - (h) Measurement of Vibration
  - (i) Provision of sentries.
  - (j) Use of blast screens.
  - (k) ALL CLEAR.
  - (l) Ventilation following blasting.
  - (m) Atmosphere monitoring.
  - (n) Procedure for miss-fires.

### **26.3 References**

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

##### **Indian Standards**

IS 4081 : 1986 Safety Code for Blasting and related Drilling Operations

##### **British Standards**

BS 5607 : 1988 Code of Practice for the safe use of explosives in the construction industry.

## **27.0 DEMOLITION**

### **27.1 General**

- 27.1.1 The Contractor shall ensure that all demolition works shall be carried out in a controlled manner under the management of experienced and competent supervision.
- 27.1.2 Prior to any demolition commencing, a survey shall be conducted to identify if there are any hazardous materials present, for example the presence of materials such as asbestos and lead.
- 27.1.3 If any hazardous materials are found, then consideration shall be given as to whether they shall need to be removed by a Specialist Agency or Sub-contractor prior to the main demolition works commencing.
- 27.1.4 Before the demolition commences all relevant notifications will need to be given to the local authorities and media.
- 27.1.5 Measures for protection to the public shall be required to be put into place in order to give protection from any possible falling debris and dust generation.
- 27.1.6 All power supplies and services shall be disconnected before any demolition work commences.

### **27.2 References**

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

##### **Chapter: XII**

##### **Indian Standards**

- IS 4130 : 1991 Demolition of Buildings – Code of Safety
- IS 13416 ( Part 3):1994 Recommendations for preventive measures against hazards in the workplace, Part 3, Disposal of Debris

## 28.0 FALSEWORK / FORMWORK

### 28.1 General

- 28.1.1 The contractor shall ensure that all falsework / formwork has been properly designed and is suitable for the purpose.
- 28.1.2 All designed falsework / formwork shall be erected in strict accordance to the design.
- 28.1.3 Prior to the loading and subsequent striking of falsework / formwork, permission shall be obtained from the Contractor's Designer and Engineer who shall both inspect and sign off on the structure in person.
- 28.1.4 Adequate provision shall be made on the working platforms for the concrete placement operations, these shall include locations for vibrators and the unobstructed movement of personnel controlling the rubber hose during the concrete pumping operations or the concrete skip during any skipping operations.
- 28.1.5 The Contractor should use the following checklist to check that falsework / formwork is being used safely;
- (a) have the design and the supports for shuttering and falsework / formwork been checked?
  - (b) is it being erected safely from steps or proper platforms?
  - (c) are the props plumb and properly set out?
  - (d) are the bases and ground conditions adequate for the loads?
  - (e) are the correct pins used in the props?
  - (f) are the timbers in good condition?
  - (g) is it inspected by a competent person against the agreed design before permission is given to pour concrete?

### References

**Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

Chapter:

XVII

## **29.0 PILING AND DIAPHRAGM WALLS**

### **29.1 General**

- 29.1.1 The contractor shall prepare safe systems of work and method statements for all work concerned with piling and diaphragm walls. He shall take the following points into consideration.
- 29.1.2 Any excavated piles or panels shall not be left unattended, unless they are adequately fenced around to prevent accidental entry into the immediate vicinity of the pile or panel.
- 29.1.3 Because of the use of heavy plant and equipment in generally congested work areas then trained banksmen shall be deployed to control the movement of the plant and personnel interface.
- 29.1.4 All lifting operations shall be conducted in accordance with the requirements as detailed in Section 18 Lifting Operations.
- 29.1.5 Calcium Oxide shall not be used for stabilising the excavated spoil as it is an acute irritant, unless an agreed method statement has been produced.
- 29.1.6 A method statement shall be produced by the Contractor, which details the process for grab retrieval in the event of a grab becoming detached during the course of a pile or panel excavation.
- 29.1.7 A method statement shall be produced by the Contractor, which details the process for stop end recovery.
- 29.1.8 Wheel washing facilities shall be available on the sites for washing down the spoil removal trucks and the concrete delivery vehicles.
- 29.1.9 Bentonite and polymer storage tanks shall be bunded around to retain any unintentional and uncontrolled spillage.
- 29.1.10 The contractor shall submit to the Employer's Representative, for approval, proposals for the treatment of Bentonite slurry and its subsequent disposal.
- 29.1.11 No Bentonite spillage shall be allowed on any roads.
- 29.1.12 Regular site cleaning shall be carried out at all work-sites.
- 29.1.13 The Contractor as part of his Emergency Plans shall develop procedures for the collapse of piles and diaphragm walls.

