

University of Southern Queensland
Faculty of Engineering and Surveying

Safety Management System

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Abstract

TPS Construction Pte Ltd (TPS) is committed to provide a safe working environment so that everyone working therein can strive to do their best without worrying of personal safety as well as the safety of their fellow colleagues. As technology improves and changes are constantly made, safety considerations must be made before such changes are accepted and put into practice.

To achieve this objective, **TPS** has defined the procedures in this manual by which it controls the work for the safe operation of **TPS** and its contractors. The purpose of this manual is to provide a safe method in managing work for all general operations and specific tasks that are covered by instructions issued under the authority of the project manager and the safety committee.

The Company will implement this Safety Management System in accordance with Factories Act, its Subsidiary Legislations and Building Operations and Works Of Engineering Construction Regulations 1994 (BOWEC).

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I further certify that the work is original and have not been previously submitted for assessment in any other course or institution, except where specifically stated.

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1. Introduction

1.1 General

TPS CONSTRUCTION PTE LTD (TPS) has defined the procedures by which it controls the work carried out within the site. The principles for personal behaviour are outlined in the In-House Safety Rules and Regulations for the all personnel to abide by and formed part of the Safety Management System. This Safety Management System also contained the objectives in formulating job-related procedures, which must be followed by all employees and contractor personnel involved in their respective types of work within its scope.

1.2 Purpose

This manual set out the procedures for the safe operation of **TPS** and its contractors. Its purpose is to provide a safe method of work for all general operations and specific tasks that are covered by instructions issued under the authority of Project Manager and the Safety Committee. The procedures are designed to protect:-

- the health and safety of personnel;
- the assets which are necessary for the Company's operations; and
- the Company's ability to continue in operation giving good service to our client.

TPS CONSTRUCTION PTE LTD will implement this management system in accordance with Regulation 27A of the Factories (Building Operations and Works of Engineering Construction) Regulations 1994.

1.3 Scope

The procedures apply to all activities within the site premises, whether carried out by **TPS** employees, contractor personnel, short-term workers or advisors.

1.4 Definitions

The following are definitions of the term used in this Safety Management System. The definitions have been adopted from the Factories (Building Operations and Works of Engineering Construction) Regulations.

1.4.1 Approved Person

- means any person who is approved by the Chief Inspector by a certificate in writing for the purposes of carrying out

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examinations and tests of hoists and lifts, lifting gear, or lifting appliances and lifting gear.

1.4.2. Contractor

- means a person who has entered into a contract for the purpose of carrying out any building operations or work of engineering construction and includes a main contractor and a sub-contractor.

1.4.3 Contractors Safety Supervisor

- means a safety supervisor appointed under the regulation 26

1.4.4 Designated Person

- means a competent person appointed by an employer to carry out any supervision or inspection or to perform any task or duty prescribed by the Regulations.

1.4.5 Employee

- a person who has entered into a contract of service with an employer.

1.4.6 Employer

- means any person who employs another person under a contract of service to carry out any work to which these Regulations apply.

1.4.7 Professional Engineer

- means a person registered as a professional engineer under the Professional Engineers Act.

1.4.8 Sub-contractor

- means a person who has entered into a contract with another contractor for the purpose of carrying out any building operations or works of engineering construction.

1.4.9 Site Safety Supervisor

- means a safety supervisor appointed under the regulation 25 (Factories Act 104).

1. Introduction

1.5 Interpretation and Abbreviations

<i>Must</i>	Actions, which is mandatory.
<i>Should</i>	Actions which is mandatory, unless circumstance dictate a better course of action.
<i>May</i>	Action, which is at discretion of the person responsible.
<i>He, Him, His</i>	The masculine is to be read as including the feminine where applicable.
<i>Act</i>	The Factories Act Chapter 104.
<i>Company</i>	TPS CONSTRUCTION PTE LTD
<i>MOM</i>	Ministry of Manpower
<i>PPE</i>	Personal Protective Equipment
<i>Regulation</i>	The Factories (Building Operations and Works of Engineering construction) Regulations.
<i>SMS</i>	Safety Management System
<i>MSDS</i>	Material Safety Data Sheet

1.6 History pertaining Safety Regulations (Singapore)

The present Occupational Safety Department was first set up under the name of "Factory Inspectorate" set-up in the 1960s. The safety legislation at that time was the Factories Ordinance, taken from the British. In April 1973, it was renamed the Factories Act 1973 and enacted by the Singapore Parliament. From 1973 till today, much other subsidiary legislation was gazetted to strengthen occupational safety and health in factories, construction worksites and shipyards.

Factory Inspectorate was changed to Department of Industrial Safety in 1985 and then to present Occupational Safety Department on 1st May 2000.

2. Safety Policy

2.1 General

Regard for the safety of the general public, our own engineers, employees and the employees of our subcontractors and our clients is a supreme responsibility at all levels of the company organisation. We seek to prevent any accident, injury, property damage, fire damage and occupational illness, any of which could result in human suffering (both mental and physical). It is our policy to strive to provide the highest safety standards at all our projects.

Safety at all job sites does not just occur. It is the result of careful attention to all companies operations by those who are directly and indirectly involved.

A safe operation is organised, clean and efficient. If all our employees view accidents in the same way we consider all other aspects of the company operations, we will be in excellent position not only to control accidents but also to improve the total performance of our company. Therefore it is of utmost importance that all aspects of our safety management systems be strictly enforced and followed.

Our safety management system is developed to ensure compliance with the Factories Act (Chapter 104) and the client's requirement to all our construction operations.

It is the obligation of all employees of the company to be knowledgeable of the standards established by these agencies and to implement the rules and regulations contained therein, on projects under their direction/supervision.

Any recommendation to improve our safety management systems and make our construction project a safer place are encouraged and welcomed.

The Company and their contractors will comply with the Factories Act and its subsidiary legislation for accident prevention. Management aims for ZERO accident rates and will ensure all site personnel participate in this goal.

2. Safety Policy

2.2 Duties and Responsibilities

Establish responsibility and authority of all personnel to achieve a safe and healthy working environment.

2.2.1 Managing Director/Project Director

- a. Overall in-charge of the safety management in the company.
- b. Direct the implement of the company's safety programme and procedures.
- c. Review and update the company's safety policy and other related duties as required by the relevant authorities.
- d. Approves safety policies, programs and Safety Management System.
- e. Holds executive responsibilities and authorises expenditures for safety.

2.2.2 Project Manager/ Site Manager

- a. Implement the company's safety management program and procedures.
- b. Lead and execute the overall safety programme.
- c. Be the Chairman of safety committee and take follow-up action on safety matters discussed.
- d. Conduct regular inspections and audits on safety provisions.
- e. Responsible for safety and health at the site and compliance of Factories Act, Factories (BOWEC) Regulations and other relevant legislation.
- f. Ensures safety takes precedence over work operations
- g. Ensures compliance of all parties and subcontractors by adhering to the company's safety control system and safe work practices.
- h. Organise safety patrol and inspection programs.
- i. Enforce the company's safety rules and regulations.
- j. Lead investigation of all incidents at site.

Safety Management System

2. Safety Policy

- k. Implement corrective action to prevent recurrence of accidents and incidents.
- l. Review Safety Management System periodically.

2.2.3 Site Engineer

- a. In-charge of overall structural work and inspection.
- b. Act as a site manager in the absence of the site manager.
- c. Implement all safety provisions during the progress of work.

2.2.4 Registered Safety Officer

- a. Act as the secretary of safety committee.
- b. Exercise general supervision of the observance of the provisions of the Factories Act, Chapter 104 and any regulations made there under.
- c. ensures that the safety management system is being implemented and monitored accordingly and also assuring its adherence.
- d. promotes the safe conduct of work within the site.
- e. advises management on all matter pertaining to safety.
- f. Liase with the management and relevant authorities on safety matters.
- g. Submit safety monthly report to Project Manager.
- h. Facilitate accident investigation and put up recommendations to prevent recurrence of similar accidents
- i. Conduct periodic safety inspections / direct his safety supervisors to inspect on his behalf to identify unsafe acts / unsafe conditions.
- j. Monitor and promote implementation of Safety Management System.
- j. Advise the safety committee on safety matters.
- k. Maintains all documents pertaining to safety.

Safety Management System

2. Safety Policy

2.2.5 Site Safety Supervisor

- a. Act as Asst. secretary of safety committee.
- b. Conduct daily inspection and act on unsafe acts and conditions.
- c. Train and monitor workers work practices.
- d. Monitor the conduct of toolbox meetings.
- e. Maintain and monitor safety records and checklist.
- f. Check each sub-contractor's work plan or work procedure from the safety point of view and advise the person in charge during progress of work.
- g. Safety supervisor shall advise the main/ sub-contractors' site supervisors of his opinion or concept from safety point of view.
- h. Safety supervisors shall patrol the site daily and check ensure the compliance of elements of safety program/ management system, Factories Act, Factories (BOWEC) Regulations and other related legislation.
- i. Results of safety patrol shall be recorded in safety inspection checklists. Any safety discrepancies spotted shall be recorded in appropriate forms and pursue on corrective actions required.

2.2.6 Lifting Supervisor

- a. Checks and prepare crane access for lifting operations.
- b. Monitor daily checking of cranes by crane operators.
- c. Monitor and ensure the maintenance and inspection programme of cranes.
- d. Ensure and monitors safe lifting procedures are carried out.

2. Safety Policy

2.2.7 Site Foreman/Site Supervisor

- a. Check the sub-contractors work to ensure compliance with the safety regulations.
- c. Rectify any unsafe condition and correct any unsafe practice immediately.
- d. Attend the safety meeting to contribute the work site safe working condition.
- e. Supervise workers and ensure compliance of Factories Act, Factories (BOWEC) Regulations and related legislation.
- f. Take instruction from site staff related to safety matters.
- g. Promote safe conduct and safe work practices.
- h. Participate in safety patrol and inspections.

2.2.8 Sub-Contractors Foreman

- a. Ensure compliance of safety provisions at their work areas.
- b. Conduct daily inspection and act on unsafe acts and conditions.
- c. Conduct daily toolbox meeting.
- d. Monitor workers for safe work practices.
- e. To attend safety meeting.

2.2.9 Sub-Contractors Safety Supervisor

- a. Ensure safe work practices during operations under his control.
- b. Ensure compliance of the Factories (BOWEC) Regulation and other relevant legislation within his scope of work.
- c. Take instructions from site safety personnel pertaining to safety matters.
- d. Ensure safety provisions are adequately provided and maintained.

2. Safety Policy

- e. Ensure workers under his control are trained in safety.
- f. Observe all safety procedure and report any unsafe conditions and practices.
- g. Attends safety committee meetings and participates in safety promotional activities.

2.2.10 All Employees

- a. It is their primary duty to wear and make use of all personal protective equipment issued by the company while carrying out their duties.
- b. All equipment and hand tools must be kept in good condition.
- c. They must observe all safety precautions and report any unsafe conditions immediately.
- d. All injuries, accident or dangerous occurrence must be reported immediately.
- e. All workers must undergo the compulsory Safety Orientation Course.

3. Safe Work Practices

3.1 Purpose

The objective of establishing safe work practices is to eliminate or reduce to a minimum level the risk of death, injury, or damage to people and /or assets during the performance of the functions of the work site. It also served as a prescribed instruction for the different trades of personnel working to follow and abide when they carry out their work.

The Company has established safe work practices for different trades to follow. However, for the part on civil and building construction safe work practices, the Company will follow the safe work practices submitted by their Civil and Building contractors which are incorporated and formed part of this Safety Management System (SMS). This will prevent unnecessary inconveniences for the work contractor in carrying out the work method for their related jobs.

This plan is not meant to be all encompassing and therefore during the course of the project, additional safe work practices may be issued by our company. All deviations from the plan must be approved in writing by our company Safety Department, prior to the work being performed.

3.2 Preliminary Work

- a. A survey of the site vicinity will be made and measures will be taken to ensure public safety.
- b. Hoarding/fencing will be provided around the site boundary with warning signs posted.
- c. Site Safety Committee will be formed and comprises representatives from site management and all trades of subcontractors.
- d. Personal Protective Equipment such as safety helmets, belts, gloves, earplugs etc. will be issued to all workers exposed to hazards.
- e. A First Aider will be deployed with adequate first aid kits (Appendix J).
- f. All building materials and equipment will be stored in designated areas away from access. They will be stacked in such a manner not to cause obstruction and hazards to personnel.
- g. Daily housekeeping program will be maintained.

3. Safe Work Practices

- h. All working tools will be maintained and workers will be briefed on their correct use.
- i. All moving parts of machinery will be fitted with protective guards.
- j. A qualified electrician will carry out all electrical installation.
- k. Electrical equipment will be well constructed and of sound material, free from defects and maintained according to the manufacturer's instructions.
- l. Sufficient sanitary and washing facilities shall be provided and maintained and kept clean at all times.

4. Group Meeting

4.1 Purpose

The objective of group meetings is to assemble persons with particular responsibilities for safety so that they can formally address issues and take appropriate actions towards the achievement of the site safety management objectives.

The following are the main meetings by which safety issues are raised for discussion and communication to the personnel affected by them.

- ◆ Safety & Security Steering Committee Meeting;
- ◆ Project Safety Committee Meeting;
- ◆ Project Co-ordination Meeting;
- ◆ Pre-Construction (Kick-Off) Meeting;
- ◆ Subcontractor Safety Committee Meeting;
- ◆ Total Safety Task Instruction (TSTI);
- ◆ Daily Tool-box Meeting;
- ◆ Technical Committee Meeting.

4.2 Project Safety Committee

- The Project Safety Committee will be formulated to meet fortnightly for the first 6 months and subsequently monthly to discuss major issues in relation to safety & health in the work site. As a statutory requirement, this committee shall function whenever the total workforce in the work site is 50 or more workers (or as and when required).
- This committee will function in pursuant to Section 72 of the Factories Act (Chapter 104) and the Factories (Safety Committees) Regulations 1975 in which both the employees and management are represented for the purpose of keeping under review circumstances in the factory. This may affect the safety or health of persons employed in the work site.
- This committee shall be effected to:-
 - ◆ Promote co-operation in achieving and maintaining a safe and healthy working conditions in the work site between the management and the persons employed by the occupier to work in the work site; and
 - ◆ Carry out from time to time inspection in the work site in the interest of the safety and health of persons so employed and to inspect the scene of any accident or dangerous occurrence.
 - ◆ The Company shall provide facilities and assistance as the committee may reasonably require for the purpose of carrying out its functions.

4. Group Meeting

- ◆ The safety committee may, on completion of the inspection, make and sign a record of the inspection stating :-
 - the date of the inspection;
 - the parts of the work site inspected; and
 - anything disclosed by the inspection which in its opinion was at the date of the inspection prejudicial to the safety or health of persons employed on the work site.
- ◆ A register shall be provided in which such record shall be entered.

