GANOPE

Ganope
جنوب

SAFETY MANUAL

HSE GENERAL DEPARTMENT

SOUTH VALLEY EGYPTIAN PETROLEUM
HOLDING COMPANY

Contents

i-HSE Policy

South Valley Egyptian Petroleum Holding Co.

Health, Safety And Environment Policy

South Valley Egyptian Petroleum Holding Co is one of the entities of petroleum ministry, mandated to manage and supervise all petroleum activities (exploration, production, refining and transportation), Beside preparing the necessary plans for development of petroleum sector.

The Company is committed to manage all Health, Safety and Environment (HSE) practices as an integral part of our business. It is our policy to the HSE integrity of our processes, facilities and of our affiliated, contractor companies at all times and places, assuring that everyone is responsible to achieve our ultimate goal.

No Accidents, No Injuries, No Harm to Environment

The above will be achieved by applying the following

- Complying with all applicable Health, Safety and Environment (HSE) national and International laws, regulations and conventions.
- Providing a suitable work Environment to reduce any negative impacts on the surrounding environment by Optimizing Energy, utilization & equipment by applying latest technologies to cope with sustainable development.
- Top management commitment to apply proper risk control systems to prevent any occupational injury or diseases, as well as being prepared for emergencies.
- All accidents, incidents and near misses will be investigated in order to prevent reoccurrence.
- Providing adequate training programs for all employees to maintain job competencies and accountability.
- Setting positive objectives and Measuring Health, Safety & Environment performance continuously, while reviewing these objectives to enhance HSE performance.
- Obligate the affiliated, contractors, suppliers companies to comply with our policy to achieve our HSE goals.
- Review policy periodically, and as required, taking into account the views of our employees, neighbors, public interested parties.

شركة جنوب الوادي المصرية القابضة للبترول

سياسة السلامة والصحة المهنية وحماية البيئة

تأسست شركة جنوب الوادي المصرية القابضة للبترول وهى أحدى شركات وزارة البترول بغرض القيام بأعمال الإدارة والإشراف على أنشطة البحث والاستكشاف وإنتاج الزيت الخام والغاز الطبيعي وعمليات التكرير والتصنيع والنقل والتسويق بجانب إعداد الخطط اللازمة لتطوير وتحديث صناعة البترول والغاز الطبيعي بمناطق عملها.

تلتزم الشركة بإدارة جميع الأنشطة المتعلقة بالسلامة والصحة المهنية وحماية البيئة باعتبارها جزءً لا يتجزأ من أعمالها. وتعتبر هذه سياستنا لضمان تكامل منظومة السلامة والصحة المهنية وحماية البيئة لكل العمليات والتسهيلات الخاصة بالشركة أو بالشركات التابعة أو الشركات المقاولة في كل الأوقات وفي جميع المواقع. ويعتبر كل فرد مسئول عن تحقيق هدفنا الأساسي من هذه السياسة وهو:

لا حوادث ، لا إصابات ، لا تلوث للبيئة

ولتطبيق هذه السياسة سيتم الالتزام بالمبادئ التالية

- التوافق مع جميع القوانين واللوائح والمواصفات والتشريعات القانونية المحلية والدولية الخاصة بالسلامة والصحة المهنية وحماية البيئة
- توفير بيئة عمل مناسبة لتقليل الآثار السلبية الناتجة من أنشطة الشركة على البيئة المحيطة ، والاستخدام الأمثل للطاقة والموارد وتطبيق أحدث الأساليب الحديثة لمواكبة التطور في مجال العمل، وتقليل الفاقد في إطار من التنمية المستدامة.
- الالتزام الكامل من الإدارة العليا بتطبيق نظم الإدارة المناسبة للتحكم في المخاطر ومنع الإصابات والأمراض المهنية ، والاستعداد التام لمواجهة حالات الطوارئ.
- التحقيق في كل الحوادث والإصابات والأخطار الكامنة لاستخلاص الأسباب الجذرية ضمانا لعدم التكرار
- تدريب جميع العاملين على البرامج اللازمة لرفع كفاءتهم وقدرتهم على منع الخسائر، وتوفير الموارد اللازمة لتحقيق ذلك.
- وضع أهداف إيجابية وقياس مؤشرات أداء السلامة والصحة المهنية وحماية البيئة بصفة دورية مع مراجعة تلك الأهداف من أجل التحسين المستمر.
- إلزام الشركات التابعة والمقاولين والموردين بالتوافق مع سياستنا ، لتحقيق أهداف السلامة والصحة المهنية وحماية البيئة.
- مراجعة السياسة دورياً ، أو كلما دعت الحاجة مع الأخذ في الاعتبار رؤية موظفينا وجيراننا والمهتمين بأنشطة الشركة.

M. Shimy

Eng. Mohamed Shimy
Chairman

Edition No.(1) : Oct. 2017

ii-Smoking Policy

South Valley Egyptian Petroleum Holding Co. — شركة جنوب الوادي المصرية القابضة للبترول

Non-Smoking Policy

سياسة عدم التدخين

1- Written & Published Policy: -

- South Valley Egyptian Petroleum Holding Company (GANOPE) Non-Smoking Policy should be published and communicated to all employees, contractors and suppliers at all departments, branches and working sites.

1-السياسة المكتوبة والمعلنة:

- يجب نشر سياسة عدم التدخين الخاصة بـ شركة جنوب الوادي المصرية القابضة للبترول (جنوب) وتوصيلها إلى جميع العاملين والمقاولين والموردين بجميع الإدارات والأفرع ومواقع العمل.

2- Smoking at Workplace: -

- Reference to Article 6 Bis (3), Law Number 154 for Year 2007 Specific to; Amendment of Some Provisions of Law Number 52 for Year 1981 in the Matter of Preventing Smoking Related Harm, Smoking is prohibited in all company administrative buildings and working sites.
- Smoking is prohibited inside live areas which contain flammable materials such as (Gas, Crude Oil, etc.)
- Smoking is permitted only at administrative buildings and worksites at the open areas which is announced by the HSE General Department as a designated area for smoking.
- Anyone who violates the Non-Smoking Policy will be penalized according to articles no. (109) & (110) from GANOPE penalties regulations.

2- التدخين في مكان العمل:-

- إيماء إلى المادة 6 مكرراً (3) من قانون رقم 154 لسنة 2007 الخاص بتعديل بعض أحكام القانون رقم 52 لسنة 1981 في شأن الوقاية من أضرار التدخين، يمنع التدخين نهائياً داخل مباني الشركة الإدارية ومواقع العمل.
- يمنع التدخين داخل مناطق التشغيل والتي تحتوي على المواد القابلة للاشتعال (الغاز، الزيت الخام، إلخ).
- يسمح بالتدخين فقط بمباني الشركة الإدارية ومواقع العمل في المناطق المفتوحة والمعلنة من قبل الإدارة العامة للسلامة والصحة المهنية كمنطقة مخصصة للتدخين.
- يعاقب كل من يخالف سياسة عدم التدخين وفقاً والمادتين رقم (109) & (110) من لائحة جزاءات شركة جنوب.

3- Non-Smoking Policy Awareness & Announcement:

- As a reinforcement for the announcement of GANOPE's Non-Smoking Policy, "Smoking is Prohibited" signs which include the internationally recognized non-smoking sign as a red cycle containing a burning cigarette with a radius line through the circle should be posted in places where smoking is prohibited.
- An awareness should be provided for all employees at all departments, branches and working sites to ensure the right communication and understanding of the new Non-Smoking Policy for all employees.

3- الإعلان والتوعية بسياسة عدم التدخين:-

- لدعم الإعلان عن سياسة عدم التدخين الخاصة بشركة جنوب ، يتم وضع علامات تحذيرية تشير إلى "عدم السماح بالتدخين" في الأماكن الغير مخصصة للتدخين على أن تشمل العلامة التحذيرية علي الرمز الدولي المتعارف عليه بعدم السماح بالتدخين وهو عبارة عن دائرة حمراء تحتوي على سيجارة مشتعلة مع خط أحمر قطري مرسوم على الدائرة.
- يجب توعية جميع العاملين بالإدارات والأفرع ومواقع العمل للتأكيد على الفهم الصحيح لسياسة عدم التدخين وتوصيلها إلى جميع العاملين.

M. Shimy

Eng. Mohamed Shimy 24/12/2017
Chairman

Rev. (0): 24th Dec. 2017

01. Traffic and Vehicle Safety

1.0 Introduction

A large number of means of transportations travel everyday on the roads carrying Ganope employees, contractors, sub-contractors and materials toward the Working areas and on the public roads. Therefore, driving is identified as one of the most dangerous work activities carried out within Ganope Operations that could result in a multiple fatalities and loss of assets.

2.0 Objective

The objective of this Driving Safety Practice is to ensure the managing of driving risks formally to reduce the number and frequency of driving related accidents and improve the driving safety performance by assurance for the competency of the drivers and the integrity of the vehicles.

3.0 Applicability

This practice should be applied across all Ganope premises, sites and activities, involves transporting of goods; materials and/or people.

Therefore; this Practice will apply to:

a) All Ganope employees driving any kind of vehicle related to the business.
b) All Ganope Vehicles and Drivers.
c) All Contractors working with / through Ganope premises or within Ganope operational control.
d) All sub-contractor drivers including catering, logistic,…etc.

4.0 Responsibilities

I. Transportation Department:

a) Develop and Implement a maintenance schedule for all Ganope vehicles.
b) Demonstrate a documented evidence of vehicles maintenance and driver's trainings.
c) Control and issue Ganope driving permit.
d) Reporting of vehicle/bus accident.
e) Ensure that all Ganope vehicles including hired vehicles comply with Ganope Driving Safety Practice.
f) Approve trips involving emergency and night driving.

II. HSE Department:

a) Review and approve driver training programs.

b) Determine and communicate the speed limits to all departments.

c) Monitoring / Audit Ganope and Contractors drivers' behavior.

d) Randomly check / monitoring the traffic inside the Site to ensure the commitment of the Site managers to the safe driving policy.

e) Take the necessary disciplinary action toward the violated drivers.

5.0 Vehicle Safety Requirements:

a) All vehicles shall be fit for the purpose, and shall be maintained in safe working order, with individual seat belts installed and functional.

b) All vehicles should be equipped with first aid kid, fire extinguishers, emergency reflective triangles, tools and spare tire in good condition.

c) The number of passengers shall not exceed the manufacturer's specification for the vehicle.

d) Future purchased vehicles should be fitted with ABS braking system, front passenger's airbags.

e) Loads shall be secured and shall not exceed the manufacturer’s specification and legal limits for the vehicle.

f) Carrying passenger is not allowed for vehicle that is not originally designed for this intent. (e.g. pickup truck)

A. Vehicle CHECKS:

i. Transportation Department Responsibility: Maintain the vehicle periodically in safe working order by carrying out the required maintenance.

ii. The Driver Responsibility: Monitor his vehicle on a daily basis; the following checks are mandatory for all drivers of vehicle checks:

- Seat belts are in good condition and function properly.
- Ensure a fire extinguisher, spare tires, jack and hand tools are situated within the vehicle and secured / fitted with a bracket.
- Ensure the tires are in good conditions.
- Ensure the tire pressure is adequate.
- Check/Ensure the lights and indicators are function.
- Check windscreen visibility and ensure that, the wipers & washers are function.
- Ensure that, the horn is working.
- Check and adjust the mirrors to give wide rear view.
- Check the radiator cooling fluid level.
- Check the engine lubricant oil level.
- Ensure that; the fire extinguisher and the warning reflector triangle are attached within the storage area.

iii. For Heavy Vehicle:

Conduct the above checks in addition to the following:

- Ensure the vehicle equipped with chock blocks.
- Drain the condensate water from air tank.
- Check air hose coupling connections
- Check oil & air pressure levels
- Check air brakes

iv. For Buses

Conduct the above checks in addition to the following:

- Inspect the seat belts.
- Inspect the seat conditions.
- Check the bus compartments.
- Check the bus closing door devices.

v. Drivers to use the inspection form every shift and to report any deviation to the Transportation Department.

vi. The Garage Gate Check

Check point to be available at the garage gates to control the vehicles travelling entering/exiting and the following check's to be carried out:

- Driver valid Driving license.
- Valid Vehicle license.
- All passengers are wearing seat belts.
- If a truck is carrying loads, the loads must be secured correctly.

6.0 Driving Safely Ground Rules

All drivers within Ganope to be fully committed with the following driving safely Ground Rules:

a) The drivers not allowed to drive unless obtaining Ganope driving permit.

b) Drivers and all passengers must be fastened their seat belt whenever the vehicle is in motion.

c) Drivers must comply with the legal traffic rules and the company traffic ground rules.

d) The mobile phone usage is prohibited for the drivers while the driving operation.

e) Drivers shall not be under the influence of alcohol or drugs, or any other substance or medication that could impair their ability to drive.

f) Follow the parking rules.

g) Drive to comply with the Defensive Driving techniques.

7.0 Required Rests Periods for Drivers

No driving under tired or fatigue; the drivers to get adequate rest while the driving duties as per below guidelines:

a) A minimum of ten minutes' rest every two hours driving.

b) The total driving period not exceeding 10 hours per day.

c) If the journey is estimated to exceed eight hours, then a backup driver is required for that journey.

8.0 Driver's Training

- All drivers Ganope; Contractors shall have a valid driving license for the class of vehicle being operated.
- It is the driver's responsibility to keep their license up-to-date and inform their supervisor of any change in status; expiry; suspended; etc.

a) Department's Manager to nominate the drivers.

b) The attendee to have a valid driving license.

c) All Ganope Drivers; Contractor drivers to attend and successfully passing the Defensive Driving Course including a driving practical assessment before being allowed to drive for Ganope.

d) All Permitted Drivers shall attend refreshment training and assessment every three years.

e) Transportation Department to keep the records of driver's attendance with dates and successful completion of trainings.

i. Professional Drivers

a) Professional drivers have to attend the following sessions before driving any company vehicle:

- Defensive Driving Training.
- First Aid Training.
- Fire Extinguisher Usage Training.

b) Complete successfully the practical driving assessment.

c) Monitor their fitness capability that relates to their ability to drive safely as part of their recruitment/selection.

d) The professional drivers are responsible to report any change in their functional capability occurs, which affects their ability to drive.

9.0 Driver Medical Assessment

i. Annual medical assessment from certified medical firm is required for all professional drivers.

ii. The medical assessment to be include but not limited the following:

a) Assessment of visual acuity, depth perception and visual fields.

b) Assessment of their risk factors for sleep apnea and drug test.

c) Assessment of mobility problems.

d) Assessment of cardiovascular risk (blood pressure, pulse, heart conditions etc.).

e) Assessment of any other condition that may interfere permanently or temporarily with the individual being able to control the vehicle.

iii. The results of the periodical medical assessment of drivers to be maintained and available at the medical department**.**

10.0 Towing of Vehicle

a) Competent personnel only allowed towing other vehicles.

b) Competent person meaning; the person well trained in the proper method of towing and understanding the associated hazards and risks.

c) The towed vehicles must be fitted with certified rigid towing fitments.

d) Equipment being towed must have its own independent braking system.

e) Towing must be within the field areas only.

f) The towing speed not exceeding 45 km/h.

g) The towing equipment to be equipped with flashing indicators and brake lights powered by the towing vehicle.

h) The towed vehicle must be lighter than the towing vehicle.

11.0 Road Accidents Reporting

a) The driver is responsible to report any vehicle accident immediately to the Site HSE Department and Security Department.

b) In case of the vehicle accident occurred outside the Site fence, "On the public road" the driver requested to not move the vehicle until notifying the local traffic police authority and immediately notify the emergency number of his work location.

c) All vehicle accidents must be reported and investigated.

12.0 Journey Management Plan (JMP)

i. Scope:

The journey management plan to be implemented in the following cases:

a) Journeys from / To Egyptian Cities or Sites.

b) Approved Night driving journeys

ii. Plan the Journey

a) Transportation Department with the traveler to complete the journey management plan.

b) Prior to the journey; the vehicle to be inspected and fit for purpose according to the journey checklist.

c) Valid vehicle driving license for vehicle and driver and to be available within the journey.

d) Transportation Department to review the journey with the driver.

e) Assessing the risks.

f) The journey management plan to be singed from all concerned parties.

g) Record / kept a register for the journeys.

iii. During the journey

The Driver Responsible to comply with the following:

a) Drivers to follow the agreed route for the journey plan.

b) Drivers to comply with the traffic road speed limits and warning signs.

c) Drivers prohibited using a mobile phone while driving.

d) The drivers responsible to ensure the fasten of the seat belt for himself and the carried passengers.

e) Drivers to follow the rest time as mentioned in the journey plan.

f) Prohibited to carry unknown passengers.

iv. Journey Follow Up

a) During the journey; the driver to be in communication with the Transportation Department Supervisor.

b) The driver to report immediately any unexpected issue or problems during the journey.

v. Closing the Journey Plan

a) By the end of the journey; the driver to contact the Transportation Department Supervisor to close the journey registration.

13.0 Assurance of Compliance

To ensure that all Ganope drivers / passengers and the contractor drivers / passengers are committed and in compliance with the driving safety practice; the following requirements to be managed:

a) Security Department to conduct seatbelt and driver license checks at security gates.

b) HSE Department to conducting a random audit and traffic campaign.

02. Transportation of Hazardous Materials

1.0 General

a) All company and governmental regulations shall be followed when transporting hazardous materials.

b) The operating supervisors are responsible for the safe transport of hazardous materials and that it is done in compliance with the law.
The safety engineer shall be consulted when questions arise concerning the safe transport of hazardous materials.

c) The material in this section only provides a brief overview of the requirements regarding the transportation of hazardous materials.

2.0 Definition of Hazardous Materials

a) A hazardous material is any substance determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety and property when transported in commerce. The Department of Transportation (DOT) has published a list of substances designated as being hazardous.

b) Classes of hazardous materials include:

- Radioactive materials
- Poison A
- Flammable Gas
- Non-flammable Gas
- Flammable Liquid - flash point 100°F or less
- Oxidizers
- Flammable Solid
- Corrosive Material (solid)
- Corrosive Material (liquid)
- Poison B
- Irritating Materials
- Combustible Liquid (110 gallons or more) - flash point100° - 200°F

3.0 Shipment of Hazardous Materials

- Regulated materials must be packed to prevent spillage, leaks, or escape of product into the environment.
- Items for shipment must be properly identified, marked, and labelled in such a manner so that any person involved in the handling of such materials will be readily aware of the nature of the contents.
- Specific packaging requirements for each class of hazardous materials can be found in the EEAA Hazardous Materials Transportation Guide.
- Placarding requirements include:

  - All four sides of a motor vehicle, rail car, or freight container must be placarded.
  - Placards must have the proper name of the material.
  - Placards must be correct and in place before the material is transported.
  - It is the shippers' responsibility to ensure placards are correct and in place.

- A shipping paper accurately describing the hazardous material must accompany every shipment of such materials when it is transported on a state or federal road. However, shipping papers are not necessary when transporting products only on lease roads within a field.
- Any tank, barrel/drum, cylinder, or other packaging not permanently attached to a motor vehicle which contains any flammable liquid, compressed or gas, corrosive material, poisonous material, or radioactive material must be secured against movement within the vehicle on which it is being transported.
- Compressed gas cylinders must be transported in one of the following ways to prevent them from overturning.
  - Securely lashed/chained in an upright position.
  - Loaded into racks securely attached to the motor vehicle.
  - Loaded in a horizontal position and securely braced.
- Sample bombs filled with hazardous materials are subject to these rules for compressed gas cylinders as stated above, and must be transported in accordance with these procedures.
- No smoking is allowed when loading or unloading any explosive, flammable liquid, flammable solid or flammable compressed gas.
- Motor vehicles operated by private carriers, must be specially marked by hazardous material. Markings must display the name of the carrier and the city in which the carrier maintains its principal office, they must be displayed on both sides of the vehicle, and be readily legible in daylight at 50 feet.
- Vehicles transporting a properly marked portable (not secured to vehicle) tank containing less than or equal to 110 gallons or 1,000 pounds of hazardous material do not have to be placarded. However, the portable tank must be marked with the proper shipping name of the contents on two opposing sides along with the hazardous materials identification number specified for that material in 49 CFR 172.1 01.
- If a cargo tank (a tank secured to the inside of the pickup’s bed) containing hazardous materials, other than fuel for the vehicle, is being transported the vehicle must be placarded.
- Rigorous driver qualification requirements must be met by employees who transport hazardous materials. However, these requirements do not apply to drivers transporting less than or equal to 100 gallons or 1,000 pounds of hazardous materials.

03. Truck Loading Rack Safety and Loading / Unloading of Flammable Liquids and Compressed Gases

1.0 Introduction

- Considering the large volumes of flammable petroleum liquids handled daily through truck loading racks, the need for better loading rack design and good training and education for those who operate them are the most important factors contributing to safe operation and loss prevention in such type of operating activities.
- On the other hand, there are many factors contributing to losses at loading racks, some of which is the faster loading rates (which run between 500 and 1200 gpm (0.03 to 0.07 cu.m./sec), and the extensive use of product filters, as well as the increase handling of more hazardous products, such as jet fuel (JP-4), and Gasoline which because of their vapor pressure, present longer exposure to vapor conditions within tank compartments which are within the flammable range.

2.0 Construction & Location

2.1 Loading racks should be constructed entirely of non-combustible materials.

2.2 In no case should a combustible material such as wooden frame enclosures for operating personnel be used.

2.3 Roof sheeting should be entirely non-combustible. The use of tar or asphalt as coating or sealing materials shall not be allowed.

2.4 Sufficient space should be provided so that even the largest trucks have ample turning radius when entering or leaving the rack.

2.5 Space should also be provided for trucks to park 100 to 200 ft. (30.5 to 61.0 m) from the rack while awaiting a turn to load.

2.6 It is important to locate loading racks as far as possible from tankage and other important structures, and that they are so located that trucks will not have to pass through any other important areas.

2.7 Separate gates should be provided for entering and leaving the premises.

2.8 Damage to loading racks because of poor driver judgment could mostly be eliminated by sufficiently strong crush barriers around the loading island to keep trucks and trailers away from all rack equipment.

3.0 Bay Design

3.1 Loading bays should be laid out to ensure free and safe access of personnel around all foreseeable sizes of vehicle and adjacent islands. Islands should be curbed to provide protection for loading equipment.

3.2 Top loading installations generally have the loading arms and meter heads installed on a steel structure whose platform level is approximately that of the vehicle tank top.

3.3 Meter elements, filters and pipe-work are normally installed below the platform.

3.4 Platforms should have access from each end, by stairways. Adequate width should be provided for safe movement around platform mounted equipment and with non-slip surface gratings.

3.5 Handrails and toe-boards should be fitted wherever practicable and access between the platform and the vehicle tank top should be provided by hinged gangways mounted to accommodate varying vehicle heights.