### **29.2 References**

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

#### **Chapter: XXIII and XI**

##### **Indian Standards**

IS 5121 : 1969 Safety Code for Piling and other Deep Foundations

IS 8989 : 1978 Safety Code for the Erection of Concrete Framed Structures

## **30.0 WORK ADJACENT TO LIVE RAILWAYS**

### **30.1 General**

- 30.1.1 Whenever work is to be conducted in close proximity to the live railways then the following measures shall need to be addressed:
- (a) The rules provided for in the Railway's manual shall be followed.
  - (b) No persons are allowed to encroach onto the railway unless specific authority has been given by the owner.
  - (c) Adequate protection in accordance with the railway owner's requirements shall be followed. ( Provision of Block Inspectors, Flagmen and Lookouts. )
  - (d) All persons shall wear high visibility clothing at all times.
  - (e) Any induction training requirements of the railway owner shall be strictly observed

## **31.0 WORK ADJACENT TO LIVE ROADWAYS**

### **31.1 General**

- 31.1.1 Whenever working adjacent to any live roadways then the following aspects shall be considered.
- (a) Close liaison with the Police and Municipal Authorities.
  - (b) Production of an agreed traffic management scheme in accordance with the local traffic laws. ( Barriers, signs, lights and road markings. ) this shall include adequate provision for pedestrians.
  - (c) The provision and wearing of high visibility clothing by all personnel engaged in the activities.
  - (d) Traffic Marshals shall be appointed and deployed to ensure that all road movement is carried out safely.

## 32.0 PERSONAL PROTECTIVE EQUIPMENT

### 32.1 General

32.1.1 The Contractor shall at all times keep and maintain an adequate supply of suitable personnel protective equipment which shall be readily available for use at all times on the sites, and would include amongst others the following items:

- (a) Safety Helmets.
- (b) Hearing Protection.
- (c) Respiratory Protection.
- (d) Eye Protection.
- (e) Protective Gloves.
- (f) Safety Footwear.
- (g) High Visibility Clothing to BS EN 471 Class 3 standard

32.1.2 All sites shall be designated as HARD HAT and SAFETY BOOTS SITES and as such an adequate supply of safety helmets and safety boots shall be kept available for use by all staff, workers and authorised visitors to the sites.

32.1.3 The Contractor shall remove from the site any worker who consistently refuses to wear the appropriate personal protective equipment.

### 32.2 References

#### **Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

#### **Chapter: VI**

##### **Indian Standards**

IS 2925 : 1984 Specification for Industrial Safety Helmets.

IS 1179 : 1967 Specification for equipment for eye and face protection during welding.

IS 6994 Standard for Industrial Gloves

##### **British Standards**

BS EN 166: 1996: Personal eye-protection. Specifications

BS EN 169: 1992: Specification for filters for personal eye protection equipment used in welding and similar operations

BS EN 175: 1997: Personal protection. Equipment for eye and face protection during welding and allied processes

BS EN 352: Hearing protectors. Safety requirements and testing

352-1: 1993: Ear muffs

352-2: 1993: Ear plugs

352-3: 1997: Earmuffs attached to an industrial safety helmet

BS EN 345: Safety footwear for professional use

BS EN 471 High visibility clothing

## **33.0 FIRST AID**

### **33.1 First Aid Bases**

- 33.1.1 The Contractor shall establish a First Aid Base, in accordance with the Employer's Requirements, at each of his principal work areas. If during the life of the contract the Contractor's principal work area moves from one location to another, the Contractor shall be required to move his First Aid Base.
- 33.1.2 If the Contractor operates more than one principal work area he will be required to have a First Aid Base at each of his principal work areas.
- 33.1.3 The First Aid Base shall consist of as a minimum;
- (a) A treatment room fitted with two treatment couches,
  - (b) A hand wash basin with running water;
  - (c) Lockable cupboards to contain sufficient medical supplies;
  - (d) Bed.
  - (e) Six Chairs with footrests
  - (f) Desk and chair.
  - (g) Six Stretchers ( Which can be lifted and lowered by a crane. )
  - (h) Pillows and blankets.
  - (i) Refuse containers.
  - (j) Medical dressings. ( Bandages, plasters, antiseptic wipes. )
  - (k) Eye irrigation sterile solution.
  - (l) Paper towels.
  - (m) Disposable gloves.

- 33.1.2 The first-aid unit shall be provided with air conditioning and shall be kept in a clean and tidy state at all times.

### **33.2 Medical Staff**

- 33.2.1 A qualified Doctor, Nurse and assistant Nurse shall be in attendance at the first aid base during all times when work is being undertaken on the site.

### **33.3 Ambulance**

- 33.3.1 A fully equipped ambulance and driver shall be provided at the first aid base during all working hours. The ambulance shall be equipped with emergency life support equipment suitable for application in construction site accidents.

### **33.4 First Aid Boxes**

- 33.4.1 Portable first aid boxes will be maintained fully equipped at each local site offices and work locations where 20 or more persons work at a time.
- 33.4.2 In each site office and location one employee, suitably trained in first aid, should be available at all working hours for the purpose of attending to emergencies.