4.3 Composition of The Project Safety Committee

Safety committee shall comprise of the following persons:-

- | | |
|------------------------------|-------------------------------------|
| ➤ Project Manager | - Chairman of the committee |
| ➤ Project Manager | - owner's representative (observer) |
| ➤ Safety Officer | - secretary of the committee |
| ➤ Safety Supervisor | - assistant to the secretary |
| ➤ Site Engineer | - member of the committee |
| ➤ Site supervisors | - members of the committee |
| ➤ Contractor Representatives | - members of the committee |
| ➤ Workers' Representatives | - members of the committee |

4.4 Project Safety Committee Meeting

The Safety Committee meetings shall be held once a month. Prior to the safety committee meeting, all safety committee members will go for the joint site inspection. **TPS** organize a Safety Committee with the following aims:-

- ✓ Confirm whether the safety and health management is being properly carried out by all parties concerned.
- ✓ Ensure that construction work is being performed safely and smoothly, complying with safety rules and regulations.
- ✓ Conduct safety inspections of the entire site prior to the meeting.
- ✓ Coordinate and control congested or hazardous working conditions of the Subcontractors.
- ✓ Discussing all safety and health matters raised by members, employees or other persons with the view of recommending appropriate action.

4. Group Meeting

- ✓ Increase subcontractors' safety knowledge and safety awareness.
- ✓ Enforce the Safety Training Program.
- ✓ Participate in and assist in the organization of Safety Promotional Activities.
- ✓ Promote and maintain housekeeping and waste disposal to the highest standards.
- ✓ Inspect scene of accidents / incidents and taking follow up on action.

By encouraging a strong group of Project Safety Committee, issues concerning safety may be resolved prior to their becoming disruptive to the project. This will not only promote a safer job, but it raises the level of safety consciousness and encourages personnel on site to be constructive rather than critical.

The following procedures apply to the meeting of the Project Safety Committee:-

- At least one week before the meeting, the Project Manager or his nominee asks the members for items to be included in the agenda and issues that agenda. The agenda includes each item discussed at the previous meeting unless the meeting has taken the decision that the action on that item is complete and the minute record the decision. The agenda contains particularly:-
 - Confirmation of minutes
 - Progress on actions from the previous meeting
 - High risk work on activity
 - Incident / Accident review and corrective action
 - Hazards identified
 - Future activities
 - Any other business
 - Date of next meeting.
- The meeting considers each item on the agenda and, on the basis of the facts presented, decides to recommend action, hold the item for a future meeting to allow time for information gathering, or decides to drop the item. It is important that the meeting has facts, rather than conjecture, on which to base its discussion and recommendations. In the absence of firm information, it should allocate the responsibility for the collection and submission of the information to an individual or team and ensure that the item is reviewed at the next meeting.
- The Secretary is responsible for the preparation of the minutes, which are circulated to the members with a copy being retained in the official file. Copies are available to any person within the site, with the reasonable cause for access to them.

4. Group Meeting

- Members will assist the Chairman in the implementation of the Safety Management Program and provide constant surveillance in the field on all matters pertaining to safety, fire and health concerns on the construction work site.

4.5 Project Coordination Meeting

The meeting shall be presided over by the Construction Site Manager and will be held weekly or as required. The purpose of the meeting is to deal with any problems detected in the engineering and construction interface, and to coordinate the progress and relationship of each Subcontractor's construction schedule and safe working practices.

In addition, the meeting shall discuss and coordinate safety matters in order to obtain safe working conditions and to eliminate congested work conditions among subcontractors, as well as to use the work areas safely and effectively.

4.6 Pre-construction (Kick-Off) Meeting

A pre-construction meeting shall be conducted by **TPS** site Management with each Subcontractor Management and their Supervisors directly in charge of the job before the actual start of work. The meeting is the final review stage where everyone must clearly understand how the work is to be carried out.

The meeting provides a good opportunity to make a last minute review of the work activities to be performed and expresses safety and health requirements and necessary preparations required for each activity. Any work which involved high risk, potential hazards and specific rules/regulations are also highlighted and discussed.

Each Subcontractor will be issued a copy of the Safety Management System manual.

4. Group Meeting

4.7 Subcontractor Safety Committee Meeting

All direct Subcontractors of **TPS** having more than 50 employees (approximate) involved in the construction site will be required to establish its own Safety Committee. This committee is to be represented by the subcontractor's management and supervisory personnel and representatives from their lower tier subcontractors. A representative from **TPS** shall be invited to attend the meeting.

The meeting shall be held once a month preferably after the monthly Project Safety Committee Meeting. The meeting shall be presided over by the subcontractor senior site management.

The primary function of this committee is to ensure that any policy, decision and planned activities agreed in the monthly Project Safety Committee meeting are effectively disseminated to all Subcontractor's employees and implemented. Also, it is an opportunity for subcontractors' management to review its own activities, which effect or may affect the safety or health of their employees, its lower tier subcontractors and, **TPS** and their other subcontractors.

4.8 Developer / Owner Safety & Security Steering Committee Meeting

TPS will participate in the Owner's Safety & Security Steering Committee Meeting. **TPS** shall comply with Owner's description and component of the safety meeting, which will include the number of participants required to attend from each party and the frequency of the meetings.

4.9 Total Safety Task Instruction (TSTI)

4.9.1 The implementation of TSTI is to be top priority, regardless of the importance or urgency of the task. TSTI is a requirement for all task assignments.

4.9.2 Project Manager will plan and analyzes each task for safety, occupational and environmental hazards.

4.9.3 Project Manager when assign the task, ensure that task performers (Supervisors, foremen and workers) are on agreement to be part of the decision-making process. The Manager's job is to provide an environment that the task performer will accept ownership of the outcome.

4. Group Meeting

- 4.9.4 The task performer will analyze the assigned task for safety, occupational health and environmental hazards. The task performer will plan what safe work practices should be used to ensure a safe work process.
- 4.9.5 The Project Manager and the task performer(s) will discuss, analyze, define task hazard and safe work practices. Before taking ownership of the task, the task performer will communicate an understanding to his Project Manager, all the recognized hazards and safe work practices to ensure safe performance.
- 4.9.6 If required, Project Manager will provide additional information, instruction and coaching to ensure the task performer(s) has a clear understanding of the safe work processes required to safely execute the task.
- 4.9.7 To ensure maximum effectiveness, TSTI must be communicated verbally at the location where the task will be performed.
- 4.9.8 Every **NEW TASK** must require a proper TSTI before work is allowed to be performed.
- 4.9.9 **EXTENDED TASK** extending beyond the normal working period by the task performer must be reviewed by the Project Manager when the environment situation may change.
- 4.9.10 After administering TSTI, if elements or conditions change that impacts a safe operation by the task performer(s), he must notify the Project Manager immediately for additional TSTI information.
- 4.9.11 Project Teams have the responsibility to reach a conclusive recognized hazards and safe work process required to safely executive the task.

4.10 Tool-Box Meeting

- 4.10.1 Toolbox meetings are necessary to maintain a high level of safety awareness on the work site. The meetings are also very useful to encourage the work force to actively take part in work site accident prevention.
Subcontractor Supervisors are to promote a high level of safety awareness by their example, behaviour and encouragement. At toolbox meetings, they are to inform the workforce in their charge on the nature of the hazard and the risks identified by the assessments, the preventative and protective measures, emergency procedures and the relevant competent personnel.

4. Group Meeting

4.10.2 Sub-Contractor Safety Supervisor shall ensure that at the construction site:-

- Tool Box meetings are scheduled daily at the same time each day and at a suitable workplace venue (Appendix C).
- Held during normal working hours with provision of 15-20 minutes downtime at the discretion of the Supervisor.
- All the operative level work force will attend their respective Subcontractor Supervisor's toolbox talk.
- Work site supervisor should always give talks on the safety toolbox.
- The number of workers should not be too large. It is recommended that workers should be separated in groups of 10 to 20 workers per safety toolbox talk.
- The toolbox talks should focus on accident prevention and not as a forum to air personal grievances.
- The toolbox talks are presented in the language and understanding of the operators and workers.

4.10.3 The Toolbox Talks are to encourage participation and discussion of safety matters and should not be restricted to the reading out a list of 'do's' and 'don'ts'.

Subjects for discussion should be chosen on a priority basis. Tool Box topics may be determined at weekly Site Safety Meetings.

As required, **TPS** Safety Department to support the presenter will provide subject material. The subject material should vary at each presentation and not be unnecessarily repetitive.

Each Toolbox Talk is to be recorded by the Subcontractor Supervisor on a Toolbox Record Sheet.

The Tool Box Talks are to be closely monitored by the subcontractors' project management and Safety Supervisors.

4. Group Meeting

4.11 Technical Committee

- 4.11.1 The Technical Committee will be formulated to meet when a need arise. They shall advise or support the Project Safety Committee on matters such as technical, design and engineering problems that are faced by the committee, when they require expertise and professional advice and engineering backup so that the committee
- 4.11.2 Could provide a safer environment or job procedures for the work to be done.
- 4.11.3 The technical committee shall consist of experts from related industries (supplier of equipment), engineers, senior technical staff and consultant.

5. Safety Training

5.1 Purpose

- 5.1.1 The objective of safety training is to equip all personnel with the necessary knowledge, skills and attitudes, which will enable them to perform their duties in a manner that do not represent safety hazards.
- 5.1.1 It is a statutory requirement under Regulations 28 of the Factories Act (Chapter 104) that:-
- *“No person shall be employed at any machine or in any process, being a machine or process liable to cause bodily injury, unless he has been fully instructed as to the dangers likely to arise in connection therewith and the precautions to be observed”*; and -
 - *“has received a sufficient training in work at the machine or in the process”*; or
 - *“Under adequate supervision by a person who has a thorough knowledge and experience of machine or process.”*

5.2 Safety Orientation Course for Construction Workers (SOC)

- 5.2.1 In compliance with the authority, every worker entering the site to work herein shall have undergone the basic SOC conducted by Ministry of Manpower, Singapore. The site will maintain records on the direct employees who have undergone this course furnished by the subcontractors before work commence:-
- 5.2.2 Photocopy of passport number, particulars of bearer, date of expiry;
- 5.2.3 Valid Singapore Work Permit (original); and
- 5.2.4 Photocopy of Certificate of Attendance at MOM, Safety Orientation Course.
- 5.2.5 TPS shall then furnish the above to the Owner’s Site Infrastructure Contractor.

5. Safety Training

5.3 Site Induction Course (SIC)

5.3.1 On completion of the above submission, **TPS** employees and sub-contractors employees shall be required to attend the Owner's site induction course. A description of the training course is to be provided by our owner.

5.3.2 An entry pass will be issued after confirming that an employee has received and successfully completed the Owner's site induction course. This course will require approximately four hours administering.

5.4 TPS Site Safety Orientation

All **TPS** and subcontractors' supervisors and employees must attend a site safety orientation, before beginning work on the project. The information provided during the orientation will include but is not limited to such topics as:-

- Company Safety Policy
- In-house Rules and Regulation
- Hazards reporting
- Reporting of all injuries
- Emergency procedures
- Hazard communication
- Safety Incentive Activities and Program including disciplinary measure and incentives.

The orientation shall be given in the main languages used on the project. It will be the responsibility of each subcontractor to provide additional instructors / translators to assist **TPS** personnel during the orientation and subsequent test.

5.5 Supervisor / Foreman's Role in Worker's Orientation

5.5.1 The attitude of employees toward accident prevention depends, a great deal upon the attitude of the foreman / supervisor. The foreman / supervisor shall take an active interest in the new workers, ensuring that the necessary safety information has been provided and that the new workers are adjusting well to the job.

5. Safety Training

5.5.2 The following action steps are a part of the foreman's/supervisor's orientation of the new worker:-

- Ask about last job
- Describe the new job
- Show worker around work area; point out hazards
- Introduce worker to others
- Describe basic rules
- Give worker a test run on tools and equipment
- Keep an eye on the new workers, during the first few days
- Check back to see how the worker is coming along.

5.6 Safety Training For Managers

5.6.1 Management training is intended to provide the knowledge, motivation, and skill necessary to manage the safety control program. **TPS** and Subcontractor Managers will attend Ministry of Manpower Project Manager's safety training program. Managers are expected to possess a basic knowledge of:-

- Safety Management Systems,
- Safety Inspections,
- Accident Investigation.

5.7 Supervisor's Orientation

5.7.1 All supervisors assigned to the project or promoted from the field work force must be indoctrinated to their responsibilities. Information covered includes:-

- Foreman / supervisor safety responsibilities and project requirements;
- Enforcement of safety rules;
- Safety motivation;
- Safe practices for specific crafts;
- Accident reporting/investigation;
- Conducting effective safety meetings;
- **TPS**, and governmental requirements;
- Effects of unsafe acts, conditions and accidents on productivity; and
- Welfare of workers.

5. Safety Training

5.7.2 All supervisors must learn and enforce all **TPS** rules and regulation applicable to their work. They set an example for their subordinates and co-workers by their compliance with work rules and their aggressive leadership in safety.

5.8 Other In-House Safety & Health Training

5.8.1 Other training will need to be developed for specific work operation and subcontractors are required to nominate their site personnel and workers to attend such training. Example of such training are as follows:-

- Banks men Training
- Proper use of Safety Harness
- Rigger Training
- Abrasive Wheel
- Handling of Hazardous Substance

6. Safety Inspection

6.1 Purpose

The objective of safety inspections is to verify that safety provisions and practices conform to the corporate safety management system and relevant statutory requirements.

TPS shall establish and maintain documented procedures for all safety inspections (i.e. inspection which are statutory requirements under the Factories Act (Chapter 104) and the Factories (Building Operations And Works of Engineering Construction) Regulation 1999 to ensure that unsafe conditions and practices at the worksite are identified and corrective measures are implemented promptly and effectively.

6.2 Types of Inspections

Safety inspections shall include the following:-

- a. General regular inspection;
- b. Safety committee inspection;
- c. Plant, machinery and equipment inspection; and
- d. Inspection arising from incident occurrence;
- e. Inspection arising from hazard analysis;
- f. Inspection of specialize operations and equipment such as shoring system and tunneling equipment;
- g. Other specified inspection as required by authorities such as Ministry of Manpower and Fire Safety Bureau

6. Safety Inspection

6.3 Competency of Personnel Conducting Safety Inspections

TPS will ensure that the safety inspections are carried out by competent persons who are fully conversant with safe work practices, the in-house rules and regulations, and statutory requirements.

The results of such inspections will be recorded and brought to the attention of the safety supervisor or safety personnel who has responsibilities in the area of work concerned. Any corrective action, which is required to be done, shall be immediately implemented.

6.4 Types of Inspection

6.4.1 Daily Inspection of Intended Work Areas in the Building

- a. This inspection shall be carried out by the trade's foreman of the respective contractors who wish to apply for the permit-to-work in the building before carrying out works.
- b. During each inspection, these trades foreman shall ensure that the intended work place is safe for the intended work to be carried out, and
- c. provided with the necessary safety precautions so that the intended works could be carried out safely.
- d. After having been satisfied with the results of his inspection, the trade's foreman shall put up the application for the permit-to-work and submit the application to the Safety Supervisor for the approval.