3.6 Grip rails should be provided for personnel working on the vehicle top during loading operations.

3.7 Care should be taken to ensure adequate clearance between fixed structures and the largest vehicles.

4.0 Drainage

4.1 Rack areas should be fully paved, curbed and drained so that all spills from trucks or equipment would quickly flow to adequately size trapped drains capable to handle the hydrocarbon spills and fire water without over flow or any flooding to the area under racks.

4.2 Contrary to the present general practice of locating drains directly under trucks, they should be located out from under the trucks on the outboard side of the rack, so as to minimize fire exposure to both the loading rack and the underside of the truck or trailer.

4.3 Special considerations should be given to drainage and curbing needs when special fixed fire protection systems are provided.

5.0 Bonding

5.1 Good bonding is essential between the loading pipe and the shell of the tank compartment in order to eliminate sparking at the hatch.

5.2 Bonding between the loading pipe and the tank compartment should be made before the loading pipe is inserted into any truck compartment.

5.3 Bonding to the shell of the tank truck being loaded shall also be provided.

5.4 Bonding is usually accomplished by means of heavy flexible stranded steel or copper cable securely attached to a fixed portion of product pipe riser or the steel structure on one end, and clamped to the shell of the compartment being loaded, using a strong alligator clip or pressure clamp.

6.0 Grounding

6.1 In grounding the bonding system is electrically connected to the earth so that any static charges, as well as stray electrical currents from the truck are led to a common ground.

6.2 The effectiveness of rack grounding shall be checked on regular intervals.

7.0 Top Loading

7.1 Arms for top loading should be sturdy construction.

7.2 Where overfill protection is not provided, then the loading should be continuously supervised and the arm should be fitted with an emergency stop valve.

7.3 The straight tips formed by a loading tube cut at right angles to its centerline would appear to be unsatisfactory from the standpoint of causing turbulence and its tendency to be thrown upward when loading is initiated. In contrast, a loading tube cut at a 45-degree angle to its centerline forms a loading tip which at moderate flow rates has satisfactory turbulence characteristics.

7.4 With all loading operations the loading tube should be of all metal construction and of sufficient length to rest on the bottom of the tank compartment being loaded.

7.5 For loading (JP-4) fuel, Benzene, Toluene, Xylene, or for loading distillate materials after handling gasoline (switch loading), the initial loading rate should not exceed a velocity of 3 feet/second (0.9 m/sec) until such time as the outlet is completely submerged. The full loading rate should then not exceed 15 to 20 ft./sec (4.6 to 6.1 m/sec).

7.6 This shifting in rate in readily is accomplished by using a special loading regulator tip. This special loading tip automatically shifts to the full loading rate when submerged to a safe depth. The tip design is of the circular deflector type which minimizes spraying and splashing and helps prevent the loading tube from being thrown out of the tank compartment when loading is initiated.

7.7 On automatic systems an interlocking limit switch should be arranged so that loading cannot start unless the arm is fully inserted into the tank compartment. Arms should be designed to minimize splash loading and free fall of product, by providing circular splash deflectors.

7.8 If automatic meter operated slow start valve are not used, considerations should be given to the fitting of a flow restricting valve which will limit the velocity until the tip is submerged as indicated fewer than 7.6 above.

8.0 Bottom Loading

8.1 It is important that articulated pipe and hose connections for bottom loading operations are carefully checked for suitability for all conditions to be met in service.

8.2 Isolation valves should be installed immediately upstream of each arm.

8.3 Where overfill protection is not provided then the loading operation be continuously supervised and the system should be provided with an emergency stop valve.

8.4 A block valve should be fitted to the end of the arm to reduce product spillage.

8.5 DE pressuring / draining connections piped to a safe location should be provided.

9.0 Hoses

9.1 Loading hoses should be suitable for the product being handled at the pressure and temperature of operation.

9.2 Hose must be electrically continuous. “Reference should be made to BS 1435 and BS 3492 for suitable specifications”.

10.0 Pipe-work, Valves and Filters

10.0 Due regard should be paid to problems of expansion of heat traced systems and the possibility of severe shock loads caused by quick acting shut off valves.

10.1 Pipe-work layout should be designed so as to avoid obstructions to normal emergency access.

10.2 Isolating valves should be installed on all product lines entering the loading area, in such a location that easy and safe access is possible in case of fire or other emergency.

10.3 Emergency loading pumps stop switch shall be located at the bottom of rack stairs.

10.4 Where there is a risk of stray electrical currents (e.g. cathodically protected systems) fully insulated flanged joints should be fitted in each pipeline at the loading area battery limit. Downstream of these points the pipe-work should be electrically continuous.

10.5 Where micro-filters are installed, the pipe-work between the filter and the loading arm should be sized to provide at least 30 seconds relaxation time in order to dissipate any static charges.

11.0 Vehicle Loading Instructions

11.0 Clear, concise written procedures on the safe and proper operation of loading equipment and on the action to be taken in the event of any unsafe or potentially hazardous occurrence should be available to, and understood by all operators and drivers.

11.1 These procedures should be regularly revised in view of any changes and operating experience.

11.2 Loading operations should be supervised so as to ensure that procedures are being observed and that safety interlocks, sealed equipment and meters are not tampered with.

12.0 Static Charge Relaxation

12.0 After loading has been completed, a static charge relaxation time of at least one minute should be allowed before the loading pipe is withdrawn and before any sampling devices are inserted. This period of time is essential to permit charges on the surface of the oil to migrate to the loading pipe or the compartment structure where they are neutralized.

12.1 Longer periods may be required when handling pure or dry products, especially in colder weather when static dissipation takes place at a slower rate.

13.0 Loading Procedures

- Written procedures should cover at least the following items. Any other requirements specific to the installation and equipment in use should be written and displayed in a manner to ensure that all concerned are familiar and conversant with them:

13.1 Vehicles should stop at a clearly marked stop line; at least 6m from the loading bay, and all non-essential devices should be switched off.

13.2 When the vehicle entered the loading bay the engine should be stopped, and handbrake applied, the battery isolation switch turned off and the vehicle bonded to the loading rack.

13.3 The compartment to be loaded should be checked to ensure that each is empty, reasonably clean, and water free. Foot valves and outlet valves should be checked to ensure that they are all closed and drip caps should be secured (except in case of bottom loading).

13.4 The appropriate equipment for the product to be loaded should be selected and prepared in accordance with the documentation and loading permits provided.

13.5 A check should be made that the compartment capacity is adequate for the quantity to be loaded before connection of arms or hoses or insertion of loading pipe into the compartment. The loading pipe should be fully inserted to reach the bottom of the compartment before loading commences.

13.6 Compartment man lids other than that of the compartment being loaded should be kept closed.

13.7 When products are being loaded which may create a flammable atmosphere in the ullage space of the compartment, including switch loading, the loading rate should be reduced until the fill pipe is full submerged.

13.8 While loading is in progress the vehicle should not be left unattended.

13.9 The loading rate should be gradually decreased prior to completion of filling.

13.10 On completion of loading

13.10.1 Loading arms or filling pipes should be drained and retracted.

13.10.2 All manlids should be closed.

13.10.3 All valves should be closed and drip caps secured.

13.10.4 Loading arms or hoses should be drained, if necessary, and properly stowed.

13.10.5 Top access gang way should be retracted.

13.10.6 Bonding connections should be removed when all other activities are completed.

13.11 If sampling or dipping of compartments is to be carried out two minutes' relaxation time should be allowed.

13.12 Loading should be stopped immediately throughout the whole loading area if fire occurs, or a potential fire risk, such as a major spillage develops.

13.13 Individual loading operations should always be stopped if there is evidence of any equipment malfunction, small spillage's or product leakage from equipment or vehicle.

14.0 Switch Loading

- When a low vapor pressure product such as Kerosene or gas oil is loaded into a vehicle compartment which has previously contained a high vapor pressure product such as gasoline, a hazardous atmosphere may be present in the vapor space.
- This operation is known as switch loading and should be avoided.
- It is necessary to flush or clean the vehicle compartment prior to switch loading.

15.0 Loss Causes

- The main factors in loss causes are:

15.1 Human Failure:

- There is no substitute for well-trained operator who consistently follows well established safe loading procedures.
- Failure on the part of operating personnel can be one or more of the following:

15.1.1 Bonding wires are not used.

15.1.2 Bonding wires are broken and not reported immediately.

15.1.3 Compartments are overfilled because the operator is either carrying many operations at one time, or he fails to pay attention to what he is doing.

15.1.4 Hatches are left open on compartments that are not actually being filled.

15.1.5 No static relaxation time is allowed before the loading pipe is withdrawn or before samples are taken or dipping.

15.1.6 Loading hose is not disconnected, or fill pipes are not removed before a truck is permitted to pull away from the rack.

15.1.7 Operators are not aware of the exact procedure to shut down the loading pumps or how to actuate and/or properly use fire protection equipment provided at the rack.

15.1.8 Ignition circuits, lighting circuits, radio circuits are left alive by drivers during loading operations.

15.1.9 Drivers are allowed to stay in their cabs or are allowed to re-enter their cabs during loading operations.

15.2 Equipment Failure

15.2.1 Equipment failure is a fairly common cause of loss which cannot always be prevented, but it can be through:

15.2.1.1 Proper selection of rack components which have a proven record of reliable service.

15.2.1.2 Proper maintenance and periodic inspection.

15.2.2 At frequent intervals, pump seals, gaskets, and valve packing should be examined for leaks. Pipe and hose fittings should be leak free.

15.2.3 Hose that is used under pressure should be hydrostatically tested yearly to not less than 150 % of its rated working pressure.

16.0 LPG Tank Trucks

16.1 Scope

- This part is applied to vehicles used in the transportation of LPG as liquid cargo, normally loaded into the cargo vehicle container at refineries or gas plants and transferred into other containers at bulk plants or other point of delivery, whether these vehicles fabricated by mounting cargo tanks on conventional truck or trailer chassis, or constructed as integral cargo units in which the container constitutes in whole, or in part, the stress member of the vehicle frame.

16.2 Containers

16.2.1 Containers mounted on, or comprising in whole or in part, the stress member used in lieu of a frame of cargo vehicles shall comply with DOT cargo tank specifications for LPG service.

16.2.2 Liquid hoses, and vapor hoses of 1 ½ inch (nominal size) and larger shall be protected with an emergency shut-off valve having all of the following means of closing:

16.2.2.1 Automatic shut-off through thermal (fire) actuation. Where fusible elements are used, they shall have a melting point not exceeding 250 °F (121 °C).

16.2.2.2 Manual shut-off from a remote location.

16.2.2.3 Manual shut-off at the installed location.

16.2.3 A backflow check valve shall be permitted to be used in the cargo container piping or internally in lieu of an emergency shut off valve if the flow is only into the cargo container.

16.2.4 Container openings whose only function is for pump a by-pass return shall be provided with one of the following:

16.2.4.1 A positive shut off valve capable of being secured in the open position located as close to the tank as practical in combination with a steel backflow check valve installed in the tank.

16.2.4.2 An internal valve with excess flow protection.

16.3 Transfer Pumps and Compressors

16.3.1 Transfer can be made by a pump or compressor mounted on the vehicle or by a transfer means at the delivery point.

16.3.2 Where pumps or compressor used for LPG transfer are mounted on tank trucks, trailers, semi-trailers, and with electric drive, obtaining energy from the electrical installation at the delivery point, the installation on the vehicle and the transfer point shall comply with NFPA-70 National Electrical Code.

16.3.3 Where wet hose is carried while connected to the truck's liquid pump discharge piping, and automatic device, such as a differential regulator shall be installed between the pumps discharge and the hose connection to prevent liquid discharge while the pump is not operating.

16.4 Fire Extinguishers

16.4.1 Each tank truck or tractor shall be provided with at least one approved portable fire extinguisher having a minimum capacity of 18 lb (8.2 kg) dry chemical with BC rating.

16.5 Maximum Filling Capacity

16.5.1 LPG containers shall be gauged or weighed to determine that they are not filled beyond the maximum filling capacity.

04. Personal Protective Equipment

1.0 General Requirements

1.1 Selection

1.1.1 It is important that items of protective clothing and equipment be selected by persons having a full understanding of the nature of the hazard and of the type, range and performance, etc., of the protection required.

1.1.2 Items selected should conform, where appropriate, to the relevant Egyptian Standard or other equivalent.

1.1.3 Account should be taken of compatibility between equipment, such as safety helmets and ear defenders.

1.1.4 The comfort and convenience to the wearer are also factors of considerable importance; wearers should be consulted and, where possible, given a degree of choice before the final selection is made.

1.1.5 In this respect, the technical representative of the – manufacturer / supplier should be consulted.

1.2 Maintenance

- Items such as respiratory protective equipment, safety helmets and safety harnesses should be kept in appropriate storage under the control of a responsible stores controller who has been trained in the necessary cleaning and maintenance requirements recommended by the manufacturer / supplier.

1.3 Training

- Adequate training must be given on the wearing and use of personal protection.
- This training should include information on such matters as:
    - The nature of the hazard,
    - The source of the hazard,
    - The effects of exposure to the hazard,
    - The way in which the protection functions,
    - The way in which the protection must be worn,
    - Any limitations of the protection,
    - The way in which the protection must be inspected and stored,
    - The person to whom any defects or other problems should be referred.

1.4 Use

- Whilst the use of protective clothing and / or equipment is at times unavoidable, it should, generally speaking, be considered as a last rather the first resort in providing worker protection. Where it is practicable to do so, the hazard should be reduced, or eliminated altogether e.g. by the provision of adequate fume extraction or ventilation, the reduction of noise at source, etc.

2.0 Head Protection

2.1 In the vast majority of construction operations there is a foreseeable risk of head injury, either due to falling objects/materials or from the head striking against another object. Although the prevention of falling objects/materials must be the first aim of management, the proper wearing of head protection is essential in reducing head injuries.

2.2 Persons Duties Should

2.2.1 Identify when and where head protection should be worn.

2.2.2 Inform the personnel concerned in writing, verbally, or by means of suitable signs when and where the head protection is to be worn.

2.2.3 Ensure that such rules take account of visitors to site, who may also be exposed to risk of head injury.

2.2.4 Arrangements should be made to ensure that visitors are informed of the risk and that adequate stocks of helmets are kept on site for their use.

2.2.5 Provide adequate supervision to ensure compliance with the rules.

2.3 Selection of Head Protection

2.3.1 Apart from ensuring that the head protection provided is suitable for the purpose, it is also important for it to be comfortable, bearing in mind that it may have to be worn for long periods by persons engaged in heavy manual work.

- It is therefore recommended that, where possible, those required to wear the head protection are involved in its selection.

2.3.2 Harnesses are manufactured from plastics, textiles or basil leather and sometimes incorporate a chin strap. Helmets may include optional comfort features such as a flexible contoured headband, an absorbent and easily replaceable sweatband and textile cradle straps.

2.4 Use and Maintenance of Head Protection

2.4.1 As with all personal protective clothing and equipment, instruction should be given on the correct use and maintenance of head protection, in particular the following requirements:

2.4.1.1 For the harness to be properly adjusted, but not to tight, and for the helmet not to be worn at an angle,

2.4.1.2 To keep the clearance between the helmet and the harness, i.e. nothing must be carried in the helmet,

2.4.1.3 To handle the helmet with care,

2.4.1.4 Regular inspection of the helmet for cracks or signs of wear and of the harness for loose or broken straps, worn stitching etc.,

2.4.1.5 Not to paint, mark or label a helmet, as this can affect its strength. The affixing of labels, names etc., should only be undertaken in consultation with the manufacturer / supplier,

2.4.1.6 To minimize exposure to sunlight, extreme heat or cold, chemicals, etc.,

2.4.1.7 To remove all dirt and moisture after use, with warm soapy water,

2.4.1.8 To keep in lockers or other places provided when not in use,

2.4.1.9 To request a replacement if the helmet is lost or if the shell or harness has become damaged.

2.4.2 Helmets which are used daily and exposed to sunlight have a realistic life span of about three years and should be replaced after this period, irrespective of any sign of wear or damage.

3.0 Protective Footwear

3.1 Provision

3.1.1 Every working day accidents occur on sites, which result in both serious and minor foot injuries.

3.1.2 Many of these accidents can be avoided by the wearing of boots or shoes having built-in steel toe-caps and reinforced soles.

3.1.3 Such safety footwear must conform to Egyptian or International Standards.

3.1.4 All site personnel should be encouraged to use safety footwear.

3.2 Selection

3.2.1 Comfort is important in any shoe, but particularly so with safety footwear. 'However, as well as the fitting of the boot or shoe, the purpose for which it will be used must be considered.

3.2.2 Another consideration will be the type of surface on which the footwear will be used; will this be slippery or oily? will there be a considerable amount of rough ground, in which case boots providing ankle support would be preferable to shoes.

Is there a risk of electric shock for instance? in which case, soles with high electrical resistivity would be a serious consideration.

3.2.3 For work carried out in wet or muddy conditions, rubber boots will be required and these again can be provided with steel toecaps and steel mid-soles if required.

3.2.4 The weight factor, particularly with boots having safety features such as steel toecaps and midsoles can be important with respect to foot comfort.

3.2.5 Steel toecaps designed to protect the toes may bruise or chafe the toes across the foot joint after prolonged use. A poorly located toecap may produce a prominent ledge adjacent to the foot joint.

3.2.6 It is important to choose the correct size of footwear, allowing for the type of socks to be worn.

4.0 Body Protection

4.1 General

4.1.1 Long term health problems resulting from unprotected exposure of the human body to adverse weather conditions have always been a problem for outdoor workers.

4.1.2 It is now recognized that chronic medical conditions in later life, such as bronchitis and rheumatism, can and do result from such unprotected exposure.

4.1.3 Protective clothing can usually be obtained in company livery. If, however this is a dark color, then it would be advantageous to incorporate a brighter color to enhance visibility.

4.1.4 With offshore work this is an extremely important consideration and it might well be preferable to issue garments in colors such as bright orange or yellow only.

4.1.5 The company logo may be incorporated by means of a suitable sized patch or patches.

4.2 Wet Weather Clothing

4.2.1 Such clothing is available in either one or two piece suits and normally incorporates a hood.

4.2.2 These should not only be waterproof and durable but also flame resistant and should not be affected by oil and grease.

4.3 Overall / Coveralls

4.3.1 These can be obtained as either one piece, or two piece suits, normally made of poly cotton.

4.3.2 The use of these will necessitate arrangements being made for regular cleaning.

4.3.3 Special trades, such as asbestos removers and operatives working with lead, will usually have lightweight overalls particularly suited to the operation.

4.3.4 Such overalls are normally provided with a hood and may be of the disposable type.

4.3.5 As with weatherproof clothing it is well worth exploring the market and giving careful consideration to such features as pockets, hoods, cuffs and type of fastenings, i.e. buttons or zips.

4.4 High Visibility Clothing

This is normally available in the form of waistcoats or cummerbunds for use, for instance, by persons working in the vicinity of moving traffic, or by operatives controlling crane movements. These garments will usually incorporate retro- reflective strips front and rear.

4.5 Aprons and Gaiters

4.5.1 Leather aprons are used by welders and burners to provide protection against sparks and molten metals which might otherwise ignite clothing.

4.5.2 Where the work process involves the casting of molten metals, the operatives concerned must be provided with suitable gaiters manufactured to BS 4676.

4.6 Ballistic Trousers and Jackets

4.6.1 These are worn by forestry workers for protection against injury when using chain saws.

4.6.2 The material, which is of nylon, is woven in such a way as to cause the chain of the saw to jam and stop on contact, so preventing penetration through the clothing to the body of the worker.

4.6.3 Chain saws are now being used by carpenters on a regular basis in the construction industry and the use of this type of protective clothing should be considered.

5.0 Hand Protection

5.1 The first consideration in the selection of industrial protective gloves must be to identify the hazard to be overcome and the handling requirements.

5.2 The handling of small components will require that the glove must be highly flexible and give good dexterity to the operator; alternatively, a glove to give heat protection might place almost no emphasis on the latter properties.

5.3 The type of the glove must also be considered e.g. is the glove to be subjected to abrasion, cutting or tearing?

5.4 The following are the main considerations which will apply in the Petroleum and Petrochemicals Industries:

5.4.1 Abrasion

Gloves which are used to protect against abrasion will usually be of leather, or those having leather palms. Where gloves are worn in the wet, polyvinyl chloride (PVC) will give a high standard of water (and oil / chemical) resistance, in addition to preventing abrasion.

5.4.2 Grip

Where grip is important (e.g. for riggers and scaffolders), gloves made of a base material such as knitted nylon or cloth, with a latex coating, are suitable.

5.4.3 Chemical Resistance

Air-impermeable (plastic or rubber) gloves will be necessary for operations such as degreasing, paint spraying and pesticide handling.

5.4.4 Heat Resistance

This will be required by welders, burners and others such as those working on live heating systems. Leather gauntlets will be appropriate for these trades.

5.4.5 Water Resistance

Resistance to water and other fluids is rarely a quality which is required on its own and PVC gloves resistant to abrasions would normally be suitable.

6.0 Eye Protection

6.1 Types of Eye Protection

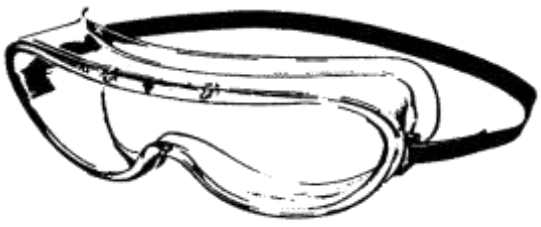
6.1.1 Safety spectacles

- These include those with robust acetate frames with toughened glass lenses and lightweight nylon frame spectacles. Side shields are fitted for lateral protection.
- Lightweight "wraparound" eye protectors are available which have the lenses and frames moulded in one piece.
- Eye protection is usually required to protect against impact, and frequently against other hazards such as dust. Spectacles can only give limited protection against most hazards.

Safety spectacles

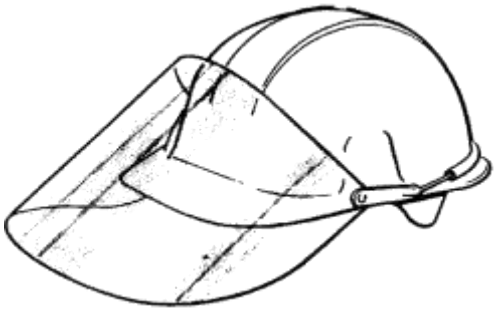
6.1.2 Safety Goggles (Box Goggles)

Wide vision goggles, usually with lenses giving general purpose impact protection, are widely used. The ventilation styles offered cover most industrial hazards. "Antimist" and "Molten metal splash" approved goggles are also available. This type of eye protection can be worn over ordinary prescription glasses.