### **33.5 References**

**Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

## **34.0 FIRE PRECAUTIONS**

### **34.1 General**

- 34.1.1 The Contractor shall be responsible for supplying and maintaining adequate fire precaution facilities on all his sites. The following minimum standards should be adhered to.
- 34.1.2 The Contractor shall ensure that specially trained personnel are available to deal with fires due to electrical causes, gas explosions etc.
- 34.1.3 A good standard of housekeeping shall be maintained at all times on the sites.
- 34.1.4 No accumulations of rubbish shall be allowed to gather.
- 34.1.5 Combustible scrap and other construction debris should be disposed off site on a regular basis. If scrap is to be burnt on site, the burning site should be specified and located at a distance no less than 12 metres from any construction work or any other combustible material.
- 34.1.6 Signage shall be erected at prominent positions showing the correct use of portable first aid fire extinguishers.
- 34.1.7 Emergency plans and Fire Evacuation plans shall be prepared and issued . Mock drills should be held on a regular basis to ensure the effectiveness of the arrangements.

### **34.2 Fire Fighting Equipment**

- 34.2.1 At various locations around the site clearly visible fire points shall be established for use in an emergency and each fire point should have available as a minimum the following type of equipment:
  - (a) Dry Powder Extinguisher.
  - (b) Water Type Extinguisher.
  - (c) Bucket of Sand.
- 34.2.2 Recharging of fire extinguishers and their proper maintenance should be ensured and as a minimum should meet Indian National Standards
- 34.2.3 Water supply for fire fighting purposes should be provided at the construction site. This may be in the form of static water tank of adequate capacity or a hydrant line with adequate water pressure at outlet points.
- 34.2.4 Sufficient number of fire hoses with branch pipes should be provided at site so that the fire can be controlled until the arrival the arrival of the Fire Brigade.
- 34.2.5 The contractor shall need to give consideration to the provision of adequate fire fighting arrangements within the underground and tunnelling operations including the provision of Fire Service compatible hose connections and emergency lighting
- 34.2.6 The Telephone Number of the local fire brigade should be prominently displayed near each telephone on site.
- 34.2.7 Supervisors and workmen at the site should be trained in the use of fire fighting equipment provided at the site.

### **34.3 Storage of Flammable Liquids**

- 34.3.1 All flammable liquids shall be kept in a secure fire resistant store protected from electrical sparks welding sparks open flames and smoking.
- 34.3.2 Only such amounts of flammable liquids should be issued as are required for immediate use. Cans for carrying flammable liquids should be leakproof and properly stoppered and clearly marked "FLAMMABLE LIQUID".

- 34.3.3 Rags soaked in paints, kerosene and other flammable liquids should be disposed of daily under supervision. Large quantities of such rags should not be allowed to accumulate.
- 34.3.4 All Diesel fuel storage tanks shall be bunded around in order to control any spillage or leakage that may occur.
- 34.3.5 “NO SMOKING” signs shall be prominently displayed at all areas where flammable materials are stored.

**34.4 References**

**Building And Other Construction Workers (Regulation of Employment and Conditions of Service) Rules 2002**

**Chapter VI**

**Indian Standards**

IS 13416 (Part 5) : 1994 Preventative measures against hazards at workplaces – Recommendations Part 5 Fire Protection

IS 1646 : 1982 Code of Practice for fire safety of buildings (general) : Electrical Installations

IS 2190 : 1979 Code of practice for selection installation and maintenance of portable first aid fire extinguishers

IS 12349 : 1988 Fire Protection – Safety Signs

Also Part IV of National Building Code of India : 1983

## 35.0 SITE PERIMETER HOARDING

### 35.1 General

- 35.1.1 The Contractor is required to keep the site as safe and secure as possible at all times, this includes the erection of site perimeter Hoarding which shall also deter trespassers both adult and children alike.
- 35.1.2 The Contractor shall provide a solid two metre high securely erected fence be installed around the perimeter of the site, with agreed and guarded access and egress points for both personnel and vehicles.
- 35.1.3 The Site Perimeter Fencing shall be constructed in accordance with the Specification attached as Appendix xx
- 35.1.4 At each entrance to the site the Contractor shall erect a large billboard warning all persons who enter the site that they are required to wear the appropriate Personal Protective Clothing and that no unauthorised access is allowed.
- 35.1.5 Wherever the fence runs adjacent to the highway with no buffer-zones then the fence shall have traffic warning lights duly affixed to it.
- 35.1.6 Wherever the fence borders on pedestrian footpaths lighting shall be provided to illuminate the pedestrian routes. The positioning of the fence-line shall not reduce the width of the pedestrian footpath to less than 900 mm in order to be able to accommodate disabled persons in wheelchairs.
- 35.1.7 Site perimeter fencing shall be washed at least once a month and repainted at least annually.
- 35.1.8 The site fencing shall need to be inspected on a regular basis in order to ensure that the integrity of the fencing is maintained at all times as far as is practicable.