6.4.2 Daily Routine Inspection of Work Areas

- a. The safety officer shall work out a schedule of daily routine inspections of the site for the safety supervisor and safety personnel from the sub-contractors under his charge to carry out.
- b. The safety supervisor shall each carry a pocket dairy for use during their safety inspections in the open site and even in the building.

6. Safety Inspection

- The safety supervisor shall record, in his patrol book, events, which took place during his inspections of the site and in the building.
- c. During the inspections, the safety supervisor shall order for an immediate cease of operation or work if he find that the work being carried out in an unsafe manner which could endanger the safety of the particular worker or even other workers working in the vicinity of the work area.
- d. The safety supervisor shall then order for an immediate rectification of the unsafe condition or practices before he allows the work to be continued. He shall also record such events in his Daily Safety Inspection Report (Appendix D).

6.4.3 Weekly Inspection by Safety Supervisors Co-ordination Committee Inspection Team

- a. The Safety Committee shall conduct an inspection of the worksite before each meeting. The finding of such inspections shall be recorded and discussed during the meeting. The minutes of the weekly safety committee meeting shall be kept available by the safety supervisor for the visiting factory Inspector upon his request.

6.4.4 Safety Committee Inspection

- a. The inspection team which represents the safety committee shall spend some time to conduct an inspection of the worksite before each meeting. The finding of such inspections shall be recorded and discussed during the meeting.
- b. The minutes of the monthly safety committee meeting shall be kept available by the safety supervisor for the visiting Factory Inspector from Ministry of Manpower (Department of Industrial Safety) upon his request.

6. Safety Inspection

6.5 Inspection Methodology

The inspection methodology shall include the following:-

- a. safety inspections carried out at a specified frequency and thoroughness commensurate with dynamic and rapid changes of the worksite conditions;
- b. suitable safety checklists shall be developed and maintained to facilitate the inspection;
- c. the results of the inspection shall be recorded in the checklists and reported to the person responsible to rectify the unsafe conditions and unsafe practices.

6.6 Follow-Up System

The Company shall establish procedures for the implementation of corrective and preventive actions.

The procedures for the corrective and preventive actions shall include:-

- a. Investigation of the causes of unsafe practices and conditions;
- b. Determination of actions needed to eliminate the cause of non conformities;
- c. Application of controls to ensure that corrective and preventive actions are taken and that they are effective; &
- d. Monitoring and implementation of the corrective actions.

7. Accident Investigation and Analysis

7.1 General

Accident/dangerous occurrence investigation is a post-contact activity in terms of accident/dangerous occurrence prevention; proper investigation will provide the necessary data to identify weakness in the pre-contact elements of the accident chains of events. Quality of investigation and reporting facts are quite frequently insufficient, it is important to improve the quality of the investigation and reporting among all levels of supervision.

7.2 Definitions of accidents.

Where an *Accident* in a worksite

- a) causes loss of life to a person employed in the factory;
- b) disable any such person for more than 3 days from earning full wages at the work at which he was employed; or
- c) causes any injury to any person which requires such person to be detained in a hospital for at least 24 hours for observation or treatment.

7.3 Definition of dangerous occurrences

Dangerous Occurrences shall be defined as stated in the *Forth Schedule* of the *Factories Act (Chapter 104)*.

7.3.1 Classes of Dangerous Occurrences

- a. Bursting of revolving vessel, wheel, grindstone or grinding wheel moved by mechanical power.
- b. Collapse or failure of a crane, derrick, winch, hoist, piling frame, or other appliance used in raising or lowering persons or goods, or any part thereof (except breakage of chain or rope slings), or the overturning of a crane.
- c. Explosion or fire causing damage to the structure of any room or place in which persons are employed, or to any machine or plant contained therein, and resulting in the complete suspension of ordinary work in the room or place or stoppage of machinery or plant for not less than 5 hours, where the explosion or fire is due to the ignition of dust, gas or vapour, or the ignition of celluloid or substance composed wholly or in part of celluloid.
- d. Electrical short circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire or causing structural damage thereto, and involving its stoppage or disuse for not less than 5 hours.

7. Accident Investigation and Analysis

- e. Explosion or fire affecting any room in which persons are employed and causing completed suspension of ordinary work therein for not less than 24 hours.
- f. Explosion or failure of structure of a steam boiler, or of a cast-iron vulcaniser, or of a receive 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.

7.4 Procedures for Reporting an Accident

It is the duty of every contractor to report all accident or dangerous occurrence. If in the case of fatal accident or dangerous occurrences, the contractor should immediately:

- a) Call for Police or Ambulance
- b) Call the developer and Safety Officer In-charge.
- c) Call the relevant authority

If other than an accident resulting in fatal cases or dangerous occurrences, the contractor shall

- a) submit an accident report to the developer Safety Unit;
- b) submit an accident report to the authority;
- c) inform the employer if the contractor is not the actual employer, to give notice
 - i) to the commissioner in the prescribed form; and
 - ii) to his insurer in writing of the occurrence of any accident thereof where the accident results in the death or immediate incapacity of any workman employed by him.

7.5 Accident/dangerous occurrence investigations.

An Investigation Team will be set up to identify the root causes leading to the accident and making recommendations for additions or modifications to the company safe work practices and safety measures.

The Investigation Team shall comprise the following:

- | | | |
|-------------------|---|--------------------------------|
| Team Leader | - | Project Manager |
| Asst. Team Leader | - | Resident Engineer |
| Member | - | Safety Officer |
| | - | Safety Supervisor |
| | - | Lifting Supervisor |
| | - | Sub-contractor Representative. |

7. Accident Investigation and Analysis

- Other personnel which the Team may find it necessary.

All findings and investigation will be recorded and filed for future analysis (Appendix E).

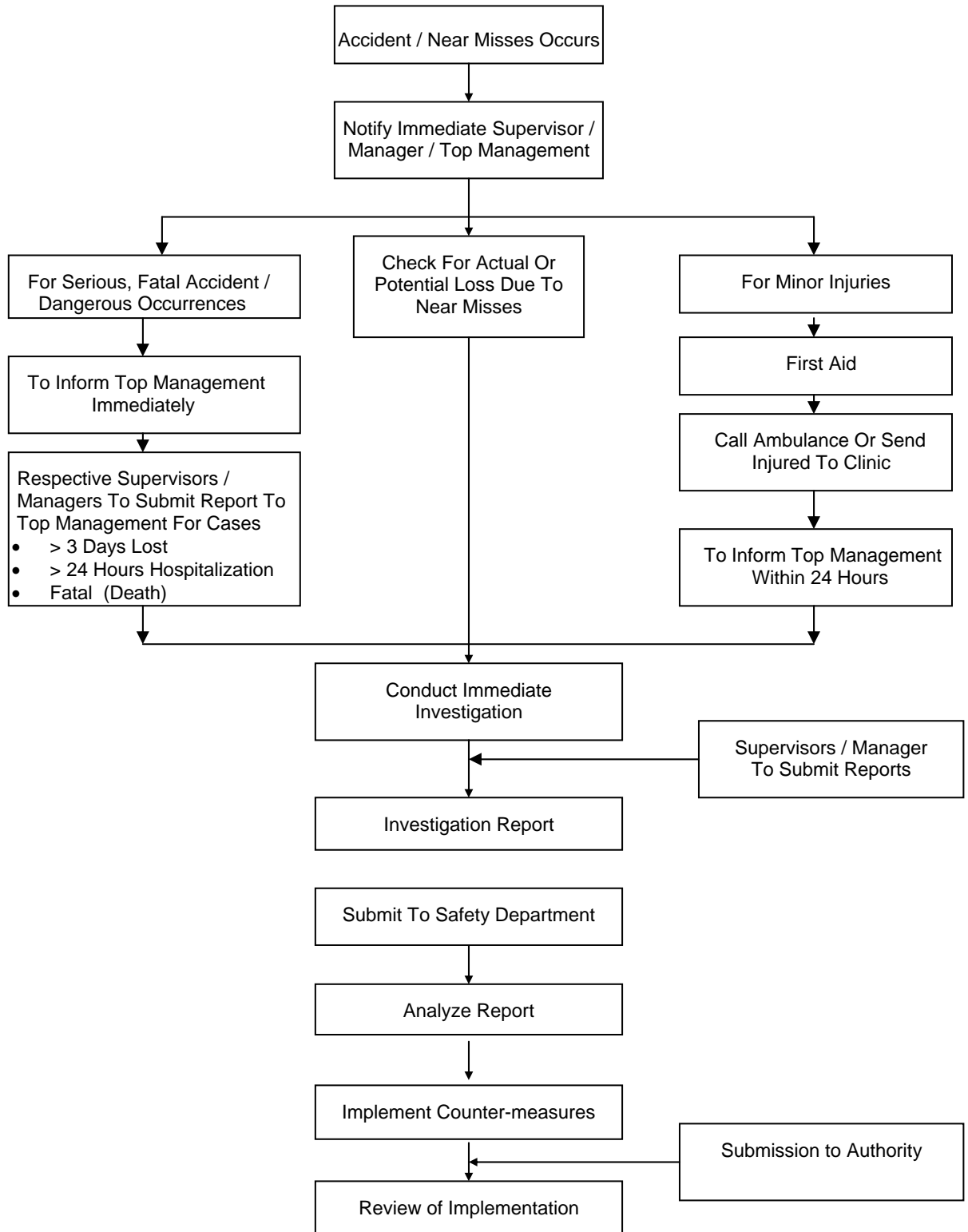
7.6 Accident Analysis

Statistic of accident occurrences is to be kept at the site and company level. Classifications of incidents by types, numbers, agencies, frequency, severity, dates, and time are kept for analytical purposes. This is to monitor the trend of incident occurrence and help to set the database for future action to minimize the more frequent type of incidents.

7. Accident Investigation and Analysis

7.7

ACCIDENT REPORTING FLOW CHART



8. Maintenance Regime

8.1 Purpose

The objective of maintenance regime is to ensure that all hand tools, plant, machinery and equipment used in the premises of **TPS** are regularly maintained so that they do not represent any hazard due to lack of repair and maintenance, which might affect the safety and health of workers working in the work site.

8.2 General

The Company shall establish maintenance program to ensure safe and efficient operation of hand tools, plant, machinery and equipment used at the worksite. This program shall apply to hand tools, plant, machinery and equipment owned by all sub-contractors and suppliers.

8.3 Maintenance Program

TPS shall implement an effective maintenance program which shall include -

- a. listing of hand tools, plant, machinery and equipment;
- b. schedule of inspection and maintenance;
- c. procedure for breakdown and repair; &
- d. record of inspection and maintenance.

The Company shall also identify, compile and maintain a list of all hand tools, plant, machinery and equipment used at worksite.

8.4 Schedule of Inspection and Maintenance

TPS shall establish a system to ensure that all hand tools, plant, machinery and equipment be inspected and maintained in accordance to statutory requirements, manufacturer's recommendations and worksite's in-house rules and regulations. A schedule of inspection and maintenance shall be documented and maintained.

Defects and malfunctions identified during the inspection shall be documented and brought to the attention of the authorized personnel for corrective action such as repairs. All repaired hand tools, plant, machinery and equipment shall be certified by authorized competent person prior to re-use.

8. Maintenance Regime

8.5 Procedure for Breakdown and Repair

TPS shall establish procedures for breakdown and repair of all hand tools, plant, machinery and equipment which shall include the following -

- a. identify and record all defects and malfunctions;
- b. ensure that all repairs are carried out by authorized competent persons and conform to statutory requirements, manufacturer's recommendations and worksite's in-house rules and regulations;
- c. display warning signs and notices at the hand tools, plant, machinery and equipment;
- d. ensure that all hand tools, plant, machinery and equipment undergoing repairs be prohibited from use; &
- e. ensure that all repaired hand tools, plant, machinery and equipment are certified by authorized competent person prior to re-use.

The records of all inspections, maintenance, breakdowns and repairs carried out including maintenance and repairs by external agents shall be documented.

8.6 Competency of Maintenance Personnel

All repairs and maintenance are only to be carried out by personnel who are trained and competent. All repairs and maintenance carried out by external agents shall conform to the manufacturer's recommendations and specifications and worksite's in-house rules and regulations.

8.7 Maintenance/ Inspection Routine of Machinery and Equipment

- a. The company has planned a routine maintenance / inspection schedule for all machineries and equipments that are brought into the site by the company or the contractor for the purpose of any work which might be covered under the Factories Act Chapter 104, to ensure that they are of good construction, sound material and adequate strength, free from patent defects, and appropriate for the works for which it is to be used.
- b. The company shall retain a copy of the maintenance / inspection records that has been carried out either by the maintenance service provider designated by the company or by the Sub-Contractors' maintenance service

8. Maintenance Regime

provider for all Sub-Contractors' machineries and equipments that are brought into the worksite by the Sub-Contractor.

- c. The company shall ensure that all machinery/equipment has a valid inspection certificate and the maintenance period is not expired for the equipment / machinery brought into the site (comply with Factories Act Chapter 104).

9. Safety Promotion

9.1 Purpose

The objective of safety promotion is to develop and inculcate safety awareness among all personnel. The Company shall establish and maintain safety programs to promote safety at the worksite. The promotion programmes are to demonstrate the management's commitment towards establishing and maintaining a safe working environment.

TPS recognize that the promotion of safety is a valuable way of advancing the culture of safety in the workplace and of reinforcing the concept that safety and production are inseparable.

As a very basic approach towards safety promotion, **TPS** shall put up safety signs, posters, and other safety related news-letters or articles at appropriate locations (such as notice board, canteen and workshops etc.) to educate and remind workers in the worksite, always to be safety conscious. Video shows on safety awareness or training will be shown to workers to enhance their safety awareness and knowledge from time to time.

9.2 Promotional Programs / Activities

TPS will develop promotional programs aimed at clearly demonstrating the company's commitment to establishing an effective safety management that will provide and maintain a safe working environment.

The promotional activities shall include the following :-

- a. display of the company's safety policy, in prominent locations where all personnel could view;
- b. display of incident statistics and pictures on notice boards placed at prominent locations where all personnel could view;
- c. conducting in-house safety exhibition and safety talks and toolbox meeting;
- d. displayed safety signs and posters or safety related materials;
- e. distribution of safety handbooks and brochures;
- f. participation in external safety activities;

Safety Management System

9. Safety Promotion

- g. demonstration of safe work procedures;
- h. screening of safety videos or slides;
- i. setting up of safety improvement teams;
- j. demonstration of first-aid drills; &
- k. conducting emergency drills and exercises.

9.3 Basic Approach

Some examples of the promotional activities will be as follows :-

9.3.1 Safety Notice boards

The safety notice boards will display information such as Company's safety policy, Company in-house rules and regulation, safety memorandum / newsletter, monthly incident summary report, monthly contractors' performance measurement result, safety posters. These boards shall be displayed at location where high volumes of employees' movements take place. This may be at **TPS's** and subcontractor's site offices, workers quarters, canteen, and any other location where it is deemed recognized by Safety Department.