Box goggles

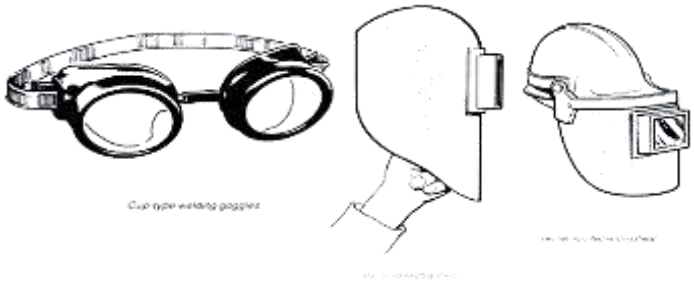
6.1.3 Face shields

Lightweight face shields in acetate, polycarbonate, etc., are manufactured for total eye and face protection and can be worn secured to the front of safety helmets.



6.1.4 Welding Goggles and Shields

Fibber-glass welding shields are available, either as hand shields or, as with face shields, fitted to the safety helmet. Lens holders and welding filters are supplied depending upon the wearer and job requirements, i.e. gas welding or electric arc welding. Cup-type welding goggles are supplied for certain gas welding operations.



7.0 Hearing Protection

7.1 Types of Hearing Protection

In order to combat noise which cannot reasonably practicably be reduced sufficiently at source, ear protection must be provided. Hearing protection ranges from the simplest form of ear plugs to extremely efficient ear muffs and noise helmets.

7.1.1 Ear plugs

These are effective in relatively low noise level areas and many different types are available e.g.:

7.1.1.1 Disposable types of wax impregnated cotton-wool, or similar materials, which are shaped and inserted into the ear canal. (Ordinary dry cotton-wool is an extremely poor protector and should not be used).

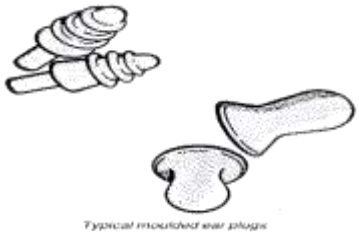
7.1.1.2 Permanent molded pre-shaped plugs of rubber or plastic for insertion into the ear anal. - Individually molded ear plugs produced from such compounds as acrylic, silicone and synthetic rubber in a fluid paste state, which are inserted

into the ear canal to harden in situ for a permanent individually molded ear plug of the correct shape.

7.1.1.3 Foam ear plugs which are compressed in order to fit into the ear and then expand to maximize the protection.

7.1.1.4 Selective hollow plugs, pre-molded of rubber or plastic with a valve system to attenuate sounds but which allows speech or other low intensity sounds to pass.

Note: Some ear plugs are supplied in different sizes and it is important that the correct size is used. The size of the ear canal should be determined by a nurse or similar qualified person.



Typical moulded ear plugs

7.1.2 Ear Muffs

These consist of two rigid cups or shells which cover the ears and are fitted with absorbent material.

They fit to the head by means of soft sealing rings known as ear seals. The ear cups are connected by a suitable headband so designed as to maintain the cups firmly against the ear.

The majority of safety helmets will enable this type of ear defender to be fitted to them and it is important to stress the need for compatibility when ordering.

Ear muffs

Helmet-mounted ear muffs

7.1.3 Noise Helmets

Noise helmets, produced from specially shaped acoustics insulating material, are available for persons who are likely to be subjected to noise at the upper end of the “Harmful Zone” 90dB.

These help to insulate the bone structure of the skull and neck which transmits very high intensity noise to the ears.

7.2 Selection of Hearing Protection

7.2.1 The level of protection (amount of noise reduction) offered by hearing protectors, known as the attenuation, will be dependent on the frequency of the sound source.

7.2.2 Each manufacturer of ear protection will have available an attenuation chart or graph, showing the level of attenuation at a range of different frequencies.

7.2.3 Unless it is known that the lower levels of attenuation are sufficient to reduce the level of noise received by the ear to an acceptable level, then it will be necessary to further evaluate the noise source.

7.2.4 Measurements of the noise levels of the source at different frequencies will identify at what frequencies the greatest noise is being emitted.

7.2.5 It is then possible to subtract from that figure the attenuation of the ear protector at that frequency to determine the suitability of the hearing protection.

7.2.6 When investigating the attenuation at different frequencies, attention should be paid to any audible warning systems to ensure that they can be clearly heard when the ear protection is being worn.

7.2.7 Hearing protection should conform law no. 4 for year 1994 and be tested in accordance with its regulations.

8.0 Safety Harnesses and Belts

8.1 General

8.1.1 The main reason for the use of safety belts and harnesses is to limit the distance of any fall and thereby minimize the risk of injury. They will also be used to facilitate the rescue of persons working in confined spaces.

8.1.2 Safety belts and harnesses provide valuable protection, but they are not a substitute for effective fall prevention.

Where practicable, proper working platforms, equipped with edge protection, must be provided.

Where this is not practicable, the regulations require that safety nets or, alternatively, safety belts or harnesses which are always worn and always attached to a safe anchorage, must be provided and used.

8.1.3 In choosing a belt or harness for a particular application, care should be taken to ensure that it will give the user, as far as is compatible with safety, maximum comfort, freedom of movement and, in the event of a fall, every possible protection to the body from the shock of sudden arrest. Proper fitting and adjustment are essential to achieve these aims.

8.1.4 A full harness gives greater protection that a safety belt in the event of a fall and is therefore preferable; the use of lanyards fitted with shock absorbers is also recommended.

8.2 Types of Belts and Harnesses

8.2.1 BS 1397 Specification for industrial safety belts and harnesses and safety lanyards, gives guidance on the choice of a suitable belt or harness but, in view of the wide variations in conditions of use, it does not attempt to standardize the design of any specific type, or to prescribe which type should be used in any particular industry.

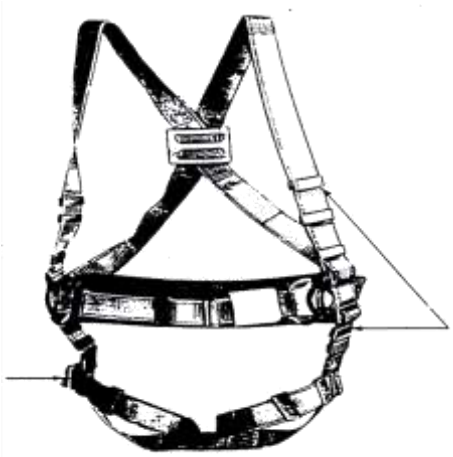
8.2.2 BS 1397 classifies belts and harnesses into various types:

8.2.2.1 Type “A” Pole belts, comprising an adjustable body belt, combined with a pole strap which may be integral, or detachable by means of suitable snap-hooks and rings. The user should be able to alter the length of the pole strap without uncoupling it, permitting movement within 600mm of the anchorage.

8.2.2.2 Type “B" General purpose belts which are provided with a line which should be so connected to the structure as to reduce the maxi- mum free fall to 600mm. Alternatively, a lanyard of 1.2m may be fitted, provided it embodies an integral shock absorber.

8.2.2.3 Type “C" Chest harnesses, comprising a chest belt and shoulder straps and fitted with a lanyard which will limit the fall to a maximum of 2m.

8.2.2.4 Type "D" General purpose harness incorporating shoulder and crutch straps and fitted with a lanyard which will limit the fall to a maximum of 2m.



Typical general purpose safety harness

8.2.2.5 Type "E" Rescue harnesses suitable for protecting or rescuing personnel entering dangerous enclosed places. It must be capable of reasonable size adjustment, be easy to fit in an emergency and be used in such a way that the fall is limited to 600mm. Such harnesses should be used in conjunction with safety lines to BS 3367 Specification for fire brigade and industrial ropes and rescue lines.

8.3 Use of Bells and Harnesses

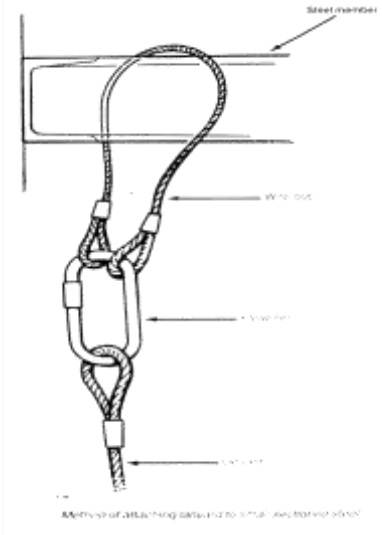
8.3.1 It is of the utmost importance that, whenever a safety belt or harness is provided, there is also an effective means of fixing it to the structure at all times the protection is required.

8.3.2 It is also vital that the fixing point is strong enough to withstand the snatch load of a fall.

8.3.3 The use of two lanyards will sometimes be necessary to ensure constant attachment whilst moving. There is, however, at least one proprietary system available which provides continuous attachment, thereby obviating the need for two lanyards.

8.3.4 The distance of fall should be as small as possible and should not exceed the dimensions specified in para 8.2. To that end, the belt or harnesses should be fixed to the structure, or fixing point, as high as practicable above the working position.

8.3.5 It is vital that the safety belt or harness and the attendant lanyard are not damaged during use. The practice of fastening the lanyard around sharp objects may cause failure. As an alternative, a tested loop, of at least 8mm diameter steel wire rope, with properly made eyes may be used. The wire rope loop should be wrapped around the steel and the harness or belt attached to the loop, maintaining the maximum falling distances previously outlined.



8.3.6 An alternative anchorage may be provided by use of special proprietary hooks which are available with openings to accommodate metal sections up to 50mm.

8.3.7 Wherever possible the means of attachment of the harness or belt to the structure should be incorporated into the design, so that all facilities are available at the earliest possible stage of construction.

8.4 Fall Arrest Devices

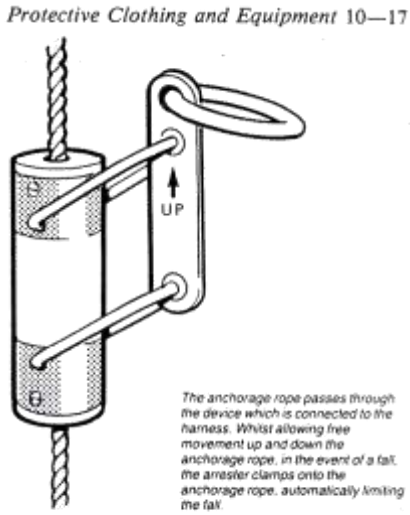
8.4.1 These mechanical devices, when used in conjunction with a safety harness or belt permit greater freedom of movement. The devices have two main features:

8.4.1.1 They extend the area over which the user may work safely.

8.4.1.2 In the event of a fall, they restrict the drop, thereby reducing the load imposed upon the body on sudden arrest.

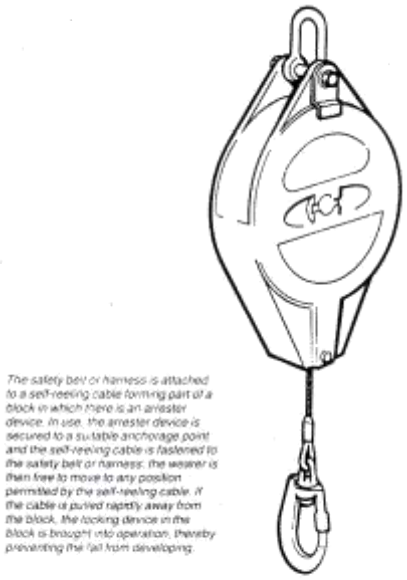
8.4.2 BS5062 Specification for self-locking anchorages for industrial use, classifies fall arrest devices into two types:

8.4.2.1 Type 1 A device which runs on a fixed anchorage line or rail, the safety harness or belt being attached to the device.



Type 1 *Fall arrest device*

8.4.1.1 Type 2 A devices through which an extendable line passes or unreels from, the user being connected to the end of the anchorage line, the device itself being attached to a fixed anchorage point.



Type 2 *Fall arrest device*

8.5 Use of Fall Arrest Devices

The following precautions must be observed when using fall arrest devices:

8.5.1 The correct type of rail or cable for the device must be used for the anchorage line.

8.5.2 The attachment point and attachment structures must be adequate to hold the user in the event of a fall.

8.5.3 Before each occasion of use, devices should be tested on the anchorage line by simply lifting the device and letting go - if it does not lock at once, it must immediately be withdrawn from service for inspection, overhaul and rectification.

8.5.4 For velocity sensing devices, the end of the anchorage line should be jerked to simulate a fall; this will lock the device. Should the device not lock it must be immediately withdrawn from service for investigation.

8.5.5 Instructions for safe use, which must be provided by manufacturers, must be given to the users.

8.5.6 Regular inspection and maintenance of the equipment must be carried out in accordance with the manufacturer's instructions.

8.5.7 Equipment must be stored safely in accordance with the manufacturer's instructions.

8.5.8 In the event that the device is subject to shock loading, action must be taken in accordance with the manufacturer's instructions. Usually the device must be returned to the manufacturer for inspection and overhaul.

8.6 Shock Absorbers

- In order to reduce the possibility of injury to the body in the event of a fall, shock absorbers have been developed. These devices, installed between harness or belt and the anchorage point, allow the fall to be slowed down, thus absorbing energy and reducing the final loading on the body. The various types are illustrated.

05. Respiratory Protection Program

1.0 Introduction

1.1 The circumstances which demand or indicate the use of respiratory protective equipment (RPE) are potentially variable, and usually need careful evaluation if the correct, and most cost effective, choice of such equipment is to be made.

1.2 Such an evaluation will often need to include a quantitative and qualitative determination of what is present in a given workplace atmosphere, and in the case particularly of confined spaces an additional assessment of whether oxygen deficiency or enrichment might occur.

1.3 The possibility of a workplace atmosphere being flammable as well as hazardous for other reasons must also be considered.

1.4 The position is further complicated by the fact that RPE is now available in an ever-increasing number of different types, with variable inherent characteristics and equally variable protective capabilities. In general, use of RPE should be regarded as a 'last resort' (i.e. only after all reasonably practicable steps have been taken to try and render a workplace atmosphere safe and healthy to breathe, should use of RPE be considered.

1.5 The fact is that, whilst some types of RPE are reasonably comfortable to wear, all types represent a certain amount of encumbrance to the wearer, and many types still have severe limitations, particularly in respect of long-term comfort and wearer acceptability.

1.6 Selection and prescription of RPE should therefore never be undertaken lightly and a sophisticated and knowledgeable approach is usually required.

1.7 Broadly, RPE is comprised of two types, as per BS 4275: 1974. These are:

- Breathing apparatus defined as: 'Apparatus enabling its users to breathe independently of the ambient atmosphere.'
- Respirators defined as: 'A device in which the inhaled air passes through a filter medium to remove contaminants.'

2.0 The Physiology of Respiration

2.1 The air we breathe contains the following constituents at typical approximate concentrations:

- Nitrogen 79.00 percent
- Oxygen 20.80 percent
- Carbon Dioxide 0.03 percent
- Inert Gases 0.17 percent
- Water Vapor variable

2.2 Broadly, human energy is derived from the oxidation of food material.

2.3 This process in turn produces waste products part of which are in the form of carbon dioxide and water.

2.4 On inhalation, some of the oxygen in the air is exchanged into the blood stream through millions of tiny gas exchange cells (alveoli) in the lungs.

2.5 Oxygen-rich blood is then pumped by the heart round the circulatory system, giving off oxygen to the tissues; but at the same time picking up carbon dioxide and water.

2.6 The blood, now reduced in oxygen but increased in carbon dioxide and water, is pumped back to the alveoli in the lungs and on exhalation the breath now typically contains approximately:

- Nitrogen 79.00 percent (same as air)
- Oxygen 17.00 percent (approx. 4 percent less than air)
- Carbon Dioxide 4.00 percent (approx. 4 percent more than air)
- Inert Gas 0.17 percent (same as air)
- Water Vapor Saturated

2.7 The above figures illustrate that with each breathing cycle the body takes up about 4 percent oxygen and gives off the same amount in carbon dioxide.

2.8 The next important fact to appreciate is the high variation in the body's oxygen requirements relative to degree of exertion.

2.9 Thus when the body is at rest only the involuntary muscles governing the action of the lungs, the heart and digestive organs are being used, and as a result very little oxygen uptake is required.

2.10 As soon as the body becomes active, however, more muscles are used, more oxygen uptake is required and more carbon dioxide must be disposed of by exhalation.

2.11 Table 1, below, compares degree of exertion with bodily oxygen consumption, total air consumption, respiratory volume and respiration rate.

Table (1) - Degree of Exertion Compared with Oxygen Consumption

Degree of Exertion	Oxygen Consumed Liters/Minute	Air Breathed Liters/Minute	Air Volume at Each Respiration	Number of Respirations per Minute
At rest in bed	0.237	7.7	0.457	16.8
At rest standing	0.328	10.4	0.612	17.1
Walking at 2 mph	0.780	18.6	1.27	14.7
Walking at 3 mph	1.065	24.8	1.53	16.2
Walking at 4 mph	1.595	37.3	2.06	18.2
Walking at 5 mph	2.543	60.9	3.14	19.5

2.12 With heavier exertion than that indicated in the table (for instance, climbing a vertical ladder under emergency circumstances) the oxygen consumed may reach not less than three liters per minute and the total volume of air breathed may reach in excess of 100 liters per minute.

2.13 From the foregoing data it will be seen that apart from more obvious factors, such as degree of protection afforded, choice of RPE must also reflect the likely degree of exertion of the wearer and in turn his oxygen needs.

2.14 The latter consideration is particularly important in highly toxic atmospheres where removal of the breathing mask in order to obtain sufficient oxygen could produce fatal results or severe damage to health.

2.15 Another factor to consider here, relative to filter and canister respirators (see paragraph 3 below) is that, broadly, the higher their level of protection the greater their resistance to breathing.

3.0 Use of RPE (Including Care, Maintenance and Storage)

- RPE must often be used in confined spaces, tunnels, and the 'legs' of offshore installations, etc., and so a primary consideration must be emergency procedure in the event of the wearer getting into difficulties or collapsing.

3.1 In many cases the use of an appropriate permit-to-work system is the best answer.

3.2 In any case, provision must be made for:

3.2.1 The immediate availability, outside the confined space, of appropriate resuscitation equipment, together with a person (i.e. the 'observer) or persons trained in its use, and for rescue purposes.

3.2.2 The provision of a trained observer or observers, and, if necessary, additional rescue personnel.

3.2.3 The provision of a harness and life line of sufficient length. By this means the RPE wearer should then, if practicable, be attached to the observer outside the confined space.

- * N.B. In some cases, where vertical entry into a shaft, tank, etc is necessary, additional provision will have to be made for a man-hoist capable of lifting an unconscious person (attached by means of the aforementioned harness) out of the confined space.

3.2.4 In many cases, it is essential for a 'competent person' to be placed in charge of operations in order to ascertain that the correct procedures are being followed.

3.3 Provision must also be made for the correct issue, care, maintenance and storage of RPE. Facilities for this should always be kept in a clean, dry condition, and be separated from the contaminated workplace which necessitates the use of RPE.

3.4 Manufacturers' instructions on storage and shelf life of canisters and filters must be carefully followed, and provision must be made for the replacement of filters, canisters, air cylinders, or damaged parts of RPE as appropriate.

3.5 This normally means the holding of a sufficient stock both of complete sets of RPE and of spare parts.

3.6 The competent person in charge of operations should keep an eye on the condition of the RPE when in use, and assess when filters. Canisters, etc need changing (i.e. before the wearer complains of inadequate performance).

3.7 The above-mentioned facilities will also need to include provision for the cleaning and disinfection of RPE (except for the disposable half-mask variety).

3.8 In general, it should always be performed between work shifts, and one person should never be expected to use RPE which has been used by another person, unless that RPE has been so cleaned and disinfected.

3.9 Where used filters have to be removed after use against highly dangerous dusts – such as asbestos – or other hazardous particulates, the person carrying out the replacement should himself use RPE or local exhaust ventilation. and dispose of the filters in a safe manner (in the case of asbestos in a suitable sealed and marked container).

3.10 The same principles apply to the handling and disposal of disposable filtering respirators.

3.11 Where the amount of handling of contaminated RPE is significant, adjacent washing facilities, and approved vacuum cleaning facilities, must also be provided.

3.12 Where RPE is in frequent use (unless of the disposable type) it is often necessary to issue users with two sets, so that they have one to wear while the other is cleaned and serviced.

3.13 Disposable filtering respirators should not be used for more than one working shift without disposal and replacement. In cases of nuisance dusts at low concentrations, some flexibility is permissible in this connection.

3.14 A disposable filtering respirator should only be used by the person to whom it is issued.

3.15 Just as a competent person should be appointed to oversee the correct use of RPE during work operations, so also should he, or another competent person, perform or oversee its correct storage, cleaning and maintenance.

3.16 Training will particularly be required for anyone appointed to look after breathing apparatus because of its inherent complexity.

4.0 Training

4.1 From all that has been said so far it will now be obvious that (except in simple cases) training is absolutely vital if RPE is to be used, stored, cleaned, maintained and, where relevant, disposed of correctly.

4.2 As already indicated, the first requirement is for the appointment and training of a competent person or persons to oversee the above functions.

4.3 Next is the requirement for the training and instruction of the users of the RPE. This may be performed either by means of courses run by Safety Dept., or by the above, already trained, competent person(s).

4.4 User training should include specifically:

4.4.1 Details on the nature, level of toxicity, and health hazard presented by the airborne contaminants against which the RPE has been prescribed. (Also information, where relevant, on oxygen deficiency/enrichment or flammable/explosive atmospheres).

4.4.2 A practical demonstration and strip down of the RPE involved, together with instruction on how to preserve its integrity.

4.4.3 Instructions on how to put on the RPE correctly and obtain both an effective face seal, and a comfortable fit.

4.4.4 Instructions on how to test relevant RPE for an effective face seal, and the efficacy of any exhalation valve (if fitted). The wearer should carry out the ‘negative pressure test’ each time the RPE is donned. This test IS performed as follows:

- Ensure any harness straps have been properly tensioned and adjusted.
- Close off air inlet and inhale gently.
- Face-piece should collapse inwards slightly and maintain a slight vacuum until the wearer exhales into it.

- * N.B. If the RPE fails this test, readjustments should be made and the equipment checked for leaks. It should however be perfectly possible for the wearer to be comfortable and yet obtain an adequate face seal, i.e. it should not be necessary to have to tension the harness straps to an extent which causes discomfort.

4.5 Detailed instructions as to what to do in an emergency, how to use any communication system, and how to use, where relevant, the rescue equipment mentioned in item 3.

4.6 Details on the issue, cleaning and maintenance of the RPE involved, and the need to report immediately defects and the imminent clogging of filters, etc.

06. Work Permits

1.0 Introduction

1.1 Permit-to-work systems and procedures constitute the most formal method of ensuring safe working practices and safe systems of work. The objective is for an experienced and trained authorized person, who will ultimately sign the permit-to-work certificate, to pre-assess (with all necessary technical assistance) the hazardous circumstances involved and then prescribe, in writing:

1.1.1 The work to be carried out and the hazards involved.

1.1.2 All the precautions required together with emergency procedures.

1.1.3 Who may carry out the work?

1.1.4 The limits of the permit-to-work area or equipment.

1.2 According to circumstances, the permit-to-work certificate will require acknowledgement by all the personnel carrying out the hazardous work and by the supervisor in charge of them.