### 35.2 References

#### Indian Standards

- |                 |   |
|-----------------|---|
| IS 13430 : 1992 | Safety During Additional Construction and Alteration to Existing Buildings - Code of Practice |
| IS 9457         | Standard for colours of safety signs  |

## **36.0 TRAFFIC MANAGEMENT**

### **36.1 General**

- 36.1.1 The contractor shall ensure that all traffic management schemes shall be in accordance with the agreed schemes following consultation with the Local Traffic Police and the Metropolitan and other Authorities in charge of the area.
- 36.1.2 Adequate and clear warning signs shall be displayed at appropriate distances before the commencement of the site workings. In addition prior warning shall be given concerning the location of the approaching site entry and exit points.
- 36.1.3 All traffic signs, barriers, cones and lighting shall be kept maintained and clean at all times.
- 36.1.4 Site vehicles exiting the site shall observe caution at all times, if the vehicles are exiting directly onto the live carriageway then they shall be directed by an identifiable Traffic Controller.
- 36.1.5 Regular inspections of the traffic management schemes shall be conducted by the Contractors in both the daytime and night time hours with the results of these inspections being recorded. These records shall be kept available for inspection by the Employer's Representative.

### **36.2 Vehicle Control**

- 36.2.1 Traffic Controllers shall be available for directing vehicles that are exiting the sites directly onto the live carriageways. Any vehicles entering the sites that are required to execute reversing manoeuvres shall do so under the strict control of a trained and designated banksman.

### **36.3 Spoil Removal**

- 36.3.1 Only well maintained and licensed vehicles shall be allowed to be used for the removal of excavated spoil from the sites.
- 36.3.2 All drivers shall be medically fit and in possession of a valid and current driving licence.
- 36.3.3 No vehicles, which are overloaded, shall be allowed to leave the site.
- 36.3.4 Any vehicles leaving the sites carrying loads which are liable to produce airborne contaminants shall prior to leaving the site securely sheet the load over in order to effectively contain any dispersment during transportation on the public highway.
- 36.3.5 Vehicles exiting the site directly onto the live carriageway shall do so under the control of the clearly identified Traffic Controller.
- 36.3.6 Any vehicles that are required to reverse whilst on the site shall do so under the control of a trained banksman.
- 36.3.7 Any vehicles prior to leaving the site shall have their wheels washed and any loose material removed.
- 36.3.8 Any spoil that is removed from the work-sites shall be disposed of only at authorised dumping sites.

### **36.4 References**

#### **Indian standards**

IS 4130 : 1991 Demolition of Buildings – Code of Safety

IS 13416 ( Part 3):1994 Recommendations for preventive measures against hazards in the workplace, Part 3, Disposal of Debris

## **38.0 VISITORS TO SITE**

### **38.1 General**

- 38.1.1 All visitors to site shall report to the Contractors site offices where they shall be issued with appropriate Personal Protective Equipment if they are to go out onto the site work areas. Any visitors going out to the site work areas shall be accompanied at all times by a member of the site personnel.

## **LIST OF SCHEDULES**

The following Schedules are given to assist the Contractor's understanding of the Hierarchy of Safety adopted by KMRC and to give additional advice in support of this Manual.

- |            |  |
|------------|--|
| Schedule 1 | Sample Safety Forms:   |
| Schedule 2 | Example of Toolbox Talks                                     |
| Schedule 3 | Hierarchy of Safety and Industrial Health for KMRC Contracts |

## SCHEDULE 1

### SAMPLE SAFETY FORMS

The purpose of this schedule is to provide a set of standardised forms for the Contractor to use when reporting information to the Employer's Representative. The Contractor is free to adapt the forms for his own use, however when the form is being used to transmit information to the Employer's Representative it must contain, as a minimum, the information shown on the following forms.

#### List of Forms:

SAF 001	Accident / Incident / Dangerous Occurrence Report Form
SAF 002	Accident Report - Injury Analysis Form
SAF 003	Accident Statistics – Monthly Report Form
SAF 004	Contractor's Monthly Safety Report
SAF 010	Permit to Work – Confined Spaces
SAF 011	Permit to Work – Electrical
SAF 012	Permit to Work – Hot Work
SAF 020	Risk Assessment Work Sheet
SAF 021	Hazardous Substance Assessment Sheet
SAF 030	Site Safety and Emergency Standby List
SAF 031	Safety Training Attendance Record
SAF 032	Weekly Fire Fighting Equipment Check List
SAF 033	Scaffold Inspection Checklist
SAF 040	Contractor's Application for Approval of Safety Manager