9.3.2 Warning Signs

Warning signs shall be adopted as visual aids for accident and fire prevention. Signs shall be written in English and the main language(s) of the workers and be conspicuously displayed.

9.3.3 Posters and Safety Banners

Posters and Safety Banners shall be displayed to promote and to maintain safety awareness at site. These posters and banners shall be displayed at the safety notice boards, and conspicuously placed at site. These shall be updated frequently to maintain interest.

9. Safety Promotion

9.3.4 Safety Handbook

To increase safety awareness and as part of personnel safety training, safety handbooks will be issued to all personnel at site during **TPS**'s site safety orientation program.

9.4 Recognition of Safety Performance

TPS Construction Pte Ltd will develop a procedure, as part of its safety promotional program, to recognize and acknowledge good safety performance either by individual, teams, sections, departments or as an organization. The company will ensure that their effort and contribution in making the work site a safe and healthy place of work to be well rewarded.

9.5 Examples of Awards

9.5.1 Instant Recognition Award

Every month, a certain number of employees will be selected from among the subcontractors who perform their work safely. The selection will be done by any **TPS** management and the safety team based on their daily observation where an employee is seen working in strict accordance with all the safety requirements, or where an employee identifies and seeks to correct unsafe conditions at the workplace. Some examples are:-

- Housekeeping;
- Safe operation of all mobile plant and equipment;
- Working safely at height; or
- Preventing items from falling from height.

The type / amount of award will be at the discretion of the Company and may take the form of either cash or souvenirs.

9.5.2 Lost Time Injury Free Man-hours Milestone Award

This award will be given to all **TPS** and subcontractors personnel involved in the worksite for the achievement of man-hour milestone without lost time injury (LTI).

Accumulated man-hours of:-

Safety Management System

9. Safety Promotion

- 100,000 man-hours of LTI free
- 200,000 man-hours of LTI free
- 300,000 man-hours of LTI free
- 400,000 man-hours of LTI free

The type / amount of award will be at the discretion of the Company and may take the form of either cash or souvenirs.

9.5.3 Best Safety Subcontractor of the Month

Every month, one subcontractor will be awarded for this category. **TPS** Management and Safety Department will review each subcontractor's safety performance. The decision made will be final.

10. Evaluation and Control of Sub-Contractor

10.1 Purpose

The objective of evaluation and control of sub-contractors is to ensure that those who intend to work under **TPS** are fully aware of their safety obligations and only those sub-contractors who can meet these obligations are engaged.

10.2 General

TPS has a system to evaluate the safety performance of prospective sub-contractors who intend to undertake the works. Only competent sub-contractors who meet the safety requirements and expectations will be selected for the works.

TPS will provide the sub-contractors with a full understanding of all safety requirements and expectations before commencement of works. The sub-contractors will meet these requirements and expectations at all times.

When a need arises for the engagement of a sub-contractor, it will be based on a list of Sub-Contractors whom **TPS** have maintained, based on either their previous experience on work with **TPS** or from reports available from elsewhere and then the following sequences of events is followed to the extent that each step is necessary -

- a. Specify the work including the technical content and safety conditions and any other requirements;
- b. Prepare a list of sub-contractors who are pre-qualified as potentially able to fulfill the conditions;
- c. Compile an invitation to tender and circulate to those sub-contractors who pre-qualify. Ensure that the return date and time are stated;
- d. Provide a sealed tender system, ensuring that the tender are not opened prematurely and that information on any tender is not divulged to another tenderer, unless the original conditions are amplified, changed or qualified, in which case, ensure that all bidders are informed immediately;
- e. Analyse the returns in terms of:
 - Price and total anticipated cost of the contract;

10. Evaluation and Control of Sub-Contractor

- Resources;
 - Safety, quality and performance record; and
 - Any other relevant factors.
- f. Select the sub-contractor who best fits the Company's requirements;
- g. Carry out regular reviews of their performance, including inspections of safety aspects of the work and adherence to the Company's policy, rules, practices and procedures;
- h. The Company will keep a register of the sub-contractors and their safety records;
- i. In the event of non-compliance, the Company will give clear instruction on the action to be taken to prevent recurrence;
- j. A procedure to evaluate the sub-contractors safety performance in the workplace is developed. The result of these evaluation and control will be used as a factor in selection of sub-contractors for a particular job or project.

The details of the above outline procedure are administered by the appointed person from the management of the company.

10.3 Evaluation of Sub-Contractors

TPS has established procedures to evaluate sub-contractors' safety performance. The result of these evaluations shall be used as criteria in the selection of sub-contractors. The evaluation of sub-contractors' safety performance includes the following;-

- a. Company's Occupational Safety and Health Policy and Corporate Safety Management System;
- b. Safety Plan, Safe Work Procedures and Method Statements;
- c. Listing of construction plant, machinery and equipment;
- d. Safety tracks records; and
- e. Training records of managers, supervisors and workers.

TPS will also establish and maintain safety records of acceptable sub-contractors (Appendix F).

10. Evaluation and Control of Sub-Contractor

10.4 Control of Sub-Contractor

The Company has established procedures to ensure that the safety requirements in the contract agreement are implemented effectively.

The Company shall :-

- a. establish an effective on-going program to evaluate safety performance of sub-contractors;
- b. review regularly the effectiveness of the sub-contractor's safety plan;
- c. carry out periodic inspections to ensure sub-contractor's compliance with safety requirements;
- d. review safety training records of sub-contractors; and
- e. keep incident statistics of all sub-contractors.

11. In-house Rules and Regulations

11.1 Purpose

TPS would set a general site safety rules and regulations for workers (both direct and contractor workers) to follow. This is to establish a common understanding of their obligations and responsibilities to the achievement of the site safety management system.

Safety rules and regulations, formulated by the Company are to be posted at prominent locations at the work site. All new employees will be briefed on the rules and expected to abide by them. **TPS** has conducted and will continue to conduct and monitor their assessments to ensure the compliance with the Regulations, for the Health and Safety of their own workforce as well as the interests of their clients.

11.2 Responsibility

Safety is the responsibility of everyone. Managers, superintendents, supervisors, foremen, fellow employees and our self have a responsibility in making our place of employment a safe place to work. Follow the proper safety rules and common sense safety practices at all times. They include area like the work site, site offices and head office.

11.3 Safety Violation Policy

TPS would take every step and effort to ensure that site personnel are trained to carry out safe work practices on their job. We would not tolerate anybody who deliberately not followed safety instructions that have been instructed to them. Any violation to the implemented safety standards by project personnel is subject to the disciplinary actions. All disciplinary action shall be reviewed and approved by site Project Manager.

11.4 Responsibility

It is a condition of employment that every employee complies with the Company (**TPS**) Rules and Regulations and all relevant statutory requirements.

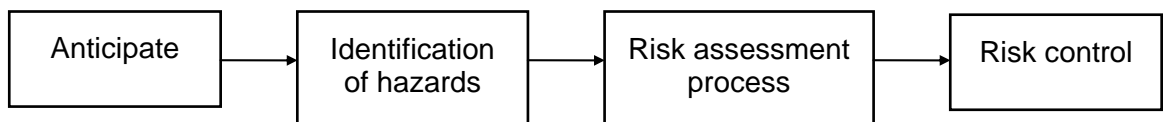
Each supervisor will be responsible for ensuring that the Company's general safety policy is implemented. He/she will create and maintain a safe working environment.

12. Hazard Analysis

12.1 Purpose

The objective of a hazard analysis is to provide means whereby hazards or potential hazards are identified and managed in a way that eliminates or reduces to an acceptable level, the risk of a safety incident occurring.

Three basic steps should be taken to ensure a safe and healthy workplace. They are based on the concept that the workplace should be modified to suit people, not vice versa.



12.2 Prevention and Control Strategies

12.2.1 Anticipation

The first step is to anticipate potentially hazardous situations before they actually occur so that they can be prevented. Designing safe systems of work safety procedures and plans are all part of this process. It assumes that things can go wrong and tries to predict what hazards can be created as a result.

12.2.2 Identification of Hazards

It should involve a critical appraisal of all activities to take account of hazards to employees, others affected by activities (e.g. members of the public and contractors) and to those using products and services. Adequate hazard identification requires a complete understanding of the working situation.

Simplest cases

Hazards can be identified by observation, comparing the circumstances with the relevant information.

Complex cases

Measurement such as air sampling or examining the methods of machine operation may be necessary to identify the presence of hazards presented by chemicals or machinery.

12. Hazard Analysis

Most complex or high risk cases

Special techniques and systems may be required. Specialist advice may be necessary in choosing and applying the most appropriate techniques.

Effective methods of identifying workplace hazards include:

- Previewing legislation and supporting codes of practice and guidance;
- Reviewing relevant Singapore and international standards;
- Reviewing industry or trade association guidance;
- Reviewing other published information;
- Developing a hazard checklist;
- Conducting walk through surveys (audits) and inspections;
- Reviewing information from designers or manufacturers;
- Assessing the adequacy of training or knowledge required to work safely;
- Analyzing unsafe incident, accident and injury data;
- Analyzing work processes;
- Job safety analysis;
- Consulting with employees;
- Observation;
- Examining and considering material safety data sheets and product labels; and
- Seeking advice from specialists.

12. Hazard Analysis

12.3 Risk Assessment Process

Gather information about each hazard identified. Consider about how many people are exposed to each hazard and for how long. Use the information to assess the likelihood and consequence of each hazard and produce a qualitative risk table.

QUALITATIVE RISK TABLE

Consequences	Likelihood			
	Very likely	Likely	Unlikely	Highly unlikely
Fatality	High	High	High	Medium
Major injuries	High	High	Medium	Medium
Minor injuries	High	Medium	Medium	Low
Negligible injuries	Medium	Medium	Low	Low

Events or situations assessed as very likely with fatal consequences are the most serious (HIGH risk); those assessed as unlikely with negligible injuries are the least serious (LOW risk).

Note the risk rating for each hazard on a worksheet. When you are developing risk control strategies, you should tackle anything with a HIGH rating first.

12.4 Hierarchy of Controls

It is a list of control measures, in priority order, that can be used to eliminate or minimize exposure to a hazardous situations or substances. The following order of control measures is recommended:-

- Elimination** - Removing the hazard or hazardous work practice from the workplace. This is the most effective control measures.
- Substitution** - Substituting or replacing a hazard or hazardous work practice with a less hazardous one.

12. Hazard Analysis

- | | |
|--------------------------------------|--|
| Isolation | - Isolating or separating the hazard or hazardous work practice from people not involved in the work or the general work areas. This can be done by marking off hazardous areas, installing screens or barriers. |
| Engineering control | - This involves modifications to tools or equipment, providing guarding to machinery or equipment. |
| Administrative control | - Includes introducing work practices that reduce the risk. This could include limiting the amount of time a person is exposed to a particular hazard. |
| Personal protective equipment | - It should be considered only when other control measures are not practicable or to increase protection and it is the last resort measure. |

13. Emergency Preparedness

13.1 Purpose

The objective of emergency preparedness is to ensure emergency situations can be managed effectively to minimize loss. Emergency preparedness is intended to provide all personnel with clear instructions on the action to be taken to minimize the effects of the emergency and protect;

- personnel from injury;
- the assets of the Company and the client;
- the environment; and
- the goodwill of the company and its ability to continue to meet its production commitments.

This document is intended also to fulfill the company's obligations under its safety management system and to maintain a procedure for an effective response to an emergency.

13.2 General

TPS has established emergency plans to respond to emergency situations. The plans shall be reviewed and tested regularly to ensure its effectiveness and suitability.

Note:

It is not practical to prescribe an exact procedure for every possible emergency. The procedures therefore are general; any incident must be handled in the light of the actual situation.

An emergency is likely to consist of several different incidents at the same time. For example, an explosion may cause a fire to affect the environment, cause destruction and possibly result in serious injuries and fatalities.

This procedure therefore puts essential information about what should be done in the hands of trained and responsible personnel.

The company's priorities are to:

- Prevent incidents from happening. An example would be to sample the atmosphere in a confined space before entry;
- Mitigate the effects of an incident if it should occur. An example would be the provision of fire extinguishers to quench an incipient fire; and

13. Emergency Preparedness

- Restore operations as quickly as possible so as to minimize the stoppage of work.

13.3 Types of Emergency Situations

The emergency situations shall include:

1. fire;
2. explosion;
3. failure and collapse of structure;
4. failure and collapse of heavy machinery and equipment;
5. leakage of hazardous materials;
6. adverse weather and flooding; and
7. any other incident resulting in injuries and destruction of property.

13. Emergency Preparedness

13.4 Definitions

The following terms are used in this manual with the meanings shown:

Term and Definition	Examples
<p><u>Incident</u> This is an event which may result in:-</p> <ul style="list-style-type: none"> • injury to personnel; • damage to equipment; • loss of substances, production time or assets; • damage to the environment; • or which may have had the potential for any of these. 	<ul style="list-style-type: none"> • Person falling • Small fire from welding slag • Lapse of security • Spill of cleaning fluid • Failure of lifting equipment
<p><u>Emergency</u> This is an incident which escalates because:-</p> <ul style="list-style-type: none"> • control is lost to some extent; • immediate action is required; • other people, not immediately connected with the incident, are involved; • the incident is complex, probably involving more than one incident at once. 	<ul style="list-style-type: none"> • Fire requiring evacuation of an area, scaffolding collapse, gas escape, lifting failure. • Simultaneous events could include:- <ul style="list-style-type: none"> – fire – man falling from height – danger of explosion of gas bottles
<p><u>Crisis</u> The emergency will escalate into a crisis if the following become involved in the response:-</p> <ul style="list-style-type: none"> • The news media; • Government departments; • Customer; • Relatives of potentially involved personnel on site. <p>The presumption is that the Company's ability to manage is in question.</p>	<ul style="list-style-type: none"> • Explosion causing multiple deaths • Fire and explosion in the building • Toxic gas cloud or smoke drifting over housing area • Food poisonous affecting large proportion of work force

13. Emergency Preparedness

13.5 Severe Weather Plan – Lightning Risk

In the event of lightening, the report will contain the timing and category (lightening risk) as follows:-

Category (CAT)	Lightening Risk	Are when lightening producing cumulonimbus clouds over the area
Cat 1	Very High	Extremely Probable
Cat 2	High	Probable
Cat 3	Moderate	Improbable
Cat 4	Low	Extremely Improbable (large cumulus expected)
Cat 5	NIL	Extremely Improbable. Only fair weather cumulus expected.

TPS worksite will be informed by head quarter via phone and/or ER radio on the type of category.

Upon receiving the information, **TPS** safety personnel will confirm to Site Construction Manager, whether to initiate an evacuation.

Personnel are to observe the sky condition and immediately take cover if they see any lightning activity close by.

On hearing the lightning alert, all site personnel will proceed to their respective lightening protection shelters immediately.