1.3 A well-considered permit-to-work certificate will also make provision for signed confirmation that the work area or equipment involved has been restored to a safe condition, for possible time extension of the permit, and for its formal cancellation and the keeping of a record.

2.0 Legal Considerations

2.1 Employer had to provide and maintain systems of work for his employees that are, so far as is reasonably practicable, safe and without risks to health.

2.2 In order to satisfy this legal duty, it may be both necessary and reasonably practicable to establish formal safe working procedures which take into account unusually hazardous conditions, in which normal work of most safety instruction from management to workforce will not suffice.

2.3 Employer had to provide such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety of his employees. Use of a permit-to-work system will help to demonstrate in writing, in the appropriate hazardous circumstances, that these duties have been fulfilled.

3.0 Circumstances of Use

3.1 Since permit-to-work systems constitute the most formal and detailed method of ensuring safe systems of work, they should be reserved only for circumstances where: first, the potential hazards involved are severe; and second, where, at the same time, the precautions necessary are complex and need positive enforcement.

3.2 It is difficult to generalize as to when permit-to-work systems should be used; but the permit types and examples listed in paragraph 7, give a non-exhaustive indication of typical applications.

3.3 In construction, the potential for accidents increases when a potentially hazardous workplace, operation, environment, plant or machine under the control of one organization is to be worked in/on by the employees of another organization. This can occur when a contractor is undertaking work on a client's operating plant, or when a sub-contractor is undertaking potentially hazardous work on premises or operations under the control of a main contractor. Dependent on degree of hazard and the complexity/severity of control required, a formal permit-to-work system may well be desirable in such circumstances.

4.0 Design of Permit-to-Work Certificates

4.1 It is important that a permit-to-work certificate should be designed to suit the circumstances of its use. In particular, the permit should assist the authorized person who will ultimately sign it after thorough deliberation, in prescribing all the necessary precautions. In this connection, so called 'blanket permits' can be a danger because of a lack of detailed specification. As will be seen from these examples, each permit details the specific precautions necessary to cope with, for example, electrical hazards, work in flammable/explosive atmospheres, confined spaces, etc. in general terms, a permit-to-work system is a formal system designed to ensure that all the parties involved are aware of:

4.1.1 The nature of the work to be performed.

4.1.2 The place the work is to be carried out and the equipment or plant involved.

4.1.3 The period of time in which the work may be carried out (with possible provision for time extension, thus reducing paperwork).

4.1.4 The hazards which are, or might be present.

4.1.5 The tests and checks which have to be made and the precautions to be taken before starting the work.

4.1.6 The precautions to be taken while undertaking the work.

4.1.7 The equipment to be used or to be made available on a standby basis.

4.1.8 The personal protective equipment to be used by those involved in the work.

4.1.9 The requirement, if any, for further periodic tests and checks.

4.1.10 The emergency / rescue procedure and other arrangements for the evacuation of personnel.

4.1.11 The personnel permitted to do the work.

5.0 Procedures

5.1 The permit-to-work certificate should be regarded as a written agreement between the person authorizing the work, and the organization or personnel receiving it. In particular, the receiving party must be made to understand that he must comply with the certificate in every detail and that the person authorizing it has complete and absolute control.

It is normal for permit-to-work certificates to be of the 'no carbon required' variety (supplied in pads) and made out with two or more copies, each copy of a different color. Each set of three copies should also share a specific serial number to avoid any muddles as to identification and a typical distribution might be as follows:

(a) Top (yellow) copy to be issued to and retained by the supervisor in charge of the work.

(b) First (pink) copy to be placed in transparent plastic envelope and displayed at point of work.

(c) Both the above copies to be returned to the authorized person for filling when work is complete.

(d) Second (blue) copy to be retained in pad for record purposes, and to contain the necessary 'confirmation of work completed' and 'cancellation' signatures.

5.2 On large projects many permits to work may be necessary, sometimes running concurrently. Under such circumstances it may be necessary to appoint a 'permit coordinator', and to have a system of pre-application for permits, thus enabling all necessary arrangements to be made

prior to the issuing of the permit by the authorized person. In such a case, a formal 'request for permit-to-work certificate' may be necessary.

5.3 The need to inform all relevant personnel that a permit-to-work system is, or will be, in operation is particularly vital. This may be achieved by formal notices on notice boards.

5.4 Despite written and verbal communication on proposed permit-to-work systems it is often difficult to get both supervisors and operatives to understand precisely what is required. In such cases, in addition to the measures suggested, above, formal training sessions should be set up and the proposed system, nature of the work, hazards, etc.

6.0 Permit Authorization and Competency to Perform Work

6.1 This is a key area, since it is vital both that the 'authorized person' in every way a fit person, ultimately signing the permit-to-work certificate, and that the personnel carrying out the work know exactly what they are required to do.

6.2 The appointment by the company of authorized persons to sign permit-to-work certificates should not be taken lightly, and just as permit-to-work systems are themselves formal, so also should be the manner of appointment of such persons. This example comes in duplicate – the original being retained by those members of senior management making the appointment, while the copy is issued to the 'authorized person.' The certificate of appointment makes clear the limits of the authorized person's responsibility, and should be returned by him to his superiors if he leaves their employment.

6.3 In appointing an authorized person to sign permit-to-work certificates employers should consider carefully the following points:

6.3.1 The age of the person involved (he must be a fully mature and responsible person).

6.3.2 His training, qualifications and experience.

6.3.3 His knowledge of the particular plant / equipment / hazardous work process involved.

6.3.4 His ability to control the situation and the personnel involved.

6.4 It is also up to employers, or the organization/contractor providing the permit-to-work system, to ensure that the personnel carrying out the work are competent to do so safely. This is in practice often delegated both to the supervisor responsible for performing the work and the authorized person signing the permit. It is then up to these parties to assess the competence of such personnel in carrying out the work, and the permit-to-work certificate often carries a suitable acknowledgment.

6.5 Site Safety Supervisor

- The Safety Supervisor responsibilities include:

6.5.1 Supporting the operation in the effective implementation of the CoW
6.5.2 Monitoring compliance with this CoW practice
6.5.3 Sign permits in accordance with Egyptian regulations (Labor Law)

7.0 Permit Types and Examples

7.1 Hot and Cold Work Permits

Both types of permit are concerned with preventing fires (or, more commonly, explosions) where work has to be carried out in circumstances where there would otherwise be a risk of fire through the presence of flammable liquids / materials, and / or explosions, through the presence of a flammable atmosphere.

A hot work permit allows 'hot work' (i.e. welding, flame cutting, etc.) to be carried out, provided all the precautions prescribed have been effected. A cold work permit allows 'cold work' (i.e. use of chisels which could nevertheless produce a spark, or any other form of work which, although ostensibly 'cold', could produce a source of ignition, for example through a discharge of static electricity, chemical reaction, etc.).

7.2 Electrical Work Permits

These permit work to be undertaken on equipment which would otherwise be hazardous because of electricity. Such permits normally cover formal isolation and earthling procedures and allow either electrical work or testing to be performed. Another form of permit is designed to cover work on, or testing of, exposed conductors (at dangerous voltages) which only for very serious reasons cannot be isolated. Use of the latter permit system should be rare, and the 'isolation method' is always to be preferred.

7.3 Confined Space Entry Permit

This is issued for work in confined spaces such as vessels, manholes tanks, and sewers, in which the atmosphere is or could become toxic, flammable, or deficient in oxygen. The hazards of entering confined spaces are not always immediately apparent, even when tests have been made. Danger can arise when sludge is disturbed or scale removed, and the possible ingress of harmful gas must always be considered. Numerous tragedies to be unconscious within a confined space and multiple further fatalities have then occurred when colleagues, not heeding the hidden danger, have entered the confined space for rescue purposes and have also been overcome.

7.4 Pressure Test Permit

This permit vessels, tanks and pipe-work, etc. to be tested hydrostatically (inherently the safest method) or by gas / air pressurization. It specifies the pressures which may be used and all the precautions which must be taken.

7.5 Ionizing Radiation or Radiography Permit

This permit use for radioactive sources and X-ray apparatus under strictly controlled circumstances usually for non-destructive testing.

7.6 Excavation Permit

This is mainly used in connection with minimizing risks from buried services, such as electric cables, gas and water mains, etc.

5.0 Responsibility for Setting up Permit-to-Work Systems

8.1 Most circumstances where a contractor is undertaking work on a client's operating plant he will be required, under the conditions of contract, to work within the constraints of the client's own permit-to-work system. It is the responsibility of the contractor's management to assess the client's system, and to assure themselves that the procedures to be followed will ensure the adequate health and safety of all the parties involved.

8.2 Where a permit-to-work system does not exist, or where it is considered inadequate, the contractor's management must bring the matter to the client's attention before proceeding further.

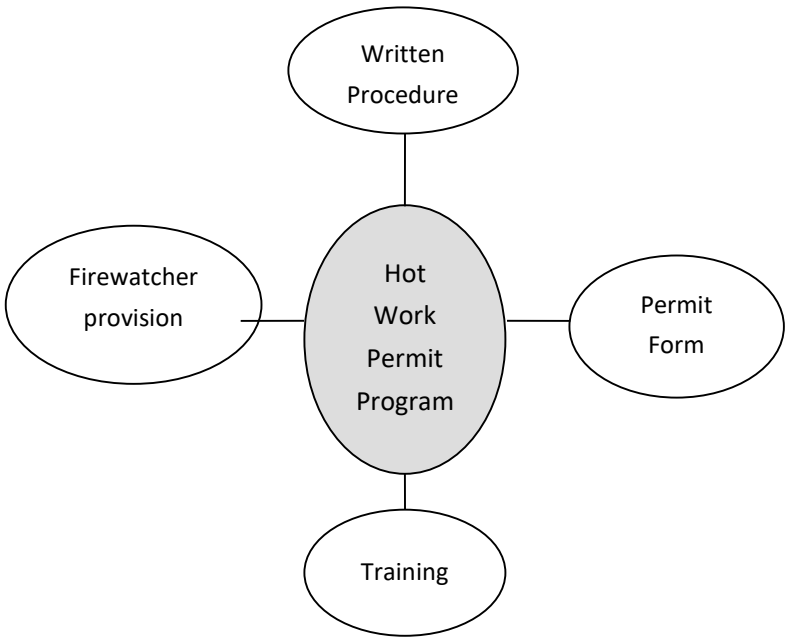
8.3 On 'Greenfield' sites where the contractor is in effect the manager or main contractor, it is the responsibility of both project and site management to identify work which will require permit-to-work procedures, and to pre-plan and execute these accordingly.

07. Hot Work Program

1.0 Introduction

- Many organizations use a permit procedure for all hot work, except that in normal operations and processes.
- Hot work is any kind of activity that involves or generates sparks or open flame. It includes heated equipment that might provide an ignition source for a fire.
- Hot work often involves people from a maintenance department going to other departments to perform activities.
- The main idea in a hot work procedure is to ensure that supervisors of all departments involved and workers who might be involved in any way in the work participate in the decision to start work and conduct it safely.
- Typically, the company HSE department is responsible for implementing and managing the hot work permitting procedure.
- The Safety Supervisor responsibilities include:
  - Supporting the operation in the effective implementation of the hot work program.
  - Monitoring compliance with this hot work program.
  - Sign permits in accordance with Egyptian regulations (Labor Law)

- As shown in the figure below, the primary elements required to be incorporated into a viable hot work permit system include a standard operating procedure consisting of:
  - A written procedure
  - A permit
  - Worker training
  - Fire watches provisions.



Elements Required in a Hot Work Permit Procedure

- A hot work permit ensures that work areas and all adjacent areas to which sparks and heat might be spread are inspected during the work and again 30 minutes after the work is completed, to ensure they are fire-safe.

- During the inspection, work areas and surrounding areas should be inspected to ensure that:
  1 Sprinklers are in service.
  2 Cutting and welding equipment is in good condition.
  3 Floors are swept clean of combustibles.
  4 Combustible floors are wetted down, covered with damp sand, metal, or other shields.
  5 No combustible material or flammable liquids are within 35 feet of the work.
  6 Combustibles and flammable liquids within 35 feet of work are protected with covers, guards, or metal shields.
  7 All wall and floor openings within 35 feet of work are covered.
  8 Covers are suspended beneath the work to collect sparks.
  9 For work on walls or ceilings, ensure construction non-combustible materials.
  10 Combustibles must be moved away from opposite side of wall.
  11 For work on or in enclosed tanks, containers, ducts, etc., equipment must be cleaned of all combustibles and purged of flammable vapors.
  12 Fire watch is provided during and until 30 minutes after the operation.
  13 Assigned fire watchers are properly trained and equipped.
- To assist the HSE department in incorporating a hot work permitting procedure into his workplace, we provide a general sample Hot Work Program, including a sample permits.

2.0 Hot Work Permit Program

2.1 Hot Work Definition

Hot Work is defined as the use of oxy-acetylene torches, welding equipment, cutting, brazing, or similar flame-producing or spark-producing operations.

2.2 Hot Work Permit

2.2.1 A Hot Work Permit will be required for contractors and company employees for any hot work performed ‘in or near’ hazardous material / chemical processes, facilities, and confined spaces as follows:

2.2.1.1 Work on tanks, containers, piping, or ancillary equipment containing chemicals or fuels, and work in confined spaces.

2.2.1.2 Work in chemical rooms or on any part of chemical systems.

Note: Never use acetylene or propane in the presence of chlorine.

2.2.1.3 Work within 25” of any flammable / combustible material.

2.2.1.4 Wherever a ‘Hot Work Permit Required’ sign is posted.

2.2.1.5 Work anywhere within fence-line of the company.

2.2.1.6 Work anywhere within 25” of an excavation (no matter the depth, length, or width).

2.2.2 When contractors perform work on company property and lines, company construction project engineers or representatives from the safety division will point out to the contractors where Hot Work Permit procedures will be required.

2.2.3 Hot Work Permits expire upon completion of each indicated task, and at the end of the workday. A new permit must be completed and issued at the beginning of each workday, if not renewed.

2.2.4 The original copy of the form will be passed on to company performing department / maintenance / private contractor who display the white copy at the work site until hot work operations are completed. Air sampling to determine oxygen level and LEL will be completed and readings entered on the Hot Work Permit form.

2.3 Permit Information / Safe Work Practices

The Hot Work Permit lists required safe work practices that must be documented in the permit and followed during the specified hot work operations.

Any of the safe work practice items listed in the permit that are not applicable to a particular work operation must be noted in the appropriate comment area.

2.4 Filling out the Hot Work Permit

2.4.1 Hot Work Permit is divided into three main parts (These parts may be divided to more sections). The procedure for completing each of these main parts are described as follows:

Part -1:

Must be completed by the company work site supervisor. This supervisor must be trained on hot work safe work practices and permitting procedures.

Part -2:

All actions indicated in this part must be completed and verified by the designated company work site supervisor. This supervisor must have been trained in hot work safe work practices and permitting procedures.

Part -3:

Must be completed by the company maintenance person or contactor person who is to perform the Hot Work.

2.4.2 The hot work cannot proceed unless all items in Part 2 and 3 are checked ‘yes’ or indicated as not-applicable (N/A) in the comment section. A check of ‘yes’ by the designated supervisor, Company maintenance person, or contractor verifies that the designated supervisor has established that the indicated safe work practice is accomplished.

2.4.2.1 <u>Part -1 Items</u>

- Work Description: Describes Hot Work to be accomplished and location.
- Tools to be Use: Describes tools to be used in performing Hot Work (e.g., welding machine, oxy-acetylene, brazing equipment, etc.).
- Permit Issued to (Name/Company): Company person or contractor person and Company’s name (must be a designated person and not just the Company name) is entered here.
- Time: Enter time Hot Work is to begin and end.
- Date: Effective date of the permit. Note: A new permit must be issued each day – unless renewed.

- Permit Issued by (Name): Company person who issued permit.

2.4.2.2 Part-2 Items

- Lines / Tanks Washed: Lines / Tanks have been washed and are free of chemical and flammable residue.
- Lines / Tanks Drained: Lines / Tanks have been drained and flushed of chemicals/flammable.
- Lines / Tanks Pressure Vented: Pressure lines / tanks have been vented.
- Lines Blinded / Disconnected: Lines undergoing hot work that might pose hazard to other connected parts / systems have been blinded / disconnected.
- Valves off / Locked / Tagged: Affected valves in system / lines are closed and Lockout / Tag out is complete. Locks / Tags should be used by both sites personnel and contractor personnel if system to be locked/tagged out is a site system.
- Power off / locked / tagged: All stored energy sources of affected system are placed in zero energy state and locked/tagged. Mutual locks/tags should be used on site systems.
- Interfacing Areas Notified: Adjacent buildings, rooms, or compartments that might be affected by hot work must be inspected and personnel in affected areas notified of adjacent hot work.
- Extinguisher Present: An appropriately rated fire extinguisher is present at the hot work site.
- Confined Space: For hot work performed in a confined space, confined space entry by permit procedures have been completed. Always ensure oxygen and LEL levels are listed.
- Oxygen Level: For hot work performed in a confined space, enter the oxygen level in the comment section. This entry is made by company's qualified atmosphere tester for hot work performed.
- LEL: For hot work performed in a confined space, enter the lower explosive limit (LEL) in the comment section. This entry is made by company's qualified atmosphere tester for hot work performed.
- Fire Watch: All hot work may require the stationing of a designated Fire Watch. The fire watchers must be trained, and must remain on site for at least 30 minutes after completion of hot work to guard against re-flash.
- Atmosphere Tester Signature: If confined space LEL and oxygen testing is required, a qualified atmosphere tester for Company will test the atmosphere and sign for hot work to be performed.
- Site Supervisor's Initials: The site supervisor verifies the permit information in Part-1 and 2.

2.4.2.3 Part -3 Items

Lines Blinded / Disconnected: Performing supervisor should ensure that:

- Valves off / Locked / Tagged.
- Power off / Locked / Tagged.
- Air Mask: For hot work performed in confined space or where possible inhalation of fumes is excessive, the appropriate approved Respiratory Protection Procedure must be followed.
- Glasses / Gloves: Approved glasses and gloves are in use.

- Protective Curtains: Covering for protecting combustibles when hot work might produce slag and sparks that could cause fire.
- Area Roped off / Barricaded with Signs: Whenever hot work is performed in an area where normal transit of personnel takes place, it must be roped off. If a normally transited area cannot be roped off to prevent unauthorized entry, then it must be barricaded with appropriate warning signs posted.
- Fire Watch Present: Verify Fire Watcher is present.
- Screens & Curtains: Welding operations must be conducted with proper screens or curtains to protect passing personnel from ultraviolet radiation.
- Company Maintenance Person / Contractor Signature: Company maintenance person or contractor person verifies that all indicated items have been completed.

3.0 Fire Watch Requirements

- A fire watcher must be assigned whenever hot work operations are performed around hazardous materials, in confined spaces, and other times when there is the danger of fire and / or explosion from such work.
- Fire watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least 30 minutes after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

08. Electrical Safety

1. All electrically energized portions of switchgear and electrical equipment must be effectively guarded against accidental contact. This includes temporary guarding when electrical enclosures are open for inspection or maintenance.
2. Fenced substations and transformer banks must be securely locked and fences must be grounded.
3. All explosion-proof and weatherproof electrical enclosures must be maintained in good condition and be tightly bolted shut except when maintenance is being performed by designated qualified personnel.
4. All electrical wiring and electrically energized portions of electrical devices, and flexible cords, must be covered or guarded against accidental contact.
5. Suitable guards must be provided for portable lamps and other electrical equipment.
6. Appropriate signs must be posted to warn personnel of electrical and other dangers at switchgear cabinets, substations and rooms where voltage exceeds 600volts.
7. Where transformers are installed with exposed live parts there shall be danger sign, posted in a conspicuous place, showing the operating voltage.
8. Motor controllers and other electrical devices shall be permanently and clearly marked to show what equipment is served by them.
9. If two or more voltages are used in the same plant or other installation, each circuit must be clearly identified wherever maintenance or work might be performed.
10. One or more signs, indicating, “Danger-Automatically Controlled”, must be prominently displayed at every applicable location.
11. Manufacturers “nameplates on motors, controllers, transformers, breakers and other electrical devices, must be preserved, be legible, and be located where they can be safely read.
12. Low voltages, such as ordinary 120 volt lighting circuits, are dangerous and under certain conditions can cause serious injury or death. Never expose yourself to electric shock.
13. Trouble light cords used on wet jobs, in boilers, etc., should be equipped with portable transformers to reduce voltage to 32 volts or less.
14. All control boxes; switch handles, motors or other electrical equipment must be tested with the back of the hand before grasping any part.
15. Any connected wire that is found on or near the ground should not be touched by anyone but a qualified person unless it is definitely know that it is not “hot”.
16. When work is to be performed in the vicinity of electric lines, supervisors must make all necessary provisions to insure safe performance of the work. A representative of the power company involved should be consulted if it may become necessary to cut off the power, move the line or if he can be of assistance in any way.
17. When it is necessary to move drilling or well servicing equipment, tanks, or other high loads where electric lines are present, an electrician should accompany the load. If there is any possibility of contacting service or power lines, the power should be cut off in sections that could be contacted.