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE :</b>	<b>SAF - 001</b>
<b>ACCIDENT/DANGEROUS OCCURRENCE REPORT FORM</b>		<b>Accident No.</b>
<b>Name of Contractor</b>		<b>Contract No.</b>
<p><b>Instructions :</b></p> <ol style="list-style-type: none"> <li>1. A copy of this form shall be completed for every Accident and Dangerous Occurrence.</li> <li>2. It must be signed by a senior site management representative.</li> <li>3. A copy shall be sent to the Employer's Representative within 24 hours of the Accident.</li> </ol>		
<b>Part A : Details of Injured Person</b>		
<p>Name : _____ Date of Birth : _____ Male <input type="checkbox"/> Female <input type="checkbox"/></p> <p>Address : _____</p> <p>Job Title : _____ Name of Employer : _____</p>		
<b>Part B : Details of The Accident (use additional paper as necessary)</b>		
<p>Date : _____ Time : _____ Location : _____</p> <ul style="list-style-type: none"> <li>➤ Describe the task the injured person was doing at the time of the accident:</li> <li>➤ Describe in details how the accident happened (Attach, sketch, plan photographs etc.):</li> <li>➤ Was any plant or machinery involved yes/no : if yes give details:</li> <li>➤ Name of any Witnesses:</li> </ul>		
<b>Part C : Details of the Inquiry</b>		
<p>What was the Injury ? (eg. Fracture, Lacerations)</p> <p>What part of the body was injured?</p> <p>Was the injury : Fatal <input type="checkbox"/> Major Injury <input type="checkbox"/> Minor Injury <input type="checkbox"/></p> <p>Was the injured person sent to ; First Aid <input type="checkbox"/> Doctor <input type="checkbox"/> Hospital <input type="checkbox"/> Home <input type="checkbox"/></p> <p><b>(If doctor or hospital, provide doctors/hospital reports say if/when the employee can return to work)</b></p>		
<b>Part D : Certification</b>		
<p>I have checked the above information and can confirm that it is a true record of the accident</p> <p>Signed _____ Safety Officer Date _____</p> <p>Signed _____ Project Manager Date _____</p>		



<u>Safety Officer</u>	<u>Sign:</u>	<u>Name:</u>	<u>Date:</u> / /
<u>Project Manager</u>	<u>Sign:</u>	Name: _____	Date: / /

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE:</b>	<b>SAF- 003</b>	
<b>CONTRACTORS MONTHLY ACCIDENT STATISTICS REPORT</b>			
<b>NAME OF CONTRACTOR</b>		<b>CONTRACT NO</b>	
<b>REPORT FOR MONTH ENDING:</b> .....			
<b>COMMENCEMENT DATE:</b>		<b>SCHEDULED COMPLETION DATE:</b>	
	<b>ACCIDENT STATISTICS SUMMARY</b>	<b>FOR MONTH</b>	<b>CUMULATIVE</b>
1.	Number of Manhours Worked		
2.	<i>Number of Mandays Worked</i>		
3.	<i>Number of Reportable Fatal Accidents</i>		
4.	<i>Number of Reportable Non-Fatal Accidents</i>		
5.	<i>Number of Dangerous Occurrences</i>		
6.	<i>Number of Manhours Lost</i>		
7.	<i>Number of Mandays Lost</i>		
8.	<i>Number of Reportable Accidents per 100,000 Manhours Worked</i> $= \left\{ \frac{[(3) + (4)]}{(1)} \right\} \times 100,000 = \text{Accident Frequency Rate}$		
9.	<i>Average Number of Worker Daily</i>		
REMARKS:			
Signed: _____		Safety Officer: _____	Date: / /
Signed: _____		Project Manager: _____	Date: / /
<b>NOTE:</b> This form must be completed and returned to the Employer's Representative within 5 days after the end of each month.			

KOLKATA METRO RAIL CORPORATION	SAMPLE SAFETY FORM REFERENCE:	SAF - 004
<b>CONTRACTORS MONTHLY SAFETY REPORT</b>		
<b>NAME OF CONTRACTOR</b>	<b>CONTRACT NO.</b>	
<p>This report which shall be submitted to the Employer's Representative within five days of the end of each month consists of two sections; Part A. and Part B.</p> <p><b>PART A Accident Statistics</b></p> <ol style="list-style-type: none"> <li>1. Accident Statistics which shall be presented in the format shown on the Accident Statistics Monthly Report Form ( SAF 003 )</li> <li>2. Highlights of serious accidents which have occurred during the Month.</li> <li>3. Details of any Fires which have occurred during the Month.</li> </ol> <p><b>PART B Safety Activities</b></p> <ol style="list-style-type: none"> <li>1. Safety Committee. An extract of the salient points of the last month's meeting and any action taken.</li> <li>2. Details of Tool Box Talks held during the month to include: <ul style="list-style-type: none"> <li>• numbers up to date,</li> <li>• total number of workers attending each talk,</li> <li>• the safety topics covered,</li> </ul> </li> <li>3. Details of any other training provided either on site or by attendance to outside courses such as First-Aid, Crane Operator, Singer/Rigger's Etc.</li> <li>4. Safety promotion undertaken during the month, poster campaigns, competitions, etc.</li> <li>5. Details of Safety Inspections carried out during the month. This information should show internal inspections and inspections by any outside bodies.</li> <li>6. Details of Emergency Evacuation drills or exercises carried out during the month including the involvement, if any, of outside bodies.</li> <li>7. Any other relevant information.</li> </ol>		