13.6 Principles

- This section lists the principles on which the emergency response is based.
- Again, it is not practical to prescribe an exact procedure for every possible emergency. The procedures therefore are general; any specific incident must be handled in the light of the actual situation.
- Emergency response is a combination of:
 - physical action, such as fire- fighting , rescue, recovery of plant;
 - local direction and support, including the provision of resources management support to deal with major decisions and with the outside world.

13. Emergency Preparedness

- Emergency is likely to consist of several different incidents at the same time. For example, an explosion may cause a fire, serious injuries,
- perhaps fatalities, people in the water and failure of part of a structure of the building or a crane.
- The emergency procedures therefore put information about the emergency in the hands of trained and responsible personnel who have the authority to make decisions, and let them work out what to do.
- The Company's priorities are to:-
 - prevent incidents, by defining and implementing a safety management system; defining and eliminating, mitigating or protecting against hazards; training people; and motivating them to behave safely;
 - detect a condition which could develop into an incident, for example by sampling the atmosphere in a confined space before entry;
 - mitigate the effects of an incident if it should occur, for example by providing fire -fighting equipment and personnel trained in its use at the site of hot work;
 - restore operation as quickly as possible to minimize the disruption to the Client, the Company and the workers.
- The Company's emergency provisions include:-
 - overall emergency procedures, supported by separate departmental procedures, e.g. for figure finance, legal, engineering, personnel, public relations and other functions, to define how these should carry out their functions in an emergency.
 - a clear dedication of authority so that decisions can be made quickly and effectively.
 - physical resources and people to operate them, such as fire-fighting equipment and medical facilities, in addition to regular plant diverted to help in the response, such as cranes and company vehicles, and also to the external resources provided by the national authorities.

13. Emergency Preparedness

- **TPS** has assessed the risks associated with its type of work involving minimal exposure to fire and hazardous materials, it relies therefore on the resources available from the statutory bodies for fire fighting, medical services and the police.

13.7 Categorization of Emergencies

13.7.1 Minor Emergency

- * An emergency which can be dealt with effectively and quickly by personnel on the spot, using the equipment readily available to them.
- * Stopping of work and evacuation of personnel may be necessary.
- * Such an emergency may, however, be over before an alarm has been raised.
- * Examples; minor injury, limited fire/immediately extinguished, minor equipment failure.

13.7.2 Major Emergency

- * An emergency causing a major hazard to life and equipment, which necessitates the use of outside emergency services.
- * This will have a high level of government concern and involvement that will attract media.
- * Examples; major fire, major toxic release from neighbouring plant, death and/or serious injury.

13. Emergency Preparedness

13.8 Organization and Responsibilities

The organization, which would be mobilized in the event of an emergency, would be as follows:-

Team	Led By	Action
On scene action	A Company or contractor supervisor or safety personnel	Teams would be group from personnel available and suitably equipped to deal with the emergency, such as rescue of injured personnel, fire fighting, and first aids.
Support Team	The Safety Supervisor or his nominee	This team would take charge of the support activities, such as supplying vehicles, personnel, outside emergency services or other resources.
Management Team	The Project Manager or his nominee	Group management may be called out to deal with external issues, such as:- <ul style="list-style-type: none">• dealing with the media;• press, radio and television; and• relatives of personnel possibly involved in the emergency, client, other local companies, financial, legal and insurance issues.

Note: The organization of an emergency response team shall be reviewed from time to time, whereby decisions shall be agreed upon by all members of the team.

13.9 Assembly Area

A muster point has been designated in the work site and prominent signboard will be put up for easy identification by all site personnel. All personnel must be familiar with the muster point location.

13.10 Raising of Alarms (Emergency Sirens)

- The construction site alarm consist of:-
 - * Evacuation - 2 tone continuous signal for 5 minutes
 - * All Clear - single tone continuous signal for 1 minute
- Testing of alarm periodically.

13. Emergency Preparedness

- Any person identifying and/or spotting an emergency shall notify the Supervisor or any member of the work team.
- Means of communication:-
 - * Emergency Radio Call – call sign (Emergency, Emergency, Emergency).
 - * Telephone – Emergency response line.
 - * Runner to the nearest guard room or medical centre or first-aid station.
- The person shall speak slowly and calmly, providing the following information:-
 - * Nature of emergency;
 - * Location of emergency; and
 - * The Company of the individual raising the alarm.
- The site emergency siren can be initiated at the local guard post on instruction from the Incident Controller.

13.11 Site Evacuation Procedures

1. In the event of an emergency, the following procedure should be followed to ensure that information is passed to the members of management and supervision who are required to organize the response.
2. An observer who becomes aware of the incident should raise the alarm by informing his Supervisor or anyone else in authority.
3. Inform the Incident Controller or his nominee, either by:-
 - * radio
 - * mobile telephone
 - * a runner
4. Upon hearing the alarm, all work activities shall be stop and shut off the engines' of the machinery.
5. Walk briskly and calmly to the designated assembly point. DO NOT RUN. Act to prevent panic.
6. The Incident Controller should alert the Management; the urgency with which the Management group is mobilized depends on the nature and seriousness of the emergency.

13. Emergency Preparedness

7. The Incident Controller shall establish a Command Centre at which the support team can direct resources, including mobilization of the external emergency services.
8. The Incident Controller or his nominee should assess the nature and seriousness of the incident and ensure that on-scene action groups are assembled according to the nature of the emergency. In the event of having to evacuate personnel to an area outside of the fence line, the Incident Controller will advise to the action groups.
9. The Incident Controller will initiate a head count, if required.

13.12 Resources

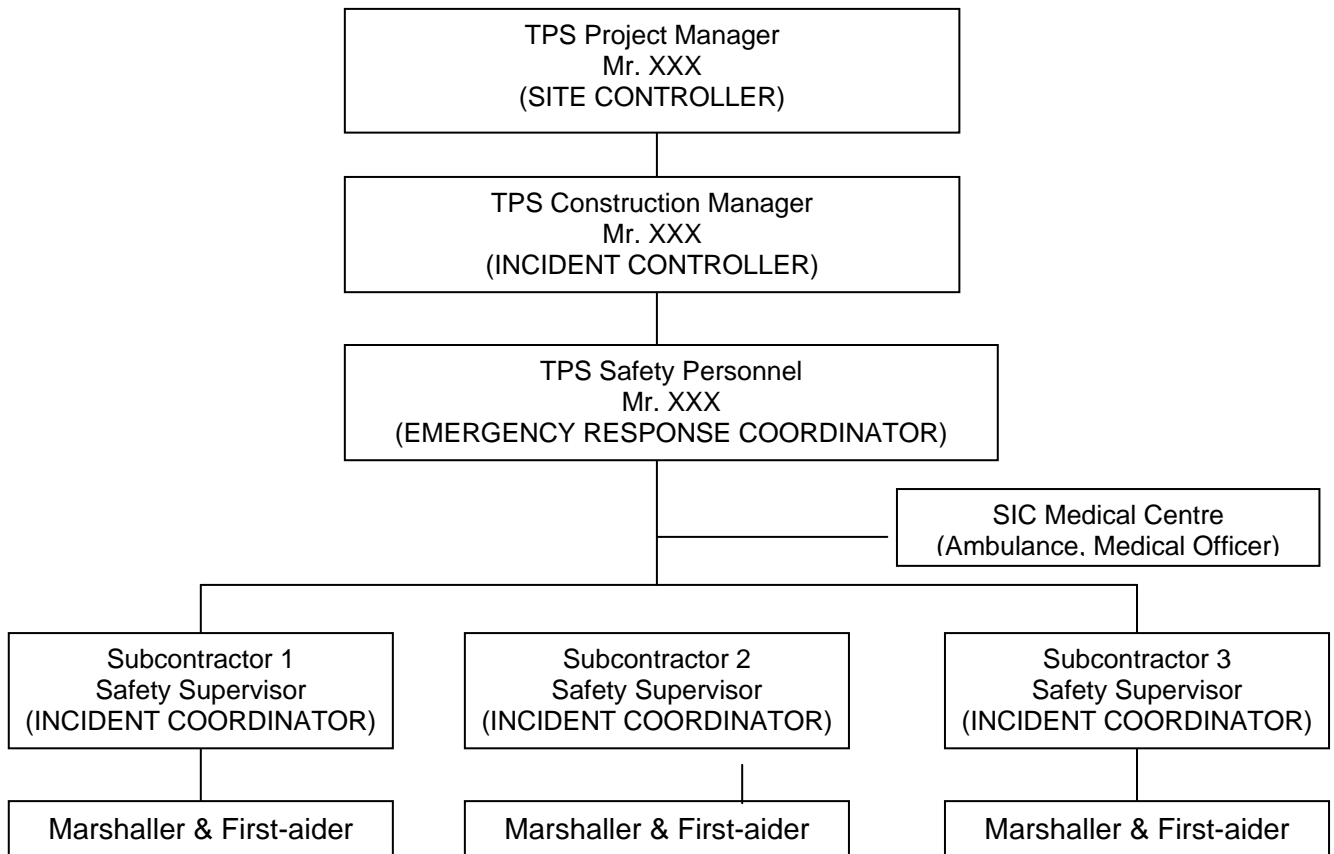
1. It is the Company's view that the estimated risk of an incident escalating into a full-blown emergency is low. The resources available on site are limited to:-
 - * fire main & hoses and portable fire extinguishers;
 - * personnel trained in fire- fighting and first aid.
2. **TPS** relies on the resources of the emergency services, who would be expected to take charge of the on scene action.

13.13 Ambulance Service and Hospitalization of Sick or Injured Person

- 11.1. Anybody who are aware or witness the occurrence of incident/injury will notify site office and provide information regarding nature of the injury and location of the person needing attention.
- 11.2. If necessary, Emergency Response personnel will be dispatched to provide aid and transport the injured person to the nearest hospital.