18. In locating drilling equipment, well servicing equipment, tanks separators, etc., the site selected must be as far from overhead wires as possible.
19. If it becomes necessary to set up a derrick or mast, or run guy wires in the immediate vicinity of service or power lines, all wires that could be contacted shall be de-energized for the duration of the job and until raised equipment is lowered and moved out.
20. When using gin poles, installing or removing guy wires or any like work, in the vicinity or overhead wires, extreme caution must be taken to avoid contact with them.
21. Effective grounds must be provided for all transformers, motors operating on more than 90 volts, electrical enclosures and metal structures supporting electrical devices.
22. Effective grounds must be provided for all metal tanks, towers, vessel, metal frame buildings, air cooler structures and similar items subject to static electricity or lightening.
23. All enclosures for switches, pushbuttons, relays receptacles, breaks, motor controllers, etc., must be grounded by a suitable copper conductor or by rigid metal conduit, which in turn is effectively grounded.
24. All electrical portable tools, (expect distinctively marked double insulated tools), vending machines, water coolers and the like, must be grounded with effective grounding conductors.
25. All receptacles and plugs must be of the three-wire grounding type and tests must have been run to insure that the grounding circuit is complete.
26. All flexible cords must be of the three-wire grounding type, with no splices, no taps, no adapters, and they must be in good condition.
27. Whenever ground wires are removed for repair or damaged through accident, they must be replaced or repaired by a qualified workman as soon as possible.
28. All grounds must be tested periodically to insure that resistance to ground is less than 25 ohms.
29. All electrical devices, equipment and fittings installed in hazardous areas must meet or exceed – NFPA-500 requirements.
30. All explosion-proof cover globes must be kept in place and must be replaced immediately if broken.
31. Explosion-proof cover globes and flood light lenses must be kept clean to afford maximum light.
32. Electrical circuits are not to be opened or closed by unprotected switches if the area accidentally becomes gaseous.
33. Radio transmitters or mobile phones are not to be used when within 500 feet of blasting or perforating operations.
34. Whenever you are working with or around energized electrical equipment, be sure your hands, feet and clothing are dry.
35. The main line switch on a motor should never be disconnected while the motor is running. Use the proper stopping control.
36. Care must be taken not to overload electrical wiring or equipment.
37. All electrical equipment shall be provided with a local start/stop station within sight of the controlled equipment,

38. Before starting electrical equipment that is not designed for hazardous area operations, the operator must be sure the atmosphere has not become gaseous. A permit to work should be obtained.
39. Never stand directly in front of a switch box when throwing a switch. There may be an unexpected flash.
40. Pennies, foil, wire or any other materials are not to be used instead of proper fusing of any electrical circuit.
41. Broken wires, poles, guy lines and any other equipment requiring repair should be reported to the supervisor when discovered. Repair must be made as promptly as possible.
42. In case of emergency, when power lines are down, every wire, including fences and guy wires, should be considered "hot" and should be handled only by qualified persons.
43. Employees, when operating electrical equipment, should follow written or verbal instructions. If the equipment does not operate properly, it should be turned off and the supervisor notified.
44. All globes and guards are to be properly maintained on lighting fixtures. Burned out lamps must be promptly replaced in areas such as walkways, stairs and ladders where illumination is a safety consideration.
45. Light bulbs and fuses should not be installed or removed while the current is on.
46. Floodlight poles must be arranged for safe changing of lamps. They are to be either the folding type with lowering chain or be equipped with a locking type ladder, safety system using a carrier rail, locking safety sleeve and belt.
47. A sign must be at the base of each pole equipped with a ladder safety system indicating that employees shall use the belt and safety sleeve when necessary to climb the pole.
48. All temporary floodlights, installed for emergency purposes, must conform to necessary standards, must be properly grounded and must equip with securely anchored safety chains.
49. A "hot stick" shall be used when opening or closing knife-type line disconnects switches.
50. All conduit fittings must be unbroken, made up tightly and be in good condition.
51. Covers must be securely installed on all conduit fittings.
52. In non-hazardous areas or Division 2 areas junction boxes (with terminals or splices and taps only) may be kept free of collected moisture by a drain hole. In Division 1 areas, only approved breathers and drains must be used.
53. All electrical devices are to be locked out and properly tagged to prevent accidental operation during maintenance or repair work on affected equipment.
54. After electric circuits are locked out and before work is started on electrical equipment that may contain capacitors, etc., the equipment must be de-energized to a positive ground.
55. Only qualified personnel are permitted to change fuses in pumping unit controllers. Approved fuse pullers must always be used.
56. Broken insulation on any wires or electrical equipment is to be repaired or replaced by qualified personnel as soon as possible.
57. All electrical maintenance tools must be in good condition and adequate for the work to be done.
58. The condition of all electrical, safety rubber gloves must be checked frequently and should be tested by the electrician before being used.

59. Cleaning of electrical equipment must be done by a qualified person. Only approved materials may be used.
60. Work should not be performed on pole lines, outdoor electrical services or associated equipment during electrical storms.
61. All electrical switch rooms, vaults and other spaces containing electrical equipment are to be kept clean, with clear walking and working areas around them and are not to be used for storage of any materials.
62. Wet rags are never to be placed on electrical equipment, either to cool the equipment or to dry the rags.
63. All electrical devices, equipment, fittings and supplies installed or used within Company operations must meet or exceed specifications as set forth in Company Engineering Standards and Specifications, and be properly maintained.
64. Poles supporting electric wires or any type of electrical equipment are not to be used as snub or “dead man” for winch lines on trucks or pickups.
65. Clotheslines, radio antennas or similar lines are not to be attached to poles, guy wires or anchors supporting electric wires or any type of electrical equipment.
66. All electrical panels should be equipped with Ground Fault Circuit Interrupter (GFCI) devices.

09. Machine Guarding

1.0 Introduction

The most common sources of mechanical hazards are unguarded shafting, shaft ends, belt drives, gear train and projections on rotating parts. Where a moving part passes a stationary part or another moving part there can be a scissor-like effect on anything caught between the parts.

A machine component which moves rapidly with power or a point of operation where the machine performs its work is also typical hazard sources.

2.0 Objective

The basic objective of machine guarding is to prevent personnel from coming in contact with revolving or moving parts such as belts, chains, pulleys gears, fly wheels, shafts, spindles and any working part that creates a shearing or crushing action or that may entangle the worker.

Machine guarding is visible evidence of management's interested in the worker and its commitment to a safe work environment. It is also to management's benefit as unguarded machinery is a principal source of costly accidents, waste compensation claims and lost time.

3.0 Types of Machine Safeguards Required

Safeguards can be broadly categorized as:

3.1 Point of operation guards: that point where work is performed on the material such as cutting, shaping, boring or forming of stock.

3.2 Point of operation devices (power transmission apparatus): all components of the mechanical system that transmit energy to the part of the machine performing the work. These components include flywheels, pulleys belts, connecting rods, couplings, spindles, chains, cranks and gears.

3.3 Feeding / Ejection devices and other moving parts: all parts of the machine that moves while the machine is working. They can include reciprocating rotating and transverse moving parts as well as feed mechanisms and auxiliary parts of the machine.

4.0 Common Safeguarding Methods

4.1 Guards - barriers that prevent access to danger areas. It has several types:

- Fixed
- Interlocked
- Adjustable
- Self-adjusting.

4.2 Devices

4.2.1 Stop the machine if a hand or any part of the body is in advertently placed in the danger.

4.2.2 Provide a barrier synchronized with operating cycle of the machine to prevent entry to the danger area during the hazardous part of the cycle.

4.3 Feeding and Ejection Methods

4.3.1 By this way we eliminate the need for the operator to work at the point of operation.

4.3.2 Using these feeding and ejection methods doesn't eliminate the need for guards and devices.

4.4 Location and Distance

It means locating a machine so that the hazardous parts of the machine are located away from operator workstations or areas where employees walk or work.

4.5 Miscellaneous Safeguarding Accessories

A variety of methods and tools can be used to help lowering the hazard potential created by certain machines, even though they don't provide full or complete machine safeguarding. They are as follows:

- Awareness barriers
- Shields
- Spreaders and non-kick back devices
- Hand tools
- Push sticks/blocks and jigs.

5.0 Safe Work Practices

Methods of safeguarding equipment can be accomplished by:

5.1 Guards should not be removed unless:

a. Permission is given by a supervisor.

b. The person concerned is trained.

c. Machine adjustment is a normal part of his job.

5.2 Don't start machinery unless guards are in place and in good condition.

5.3 Report missing or defective guards immediately to your supervisor.

5.4 When removing safeguards for repair, adjustment, or service, turn-off power and lock and tag the main switch.

5.5 Don't permit employees to work on or around equipment while wearing ties, loose clothing, and watches rings.

5.6 Inspect and conduct a maintenance program of guards on a regularly scheduled basis.

5.7 Instruct operators of mechanical equipment in all safe practices for operation of that machine.

10. Lockout / Tag out Program

1.0 Introduction

When maintenance and servicing are required on equipment and machines, the energy sources must be isolated and lockout / tagout procedures implemented.

2.0 Lockout / Tagout Procedures

2.1 Notify appropriate operations and maintenance supervisors of lockout/tagout.

2.2 Place the main switch, valve, control or operating lever in the "off" "closed" or "safe" position.

2.3 Check and test to make certain that the proper controls have been identified and deactivated.

2.4 Place a lock to secure the disconnection whenever possible. If a lock cannot be used on electrical equipment, an electrician shall remove fuses or disconnect circuits.

2.5 If a system cannot be locked out with a lock attach a "Hold-off Do Not Energize", or other such tag to the switch, valve or lever. If the work center doesn't use employee identifiable locks a lock and tag must be used together.

2.6 When auxiliary equipment or machine controls are powered by separate supply sources, such equipment or controls shall also be locked or tagged to prevent operating the equipment or exposure to live circuits.

2.7 When equipment uses pneumatic or hydraulic power, pressure in lines or accumulators shall be checked using whatever safe means possible this pressure or pressure lines shall be disconnected.

2.8 When stored energy is a factor as a result of position, spring tension or counter weighting, the equipment shall be placed in the bottom or closed position, or it shall be blocked to prevent movement.

2.9 When the work involves more than one person, additional employees shall attach their locks and tags as they report.

2.10 When outside contractors are involved the equipment shall be locked out and tagged in accordance with this procedure by the project manager supervising the work.

2.11 When the servicing or maintenance is completed and the machine or equipment is ready to return to normal operating condition, the following steps will be used:

2.11.1 Check the machine or equipment and the immediate area around the machine to ensure that tools, materials and other non-essential items have been removed, and that the machine or equipment components are operationally intact. Ensure that all guards have been replaced.

2.11.2 Check the work area to ensure that all employees have been safely positioned or removed from the area.

2.11.3 Verify that the controls are in neutral.

2.11.4 Remove the lockout devices and re-energize the machine or equipment each lockout/tagout device will be removed from each energy isolating device by the employee who applied the device.

2.12 A periodic inspection of the energy control procedures will be conducted at least quarterly to ensure that the requirements of the program and the standard are being followed to ensure fill employee protection.

2.13 Company will provide certification that the inspection of a lockout/tagout has been performed. The certification will identify:

2.13.1 The machine on which the lockout/tagout is being utilized.

2.13.2 The date of inspection.

2.13.3 Names of employees involved.

2.13.4 The name of the individual performing the inspection.

2.14 Each authorized (person who actually locks/tags out) employee shall receive training in the recognition of hazardous energy sources the type and magnitude of the energy available in the workplace and the methods and means necessary for energy isolation and control.

2.15 When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the supervisor provided that specific procedures and training for such removal have been developed documented, and incorporated into the lockout/tagout program.

11. Grounding and Bonding Procedures and Prevention of Static Electricity Ignition Sources

1.0 Introduction

The common use of electricity and electrical equipment and appliances has resulted in failure of most persons to appreciate the hazards involved. These hazards can be divided into five principal categories:

(a) Shock to Personnel

(b) Ignition of Combustible (or Explosive) Materials.

(c) Overheating and Damage to Equipment.

(d) Electrical Explosion.

(e) Inadvertent Activation of Equipment.

2.0 General Requirements

2.1 The safety engineer must apply electrical safety program in his organization.

2.2 The electrical safety program must include:

2.2.1 Engineering Controls.

2.2.2 Proper Warning Labels.

2.2.3 Proper Use of Lockout / Tag out.

2.2.4 Proper Grounding / Bonding Procedure.

2.2.5 Employee Training.

2.2.6 Safe Work Practices.

2.2.7 Hazard Control Procedures.

2.2.8 Ground Fault Circuit Interceptors (GFCI).

2.2.9 Purchase of approval electrical equipment and tools.

2.3 Safety engineer must ensure that any planned electrical equipment is suitable for installation in the proposed areas.

2.4 Classification of areas for electrical installations is as follows:

Class - (I) Locations Where Flammable Gases or Vapors Might Be Present.

Class - (II) Locations Where Combustible Dust Might Be Present.

Class - (III) Locations Where Ignitable Fibers or Filings Might Be Present.

2.5 Group Atmospheres containing:

- Group A : Acetylene.
- Group B : Butadiene, Ethylene Oxide, Propylene Oxide, Acrolein, or Hydrogen.
- Group C : Cyclopropane, Ethyl Ether, or Ethylene.
- Group D : Acetone, Alcohol, Ammonia, Benzene, Butane, Gasoline, Hexane, Lacquer Solvent Vapors, Naphtha, Natural Gas, Propane.

- Group E : Combustible Metal Dusts Having Resistivity of less than 105 ohm-cm.
- Group G : Combustible Dusts Having Resistivity of 105 ohm-cm or Greater.

2.6 Division

- Div. 1 : Flammable Atmosphere Under Normal Operating Conditions.
- Div. 2 : Flammable Atmosphere Only Under Abnormal Operating Conditions.

3.0 Control of Electrical Hazard

3.1 The facility safety engineer must be fully aware of hazards electricity, electrical activities and components and with the common means of electrical hazard controls.

3.2 The minimum electrical system and component operation knowledge we recommend the safety engineer have includes

- Over Current Devices (Fuse Circuit Breakers).
- Switching Devices (Interlocks, Lockout Thermal or Over-Speed Switches).
- Grounding and Bonding

4.0 Grounding

4.1 It is a system where the earth acts as infinite store from which electrons (current flow) can be drawn or to which they can return, any undesirable excess or deficiency can be eliminated by providing a path from where it exists back to earth.

4.2 Installed grounds are basically mechanisms to prevent:

- Overloading of circuits and equipment.
- Shock to personnel.
- Arcing or sparking that might act as an ignition source.

5.0 Bonding

Ensures that all major parts of a piece of equipment are linked

5.1 A bond is a mechanical connection which provides a low resistance path to current flow between two surfaces that are physically separated or may become separated.

5.2 A bond can be permanent, such as one in which the connection is welded or brazed to the two surfaces or it may be semi-permanent, bolted or clamped where required.

6.0 Grounding and Bonding Requirements

Grounds and Bonds should:

- Be permanent wherever possible.
- Have as low impedance as possible.
- Be continuous, as wherever possible.
- Be reused so that vibration, expansion, contraction, or other movement will not break the connection loosen it so that the resistance varies.
- Hence connection located in protected areas and where accessible for inspection or replacement.
- Not impede movable components.

- Not be compression-fast ended through non-metallic materials.
- Not have dissimilar metals in contact.
- Have metals selected to minimize corrosion.

7.0 Static electricity

Is a work place hazard because of its potential to ignite (by arc) certain vapor or dust mixtures in air, various controls are available in minimizing the effects of static charges?

- Selection of suitable materials (avoiding the use of materials such as clothing composed of synthetic fabrics that generate static electricity) is often the simplest method
- Modifying a material by spraying its surface to make it conductive frequently can reduce or eliminate the static electricity problem.
- Bonding and Grounding
- Electrostatic neutralizers can be used to neutralize changes on materials
- Humidification [raising the relative humidity above 65%] permits static changes to leak off and dissipate.

12. Blinding and Equipment Isolation

1.0 General

1.1 Blinds shall be installed to effectively isolate equipment, vessels, and piping from other parts of operating areas so repairs, maintenance, or cleaning can be conducted in a safe manner.

1.2 Closing a block valve will not be sufficient in isolating the area when entering a confined space. Disconnecting is also an adequate means of isolation.

1.3 Exceptions to blinding must be approved by the supervisor in charge at that location. The operating supervisors are responsible for the implementation and enforcement of this program.

2.0 Before Opening Any Flanged Joint for the Installation of a Blind

2.1 Verify the exact location where blinds are necessary.

2.2 Determine from the designated operator that the equipment or piping is prepared for, and properly released for blinding.

2.3 Verify that lines and equipment have been depressurized and drained. Also, ensure that drain valves are open by using proper rod-out equipment.

2.4 Determine what product or material has been contained in the equipment or piping. If this material is hazardous, secure and wear the appropriate protective clothing and equipment.

2.5 If equipment is under more than slightly above atmospheric pressure, make sure that the operating supervisor in charge has granted approval.

2.6 Please refer to Lockout / Tag-out section of this manual for applicability when performing blinding or equipment isolation.

3.0 When Opening Any Flanged Joint For The Installation Of Blinds

3.1 Wear protective clothing and equipment as dictated by the circumstances. Always wear appropriate eye protection.

3.2 Remove flange bolting leaving a minimum of two, then loosen these bolts and without completely removing the nuts spread the flanges to install the blind. Always spread the flange on the side away from the workman first so any sudden release will be directed away.

3.3 Flanges should be open a minimum length of time consistent with the safe installation of the blind.

3.4 When opening flanges suspected to contain toxic gases self-contained breathing apparatus are to be worn unless it has been definitely established through testing that no toxic gases are present.

4.0 Installation of Blinds

4.1 Blinds will be installed at the flange closest to the vessel, tank or equipment under consideration.

4.2 Blinds will be installed on the side of block valves that are most consistent with pressure testing requirements.

4.3 When vessels or process equipment is interconnected in such a way that blinding of each is not possible or practical, the combination is to be considered as one vessel. The combination will be appropriately blinded and prepared as a unit.

4.4 A blind may have a gasket installed on both sides but a minimum of one gasket installed on the pressure side of the blind is required.

4.5 Blinds should also be tagged and the blind location, person installing, date recorded in the blind record.

5.0 All Blinds Will Be Installed with the Following Considerations in Mind

5.1 Will the blind effectively accomplish its purpose in the selected location?

5.2 Can the blind be removed safely when its removal is required? The precautions taken during the installations of the blind shall be followed when removing the blind.

5.3 Is the selected location accessible to personnel and equipment?

5.4 Is the blind located at the flange closest to the equipment, tank or vessel?

5.5 Is the blind the correct size and pressure rating?

5.6 Has the line, vessel or equipment contained toxic or corrosive material?

5.7 Have provisions been made to eliminate or reduce spillage or prevent pollution?

13. Confined Space Program

1.0 Purpose

This confined space entry program has been developed in accordance with the Occupational Safety and Health Administration (OSHA) Regulations 29CFR 1910.146.

The purpose of this program is to ensure that proper protection is taken for all employees working in confined spaces.

2.0 General Program Management

2.1 Responsibility

It is the responsibility of management to protect the company's employees. Specifically, organizational management will:

2.1.1 Evaluate the workplace to determine which spaces are permit-required confined spaces.

2.1.2 Inform workplace employees of the permit-required confined spaces.

2.1.3 Determine whether employees will enter permit spaces, and/or what effective measures will be taken to prevent employees from entering permit spaces.

2.1.4 Required employees who will enter permit spaces to use a fully completed confined space permit.

2.2 Program Review and Update

The confined space program will be reviewed and/or updated under the following circumstances:

2.2.1 When the HSE Division has reason to believe that measures taken under the confined space program may not protect employees. In such cases the program will be revised to correct deficiencies before authorizing subsequent entries.

2.2.2 Review the permit-required confined space program, using cancelled permits retained within one year after each entry, and revise the program as necessary.

2.3 Identification of confined spaces

2.3.1 The Confined Space Entry Program required identification of all confined spaces within the Company.

2.3.2 Each Department shall, with assistance from safety Division personnel, be responsible for identification of all potential confined spaces in their facilities that employees are subject to entering. The confined space list will be prominently displayed on work centre bulletin boards. Any new or existing process, vessel, or space meeting the criteria based on engulfment and hazardous atmosphere of the confined space entry program shall be identified.

2.3.3 Confined spaces within the company include, but are not limited to: manholes, vertical entry spaces, channels, covered tanks, grit tanks, clarifiers, aeration tanks, thickeners, incinerators, chemicals tanks, towers, pumping station wet wells, and water meter vaults.

2.3.4 After confined space designation, a Confined Space Entry Permit shall be filled out specific to each space, and shall be completed only by the qualified person designated by each Department.

2.3.5 Warning signs shall be located in a proper place to promote awareness and to prevent unauthorized entry into potential confined spaces.

Note: Warning signs are not required for manholes; that are barricaded however, ALL vertical entry manholes are confined spaces; entry by permit only.

3.0 Methods of Compliance

3.1 General Requirements

Confined Space Entry must be performed in accordance with the following requirements:

3.1.1 Any condition making it unsafe to remove an entrance cover will be eliminated before the cover is removed.

3.1.2 When covers are removed, the entrance will be promptly guarded by a barrier that will prevent accidental fall through the opening and will protect employees in the space from foreign objects entering the space.

3.1.3 Before an employee enters the space, the internal atmosphere will be tested with a calibrated direct reading instrument, for the following conditions in the order given:

a. Oxygen content

b. Flammable gases and vapors

c. Potential toxic air contaminates

3.1.4 All necessary steps will be taken to guard against other hazards, including Lockout / Tag-out, double-valve protection, blinding & blanking, etc.

3.1.5 There may be no hazardous atmosphere within the space whenever any employee is inside the space.

3.1.6 Continuous forced air ventilation will be used as follows:

3.1.6.1 An employee may not enter the space until forced air ventilation has eliminated any hazardous atmosphere;

3.1.6.2 Forced air ventilation will be directed to ventilate the immediate areas where an employee is or will be and will continue all employees have left the space.

3.1.6.3 The air supply for the ventilation will be clean and may not increase the hazard.

3.1.7 The atmosphere within the space will be periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere.

3.1.8 If a hazardous atmosphere is detected during entry:

3.1.8.1 Every employee will leave the space immediately.

3.1.8.2 The space will be evaluated to determine how the hazardous atmosphere developed

3.1.8.3 Measures will be implemented to protect employees from the hazardous atmosphere before a subsequent entry.

3.1.9 Before each entry, the area responsible will verify that the space is safe for entry and that the above measures have been taken, with a written certification giving the date, location of the space, and signature of the person providing the certification.

3.1.10 The company may use alternate procedures for entering a permit required space providing that:

3.1.10.1 It can be demonstrated that the only hazard is actual or potentially hazardous atmosphere;

3.1.10.2 It can be demonstrated that forced air ventilation alone is sufficient to maintain safe entry;

3.1.10.3 Monitoring and inspection data are developed;

3.1.10.4 If an initial entry is needed to collect the data above, then it will be performed in compliance with this program.

3.1.10.5 The determination and data required above are to be documented and available to employees who enter the space.

3.2 Permit-Required Confined Spaces

When a space classified as a permit-required space, the following measures shall be considered:

3.2.1 The company has implemented measures necessary to prevent unauthorized entry into a confined space.

3.2.2 The company will identify and evaluate the hazards of the permit spaces before employees enter them.

Note: This requires atmospheric testing with gas detector before entry into the space.

3.2.3 Area work supervisor will provide the following equipment, maintain the equipment properly, and ensure that employees use that equipment properly:

3.2.3.1 Testing and monitoring equipment needed to evaluate the permit space conditions;

3.2.3.2 Ventilating equipment needed to obtain acceptable entry conditions;

3.2.3.3 Communications equipment;

3.2.3.4 Personal protective equipment;

3.2.3.5 Lighting equipment needed to enable safe work in, and exit from, the space;

3.2.3.6 Barriers and shields to protect entrance from external hazards;

3.2.3.7 Equipment needed for safe ingress and egress;

3.2.3.8 Rescue and emergency equipment;

3.2.3.9 Any other equipment necessary for safe entry and rescue.

3.2.4 At least one attendant will be provided outside the permit space for the duration of entry operations.

3.2.5 The persons who are to have active roles in entry operations are to be designated along with their duties. Each member will be properly trained.

3.2.6 Each area supervisor will ensure that the on-site rescue team has been notified of confined space entry activity, and is placed on standby alert for possible use.

3.2.7 When more than one company is involved in confined space entry the work area supervisor will ensure that entry procedures are coordinated to ensure that the entrants do not endanger each other.