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE :</b>	<b>SAF - 010</b>
<b>PERMIT TO WORK – CONFINED SPACES</b>		
<b>NAME OF CONTRACTOR</b>		<b>CONTRACT NO</b>
PERMIT NO. CF .....	DATE    /    /	
<b>PART 1. ISSUE</b>		
Issue to (Name of Person) _____	Section _____	
Details of Confined Space _____		
Location _____		
Work to be carried out _____		

Results of Confined Space Testing: _____	
Oxygen Content _____	Explosive Gas _____ LEL
Toxic Gas 1: _____	Toxic Gas 2: _____
Date and Time Tests Conducted _____	
Type and Model of Equipment used _____	
Precautions Required _____	

I hereby declare that the above Confined Space is safe to enter without the use of breathing apparatus, provided the conditions of this permit and the requirements of the Company Safety Rules and observed.

**THIS PERMIT ONLY VALID FOR THE PERIOD SPECIFIED, WHICH MUST NOT EXCEED 24 HOURS**

Date: \_\_\_\_\_ Time of Issue: \_\_\_\_\_ Date: \_\_\_\_\_ Time of Expiry \_\_\_\_\_  
 Signed \_\_\_\_\_ Being the Authorised Person (Confined Spaces)

**PART 2. RECEIPT**

I hereby declare that work by myself, or by any person under my control in the above Confined Space shall be carried out in accordance with the conditions of this permit and the requirements of the company Safety Rules. All persons permitted to enter the Confined Space have been or will be informed of when the safe period for entry will expire.

Signed \_\_\_\_\_ Time \_\_\_\_\_ Date \_\_\_\_\_  
 Being the Competent Person (Confined Spaces)

**PART 3. CLEARANCE CERTIFICATE**

I declare that all persons under my charge have been withdrawn and warned that it is no longer safe to work in the Confined Space detailed above, and that all gear, tools and other equipment have been removed.

Signed \_\_\_\_\_ Time \_\_\_\_\_ Date \_\_\_\_\_  
 Being the Competent Person (Confined Spaces)

**PART 4. CANCELLATION**

I acknowledge receipt of the clearance of the Permit

**THIS PERMIT IS NOW CANCELLED**

Signed \_\_\_\_\_  
 Being the Authorized Person (Confined Spaces)  
 Time \_\_\_\_\_ Date \_\_\_\_\_

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE :</b>	<b>SAF – 011</b>
<b>PERMIT TO WORK – ELECTRICAL</b>		
<b>Name of Contractor</b>	<b>Contract No.</b>	

<i>PERMIT NO. E:</i> _____	<i>Date</i> _____
<b>Part 1 : Issue</b>	
<i>Issue to</i> _____	
I hereby declare that it is safe to work on the Following apparatus which is dead, is isolated From all live conductors and is connected to earth	} _____ _____ _____
The apparatus is efficiently connected to earth At the following points	} _____ _____
<b>All other apparatus is dangerous</b>	
The following is the work to be carried out on the Apparatus.	} _____ _____
Caution Notices are posted at _____	
Special Keys required for access to enclosures _____	
Special Precautions to be taken _____	
This permit is valid only for the specified period which must not exceed 24 hours	
Signed _____ being an Authorized Person Possessing authority to issue a Permit for the work specified above.	
Time of issue _____ Date _____ Time of Enquiry _____	
<b>Part 2 : Receipt</b>	
I hereby declare that I accept responsibility for carrying out the work on the apparatus detailed on this permit, and that no attempt will be made by me, or by the men under my control, to carry out work on any other apparatus.	
Signed _____ Time _____ Date _____	
<b>Part 3 : Clearance Certificate</b>	
I hereby declare that the work for which this permit was issued is now suspended/completed and that all men under my charge have been withdrawn, and warned that it is no longer safe to work on the apparatus specified on this permit and that gear, tools and temporary earthing connections are all clear.	
I acknowledge return of authorised Key Nos _____	
Signature of person responsible for issue of permit _____	
Time _____ Date _____	

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE:</b>	<b>SAF - 012</b>
<b>PERMIT TO WORK – HOT WORK</b>		
<b>NAME OF CONTRACTOR</b>	<b>CONTRACT NO</b>	

PERMIT NO. HW: \_\_\_\_\_ Date \_\_\_\_\_

**Part 1: Issue**

Issue to (Name of person) \_\_\_\_\_ Section \_\_\_\_\_

Details of Hot Work \_\_\_\_\_

Location \_\_\_\_\_

Work to be carried out \_\_\_\_\_

I hereby declare that the above Hot Work is safe to carry out and that all appropriate fire precautions are in place including the issue of additional 5 kg Dry Powder Extinguisher on site and that all Company Safety Rules have been observed.