13. Emergency Preparedness

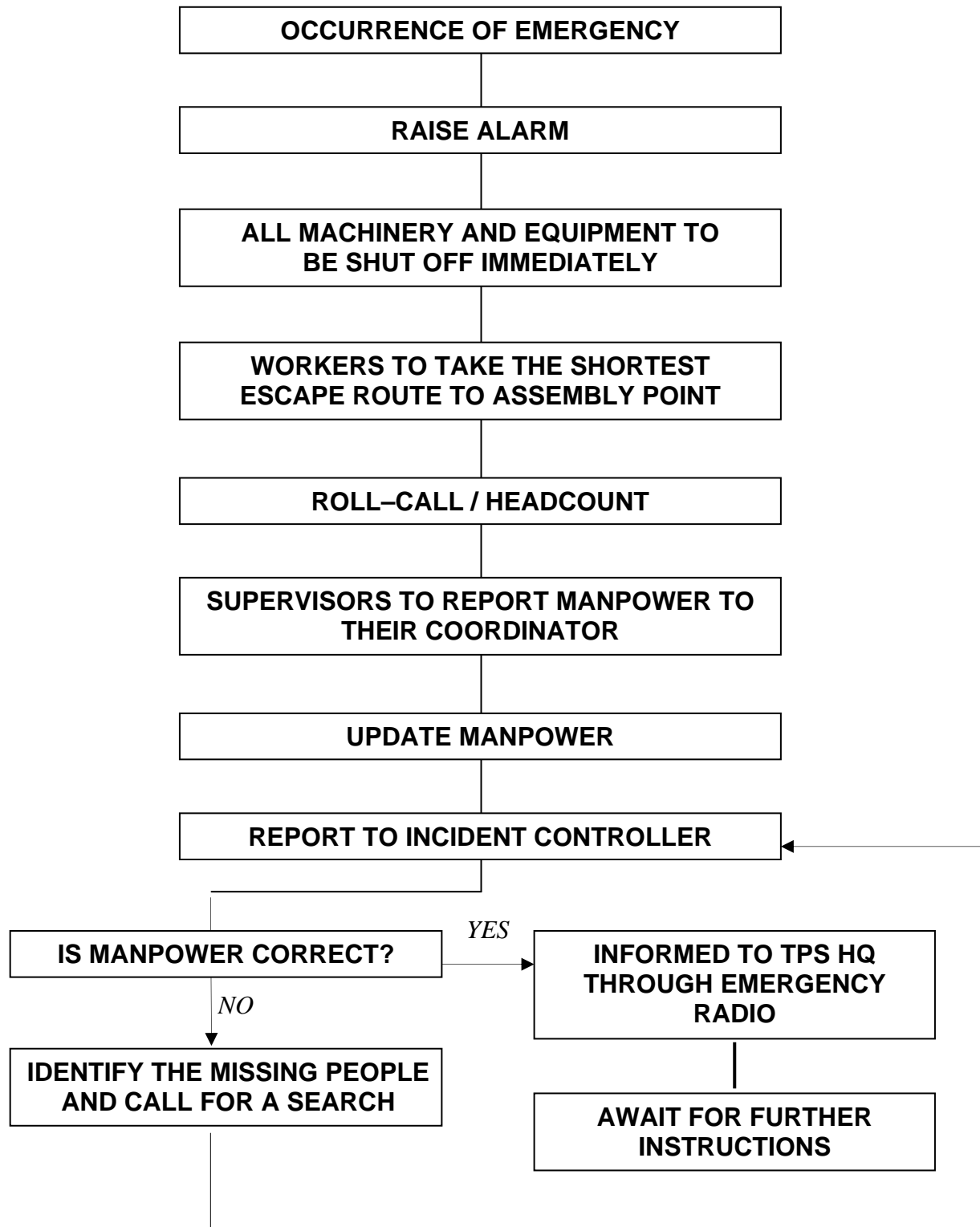
13.14 SITE EMERGENCY ORGANISATION CHART



13. Emergency Preparedness

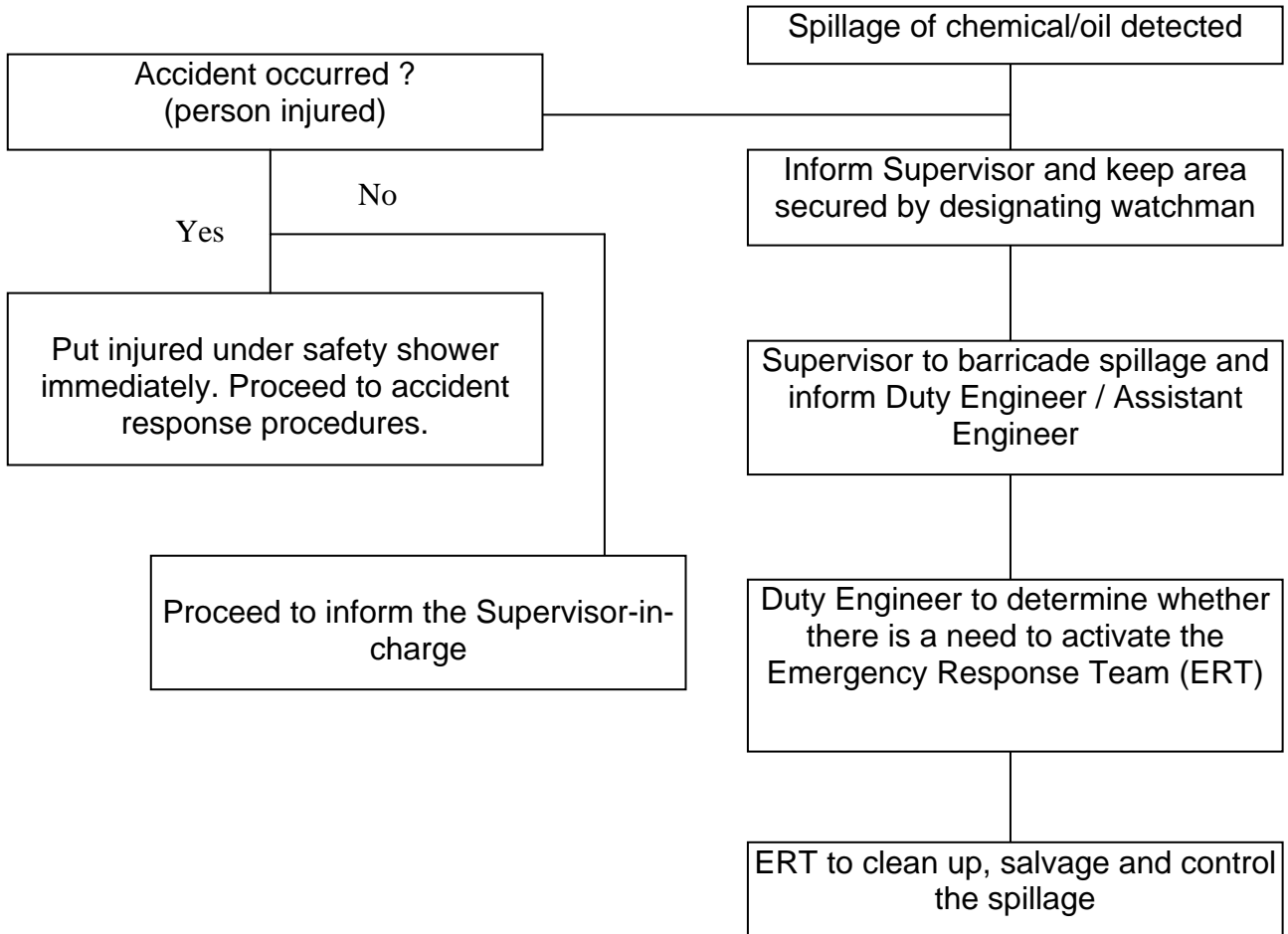
13.15

EMERGENCY EVACUATION PLAN



13. Emergency Preparedness

13.16 OIL / CHEMICAL SPILLAGE REPORTING PROCEDURES



Emergency Response Team (ERT)

A team that is familiar with the type of dangers involved will respond promptly to its duties safely. This ERT may be an Industrial Fire-Fighting Unit or just a team of fire fighters, first-aiders and spill controllers.

14. Control Movement and use of Hazardness Chemical

14.1 Purpose

The objective is to ensure that the storage, movement, use and disposal of hazardous substances and chemicals are managed to minimize the occurrence of incidents.

14.2 General

TPS has established procedures for proper management of all hazardous substances and chemicals which include flammable, toxic or corrosive substances. The procedures include the control of receipt, storage, distribution, use and disposal of such substances.

14.3 Management of Hazardous Substances and Chemicals

A control program has been established to include:-

- a. maintenance of a register of hazardous materials compiled from Material Safety Data Sheets (MSDS). The MSDS contains accurate and adequate information on :
 - composition, physical and chemical properties of the material; and
 - instructions for safe handling, storage, use and disposal.
- b. appointment of a competent person to receive such materials and ensure its safe storage and use;
- c. establishment of procedures for labeling, issue and distribution;
- d. communication of the hazards associated with the hazardous materials by the competent person to the users. This includes provisions for :
 - safety training and instructions to the users;
 - personal protective equipment (Appendix I); and
 - suitable identification tag to be worn by the users handling the materials.
- e. designation of storage areas which is suitable for the materials and secured against unauthorized access. Hazardous materials must be returned to designated storage areas when not in use; and

14. Control Movement and use of Hazardness Chemical

- f. establishment and implementation of procedures for disposal of hazardous materials, which shall be carried out in accordance with statutory requirements or manufacturer's recommendations.

14.4 Common Types of Hazardous Chemicals

Examples of hazardous chemicals used in the workplace include gasoline, thinners, adhesive products, paints, acids, solvents, industrial gases and radiography equipment.

14.4.1 Toxic / Corrosion Nature

Hazardous materials can cause immediate or long-term health problems if not handled properly. Acute effects may be severe and usually happen fast, such as acid burns. Chronic effects come from prolonged exposure, often through inhalation.

14.4.2 Fire and Explosion

Some chemicals (e.g. thinner) used at the workplace are flammable and ignite easily, thus carrying the risks of fire and explosion.

14.5 Control of Entry of Hazardous Substances and Chemicals

- a. Control of hazardous substances and chemicals brought into the workplace is an important part of the safety system.
- b. Hazardous substances and chemicals which are brought into the workplace must be declared at the security post and attached together with the Material Safety Data Sheet (MSDS) before they are allowed entry.
- c. Subcontractors must appoint a competent person to be responsible for monitoring the use and movement of hazardous substances and for coordination with **TPS**.
- d. All hazardous substances and chemicals used at the workplace must be identified and registered. Manufacturer's information on the hazardous substances and chemicals must be specified in the Material Safety Data Sheet (MSDS).
- e. The Material Safety Data Sheet must specify the following:-

Safety Management System

14. Control Movement and use of Hazardness Chemical

- characteristics of the hazardous material
 - any precautions that may be required to be taken in the handling of such material
- f. The supplier must submit a copy of the MSDS to the user, e.g. subcontractors who must read, understand and comply with requirements pertaining to Storage, Handling / Transport, Use of PPE, etc.
- g. Subcontractor to ensure proper markings and affixing of warning labels to the chemical containers are clearly legible and post signboards, eg. “NO SMOKING” at the appropriate locations at the storage area (Appendix G).
- h. A register on hazardous substances and chemicals must be kept in the workplace together with copies of the MSDS.

14.6 Storage of Hazardous Substances and Chemicals

- a. All hazardous substances and chemicals must be stored at designated storage areas in the workplace and be secured against unauthorized access. This storage space is to be protected against heat sources, which may be able to ignite vapours from the hazardous substances and chemicals in case of a spill or leak in a chemical storage container.
- b. Personnel involved in the storage, handling and use of the hazardous substances and chemicals are to be competent for the job and are fully aware of the dangers, safeguards and the measures referred to in its MSDS. They are to put on the necessary personal protective equipment and any other safety gears whenever they handle these hazardous substances and chemicals in the workplace.
- c. Hazardous substances and chemicals must be returned to the designated storage areas after use or when no longer in use.
- d. The used hazardous substances and chemical containers must be separated from the unused ones and both are to be labeled for easy identification.

14. Control Movement and use of Hazardness Chemical

14.7 Communication / Training / Education

- a. Any employee involved in the handling of hazardous substances or chemicals to which they might be exposed, must receive training and instruction from a designated person.
- b. Appropriate warning signs must also be displayed at the store or any other place where such hazardous substances and chemicals are kept.

14.8 Physical Safety Control Measures

- a. Physical storage, handling/transport, PPE and its use must comply strictly with the procedures as spelt out under the MSDS guidelines.
- b. PPE must be provided to the workers involved in the handling and use of these products.
- c. Welding and hot cutting operations is not to be carried out on containers in which there are explosive or flammable substances/vapours.
- d. Where it is practical for signs to be erected in the workplace to identify hazards, then the signs should show the following:-
 - What the hazard is;
 - What precautionary measures should be taken; and
 - What to do in an emergency.

14.9 Safety Precautions on Hazardous Substances and Chemicals

- a. Always check the MSDS and any standing notes on the recommended method of work. Also, to find out the protective equipment to be used.
- b. All hazardous substances and chemicals must be stored at designated storage areas in the workplace and be secured against unauthorized access. This storage space must be protected against the accumulation of concentrated toxic vapours and heat sources, which may be able to ignite vapours from the hazardous substances and chemicals in case of a spill or leak in the chemical storage containers.
- c. All personnel involved in the storage, handling and use of the hazardous substances and chemicals are to be competent for the job and are fully aware

14. Control Movement and use of Hazardness Chemical

of the dangers, safeguards and the measures referred to in its MSDS. They must put on the necessary personal protective equipment (PPE) and any other safety gears whenever they handle these hazardous substances and chemicals in the workplace.

- d. Stored substances are to :-
- Be kept to a minimum;
 - Be securely locked or fenced off;
 - Be held in appropriate secure containers with the substance clearly identified on the exterior of the container;
 - Have appropriate warning notices affixed to the storage facility;
 - Have “NO SMOKING” notices affixed to the storage facility where flammable substances are stored; and
 - Have fire-fighting extinguishers (appropriate to the substance) and other emergency equipment, including spill control equipment located near to the contaminated area.
- e. The following features are to be taken into consideration during storage:-
- Segregation of the hazardous substances and chemicals according to their types / uses;
 - Provision of ventilation to reduce the concentration of hazardous vapours likely to occur;
 - Provision of containment to contain leaks and spills from the containers. The purpose of the containment is also to enable the product to be more easily collected and transferred elsewhere.
 - Provision of ground earthing to prevent the accumulation of static.
- f. All containers holding hazardous substances and chemicals must have their lids replaced as soon as they are not in use. Only small quantities should be removed from the store at any one time.
- g. The used chemical containers must be separated from the unused ones and signage is to be provided for easy identification.
- h. Empty containers must be removed as soon as possible and arrangements made for their safe disposal through the Licenced Disposal Agent.

14. Control Movement and use of Hazardness Chemical

- i. Hazardous substances and chemicals must not be discharged onto the ground or into water drains where they can be harmful to health, pollute the environment, cause a fire or an explosion.
- j. Steps must be taken to ensure that users of hazardous substances and chemicals are properly informed, instructed and trained in the hazards and control measures needed.
- k. Hazardous substances and chemicals are to be returned to the designated storage areas after use or when no longer in use. Proper disposal of the hazardous substances and chemicals must be strictly adhered to.

14.10 Procedures before Using Hazardous Materials

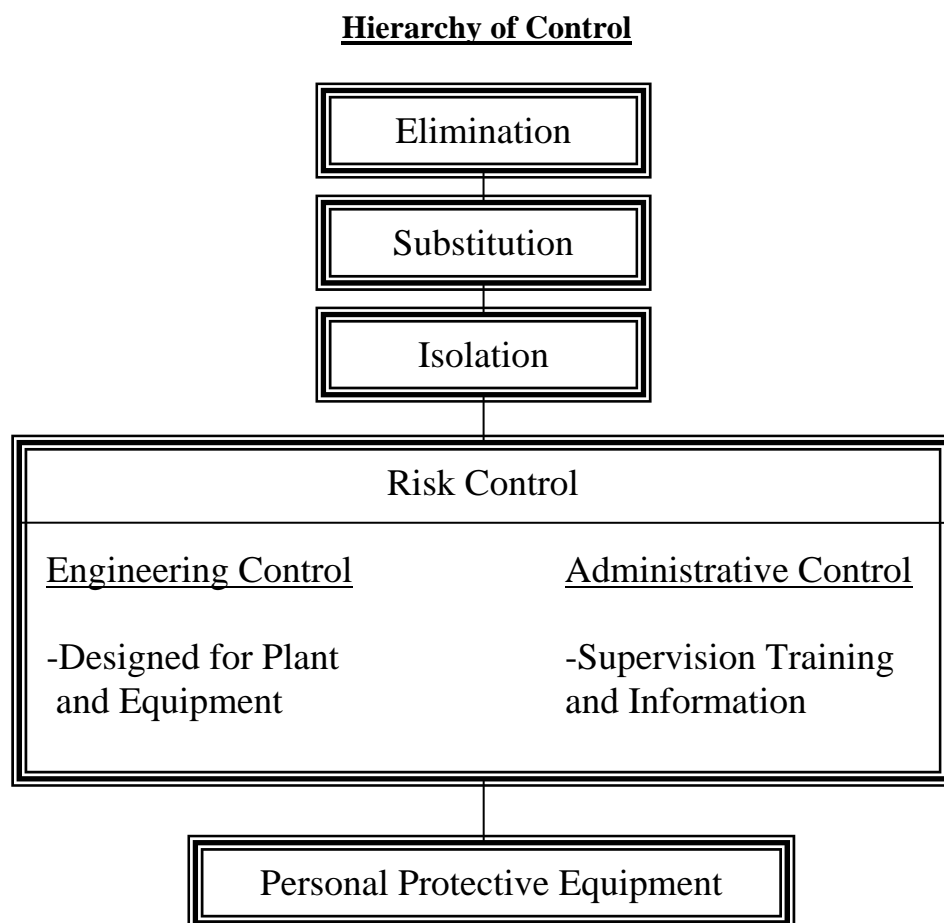
- a. Remove materials that could burn, explode or react dangerously with nearby materials.
- b. Remove consumable items and wear recommended personal protective equipment.
- c. Know where emergency showers and eye-washes are located.
- d. Make sure that the correct type of safety equipment is readily available.
- e. Check for adequate ventilation.
- f. Know who to contact and what to do in an emergency.
- g. Have someone nearby who knows where you are and what you are doing at all times.

14. Control Movement and use of Hazardness Chemical

14.11 Control of Hazardous Substances / Chemicals – Hierarchy of Control

Hierarchy of control is a list of control measures, in order of priority, which can be used to eliminate or minimize exposure to hazardous substances or chemicals.

Attempts should be made to select control measures from the top end of the hierarchy. These controls may be most accommodated at the planning design stages of a project. However, it may be necessary to use a combination of control measures to achieve the desired level of risk control. The following order of control measures is recommended :-



14. Control Movement and use of Hazardness Chemical

14.11.1 Elimination

Is a permanent solution to remove or eliminate hazards or hazardous substances and chemicals. It should be attempted in the first instance.

14.11.2 Substitution

Involves replacing the hazardous substance by one that presents a lower risk.

14.11.3 Engineering Control

Involve some structural changes to the work environment or work processes. A barrier is placed to interrupt the transmission path between the worker and the hazard. This may include machine guards, isolation or enclosure of the hazard, the use of extraction, ventilation and protective handling devices.

A common example of engineering control is a local exhaust system which removes toxic vapours from the breathing zone of the workers. Another is replacement of noisy machinery with a less noisy one.

14.11.4 Administrative Control

Reduce or eliminate exposure to a hazard by adherence to procedures or instructions. Documentation should emphasize all the steps to be taken and the controls to be used in carrying out a task safely. Administrative controls are dependent on proper training and supervision as well to enhance appropriate human behavior for success. Examples include safe working procedures and Permit-to-Work System.