3.2.8 Whenever entry into a permit required space is required, the proper permit shall be used. These permits are to be properly prepared, issued, used, and cancelled when entry is complete. Confined Space Entry Permits must be retained on file by the work area supervisor for at least one year.

3.2.9 In addition to complying with requirements that apply to the company, each contractor that performs permit space entry will:

3.2.9.1 Obtain any available information regarding permit space hazards and entry operations from the company;

3.2.9.2 Coordinate entry operations with the company when both company and contractor personnel work in or near permit spaces, as required in this program.

3.2.9.3 Inform the company of the permit space program that the contractor will follow and any hazards confronted or created in permit spaces.

3.3 Permit System

3.3.1 The Confined Space Entry Program requires issuing a Confined Space Permit prior to entry into a confined space. The purpose of the permit is to ensure safe working conditions prior to, and during, confined space entry.

3.3.2 Each work area manager will designate the "Qualified Person" responsible for the issuance and verification of the Confined Space Entry Permit and performance of all required atmospheric testing.

3.3.3 A confined Space Entry Permit shall be issued prior to each confined space entry. A new permit shall be issued when:

3.3.3.1 Work within the confined space exceeds 12 continuous hours;

3.3.3.2 A power outage occurs;

3.3.3.3 Conditions change which could affect the safety of the entrant (i.e., the bleed line shows failure of the first block; oxygen, flammable or toxic concentrations increase above acceptable limits; etc.)

3.3.4 The Confined Space Permit will be available for inspection at the work site while work is in progress.

3.3.5 After the permit has expired, it shall be filed in the work area for one year.

3.4 Confined Space Entry Permit

The entry permits to be used by the company should identify:

3.4.1 The space to be entered.

3.4.2 The purpose of the entry.

3.4.3 The date and authorized duration of the entry.

3.4.4 The authorized entrants.

3.4.5 The personnel serving as attendants.

3.4.6 The individual serving as the entry supervisor (qualified person)

3.4.7 The hazards of the permit space to be entered.

3.4.8 The Measures used to isolate the space and eliminate or control hazards before entry.

3.4.9 The acceptable entry conditions.

3.4.10 The results of initial and periodic tests performed: (accompanies by the names or initials of the testers and by an indication of when the tests were performed).

N.B.

- Test conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin, except that, if isolation of the space is not feasible because the space is larger or is part of a continuous system (such as a sewer), pre-entry testing will be before entry is authorized, and if entry is authorized under special precautionary measures, entry conditions will be continuously monitored where authorized entrants are working.
- Test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations.
- When testing for atmospheric hazards, test first for oxygen, then for combustible gases and vapors, then for toxic gases and vapors.

3.4.11 The on-site rescue team that can be called.

3.4.12 The communication procedures used by entrants and attendants to maintain contact with each other.

3.4.13 Any other information necessary to ensure employee safety.

3.4.14 Any additional permits (such as Hot Work Permits) issued for work in the space.

3.5 Training

3.5.1 The Company's Safety Division will provide training so that employees acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned.

3.5.2 Training will be provided:

3.5.2.1 Before the employee performs duties under this program.

3.5.2.2 Before there is a change in permit space operations that presents a hazard about which the employee has not previously been trained on.

3.5.2.3 Whenever the qualified person has reason to believe there are inadequacies in their knowledge of these procedures.

3.5.3 The company will certify that the training required has been accomplished, and the employee is proficient in the duties. Training records will be maintained by HSE Division.

3.6 Duties of The Authorized Entrants

The company shall ensure that all authorized entrants:

3.6.1 Know the hazard that may be faced during entry;

3.6.2 Know how to use the equipment required;

3.6.3 Communicate with the attendant as necessary to enable the attendant to monitor the entrants and to enable the attendant to alert entrants of the need to evacuate as required.

3.6.4 Alert the attendant whenever:

3.6.4.1 The entrant recognizes any warning sign or symptom of exposure to a dangerous situation

3.6.4.2 The entrant detects a prohibited condition.

3.6.5 Exit from the permit space as quickly as possible whenever:

3.6.5.1 An order to evacuate is given by the attendant or supervisor;

3.6.5.2 The entrant recognizes any warning sign or symptom or exposure to a dangerous situation.

3.6.5.3 The entrant detects prohibited condition;

3.6.5.4 An evacuation alarm is activated.

3.7 Duties of Attendants

The company will ensure that each attendant:

3.7.1 Knows the hazards that may be faced during entry.

3.7.2 Is aware of possible behavioral effects of hazard exposure.

3.7.3 Continuously maintains an accurate number of entrants.

3.7.4 Remains outside the permit space during entry until relieved by another attendant.

3.7.5 Communicates with entrants as necessary to monitor their status and to alert them of the need to evacuate:

3.7.6 Monitors activities inside and outside the space to determine if it is safe, and orders evacuation immediately under any of the following conditions:

3.7.6.1 If the attendant detects any prohibited condition

3.7.6.2 If the attendant detects the behavioral effects of hazard exposure in an entrant.

3.7.6.3 If the attendant detects a situation outside the space that could endanger entrants; or

3.7.6.4 If the attendant cannot effectively and safely perform all duties requires.

3.7.7 Summons on-site rescue and other emergency as soon as it is determined that entrants may need assistance to escape;

3.7.8 Prevents unauthorized persons from approaching or entering a permit space.

3.7.9 Performs non-entry (external only) rescue using the safety hoist-winch assembly.

3.7.10 Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.

3.8 Duties of Qualified Person (Entry Supervisor)

Each qualified Person shall:

3.8.1 Know the hazards that may be faced during entry;

3.8.2 Verify (by checking that the appropriate entries have been made on the permit) that all tests specified by the permit have been conducted, and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin;

3.8.3 Terminate the entry and cancel the permit as required by this program;

3.8.4 Verify that on-site rescue services are available and that the means for summoning them are operable;

3.8.5 Remove unauthorized individuals who enter or attempt to enter the permit space during operations;

3.8.6 Determine that entry operations remain consistent with terms of the permit, and that acceptable entry conditions are maintained.

3.9 Rescue and Emergency Services

3.9.1 The company will provide trained confined space rescue personnel for each permit required confined space entry affected. Their duties and responsibilities:

3.9.1.1 Rescue personnel must be on site must be aware that confined space entry is being performed, and must be immediately available to perform rescue.

3.9.1.2 Each member of the rescue team will practice making rescues at least once every year.

3.9.1.3 Each member of the rescue team will be trained in basic first aid and CPR.

3.9.2 Retrieval systems will meet the following:

3.9.2.1 Each authorized entrant will use a D-Ring full body harness with a life line.

3.9.2.2 The other end of the life line will be attached to a mechanical device or fixed point outside the permit space so that rescue can begin as soon as it becomes necessary.

3.9.3 If an injured entrant is exposed to a substance for which an MSDS or other similar written information is required, that sheet or written information will be made available to the medical facility treating the exposed entrant.

14. Emergency Preparedness

1.0 Introduction

- Emergency planning is a structured, framework designed and tested to deal with and manage unusual or extreme events in exceptional circumstances.
- Development of a plan requires both quantitative and qualitative techniques recognizing that human activity and decision making in conditions of uncertainty are as much a contribution to the initiation of an emergency as to its successful resolution
- Planning also extends beyond the immediate response and damage limitation capability.
- It is a powerful management tool which looks to identify how and why emergencies might arise, suggests options for reducing hazards and consequences, sets out procedures for dealing with initial events and provides a system for maximizing recovery and business continuity.
- Its strengths lie in flexibility to respond to a wide range of unusual events in extraordinary circumstances, outside normal management and operational experience. At its best emergency planning should fit seamlessly into an organization's policy and culture of good working practice.
- Its integration into the total management system is as much in the interests of the outside public and customer base as for the internal organizational use; for this reason, it should be considered as a responsibility by everyone working in an organization and as open and transparent as possible.

2.0 Principles

Proper response to all accidental occurrences will be provided, including containment and control, reporting, investigation and corrective measures.

3.0 Scope

This section provides guidelines for planned response to accidents and natural disasters of any size.

4.0 Guidelines

Minimizing losses when emergencies occur takes many precise, well timed actions. It requires bringing together special emergency and rescue equipment, people with special knowledge or ability, and systems for prompt, effective communication. For these to be done well, or even just satisfactory, takes planning and practice.

5.0 Planning Procedure

Planning ahead for emergencies must entail actions that include but are not limited to:

5.1 Listing and considering the hazards that exist in the plant. (The word "hazard" here signifies any condition or action that could eventually lead to injury or damage, and not that possible injury or damage is the hazard). In preparing the plan, the primary hazards should first be listed; for example, fire, explosion, electrical shock, asphyxiation or other sudden toxic injury, or a fall or crash.

5.2 The types and magnitudes of injury, damage, or loss which could occur if there is loss of control of the hazard should be considered. The numbers of persons who could be injured or killed, equipment that could be affected, or material that could be lost should be evaluated to determine the severity of each possible accident. The expenditures for safety equipment and the concentration of safety effort may depend on the outcome of this analysis.

5.3 The initiating and contributory hazards that could lead to the primary hazards should then be determined. The safeguards which have already been provided to prevent loss of control of each hazard should be determined. These may include such items as pressure relief valves, inerting systems for reactive chemicals or processes, or governors on equipment.

5.4 Safeguards that have already been provided to minimize injury and damage if control of the hazards is lost and an emergency begins must be evaluated for adequacy. Such safeguards include monitoring and warning systems, emergency shutdown equipment, and sprinkler systems for fires.

5.5 A procedure must be developed for rapid reaction to an emergency by designated organizations and their personnel. The available resources of personnel and equipment which could be utilized should be reviewed and any deficiencies noted. The procedure must consider the problems that could be involved, their locations, which unit is to respond if there is more than one, and the optimal means by which the problem should be combated. The availability of outside resources and when they should be utilized should be considered. It may be necessary to make agreements with the outside organizations for mutual assistance. Procedures must be established for intercommunications so that the assistance can be provided when required. The point at which the outside agency would be informed that an emergency exists and at which assistance will be rendered must be agreed upon.

5.6 Actions to be taken by designated personnel or organizations at the onset of an emergency should be established. Response must be predicated on the type of emergency. This necessitates that the person(s) who receive the first communication on the emergency be properly trained to obtain all pertinent information rapidly and accurately. Means must be provided for informing all personnel that an emergency exists and that emergency procedures are to be instituted.

5.7 Means of communication must be established by which to alert the emergency organizations that their services are required. The most effective means must be established for personnel, vehicles, and stations. It should be determined whether a special emergency number should be provided for telephone calls or whether the operator should be called. Since operators are normally occupied with other lines, additional channels of communication are required. A special number is generally more advantageous, even if it is to the operator. The number selected should be posted prominently on all phones.

5.8 Consideration must be given to a secondary communications system for emergency use. Communication by telephone is generally dependable from the standpoint of mechanical or electronic reliability. Unfortunately, personnel often jam the lines as they attempt to determine more about the emergency and to obtain instructions. In addition, the condition that created the emergency may damage the telephone system. It would therefore probably be necessary to provide backup service through a radio network. For emergency personnel, such as the fire-fighting and security groups, radio communications are vital so they can communicate directly with each other. If a plant is remote, hand radio or other radio communication services may be necessary.

5.9 Alarm systems must be provided. They must be distinctive, different from other sounds, and last long enough so that the persons for whom they are intended will be properly alerted. They must be instructive, informing personnel what and where the problem is.

5.10 Plans must be made for transportation service which must be carried on. Means must be provided to move equipment, supplies, and personnel to combat the emergency, to take injured personnel to medical facilities, to remove other personnel from the scene if it is a disaster, to remove files and valuable equipment, to remove hazardous materials to safe locations, and to act as control points.

5.11 Personnel must know how to control utility services so that they do not cause damage but are available where required. It may be necessary to cut off the power through high voltage lines which may be down so that personnel are not shocked or fires started. A circuit breaker may have to be closed to provide power for lighting or emergency equipment. A water line which may have ruptured may have to be shut off.

5.12 The types of emergency equipment with which personnel should be provided to meet specific types of emergencies must be determined. The equipment must permit quick response. It must be easy to don and simple to use, especially by personnel under the stress of an emergency. It must be highly reliable and effective. It must not degrade the mobility or performance of the user unduly, cause the user to fatigue rapidly, or constitute a hazard in itself.

5.13 The most effective locations for the emergency equipment must be established. Analyses should determine whether it should be carried by the personnel in vehicles in which they respond or whether it should be stored near the sites of possible emergencies. If it is to be stored, equipment storage sites should be located as close as possible to where the equipment might be required. Sites must not be so located that the condition which created the emergency prevents reaching it for use or renders it ineffective. Storage units should be easily accessible and marked for quick identification. Plant directives should require that access to the storage units will not be blocked, that nothing will be removed except by personnel authorized to do so, and that equipment should be inspected periodically. A log to indicate the date and by whom the inspection was made and to note any discrepancies should be provided.

5.14 A map should be provided to each unit that must respond to an emergency, indicating the best means of getting there and alternative routes in case the primary route is blocked. Emergency routes should be examined to determine if any obstructions do or could exist. Where there are such possibilities, the locations should be marked to warn personnel against parking vehicles, equipment, or material there.

5.15 In some cases, measures taken to combat an emergency may be inadequate and the situation could worsen. A state may be reached where attempts to correct the situation should be abandoned and efforts redirected to safeguarding personnel. In certain emergencies, efforts must be diverted from saving facilities, equipment, or materials which appear to be beyond saving and redirected to saving other facilities, equipment, or material. The times at which these transfers of effort should be made should be considered carefully before the emergency occurs. Persons involved in an emergency who arrive at such a point generally have little time to evaluate all conditions carefully or to review all possible actions to determine which the optimum is. They may wait too long in heroic attempts to save equipment or material and unduly endanger their lives. Procedures must indicate the point at which control of a hazard can be considered lost.

5.16 Safety zones and evacuation routes should be established. An analysis must also be made to determine locations in which personnel will be safe or to which they can withdraw during an emergency. Protective structures can be provided beforehand to house personnel or through which they can pass to safety if there is a likelihood that damaging effects can occur so rapidly that reaction or escape time will be minimal, damage could be so extensive that there would be difficulty evacuating the area, or the number of personnel who could be affected is such that some would be injured. (In earthquake regions, a common instruction is to take refuge under a sturdy table, desk, or similar piece of equipment if it appears that the building might collapse. Similar refuges can be used if a building is damaged by an explosion and in danger of collapse).

5.17 Routes to safety should be determined and analyzed for adequacy for the numbers of personnel by whom they would be used. Routes and exits should be marked conspicuously (OSHA standards require marking of routes, egresses, and exits) so that they can be followed easily. The number of exits and egresses must be adequate for the time that would be available. They must also be adequate if one or more of them are blocked. Alternatives must be established. Emergency lighting may be necessary if loss of the normal lighting system could throw the routes into darkness. Egress and exit signs must be lighted, but loss of normal power may create a problem in buildings having numerous corridors from which an egress or exit cannot be seen. This is especially common in buildings in which there is no natural lighting.

5.18 In an emergency the possibility exists that persons involved may not be able to escape using their own resources. Provisions must therefore be made for rescue by other personnel if the need should arise. Rescue devices, like those for escape, must be fool proof in an emergency, require a minimum of effort to operate, and be easy to operate when only a few words of instruction are provided. The instructions should be marked so that they are easy to recognize and easy to understand by a person under stress. In some instances, rescue attempts may be made by spontaneous action of untrained personnel. The presence of effective devices with suitable markings can mean the difference between a successful rescue attempt and failure. Periodic tests should be made to ensure that escape and rescue devices work properly when used in accordance with the instructions provided.

5.19 All personnel within a plant should receive instructions, commensurate with their work and the hazards to which they are exposed, and what to do in an emergency. This should be supplemented by reminders such as posters. Supervisors should ensure that they and the workers they supervise are familiar with the instructions. Each person can provide vital assistance if he or she is on the spot when an emergency arises and can take immediate corrective action. But the person should know also when it would be more advantageous to obtain more expert assistance first rather than to spend time combating the problem. The person should know what to do to help the professionals when they arrive.

5.20 A supervisor, foreman, or other person should be designated to ensure that everyone leaves a specific area when it is to be vacated. This person should check the washrooms and other areas where occupants might not be able to hear evacuation signals and should check for persons, especially handicapped workers, who might have trouble leaving expeditiously.

5.21 Training must be undertaken to ensure that operators and rescue personnel understand and are proficient in carrying out emergency procedures, even though the plans may never be put into actual practice. Simulated emergencies will also help increase proficiency. Investigations of many serious accidents revealed that frequently personnel died because of lack of proficiency in the use of emergency equipment and devices or because of failure to follow established procedures.

5.22 Consideration should also be given to use of volunteer emergency personnel. Organized and trained volunteers can provide tremendous benefits during any emergency. They can constitute a cadre of persons who can react rapidly and effectively, since most generally work in areas where the emergencies can arise. Since they will be trained, they are far less prone to panic and will reduce the tendency of other persons to panic. The volunteers may be able to eliminate the emergency entirely, limit it until the professionals arrive, and provide assistance after the professionals take over. Here, again, it is fundamental that these volunteers be given proper training and periodic exercise.

Figure (1) is a checklist showing a few of the many questions that can be used to determine how well plans for emergencies have been prepared. In addition to the questions listed, additional questions can be prepared based on the material in this chapter.

Figure (1)

CHECKLIST—PLANNING FOR EMERGENCIES

1. Has a Contingency Analysis been conducted to determine what emergencies might arise?
2. Have emergency plans and procedures been developed for potentially catastrophic events such as:
   a. Fires?
   b. Blasts and explosions?
   c. Leaks and spills?
   d. Extreme weather?
   e. Floods?
   f. Earthquakes?
3. Do these plans provide for procedures for extinguishing different types of fires which might occur in the plant?
4. Do these plans have adequate evacuation and recovery procedures for each type of emergency?
5. Have responsibilities been assigned in the plan to specific personnel to direct operations to counter emergencies? Are these persons aware of their responsibilities? Are they qualified to lead in the necessary actions which might be required?
6. Are emergency crews qualified, designated, and on station?
7. Are different communications channels assigned to support emergency operations? Is the emergency phone number widely and prominently displayed?
8. Are there plans to evacuate personnel from each work area in the event of emergencies?
9. Are evacuation route and warning signals information posted in each work area? Are the evacuation routes and exits marked?
10. Are the emergency plans and procedures posted in prominent areas?
11. Have personnel received training in emergency procedures:
    a. Workers?
    b. Supervisory personnel?
    c. Firefighters?
    d. Medical personnel?
    e. Communications personnel?
12. Are there drills on simulated emergencies being conducted periodically for personnel?
13. Is there a procedure to ensure that all personnel have been alerted to the emergency and those who will not combat it have been evacuated?
14. Are the egress provisions adequate (i.e., doors, stairways, elevators) for the evacuation in the event of an emergency?
15. Do all doors open in the proper direction to facilitate egress of personnel in emergencies?
16. Are there procedures to preclude obstructions to personnel or equipment in critical evacuation or emergency equipment access routes or areas?
17. Can egress routes from work areas be followed by personnel in the dark or in smoke?
18. Is the emergency equipment called out in the emergency procedures available at the facility, and is it operational? Can the equipment be reached easily if an emergency occurs?
19. Are warning systems installed (sirens, loudspeakers, etc.) and are they tested periodically? Are all personnel familiar with the meanings of warning signals and required action to be taken?
20. Is there a fire detection system at each facility? Are fire extinguishers sized, located, and of the types required by OSHA standards, and are they suitable for the types of fires which might occur?
21. Is there fire-fighting equipment located near flammables or hazardous areas?

15. First Aid Material and Training

1.0 General

1.1 It is the overall corporate policy on the first-aid, first-aid training and medical care to all employees. The medical center at each location is responsible of implementation of this policy.

1.2 First Aid is "the immediate and temporary care given the victim of an accident or sudden illness until the services of the physician can be obtained".

1.3 Since the purpose of first aid is to keep a victim alive and in the best condition possible until the physician is available.

1.4 There are several emergency measures which every employee should know:

- The control of bleeding.
- How to Administer Artificial Respiration.
- Treatment for poisons.
- Treatment for Shock.
- Treatment for Heat Exhaustion.
- Treatment for Heat Stroke.
- Care of Burns.
- Treatment for Snake Bite.
- Care of fractures and Dislocations.
- Transportation of the Injured.

2.0 Control of Bleeding

2.1 Heavy bleeding comes from wounds to one or more large blood vessel. Such loss of blood can cause death in 3 to 5 minutes.

2.1.1 Place pad (sterile if possible) – clean handkerchief, clean cloth, etc. Over the wound and press firmly with one or both hands. If you do not have a pad or bandage, close the wound with your hand or fingers.

2.1.2 Apply pressure directly over the wound.

2.1.3 Hold the Pad firmly in place with a strong bandage – neckties, cloth strips etc.

2.1.4 Raise the bleeding part higher than the rest of the body unless bones are broken.

2.1.5 Keep the victim lying down.

2.1.6 Treat for shock.

2.1.7 Get the services of the physician.

2.2 For gaping abdominal wounds if a physician is not readily available:

2.2.1 Gently replace protruding organs.

2.2.2 Cover with a damp dressing.

2.2.3 Hold the dressing firmly in place. The bandage should be firm but not tight.

2.2.4 Treat for shock.

2.2.5 Call a physician.

2.3 For deep chest wounds:

2.3.1 Prevent air from passing through the wound if possible, with a heavy dressing. This may prevent the lung from collapsing.

2.3.2 Hold pad in place with firm pressure.

2.3.3 A belt drawing snugly around the chest should be effective in holding the wound closed. Do not unduly restrict breathing.

2.3.4 Treat for shock.

2.3.5 Call a physician

2.4 If you have been trained in the location of pressure points, loss of blood can often be slowed or stopped through application of digital pressure between the wound and the heart. This method may be used on the major arteries located in the upper arm or in the groin, but direct pressure over the wound is usually the best method of controlling of blood.

2.5 Do not use a tourniquet to control bleeding except for an amputated, mangled or badly crushed arm or leg and loss of life is eminent. If a tourniquet is necessary, use only a strong wide piece of cloth, never wire, rope or twine. Tourniquet should not be loosened except on the advice of the physician. Mark a "TK" and the time applied on the victim's forehead with crayon, pencil, lipstick, soot, etc., and be sure the ambulance attendant, doctor or hospital receiving personnel gets this information.

3.0 Artificial Respiration

Everyone should know how to perform mouth to mouth artificial respiration and at least one other kind that is Back-pressure, Arm lift (Nielsen). Following is a review of Mouth to Mouth Breathing. Other methods should be learned in first aid training and should be practiced until you become proficient. Lack of breathing can cause death in less than 8 minutes.

3.1 Mouth to Mouth:

3.1.1 The patient should be laid on his back if possible. If patient is in water or cramped surroundings, mouth to mouth breathing can still be given effectively.

3.1.2 All foreign objects must be removed from patients mouth and throat. Turn the head and use your finger or a cloth wrapping around your fingers. If something is lodged in throat, turn the body on one side and strike several sharp blows between the shoulder blades. Then remove the foreign matter from the mouth with your fingers.