Date: \_\_\_\_\_ Time of Issue \_\_\_\_\_ Time of Expiry \_\_\_\_\_

This permit is valid only for the period specified which must not exceed 24 hours

Signed \_\_\_\_\_ Time \_\_\_\_\_ Date \_\_\_\_\_

***Being the Authorized Person (Hot Work)***

**Part 2 : Receipt**

I hereby declare that the work by myself, or by any person under my control or the above Hot Work shall be carried out in accordance with the conditions of this certificate and the requirements of the company Safety rules. All persons permitted to work on this Hot Work have been or will be informed of when the safe period for entry will expire.

Signed \_\_\_\_\_ Time \_\_\_\_\_ Date \_\_\_\_\_

***Being the Competent (Hot Work)***

**Part 3: Clearance**

I declare that all Hot Work under my control has now been stopped and the area has been checked out found clear of any risk of fire and that all tools and other equipment have been removed.

Signed \_\_\_\_\_ Time \_\_\_\_\_ Date \_\_\_\_\_

***Being the Competent (Hot Work)***

**Part 4 : Cancellation**

I acknowledge receipt of the clearance of this Certificate.

This certificate is now cancelled

Signed \_\_\_\_\_

**Being the Authorized Person (Hot Work)**

Time \_\_\_\_\_ Date \_\_\_\_\_

KOLKATA METRO RAIL CORPORATION			SAMPLE SAFETY FORM REFERENCE:	SAF - 020
NAME OF CONTRACTOR	CONTRACT No.		HAZARD / RISK ASSESSMENT SHEET	
OPERATION:			METHOD STATEMENT Ref:	DATE: PAGE: OF
HAZARDS	RISKS	DEGREE	CONTROL	MONITORING

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE:</b>	<b>SAF - 021</b>
<b>HAZARDOUS SUBSTANCES TO BE USED ON SITE</b>		
<b>NAME OF CONTRACTOR</b>	<b>CONTRACT No.</b>	
To be completed at Commencement and Revised Periodically and Updated as required		
Generally Assessed (For use outside or in well ventilated areas)	Others Specific assessments required	
<b>SPECIFY:</b>		
1 <input type="checkbox"/> Cement	24 <input type="checkbox"/> Epoxy Cleaners	47 <input type="checkbox"/> _____
2 <input type="checkbox"/> Lime	25 <input type="checkbox"/> Butyl Mastic Sealants	48 <input type="checkbox"/> _____
3 <input type="checkbox"/> Plaster	26 <input type="checkbox"/> Acrylic Sealants	49 <input type="checkbox"/> _____
4 <input type="checkbox"/> Artex	27 <input type="checkbox"/> Mastic Primers	50 <input type="checkbox"/> _____
5 <input type="checkbox"/> Sand	28 <input type="checkbox"/> Mastic Solvents	51 <input type="checkbox"/> _____
6 <input type="checkbox"/> Aggregates	29 <input type="checkbox"/> Elastomeric Sealants	52 <input type="checkbox"/> _____
7 <input type="checkbox"/> Plasticisers	30 <input type="checkbox"/> Elastomeric Primers	53 <input type="checkbox"/> _____
8 <input type="checkbox"/> Retarders	31 <input type="checkbox"/> Elastomeric Solvents	54 <input type="checkbox"/> _____
9 <input type="checkbox"/> Rapid Hardeners	32 <input type="checkbox"/> Hot Mastic Sealants	55 <input type="checkbox"/> _____
10 <input type="checkbox"/> Colouring / Mortar	33 <input type="checkbox"/> Bitumastics	56 <input type="checkbox"/> _____
11 <input type="checkbox"/> Curing Agents	34 <input type="checkbox"/> Coated Road Stone	57 <input type="checkbox"/> _____
12 <input type="checkbox"/> Rapid	35 <input type="checkbox"/> Contact Adhesives	58 <input type="checkbox"/> _____
13 <input type="checkbox"/> Diesel / Gas Oil	36 <input type="checkbox"/> Contact Solvents	59 <input type="checkbox"/> _____
14 <input type="checkbox"/> Engine Oils	37 <input type="checkbox"/> Softwoods	60 <input type="checkbox"/> _____
15 <input type="checkbox"/> Hydraulic Oils	38 <input type="checkbox"/> Hardwoods	
16 <input type="checkbox"/> Shutter Oils	39 <input type="checkbox"/> Fibreboards	
17 <input type="checkbox"/> Greases	40 <input type="checkbox"/> Paints / Primers	
18 <input type="checkbox"/> Pipe Lubricants	41 <input type="checkbox"/> Paint Solvents	
19 <input type="checkbox"/> Epoxy Mortars	42 <input type="checkbox"/> Brush Cleaners	
20 <input type="checkbox"/> Epoxy Adhesives	43 <input type="checkbox"/> Bleaches	
21 <input type="checkbox"/> Epoxy Sealands	44 <input type="checkbox"/> Brick Cleaner	
22 <input type="checkbox"/> Epoxy Primers	45 <input type="checkbox"/> Concrete Cleaner	
23 <input type="checkbox"/> Epoxy Solvents	46 <input type="checkbox"/> Liquified Petroleum Gas	
Completed by: _____ Sign: _____ Name: _____ Title: _____ Date: / /		