Examples of administrative control are :-

- implementing proper housekeeping practices; and
- devising appropriate workers' training.

14. Control Movement and use of Hazardness Chemical

14.11.5 Personal Protective Equipment (PPE)

Is worn by people as a barrier between themselves and the hazard. It should be used only as a short-term measure. The use of PPE should always be the last resort and should never form the basis of a control program.

14.12 Handling and Storage of Hazardous Substances and Chemicals

Information should be given about conditions recommended by the supplier for safe storage and handling. This would include the following :

- design and location of storage rooms;
- separation from workplaces and occupied buildings;
- incompatible materials;
- conditions of storage (e.g. temperature and humidity, avoidance of sunlight);
- avoidance of sources of ignition which includes static build-up;
- provision of local and general ventilation; and
- recommended methods of work and those to be avoided.

15. Implementation of Safety Management System

15.1 Purpose

The objective of this chapter is to spell out the methods to carryout the project (SMS) in a systematic and efficient way. The methods involved are part of the elements in this management system. They include safety training, safety meeting and rules and regulations.

15.2 Methods of implementation.

15.2.1 Safety training and education (Chapter 5: Safety training).

This element will equip all personnel with the necessary knowledge, skills and attitudes, which will enable them to perform their duties in a manner that do not represent safety hazards. It is the obligation of all employees of the company and its contractors to be knowledgeable of the standards established by these agencies and to implement the rules and regulations contained therein, on projects under their direction/supervision.

15.2.2 Communication (Chapter 4: Safety meetings).

This element allows communication between the top management of the company and the middle management of the contractors. Thus also provide a communication means for the middle management of the contractors and the workers in the worksite. New regulations and company policies shall be conveyed down systematically. Problems pertaining safety issues shall be high-lighted in the meeting.

15.2.3 Enforcement team (Chapter 5: Safety Inspection).

It is necessary to verify that safety provisions and practices conform to the corporate safety management system and relevant statutory requirements. An enforcement team shall carryout the following action if non-compliance persists:

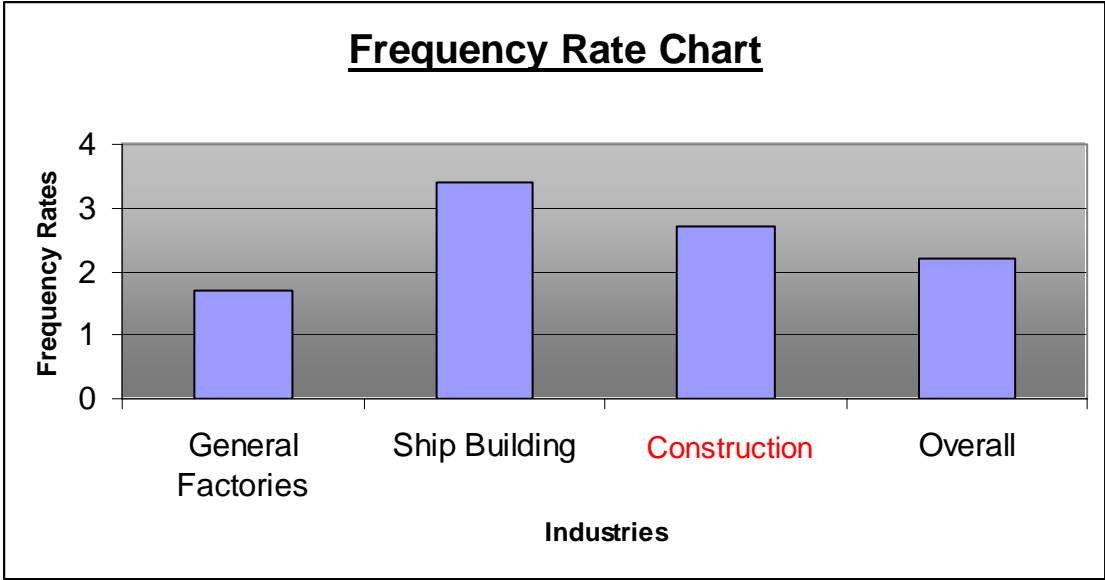
- 15.2.3.1 Issue warning letters to violators and their company. Recommend action to be taken from re-occurrence.
- 15.2.3.2 Request for higher management meeting to solve safety issue completely.
- 15.2.3.3 Violation persists, remove violator form the worksite. Fines to penalize the violators' company from failing to take effective action.
- 15.2.3.4 Stop violators' company from bidding any future jobs form **TPS Construction Pte Ltd.**

16. Evaluation of Safety Management System

16.1 Purpose

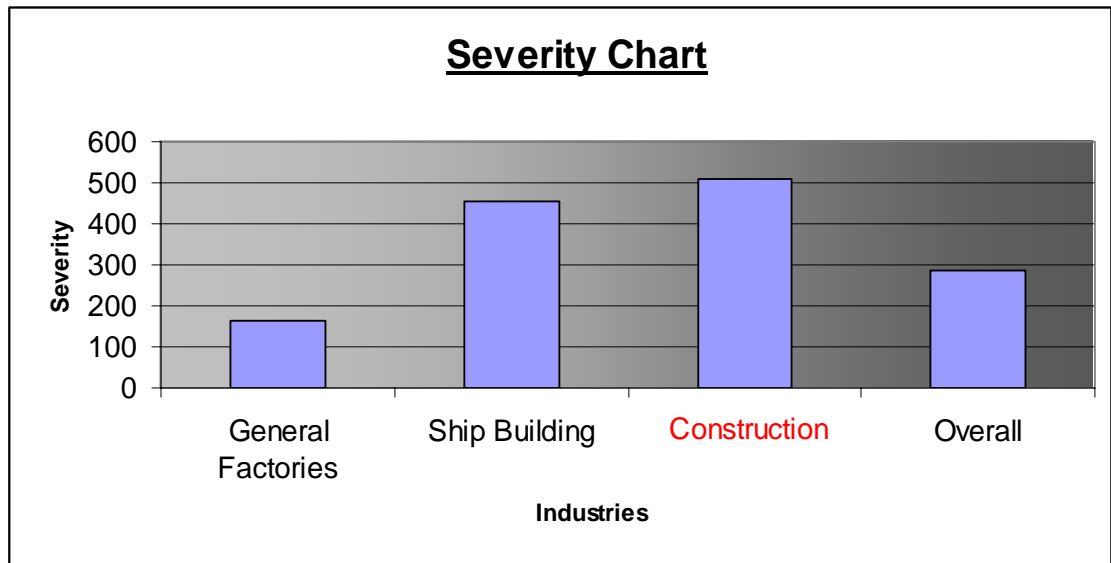
This section will discuss on results of adopting Safety Management System (SMS) in the Company’s worksite. Data was recorded from safety inspection (chapter 6) and feed back from contractors during safety meetings (chapter 4).

16.2 Statistic data for the year 2003



National Frequency Rate for the year of 2003 is **2.7** (Construction Industries).

16. Evaluation of Safety Management System



National Severity Rate for the year of 2003 is **510** (Construction Industries).

16.3 Formulation of Frequency Rates and Severity Rate for *TPS Construction Pte Ltd* after partial implementation of project (SMS).

Frequency Rate:
$$\frac{\text{No. of accident} \times 1000000}{\text{Total man-hour work}}$$
$$= \frac{1 \times 1000000}{585900}$$
$$= \mathbf{1.7}$$

Severity Rate:
$$\frac{\text{No. of lost day} \times 1000000}{\text{Total man-hour work}}$$
$$= \frac{4 \times 1000000}{585900}$$
$$= \mathbf{6.9}$$

16. Evaluation of Safety Management System

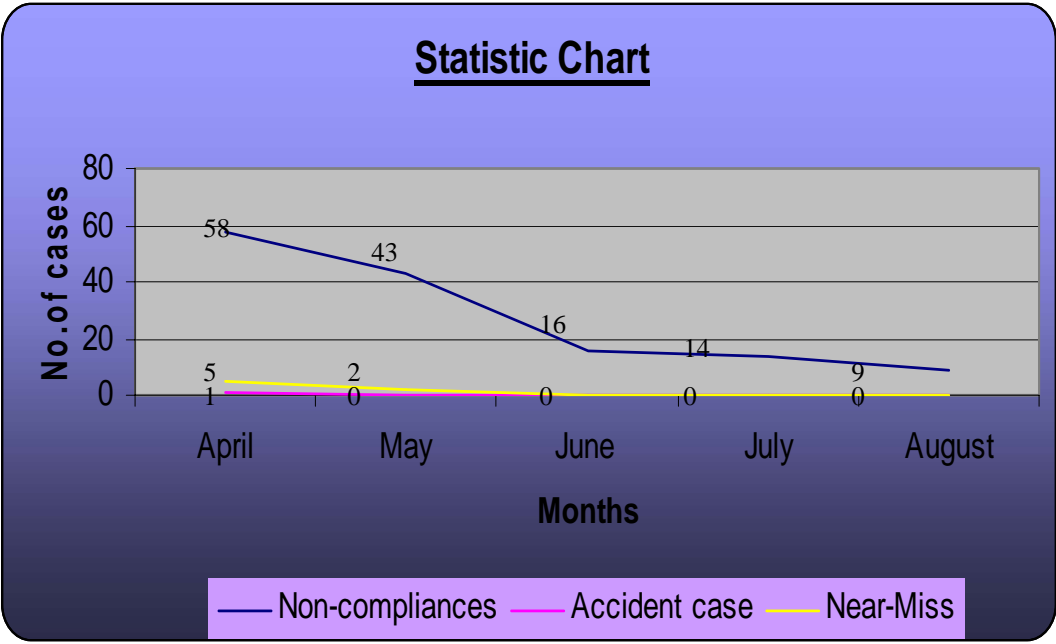
16.4 Results compared with pass year national statistic for Construction Industries after partial implementing SMS.

Year \ Rates	2001	2002	2003	2004 (Jan-Aug)
Frequency	3.2	2.6	2.7	1.7
Severity	550	460	510	6.9

Include fatal cases

Source: Ministry of Manpower (OSD)

16.5 Results after implementing project (SMS)



Note: Data taken from May 04 to Aug 04

16. Evaluation of Safety Management System

16.6 Conclusion of implementation.

16.6.1 Higher cost saving

With SMS, the overall cost of our operations is reduced. This is due to the reduction cost on fines from authority; reduce on loss time injuries and reduce in medical cost.

16.6.2 Work quality and efficiency is protected.

Worker familiar with their trade will produce a good quality of work piece. Injured worker is substituted by another worker whom is not as familiar in that trade will produce poor quality of work and less efficient.

16.6.3 Workers morale have improved

After adopting SMS, site condition is more organised, materials are systematically stored. Survey data reflect sub-contractors' morale have improved yet work progress is not affected.

16.6.4 More systematic in implementing various safety elements.

Sub-contractors use to carry out their duties to achieve targets in the easiest and most convenient way. This usually ignores workers' safety. There is no system involved in carryout any process.

By adopting SMS, data reflected are; employees are more systematic in implementing regulations, procedures for production, company's safety policy, safety inspections meeting etc.

17. Problems Encounter

17.1 Purpose

The purpose of this chapter is to briefly describe problems encounter by the management when implementing SMS. These data will be recorded for future improvement and modification of SMS. Principle of modification will not compromised safety aspect in any circumstances.

17.2 Problem faced

We were especially interested to know what problems were faced regarding the management, employees and resource available. In the process of implementation, we found that many works need to be done in a very short period of time and this created great pressure to the management and employees. The entire team needs to involve in achievement of satisfactory results base on statistics. Lower managements are more concern on daily progress rather than carry out work safely.

17.2.1.1 Misuse of SMS

Chapter 10 of SMS (Evaluation of Sub-Contractors) evaluates contractors' performance for company's safety policies which, meritocracy would be one of a way to manage/enforce on the system.

Quite often, contractors would make use of the enforcement team to sabotage one another. Reasons include poor personal relation among them, safety contest competition/performance etc. Other factors like in-house competition pertaining safety issue and demerit point system also lead to misuse of the system.

17.2.2 Less commitment to SMS

Problems face by lower management mainly concerned the allocation of resources. They were caught in dilemma between allocation time for safety issue and time to carryout daily work which generate income for the company. Another reason is, personal in-charge of trade do not want job to slow down due to the commitment in safe work practices (chapter 3), thus cut corners to maintain 'efficiency'.

17.3 As discussed above, the problems faced by the management include the pressure faced due to the increased workload during the implementation and also the shortage of scarce resources, such as time and labour, that have to be divided between the implementation and the generation of revenue.

18. Conclusion

18.1 Conclusion

The fundamental purpose of implementing SMS is to make construction worksite a safer place to work at. As illustrated in the previous chapters, top management, employees and sub-contractors are critical parties for the success of SMS. Company intending to achieve good result shall not overlook this system. SMS will not success without the commitment of the top management from the company.

As stated in SMS, training and education to equip employees to carryout jobs safely, promotion to reward and motivate workers, inspection to verify worksite practices conform to company policies and enforcement team to administrate implementation are some of the many important aspect of the system.

SMS is a management tool that can be used to identify problems and hazards before these conditions result in accidents or injuries. It also helps to identify the effectiveness of safety compliances and can be used as a guide to assure regulatory compliance and a safe workplace.

This research serve as a guide to **TPS Construction Pte Ltd** and other construction companies that are interested in practicing safety at worksite. In pursuing a higher standard management, continuous improvement on SMS pertaining to worksite safety shall be made to suit different construction methods, technologies adopts, different safety cultures of contractors and different legislations from the states/countries.

Finally, Safety does not just occur. It is the result of careful attention from all parties who make it success.

University of Southern Queensland
Faculty of Engineering and surveying

ENG 4111/2 Research Project Project Specification

FOR: Jong Hua Kwan
TOPIC: Safety Management System
SUPERVISOR: Dr. Harry Ku
ASSOCIATE SUPERVISOR: Dr. Yan Wenyi

SPONSORSHIP: TPS Construction Pte Ltd

PROJECT AIM: The project aim is to provide a safety system structure that will manage the safe operation of the entire construction worksite to prevent accident, property damage cause by construction activities and (As time permits) also ensure environment contamination free.