3.1.3 Lift the patient's neck, place a folded coat, blanket etc., under the shoulders and tilt the head back as far as possible.

3.1.4 Pull the chin upward until the head is tilted back fully. It is more important to maintain this position of the head and neck to allow adequate passage for air to enter the lungs.

3.1.5 Pinch the patient's nostrils shut, take a deep breath, and place your mouth over his mouth, creating a tight seal, or close his mouth, take a deep breath and place your mouth over his nose. Blow into patients' mouth or nose until you see his chest rise. For an infant, breathe through both his nose and mouth.

3.1.6 Remove your mouth and listen for outward flow of air. For an adult, inflate lungs 12 to 15 times per minute (every 4 or 5 seconds). For a child, inflate lungs up to 20 times per minute (every 3 or 4 seconds), using relatively shallow breaths.

3.1.7 This procedure should be continued until patient starts breathing or, if a physician is not available, it should be continued for a minimum of two hours.

3.1.8 If respiration is restored, keep the patient warm and quiet and obtain services of a physician.

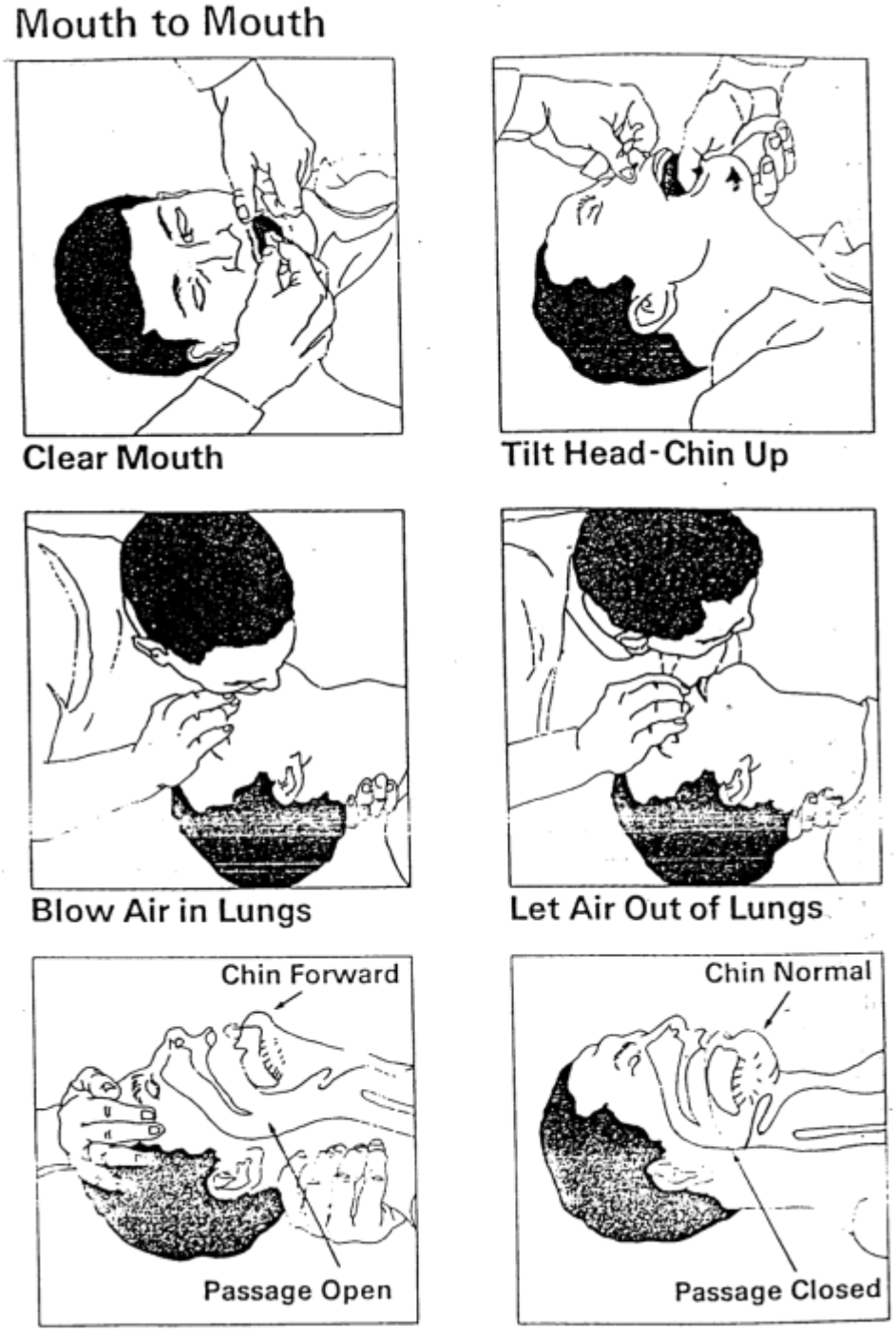
3.2 Some things to remember about artificial respiration:

3.2.1 There is need for help in breathing when breathing movements stop or lips, tongue and fingernails become blue.

3.2.2 Time is of the essence. A person has only one chance in ten if he stops breathing for six minutes.

3.2.3 Never neglect respiration to transport a person to a doctor.

3.2.4 When in doubt, begin artificial respiration. No harm can result from its use and delay may cost a victim his life.



4.0 Treatment for Poisons

Since there are many different poisons which react differently and require different treatment, only the most general first aid treatment can be covered here. First of all, try to determine what the poison is – from the person, the container, the odor or any other means – then contact a physician or poison center as quickly as possible. (For chemicals used in company operations, refer to the employee protection manual – chemicals).

4.1 Begin mouth to mouth respiration if breathing has stopped or the victim has difficulty breathing.

4.2 Give water or milk if the victim can swallow.

4.3 Do Not Induce vomiting if – the victim is:

4.3.1 Unconscious

4.3.2 In convulsions

4.3.3 Has a symptom of severe pain or burning sensations in mouth or throat?

4.3.4 Is known to have swallowed a petroleum product, toilet bowl cleaner, rust remover, drain cleaner, acids, iodine, styptic pencil, washing soda, ammonia water, household bleach or other strong acid or alkali.

4.4 Do induce vomiting if the poison is known and it is not a corrosive acid or alkali or one of the substances listed above.

4.5 If the poison is an overdose of medicine, an opiate or other non-corrosive substance vomiting should be promoted by drinks of warm salt water or soda water (2 teaspoons of salt or 2 teaspoons of baking soda in a glass of water) or by placing your finger at the back of the victim's throat. After vomiting has started, continue to give above fluids or milk and stimulate vomiting until stomach has been emptied.

4.6 In any event, if and when the victim retches and vomits, he should be placed face down with the head lower than the hips. This prevents vomitus from entering the lungs and causing further damage.

4.7 Speed is essential prevent the body from absorbing as much of the poison as possible and professional help should be obtained without delay.

4.8 It is extremely important that the doctor, hospital known the poison has been taken. All available information, some of the poison, an empty container, any possible knowledge of the substances should be given to the physician. If there is no other reliable information, a portion of the vomitus should be taken to aid the physician in determining proper treatment.

5.0 Treatment for Shock

5.1 Shock is a condition in which all activities of the body are greatly depressed. Skin is pale, cool and clammy, with beads of perspiration. Pulse is weak and rapid. Breathing is shallow the victim is usually chilled sometimes nauseated and there is generally body weakness.

5.2 Shock usually accompanies severe injury, either immediately or a little later, and can cause death even though the injury itself might not be fatal.

5.3 Treatment for shock as follows:

5.3.1 Correct the cause of shock if possible. (e.g., control bleeding, etc.)

5.3.2 Keep victim lying down

5.3.3 Keep his air way open. If the vomits, turn his head to the side with his neck arched, if possible, so he will not choke on the fluid.

5.3.4 Elevate victims' legs if there are no broken bones. Keep his head lower than trunk of body if possible.

5.3.5 Keep victim warm if the weather is cold or damp to prevent loss of body heat.

5.3.6 Give fluids (water, tea, coffee, etc.) if the victim is able to swallow, there is no abdominal injury suspected and the services of a physician will be delayed.

5.3.7 Reassure victim.

5.3.8 Never give alcoholic beverages.

5.3.9 Call a physician.

6.0 Heat Exhaustion

6.1 Symptoms of heat exhaustion are much the same as of shock pale and clammy skin, pulse rapid and weak, weakness, headache or nausea and sometimes cramps in abdomen or limbs. Sweating is usually more profuse.

6.2 Treatment for heat exhaustion is also about the same as for shock (see E above). If the victim is able to take fluids, addition of one teaspoon of salt to one quart of water, with a drink every 10 minutes, will speed recovery.

7.0 Heat Stroke

Heat stroke is a sudden attack of illness from prolonged exposure to the sun to other high temperatures without exposure to the sun. The skin is flushed, hot and dry. Pulse is rapid and strong and the victim becomes unconscious rapidly. Breathing is labored and of the snoring type and the pupils of the eyes are enlarged but equal sizes.

Treatment of heat stroke is as follows:

7.1 Lay victim down in a cool place.

7.2 Raise head and remove as much clothing as possible.

7.3 Cool body by sponging with cold water or with applications.

7.4 If the victim is fully conscious and can swallow, give him salt water to drink. (One teaspoon salt to one quart of water)

7.5 As victim returns to consciousness, watch for signs of shock and treat accordingly.

7.6 Obtain services of a physician as soon as possible.

8.0 Treatment of Burns

8.1 With first and second degree burns, when skin is not broken, the best first aid treatment is to immerse the burned portion in ice water if possible. If this cannot be done, treat as follows:

8.1.1 Apply cold or ice water or use ice packs.

8.1.2 Keep burned area covered with clean cloth to keep air away.

8.1.3 Treat for shock and call physician if large area is covered.

8.2 For severe burns treat as follows:

8.2.1 Remove clothing from the injured area (Clothing that adheres to the skin should be cut around or left in place)

8.2.2 Place cleanest available cloth material overall burned areas to exclude air.

8.2.3 Keep victim lying down, with head and chest a little lower than the rest of the body. Raise the legs, if possible.

8.2.4 If the victim is conscious and can swallow, give him plenty of nonalcoholic liquids to drink. (Water, tea, coffee etc.)

8.2.5 Do not apply an oil or grease.

8.2.6 Call a physician.

8.3 For chemical burns the area should be immediately and continuously washed with large quantities of water. Apply a low pressure stream of water while removing clothing and wash until chemical has been thoroughly flushed away. Then treat as above, depending on severity. All chemical burns, except where the skin is reddened in only a small area should be seen by a physician.

9.0 Snake Bite

It is of utmost importance that the victim of a poisonous snake bite has as little muscular activity as possible. He should be made to lie down and should be kept quiet He should also be given the following treatment:

9.1 Immediately apply a constricting bandage (not a tourniquet) between the wounds and the heart. Arterial circulation should not be cut off but the bandage should be tight enough to obstruct the return of blood to the heart.

9.2 If medical attention can be obtained within a half – hour:

9.2.1 Make No incisions.

9.2.2 If ice or cold water is available, apply to the area of the wounds in ice or cold water until medical attention is obtained.

9.2.3 If necessary, carry the victim to medical attention. (Do not let him walk)

9.2.4 After about 15 minutes, loosen the constricting bandage for a few seconds.

9.3 If medical attention cannot be obtained in half an hour:

9.3.1 Make an incision through each fang hole so the wounds can bleed freely. Incisions should be no more than 1/8" deep and ½" long and should be made in the direction of the length of the limb.

9.3.2 Bleeding is started by squeezing the cuts. If a snake bite kit is available, the suction syringe may be used.

9.3.3 The constricting bandage should be released every 20 minutes for ½ to 1 minute. The drawing of blood from the wounds should be continued.

9.3.4 Treatment should be continued until the victim is placed under medical care.

9.3.5 He should be treated for shock and should not be permitted to walk to medical attention if it can be avoided.

10.0 Treatment of Fractures and Dislocations

Do not move the person with fracture(s) unless absolutely necessary. If it is necessary to move the person, try to keep the fractured or dislocated member in the same position as found don't straighten the fractured member or attempt to set the bone.

10.1 If there is bleeding at the site of a fracture, or elsewhere, apply a pressure dressing to stop the flow.

10.2 Splint the fractured or dislocated member in as near the same position as found as possible

10.3 Use any available material for a splinting, such as sticks, boards' poles, metal rod, or even a thick, folded magazine or newspaper.

10.4 Pad splints with any soft material fractured or dislocated member in line, as found, and to avoid loss of blood circulation.

10.5 Fasten member to splints with bandage or cloth above, below and at the point of fracture or dislocation.

10.6 If the physician is not available, transport the victim to a hospital, with as little movement of the injured member(s) as possible.

11.0 Transportation of the Injured

11.0 After receiving first aid care, a seriously injured person often requires transportation to a hospital, to a physician's office, or to his home. If at all possible, the first aid man should see that the patient is transported in such a manner as to prevent further injury and is subjected to no unnecessary pain or discomfort. No matter how expert the first aid care that has been given, improper handling and careless transportation often add to the severity of the original injuries, increase shock, and frequently endanger life.

11.1 Never move a patient until a thorough examination has been made and all injuries are protected by proper dressings. Seriously injured patients should be moved only in lying position. If means for proper transportation of an injured person are not immediately at hand, continue care of the patient to conserve his strength until adequate means of transportation can be procured.

11.2 The stretcher is the preferred transportation method. Carrying in the arms, carrying astride the back, and the two-man carry should be used only when it is positively known that no injury will be aggravated by such handling of the patient.

16. Fire Protection and Prevention

1.0 General

1.1 All employees shall be thoroughly familiar with the operation, application and maintenance of all the types of fire extinguishers they might have occasion to use in case of emergency at work.

1.2 Guide to Classification of Fires

1.2.1 Class "A" Fires:

Fires of ordinary combustible materials, such as wood, paper, rubber and many plastics.

1.2.2 Class "B" Fires:

Fires of flammable liquids, combustible liquids, such as, petroleum greases, tars, oils, and oil based paints, solvents, lacquers, alcohols, and flammable gases.

1.2.3 Class "C" Fires:

Fires of electrical equipment such as motors, generators, and switch-panels where use of non-conducting extinguishing substance is of importance. (Where electrical equipment is de-energized, fire extinguishers for class A or B fires may be used safely).

1.2.4 Class "D" Fires:

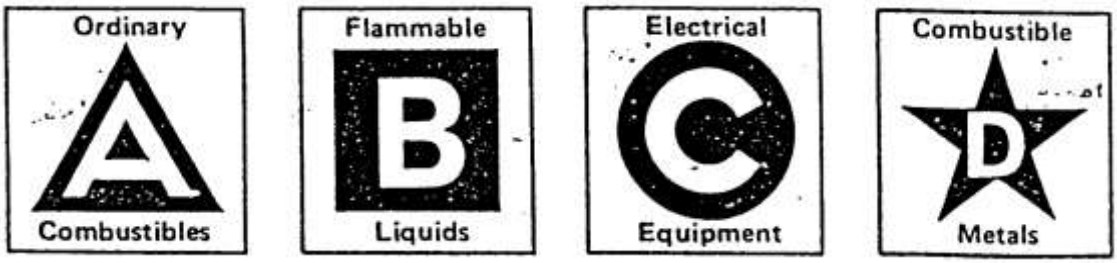
Fires involving combustible metals such as magnesium, titanium, zirconium, sodium, and potassium. If an operation involves the use of combustible metals, special fire protection procedures are to be set up by conferring with the safety representative.

1.3 Types of fire extinguishers

Water type (including anti-freeze, soda-acid, wetting agent, and loaded stream)	Class "A" Fires
Carbon Dioxide	Class "B" and "C" fires
Dry Chemical*	Class "B" and "C" fires
Multipurpose Dry Chemical	Class "A", "B" and "C" Fires
Foam	Class "A", "B" Fires
Dry Powder* (Special type)	Class "D" Fires

* In extremely low temperature climates, the pressure cartridges or cylinders on dry chemical and dry powder extinguishers shall contain Nitrogen rather than Carbon Dioxide.

1.4 Marking for Fire Extinguishers, indicating classes of fires on which they should be used:



1.4.1 Class A, Ordinary Combustibles – white "A" on Green Triangle.

1.4.2 Class B, Flammable liquids – white "B" on Red Square.

1.4.3 Class C, electrical Equipment – white "C" on blue circle.

1.4.4 Class D, Combustible metals – white "D" on yellow star.

1.5 There are three principle types of fire extinguishing means; portable extinguishers, fixed system and hose lines.

1.6 Portable-Hand Types are strictly "First aid" extinguishers and should be so located that they are quickly accessible for immediate use when the fire is small and easily put out.

1.7 Portable- wheeled Type extinguishers may be a little more remote than the hand type, but they will put out considerably larger fires when properly used.

1.8 Fixed Systems-Automatic are usually dry chemical, Carbon Dioxide, Foam, water sprinkler, water flood or combinations of these.

1.9 Manually Operated System includes high pressure water, used with straight stream or fog nozzles, or in combination with foam, light water and dry chemical, or some other chemical.

1.10 All fire extinguishing systems, equipment and apparatus, shall be checked frequently, tested when scheduled, and maintained in good working condition at all times. (For details see Portable Fire Extinguishers, Fixed Fire Fighting Equipment & Hose Lines).

1.11 Fire drills shall be held frequently at designated times.

1.12 Fire trucks and/or carts with hoses and equipment shall be housed in buildings for protection against direct sun and weather conditions.

1.13 Where fire trucks are provided, equipment shall be checked and engines shall be started daily, and as instructions.

1.14 If difficulty is encountered with wasps, mud-daubers or other insects plugging nozzles or other critical openings, paper, foil or other suitable material should be loosely tied over the opening to protect it.

1.15 Fire alarms shall be regularly checked and maintained in good working order at all times.

1.16 If fire alarms are given by signal, every employee who might be within hearing distance, shall understand the signal and know what action he should take.

2.0 Portable Fire Extinguishers

2.1 A program shall be maintained to assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept at their designated location at all times when not in use.

2.2 Extinguishers shall be conspicuously located along normal paths of travel and be readily accessible and available.

2.3 Fire extinguisher locations shall be marked with a red square of suitable size above each extinguisher. When practical, the area behind the extinguisher should also be painted red.

2.4 In areas where extinguishers cannot be seen due to visual obstructions, their locations shall be marked with painted symbols, located high enough to be seen.

2.5 All extinguishers shall be clearly and properly marked to insure proper selection at the time of a fire.

2.6 All extinguishers except wheeled type shall be mounted on brackets, in cabinets or set on shelves.

2.7 Hand type fire extinguishers shall be installed so that the top of the extinguisher is no higher than the following:

2.7.1 Those having a gross weight of 40 pounds or less – 5 feet above the floor.

2.7.2 Those having a gross weight of more than 40 pounds – 3 ½ feet above the floor.

2.8 The following table indicates the gross (filled) weights of extinguishers commonly used.

	Filled Weight	
	Less than 40 Pounds	More than 40 Pounds
Dry Chemical		
- 20 # and less	X	
- 30 # and over		X
Carbon Dioxide		
- 10 # and less	X	
- 15 # and over		X
Water - Pressurized, Pump Type, or With chemical		
- 2 ½ gal – and less	X	
- 5 gal – and over		X

2.9 Extinguishers shall be mounted or set so that identification and operating instructions face outward.

2.10 Dry chemical extinguishers, located in areas of sever vibration, such as trucks, cars and some plant locations, should be mounted in a horizontal position with hose connection in "up" position.

2.11 Different kinds of extinguishers should be available, if necessary, to protect a building structure and any combustibles that may be in it.

2.12 Extinguishers for Class "A" fires shall be placed so that no point in the protected area is more than 75 ft. from an extinguisher.

2.13 Extinguishers for Class "B" fires shall be placed so that no point in the protected area is more than 50 ft. from an extinguisher.

2.14 Class "C" rated extinguishers shall be available in areas where electrically energized equipment is located.

2.15 Wheeled type extinguishers shall be protected from direct sun or weather conditions with suitable cover.

2.16 Any portable extinguisher, if used, will be recharged as required and immediately returned to its proper location.

2.17 All portable extinguishers shall be inspected at least once a month to insure they are in their designated place, seals have not been broken, and there is no obvious physical damage.

2.18 All extinguishers shall be thoroughly examined at least once each year for mechanical parts, extinguishing material and expelling means. Any deficiencies shall be remedied or the extinguisher replaced.

2.19 A durable tag showing recharge and maintenance dates shall be attached to each extinguisher.

2.20 All fire extinguishers shall be hydrostatically tested, in accordance with NFPA Standard 10A, at any time there is evidence of corrosion or mechanical injury, and at intervals not to exceed the following periods:

2.20.1 12 years for dry chemical with brazed-brass, mild steel, or aluminum shells, and dry powder extinguishers for metal fires.

2.20.2 5 years for all other types.

2.21 Date of test, test pressure, and name or initials of person making test shall be recorded on a metal tag or equally durable material and affixed to the shell of each extinguisher passing the hydrostatic test.

2.22 Extinguisher hoses that are equipped with shutoff nozzles shall be tested at the same interval as the unit.

2.23 Spare extinguishers shall be used to replace those removed from the premises for maintenance.

3.0 Fixed Fire Fighting Equipment

3.1 All employees working in the area of automatic systems shall be familiar with emergency evacuation and rescue procedures.

3.2 Alarms or indicators that signify that automatic fire extinguishing systems are fully charged and ready shall be checked frequently to insure they will operate properly. This shall be done as per manufacturer's instructions and catalogues.

3.3 Expellant gas containers in dry chemical systems shall be checked by pressure or weight at least once every six months and be refilled or replaced if the expellant is below required minimums.

3.4 Except for stored pressure systems, at least once each year the dry chemical in the system storage container shall be sampled from the top center and also near wall to determine the existence of lumps. If lumps harder than will be friable when dropped from a height of four inches are found, this condition shall be corrected at once by competent personnel.

3.5 In carbon dioxide systems, at least once each six months, all high-pressure cylinders shall be weighed. If at any time a container shows a loss of net contents of more than ten percent, it shall be refilled or replaced.

3.6 All automatic fire extinguishing systems shall be thoroughly inspected by a competent engineer or inspector at least once each year and a report shall be filed with the company indicating the systems meet all specifications.

4.0 Hose Lines

4.1 Hose carts shall be equipped with wrenches, nozzles and small equipment, as necessary. Such items shall be in compartments on the cart or conveniently attached thereto.

4.2 Stationary fire water pumps shall be started and run for a few minutes at least once each 7 days.

4.3 Fire water systems shall be flushed at least once each 30days.

4.4 All fire hoses shall be thoroughly inspected for rodent damage at least once each 30days.

4.5 Hand tools, ladders, and other auxiliary equipment shall be checked for availability and serviceability at least once each 6 months.