(  - TICK AS APPLICABLE)



<b>KOLKATA METRO RAIL CORPORATION</b>		<b>SAMPLE SAFETY FORM REFERENCE:</b>	<b>SAF - 031</b>
<b>SAFETY TRAINING ATTENDANCE RECORD</b>			
<b>NAME OF CONTRACTOR</b>		<b>CONTRACT No.</b>	
Title of Course		Date    /    /	Course Reference No.
Duration		Name of Trainer (s)	
No.	Name	Section / Sub-Contractor	Signature
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
CONFIRMED AS CORRECT BY:			
SIGNATURE: _____		SAFETY MANAGER	DATE    /    /
SIGNATURE: _____		PROJECT MANAGER	DATE    /    /



<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE :</b>	<b>SAF - 033</b>	
<b>SCAFFOLD INSPECTION CHECKLIST</b>			
<b>NAME OF CONTRACTOR:</b>	<b>CONTRACT No.</b>	<b>DATE: / /</b>	
Work commencement – Date _____/_____/_____			
Location and description of scaffold, etc. and other plant or equipment inspected <b>1</b>	Date of Inspection <b>2</b>	Result of inspection State whether in good order <b>3</b>	Signature of person who made the inspection <b>4</b>
<b>SHORT CHECK LIST – ATTACH INSPECTION CHECK THAT YOUR SCAFFOLDING DOES NOT HAVE FAULTS</b>			
	Week	Week	Week
	1    2    3    4	1    2    3    4	1    2    3    4
<b>FOOTING</b>  uneven No base No sole boards Undermined  <b>STANDARDS</b> Not plumb Jointed at same Height Wrong Spacing Damaged Not level Joint in same bays Loose Damaged	<b>RACING</b> FAÇADE & LEDGER PUTLOGS AND TRANSOMS COUPLINGS	Some missing Loose Wrong Fittings Wrongly Spaced Loose Wrongly Supported Wrong fitting Loose Damaged No check couplers Wrong Spacing Wrong couplings Weak Support	<b>TILES</b>  <b>BOARDING</b> Bad boards Trap Boards Incomplete Insufficient Supports Wrong Height Loose <b>RAILS &amp;</b> <b>TOE BOARDS</b> Some Missing <b>LADDERS</b> Damaged Insufficient Length Not tied
SIGNATURE _____ NAME _____ DATE / /			

<b>KOLKATA METRO RAIL CORPORATION</b>	<b>SAMPLE SAFETY FORM REFERENCE:</b>	<b>SAF - 040</b>
<b>CONTRACTOR'S APPLICATION FOR SAFETY OFFICERTO WORK</b> <i>FOR CONTRACT.....</i>		
<b>NAME OF CONTRACTOR</b>	<b>CONTRACT No.</b>	
<b>GENERAL PARTICULARS</b>  Name : _____ ( In Block Capitals )  Date of Birth		

## **SCHEDULE 2**

### **EXAMPLES OF TOOL BOX TALKS**

The purpose of the following Toolbox Talks is give guidance on the subject matter to be covered during the talk. The talk should be given to groups of workers no greater than twenty in number by their supervisor. Each talk should last between ten and fifteen minutes. An attendance sheet of each talk should be kept showing who presented the session, the workers who attended, and the duration. Form SAF 031 Safety Training Attendance Record should be used for this purpose.

The following list shows the subjects that can be covered, but not limited to:

1. Personal Points (listed below)
2. Personal Protective Equipment
3. Manual Handling
4. Hand Tools
5. Woodworking Machinery
6. Ladders
7. Cartridge Tools
8. Compressed Air
9. Oxygen
10. Compressed gas Cylinders
11. Drilling Machines
12. Pre-permit activation job specific toolbox talk
13. Excavation
14. Electrical safety
15. Situational awareness
16. Other topics

<p><b>KOLKATA METRO RAIL CORPORATION</b></p>	<p><b>TOOL BOX TALK NO 1</b></p>
<p><b>PERSONAL POINTS</b></p>	
<ul style="list-style-type: none"> <li>• Never take chances.</li> <li>• Carry out the instructions you have been given.</li> <li>• If you do not know or understand - Ask.</li> <li>• If you see on unsafe condition - Rectify it or report it.</li> <li>• If you have an accident make sure you report it and get it properly attended to.</li> <li>• Obey all safety signs and rules.</li> <li>• Do not distract others or “horseplay” around</li> <li>• Only operate plant and equipment that you are authorised to.</li> <li>• Never operate machinery unless all the guards are in place.</li> <li>• Always wear the protective clothing and equipment that you have been provided with.</li> <li>• Keep your work place clean and tidy.</li> <li>• Look after your tools, don’t leave them on the ground where they can be damaged or where people can fall over them.</li> </ul>	

SCHEDULE 3

**HIERARCY OF SAFETY HEALTH & ENVIRONMENTAL FOR KMRC CONTRACTORS**