PROGRAMME: Issue A, 12th February 2004

1. Research background information pertaining Safety Management System. (By end of March)
2. Develop Safety Policy for the organization. (By end of March)
3. Research on Safe Work Practices (construction activities) procedures for general construction works. (By end of April)
4. Develop appropriate Safety Training Programs and Safety Meetings. (By end of April)
5. Implement a system of Safety Inspection addressing critically on worksite condition. (By end May)
6. Set up an Accident Investigating & Analysis procedure. (By end May)
7. Develop Machines Maintenance Regime. (by end June)
8. Organize Safety Promotion. (By end July)
9. Evaluation of sub-contractors. (By end July)
10. Establish In-House Rule and Regulations. (By end August)
11. Hazard Analysis. (By end August)
12. Emergency Preparedness. (By end Sep 2004)
13. Control movement of hazardness materials. (By end Sep 2004)

As time permits:

- ~~14. Occupational health program. (By end Sep 2004)~~
- ~~15. Environmental Control Program.(By end Oct 2004)~~

Not included base on feed
back from Supervisors

AGREED:

Jong Hua Kwan (Student), _____, _____ (Supervisors)

12th February 2004

___/___/___

___/___/___

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1. Factories Act (chapter 104), Revised Edition 1999.
 2. Daniel E. Della-Ginstina, PHD 1999, Safety and Environmental Management, Van Nostrand Reinhold, pp 466-499.
 3. Factories Act Subsidiary Legislation (Building Operation and Works of Engineering Construction, S174/85.
 4. David Koh, Lee Hock Siang, Lee Lay Tin, Koh Yang Huang, A Handbook for People Who Work, p.g 23.
 5. David L. Goetsch, Occupational Safety and Health for Technologists, engineers, and managers (third edition), P.g. 447.
 6. Andrew J. Sorine, Richard T. walls and Michael J. Brantmajer, A Cornerstone of Successful Safety Management, pp 149.
 7. Minter, Stephen G,1997, Occupational Hazards, ABI/INFORM Global, pp39.
 8. Singapore standard, CP 79, 1999, Safety Management System for Construction Worksite.
 9. James E Roughton 1999, Plant Engineering.
 - a. The Factories Act Chapter 104.
 - b. The Factories (Building Operations and Works Of Engineering Construction) Regulations 1994.
 - c. Code of Practices.
CP 37 : 1987 (Safe Use Of Mobile Cranes) CP 44 : 1988 (UDC 696.6), CP 18:1992
(Excavation Works)

Appendix D

SITE INSPECTION CHECKLIST

Date of Inspection: _____

Area of Inspection: _____

Inspected by : _____

Item	Yes	No	Remarks
<u>Personal Protective Equipment</u>			
1. Are workers issued with the appropriate safety gear?			
2. Are workers using their safety gear while working? Safety shoe Safety harness Protective glass Protective glove Ear plug			
<u>Superstructure</u>			
1. Are peripheral overhead protection or shelters provided?			
2. Are barricades provided to the building peripheral to ensure that personnel use the overhead protected shelters to enter/ exit the building?			
3. Are openings and edge of building in which a person may fall through, barricaded or covered effectively?			
4. Are all temporary electrical installation being carried out by a qualified electrician?			
5. Are working platform of at least 500mm in width provided for workers to work?			
6. Are toe-board provided to the working platform?			
7. Are proper supervision carried out during the installation and erection of precast components?			
8. Are there warning or safety signage provided to warn the workers of the hazards surrounding them?			

Item	Yes	No	Remarks
<p><u>Scaffold</u></p> <ol style="list-style-type: none"> 1. Are scaffolds inspected weekly by the Scaffold Supervisor? 2. Is the erection of the scaffold carried out by qualified erectors under the supervision of a scaffold supervisor? 3. Are the scaffold erected to the highest construction level? 4. Are toe board provided to the working platform? 5. Are working platforms properly constructed for persons and materials for the purpose of work? 6. Are the working platform provided with guardrail? 7. Are scaffold netting provided on the scaffold? 8. Are tie-back provided for the scaffold? 9. Are ladders provided for person to gain safe access from and to the working platform/ scaffold? 10. Are signage provided to indicate that the scaffold is safe for use? 			
<p><u>Electrical Safety</u></p> <ol style="list-style-type: none"> 1. Are all temporary electrical installations provided in good condition? 2. Are proper plugs and socket outlets used of the industrial types? 3. Are temporary electrical wiring suspended from ground? 			

Item	Yes	No	Remarks
<p><u>Lifting Operation</u></p> <ol style="list-style-type: none"> 1. Are the outriggers of the mobile crane fully extended and rested on strong foundation? 2. Are signalman, rigger and lifting supervisor present during lifting operation? 3. Are the lifting machines and lifting gears inspected by an approved person at least once in every 12 months? 4. Are the areas in which the lifting operation is carried out barricaded? 5. Is the weight of the load ascertained before the lifting operation? 			
<p><u>Others</u></p> <ol style="list-style-type: none"> 1. Are permit-to-work being applied for the following work: Excavation, radiography, work in confined space, hot-work, cold-work, scaffold erection. 2. Is housekeeping carried out at the end of the working day? 3. Are all operators operating machinery and equipment competent? 4. Is material receiving platform constructed in accordance to the design of a Professional Engineer? 5. Is flashback arrestor provided at the outlet of gas cylinder and at the inlet of the cutting torch of all acetylene and oxygen cylinder? 6. Is the gas hose and cylinder connection tested with soap solution to check for any leakage? 7. Are the welding holders in safe and sound condition? 			

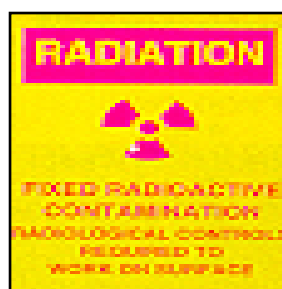
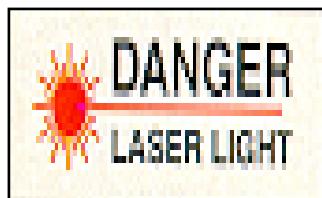
ACCIDENT INVESTIGATION RECORD

Furnished by:		Report No.:	
Designation:		Date:	
IDENTIFYING INFORMATION			
Company:		Date of Accident:	
Location of Accident:		Time of Accident:	
PERSONAL INJURY/ILLNESS		PROPERTY DAMAGED	
Name:		Clinic:	
ID no.:		Hospital:	
Date of birth:		Observation:	
Nationality:		Treatment:	
Occupation:		Medical leave:	
Experience:		Occupational accident:	Yes / no
Marital Status:		Person in control of activity at time of occurrence:	
RISK			
Evaluation of Loss		Risk Potential	Probability of occurrence
<input type="checkbox"/> Minimum & negligible		<input type="checkbox"/> Major risk	<input type="checkbox"/> Frequent
<input type="checkbox"/> Acceptable loss		<input type="checkbox"/> Serious	<input type="checkbox"/> Occasional
<input type="checkbox"/> Potential loss if not corrected		<input type="checkbox"/> Minor	<input type="checkbox"/> Seldom
<input type="checkbox"/> High loss			
DESCRIPTION OF ACCIDENT			

CAUSE CHECKLIST			
Immediate Cause			
Substandard or unsafe act		Substandard of unsafe condition	
<input type="checkbox"/> Improper use of protective equipment <input type="checkbox"/> Failure to use personal protective equipment <input type="checkbox"/> Using improper or defective tools, equipment, vehicles or materials <input type="checkbox"/> Using tools, equipment, vehicles or materials unsafely <input type="checkbox"/> Making safety devices inoperative or unsafe <input type="checkbox"/> Tampering with equipment <input type="checkbox"/> By-passing safety devices <input type="checkbox"/> Wrong method of working or faulty operation <input type="checkbox"/> Unsafe loading, placing or mixing <input type="checkbox"/> Improper or unsafe lifting or carrying <input type="checkbox"/> Unsafe climbing <input type="checkbox"/> Unsafe driving <input type="checkbox"/> Riding on loads, forklifts or other lifting equipment <input type="checkbox"/> Taking an unsafe position <input type="checkbox"/> Tampering with machinery in motion <input type="checkbox"/> Operating without authority <input type="checkbox"/> Operating at unsafe speed <input type="checkbox"/> Working under suspended load <input type="checkbox"/> Horseplay <input type="checkbox"/> Carelessness or recklessness <input type="checkbox"/> Other unsafe act:		<input type="checkbox"/> Absence of guard rails <input type="checkbox"/> Absence of safety guard <input type="checkbox"/> Inadequate guarding <input type="checkbox"/> Ineffective safety guard <input type="checkbox"/> Safety guard not properly adjusted <input type="checkbox"/> Faulty electrical installation <input type="checkbox"/> Unsafe electrical appliance <input type="checkbox"/> Faulty machinery <input type="checkbox"/> Unsafe design or construction <input type="checkbox"/> Poor housekeeping <input type="checkbox"/> Hazardous arrangement <input type="checkbox"/> Absence of safety appliance <input type="checkbox"/> Defective safety appliance <input type="checkbox"/> Ineffective protective equipment <input type="checkbox"/> Improper clothing <input type="checkbox"/> Defective tools <input type="checkbox"/> Unsound structure <input type="checkbox"/> Improper illumination <input type="checkbox"/> Improper ventilation <input type="checkbox"/> Unsafe place of work <input type="checkbox"/> Other unsafe condition:	
Other contributing factors			
Personal factors		Job factors	
<input type="checkbox"/> Lack of knowledge or skill <input type="checkbox"/> Disregard of instructions <input type="checkbox"/> Act of person other than injured <input type="checkbox"/> Low morale <input type="checkbox"/> Foul play <input type="checkbox"/> Fatigue / stress <input type="checkbox"/> Physical defects		<input type="checkbox"/> Lack of co-ordination <input type="checkbox"/> No proper supervision <input type="checkbox"/> Inadequate engineering <input type="checkbox"/> Tools and equipment not appropriate <input type="checkbox"/> Equipment lack of maintenance <input type="checkbox"/> Inadequate work instruction <input type="checkbox"/> Other contributing factors:	
Nature of injury	Part of body injured		
<input type="checkbox"/> Abrasions <input type="checkbox"/> Amputation <input type="checkbox"/> Asphyxia <input type="checkbox"/> Burns (Heat) <input type="checkbox"/> Burns (Chemical) <input type="checkbox"/> Bruises and contusions <input type="checkbox"/> Concussions and internal injuries <input type="checkbox"/> Cuts <input type="checkbox"/> Dislocation <input type="checkbox"/> Effects of electric current <input type="checkbox"/> Effects of radiation <input type="checkbox"/> Fracture <input type="checkbox"/> Freezing <input type="checkbox"/> Laceration <input type="checkbox"/> Multiple injuries <input type="checkbox"/> Poisoning <input type="checkbox"/> Puncture wound <input type="checkbox"/> Sprains and strains <input type="checkbox"/> Others	Head and Neck <input type="checkbox"/> Scalp <input type="checkbox"/> Skull <input type="checkbox"/> Eyes <input type="checkbox"/> Ears <input type="checkbox"/> Nose <input type="checkbox"/> Mouth <input type="checkbox"/> Teeth <input type="checkbox"/> Face <input type="checkbox"/> Neck <input type="checkbox"/> Others Body <input type="checkbox"/> Back <input type="checkbox"/> Chest <input type="checkbox"/> Abdomen <input type="checkbox"/> Pelvis <input type="checkbox"/> Groin <input type="checkbox"/> Others	Upper Extremities <input type="checkbox"/> Shoulder <input type="checkbox"/> Upper arms <input type="checkbox"/> Elbow <input type="checkbox"/> Forearm <input type="checkbox"/> Wrist <input type="checkbox"/> Hand <input type="checkbox"/> Palm <input type="checkbox"/> Fingers <input type="checkbox"/> Others	Lower Extremities <input type="checkbox"/> Hips <input type="checkbox"/> Thighs <input type="checkbox"/> Legs <input type="checkbox"/> Knee <input type="checkbox"/> Ankle <input type="checkbox"/> Feet <input type="checkbox"/> Toes <input type="checkbox"/> Others <input type="checkbox"/> Multiple injuries

Type of Accident		Agency of Accident	
<input type="checkbox"/> Struck against objects <input type="checkbox"/> Struck by sliding, falling, flying or other moving objects <input type="checkbox"/> Caught in or between objects <input type="checkbox"/> Fall or slip on same level <input type="checkbox"/> Fall to different level <input type="checkbox"/> Overexertion <input type="checkbox"/> Contact with temperature extremes <input type="checkbox"/> Exposure to or contact with electric current <input type="checkbox"/> Exposure to or contact with harmful substances or radiations <input type="checkbox"/> Inhalation, absorption, ingestion, poisoning <input type="checkbox"/> Drowning <input type="checkbox"/> Others		<input type="checkbox"/> Machines <input type="checkbox"/> Lifting equipment <input type="checkbox"/> Transport equipment or vehicles <input type="checkbox"/> Hand tools <input type="checkbox"/> Pressure vessels <input type="checkbox"/> Furnaces, ovens, kilns <input type="checkbox"/> Electrical equipment <input type="checkbox"/> Floors or level surfaces <input type="checkbox"/> Ladders <input type="checkbox"/> Scaffolds and staging <input type="checkbox"/> Stairs or steps <input type="checkbox"/> Explosive or inflammable substances <input type="checkbox"/> Poisonous substances <input type="checkbox"/> Others	
CAUSE ANALYSIS			
What unsafe act or conditions cause the accident?			
What other factors cause the accident?			
ACTION PLAN			
Recommended remedial / corrective / preventive action			
S/No.	Description of action		
REVIEW by Management			
Comments below are based on the adequacy of the investigation analysis and remedial action taken to prevent recurrence of accident.			
I HEREBY DELEGATE THE FOLLOWING PERSONS FOR THE REQUIRED ACTION.			
Name:		Designation:	
		Signature:	

FOLLOW UP ACTION			
Person responsible for remedial action		Person responsible to follow up	
Name:		Name:	
Company:		Company:	
Designation:		Designation:	
Completion date:		Report on:	
<p>Note:</p> <ol style="list-style-type: none"> 1. The person responsible for remedial action should report to the person responsible once action is completed. 2. The person responsible to follow up should check on the compliance by the completion date and report to the management. 			
FURTHER OR ADDITIONAL COMMENTS AND RECOMMENDATIONS BY PERSON FOLLOW UP			
Action completed on:			
Action completed by:			
Followed up by:			





Hydrant



Hosereel



Break glass call-point

Fire Extinguishers





**Ear
plugs**

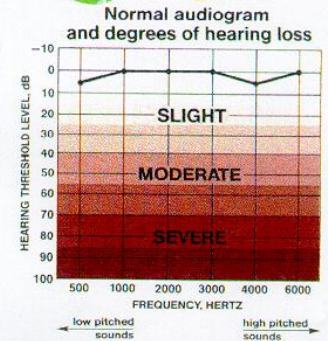
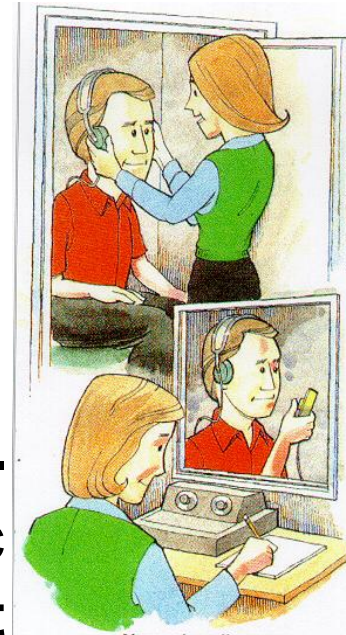


**Ear
inserts**



**Ear
muffs**

**Audio-
metric
test**





First Aid Box Items