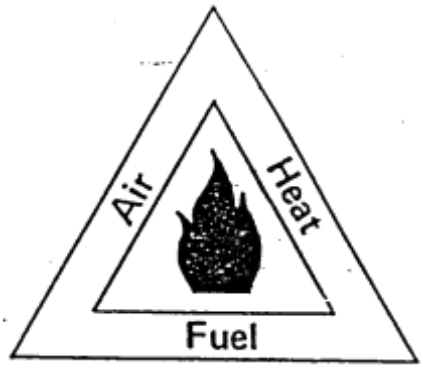
4.6 Fire hoses shall be hydrostatically tested, length by length at maximum pump pressure for at least 3 minutes once each year. Records of these tests shall be maintained for at least 3 years.

4.7 Hoses shall be dried and returned to their proper places after each use or test. (Some synthetic fire hoses do not require drying).

4.8 Fire equipment and apparatus shall be used for fire protection and training only.

5.0 Fire Prevention

5.0 Three components are necessary to start and sustain a fire commonly known as the fire triangle, they are:



Since all three components are constantly with us, it is our obligation to keep them from coming together under uncontrolled circumstances.

5.1 A fire that does not start does not have to be put out. The greatest protection against fire damage then, is to prevent the start of a fire that is not wanted.

5.2 Poor housekeeping, with accumulations of trash, rubbish, and other waste materials in places where there could be a source of ignition, is probably the greatest single cause of unwanted fire.

5.3 Suitable containers shall be provided for waste materials, and the containers shall be used.

5.4 Waste containers shall be emptied regularly and their contents destroyed, hauled away, or disposed of in an approved manner.

5.5 Flammable liquids shall be kept in safety containers and shall be safely handled, away from sources of ignition.

5.6 Paints, thinners, oil, grease and similar combustors materials, shall be stored in well ventilated places, away from sources of heat, open flame, sparks or other sources of ignition.

5.7 Proper safeguards shall be provided for heating units so they will be not the source of an unwanted fire.

5.8 Gas leaks shall never be hunted with an open flame. Combustible gas indicators, soap suds or other safe means shall be used.

5.9 Any gas leak shall be found and repaired immediately.

5.10 If a gas leak is found in any confined area, all motors, engines and other sources of ignition shall be shut down at once. Care should be taken, not to break an electrical circuit in a location where the vapors might be flammable.

5.11 Any building or room in which gasoline or gas is being handled shall be well ventilated.

5.12 Gas shall not be piped to storm or fall-out shelters.

5.13 Fuel lines shall not be installed under the floor or within the walls of buildings in a manner that will permit escaping gas to be trapped.

5.14 Rubber or plastic hose shall not be used to connect gas-fired appliances. (Bunsen Burners, propane torches and similar devices, properly installed and carefully used are accepted from this requirement).

5.15 All gas fired heating devices within closed areas shall be vented to open air.

5.16 Before an open flame, such as a welding torch, is carried into or lighted in closed building, tank or area where there is any possibility of gas being present, a test shall be made for the presence of combustible gas with an approved type of gas indicator.

5.17 The appropriate area supervisor shall personally approve any open-flame work in hazardous areas.

5.18 Kitchen-type or any other type of non-safety matches shall not be brought onto company property.

5.19 "No smoking" signs shall be posted in hazardous areas, and they shall be observed.

5.20 Cigarettes, cigars, matches, lighters or other smoking material shall not be carried to any operation which might be considered hazardous to fire or explosion.

5.21 Magnetos, spark plugs, ignition equipment and other electrical devices shall not be tested, repaired or assembled in any building or area where gas or combustible vapors might be present.

5.22 Only explosion-proof electrical devices, such as switches, motors, lights, etc., shall be permitted in gaseous areas.

5.23 If at all possible work areas should be gas freed before commencing any work which might cause a spark.

5.24 At times, it is necessary to release gas; at such times, it shall be determined beforehand that no source of ignition is nearby unless the gas is to be burned.

5.25 Any lines or vessels being put into gas service, or returned to gas service after repair shall be thoroughly purged with an inert substance before they are put into operation.

5.26 Mops, wiping cloths or other flammable materials shall not be placed near engine exhausts or other sources of ignition for drying or storing.

5.27 Oily or paint-soaked rags waste or clothing shall be placed in closed, metal containers which are to be emptied frequently and safe disposition made of the contents.

17. Task Based Risk Assessment

1.0 Introduction

1.1 Purpose

1.1.1. The purpose of this Task Risk Assessment (TRA) process is to provide a method and practical guidance for assessing general health and safety risks from tasks carried out in the workplace. The management of Risk is an integral part of our operations within Ganope. Risks involved in all activities must be reduced to "as low as reasonably practical (ALARP)", recognizing that some activities will always carry a residual risk.

1.1.2. Work will not be conducted without a pre-job risk assessment and a safety discussion appropriate for the level of risk.

1.2 Objectives

1.2.1 The objectives of this practise is to provide guidelines for use of a Level 1 and Level 2 Task risk assessment, the roles and responsibilities of the Risk Assessment Team, and the documentation and associated processes to ensure all aspects of risk are considered and mitigations implemented to achieve the lowest possible risk level.

2.0 Level 1 & 2 Risk Assessment Definition

2.1 **Level 1** (New PTW covers all significant hazards)

2.1.1 Is a broad overview of the task by a competent person (CP), to determine whether the hazards involved are significant, and if so, whether the risks will be controlled adequately by existing means?

2.2 **Level 2**

2.2.1 Is a formal semi-qualitative assessment, which is required only when a CP judges that additional safeguards will be needed to minimise the risks.

2.2.2 Task Risk Assessment will normally be initiated by the AA or PA. The Assessment must be carried out before the work is started.

2.2.3 Previously carried out L2 Risk Assessments (L2RA) can be used as a base document for repeat tasks.

2.2.4 Whenever a previous L2RA is re-used then it is critical that the details of the RA are reviewed to ensure that the scope of the task is still relevant, conditions have not changed and that the hazards and control measures are still appropriate. A new L2RA Front-Sheet must be completed, to capture details of the new review team.

3.0 Roles and Responsibilities

3.1 **Site Responsible Person**

3.1.1 Ensuring that the TRA process is applied at sites within their area of responsibility.

3.1.2 Periodic internal reviews and/or audit of the operations of TRA.

3.1.3 Act as TRA Team Leaders to facilitate the TRA process.

3.1.4 Determining the appropriate level of Risk Assessment required to support any Permit to Work application and ensure the list of mandatory activities have proper L2 Risk Assessments.

3.2 **Area Authority**

3.2.1 For L1RA, AA identifies any significant hazards using the experience and judgment supported by a hazard checklist (permit and attachment within this document) and guidelines.

3.2.2 For L2RA, Participate and/or Lead a team to discuss the work scope, analyze and identify specific hazards associated with the work; define specific safeguards to implement before work starts.

3.2.3 Visit the worksite to ensure the potential hazards are recognized and listed on the L1 and L2 Risk Assessment.

3.2.4 Trained in Risk Assessment as the AA competent person.

3.2.5 Trained on Risk Assessment.

3.3 **Performing Authority**

3.3.1 Create the Permit and identify the hazards and control measures for the task being planned.

3.3.2 Visit the work site to complete the L1 and L2 Risk Assessment.

3.3.3 Participate in the L2 Risk Assessment process.

3.3.4 Roll out the output from the Risk Assessment process to the work crew.

3.3.5 Ensure the safeguards identified in the Risk Assessment are implemented.

3.3.6 Trained in Risk Assessment as the PA competent person.

3.3.7 Ensure all personnel working on the task:

3.3.7.1 Understand the hazards, risks and controls associated with the task.

3.3.7.2 Participate and contribute in the Toolbox Talk.

3.3.7.3 Are aware of their responsibility to feedback to the PA and AA of any potential hazards not identified in the L1 and L2 Risk Assessment.

3.3.7.4 Actively monitor the worksite and surroundings for changes.

3.3.7.5 Ensure they are empowered to stop the job at any time if they are concerned about safety.

3.4 **TRA Team Leader**

3.4.1 Lead the team in performing a Level 2 Risk Assessment

3.4.2 Ensure the team understands the Assessment process

3.4.3 Take responsibility for maintaining the quality of the TRA

3.4.4 Ensure that The Assessment Team includes personnel with all the necessary experience, knowledge and competence for the task involved

3.4.5 Record the names of the team members, indicating their particular area of expertise.

3.4.6 Make proper arrangements for the group to work together.

3.4.7 Ensure all relevant documentation is present

3.4.8 Ensure sufficient time is allocated to allow rational decisions to be reached.

3.4.9 Ensure that the TRA includes a worksite visit

3.4.10 Ensure that all members of the TRA team have a full opportunity to contribute and that the details of The Assessment are agreed by all team members

3.4.11 Ensure that the details of The Assessment are accurately recorded

3.5 **Individual TRA Member**

3.5.1 Assessment must be carried out by a team composed of competent persons, who have the knowledge and experience relevant to the task.

3.5.2 Depending on the complexity and size of the task involved, a team as a minimum shall include the following people:

3.5.2.1 Area Authority (Team Leader)

3.5.2.2 Performing Authority

3.5.2.3 HSE Member

3.5.3 The Risk Assessment team must first ensure that they fully understand the task and its implications by visiting the worksite.

3.5.4 Actively participate in the TRA process

3.5.5 Help identify hazards and control measures to reduce the likelihood of an incident/accident occurring

3.5.6 Ensure they agree with the overall TRA before approval, ensuring that risks have been reduced to as low as reasonably practicable.

3.5.7 Be trained in the TRA process

4.0 Competency, Training and Awareness

4.1 **General**

4.1.1 Ppersonnel involved in developing and implementing the Task Risk Assessment process shall be trained and proven to be competent. (Competent Person - CP)

4.1.2 The Area Authority and/or Line Supervisor shall ensure that the personnel involved in the activity have the correct competencies through records or requesting individuals to produce relevant certification.

4.1.3 The required training for team members includes:

4.1.3.1 Risk Assessment

4.1.3.2 Hazard Identification

4.1.3.3 Control of Work

4.1.3.4 Hot Work

4.1.3.5 Confined Space

4.1.3.6 Breaking of Containment

5.0 Risk Assessment

5.1 **General**

5.1.1 See Appendix C for complete instructions on how to conduct a Risk Assessment and complete the form.

5.1.2 Level 2 Risk Assessment will be documented and presented in dual language, Arabic and English.

5.1.3 A common way of assessing Task Risks is by the use of a permit to work. This is a well-established practice which is adequate for the majority of tasks. However, other types of assessment method must be used to cover those work situations where the permit is either not appropriate, or where the scale of The Risk is such that the permit has to be supplemented by a more comprehensive approach.

5.1.4 The process of Task Risk Assessment described in this Practice is a method for systematically examining an individual work task to identify the hazards, evaluate the risks and specify appropriate safeguards.

5.1.5 For task where mandatory L2 Risk Assessment is not required, The Risk Assessment flow-path to be followed is provided in Appendix B.

5.1.6 Non-permitted activities shall be conducted against an appropriate generic Risk Assessment or Job Safety Analysis (JSA) that addresses potential hazards and required precautions associated with the Task. Such work activities can be documented using The Risk Assessment form.

5.1.7 Local procedures must therefore be validated periodically to determine whether any changes have occurred which might have an adverse impact on Risk. If an accident or near-miss should occur while a procedure is in use, the whole procedure, including The Risk Assessment, must be reviewed before it is used again.

5.2 **The Risk Assessment Guidance**

- The Risk Assessment Process will require either a Level 1 or 2 Risk Assessments to be completed.

5.2.1 Level 1

5.2.1.1 A Level 1 RA involves a review of the task by the PA in consultation with the Area Authority (AA) to identify the hazards associated with the task and appropriate control measures. The PA must complete the appropriate Work Permit

5.2.1.2 If the AA is not completely assured that the risks will be adequately controlled by these measures and feels a more rigorous assessment is required, they must inform the person in charge of the work and request a L2RA. This requirement should ideally be identified at the earliest opportunity.

5.2.1.3 The AA will review L1RA (Work Permit) along with any other documentation. The AA/PA will visit the worksite to ensure all hazards have been identified and controlled.

5.2.2 Level 2

5.2.2.1 A Level 2 Assessment must be carried out for the following mandatory activities:

5.2.2.1.1 Confined Space Entry
5.2.2.1.2 Naked flame hot work in all plant areas
5.2.2.1.3 Failure to meet minimum isolation standards
5.2.2.1.4 Deviation from existing policy, procedure or practice
5.2.2.1.5 Breaking Containment
5.2.2.1.6 Complex lifting operation involving multiple suspensions or lifting over live plant
5.2.2.1.7 Any activities involving potential exposure to hydrogen sulphide
5.2.2.1.8 Simultaneous operations
5.2.2.1.9 Over-side work, such as abseiling.
5.2.2.1.10 Where, as a result of Level 1, the Competent Person believes that significant risks exist which will not be adequately controlled without additional safeguards.
5.2.2.1.11 Where an element of emergency equipment is being removed from service (e.g. fire pump or lifeboat removal/maintenance)

5.2.2.2 A District may choose to specify certain tasks, known to be potentially hazardous, for which a Level 2 Assessment will always be carried out, regardless of ability to comply with any prescribed standards.

6.0 Acceptable Level of Risk

6.1 Where the residual risk is in the 32 to 48 range should **only proceed with utmost caution.**
6.2 Where the residual risk >=60, the task **may not proceed**.
6.3 Appendix E provides guidance to apply further actions based on the residual risk results.

7.0 Toolbox Talks

7.1 Toolbox talks will be carried out for all tasks, whether they are L1RA or L2RA.
7.2 A Toolbox Talk is a vital part of the process to ensure that the TRA and its associated documents are reviewed prior to the start of the job and are fully understood by all persons involved in the task.
7.3 Particular emphasis should be placed on those residual risks with a higher rating. It is also an opportunity for those involved in the work to raise any further concerns about the job and to identify any hazards not picked up in the TRA process.
7.4 If anyone at this Level identifies some additional hazards that have not been properly assessed or thinks the control measures are inadequate, then the job should not proceed until the TRA has been re-evaluated and appropriate controls identified to ensure the job is AS LOW AS RESONABLY PRACTICAL.
7.5 Keys to success of this step are:
- 7.5.1 Communication of the task, the hazards and what must be done to control them to every person involved in the task.
- 7.5.2 Language is critical, especially in complex technical tasks.
- 7.5.3 Risk assessments to be documented in English and Arabic.
- 7.5.4 The toolbox talk is held prior to work starting.
- 7.5.5 Everyone understands the topics and hazards discussed.
- 7.5.6 Everyone has the opportunity to voice concerns.

8.0 Management of Risk

8.1 **Approval**
- 8.1.1 On completion of the Risk Assessment, the Risk Assessment Front & Work Sheets must be attached to the work pack for the job. It must be reviewed and signed by the site manager before the permit is approved.
- 8.1.2 Should the AA feel that the task presents risks beyond his level of accountability, he must refer to his Manager for guidance, and if necessary request a more sophisticated analysis of the risks and mitigation than can be provided by the method described in this procedure.

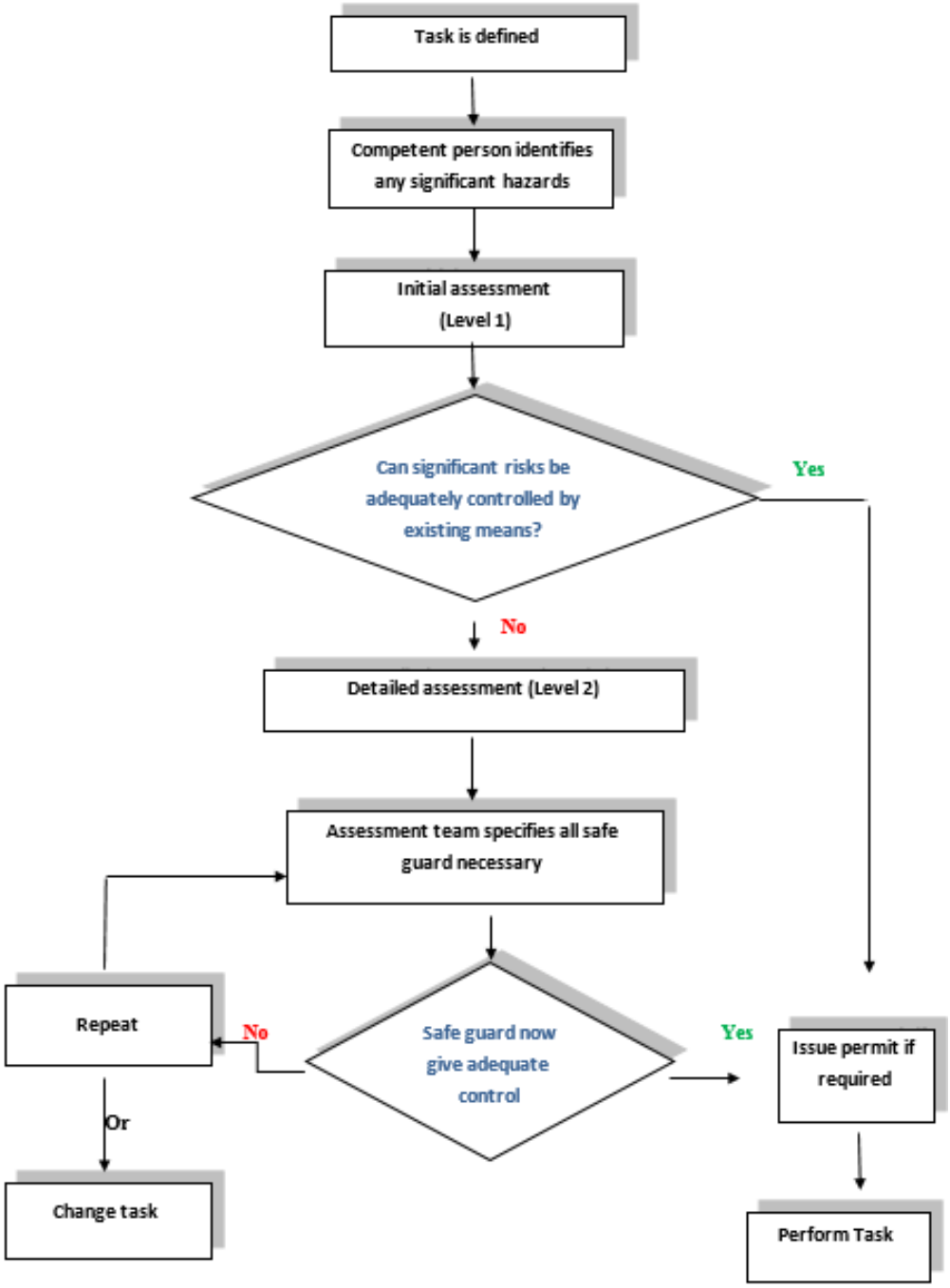
8.2 **Recording the Risk Assessment**
- 8.2.1 Where a task is likely to be repeated, a record of the Risk Assessment should be retained for future reference.
- 8.2.2 Risk Assessments, which include hazards to the health of those undertaking the task, must be attached to the permit(s) for the job and retained for 12 months.
- 8.2.3 HSE Department will register and retain copies of risk assessments.
- 8.2.4 Where a Risk Assessment form is being re-used, it must be fully reviewed and a new front sheet created.

9.0 Appendices

Appendix A: Definitions & Abbreviations

Confined Space Entry:	Where there is inadequate ventilation to dispel injurious or flammable fumes, vapor or gas or to provide sufficient oxygen. Also includes areas where access / egress are restricted.
Controls:	Steps taken to reduce either the probability or consequences, or both of a particular risk.
Hazard:	The potential for human injury or loss of life, damage to the environment or to material assets or a combination of these.
Hazardous Consequence:	The result when a hazard is realized.
Inhibition:	The isolation of the executive action of a protective system. Where practicable, this should not prevent the operation of the visual / audible warning system.
Isolation:	• Process Isolation involves the closing and locking of valves. This may include depressurizing, flushing and purging, e.g. single valve isolations. • Positive Isolation involves the disconnection of plant, equipment and systems from sources of motive power, liquids and gases. • Electrical Isolation - The secure, disconnection and separation of a circuit, or item of equipment, from every source of electrical energy. This may involve electrical, instrument and communication isolations. • Long Term Isolation - An isolation that remains in place after permits cancellation, and recorded as “Long Term”.
Probability:	The chance of occurrence of an event. Probability can be expressed as a likelihood, frequency, class, rank etc.
Risk:	A combination of the likelihood of a hazardous event and the severity of the possible consequences of that hazardous event.
Risk Assessment:	The overall process of risk analysis and risk evaluation.
Risk Evaluation:	The process to support management decisions as to acceptability or risk reduction requirements by comparing the estimated risk against relevant criteria.

Appendix B: Risk Assessment Flow Path



Appendix C: Risk Assessment Process

- The following explains the process of completing a L2 Risk Assessment.

1. Define the Task to be assessed

1.1. The task description detail must provide information on Who, What, Why, How and When the task will be performed.

2. Identify the Hazards (What Can Go Wrong?)

2.1. The team must fully understand the task and its implications, visiting the place where the activity will be carried out, is MANDATORY, to see the physical layout of the area and current site conditions. Particular attention should be given to adjacent plant and equipment.

2.2. The following aspects of the task should be examined:

2.2.1. Characteristics of the plant integrity and systems directly involved, e.g. pressure, temperature, stability, voltage, H2S, toxic chemicals, foam, LSA scale, sand, wax, sludge, etc.
Sensitivity of the location within the site/installation caused by proximity to other critical plant or systems, e.g. Drawings, HVAC intakes, flare header, explosive store, control room, NGL separator, risers, ESDV, structural support members, tankage, etc.

2.2.2. Critical activities necessary to perform the task, e.g. lifting, draining fluid, inserting, isolation, flushing, entry into confined space, work at height, transport of materials, equipment and wastes, use of power tools, hot work, grinding, bolting, use of cables and hoses, etc.

2.2.3. Possibilities of interaction between simultaneous activities within the task itself, or in other, unrelated tasks taking place nearby.

2.2.4. Checklists are supplied Appendix D as a guide for reference purposes only. They should not be considered as being comprehensive.

3. Identify the Hazard Effects

3.1. The Team must identify the Hazard Effects, which will be entered on the L2RA Work-Sheet. Hazard effects are the worst credible possible outcome of the hazard The Team should be as explicit as possible in the Hazard Effect details. It is important to consider personal injury, property damage and environmental impact.

4. Existing Control Measures

4.1. When doing a risk assessment, it is normal to assume that no controls are in place. For many tasks, some controls may be known before the risk assessment, and it is not realistic to think of the work being done without these controls, provided that:

4.1.1. They are demonstrated as part of the task definition (e.g. planned isolations must have appropriate isolation certificate and marked-up P&IDs); and the controls are confirmed to be in place prior to the work being carried out.

4.2. Controls that may be included in the definition of the task include:

4.2.1. Procedures, operating guides, etc. (supported by a valid risk assessment);
4.2.2. Energy isolations confirmation certificate (including P&IDs)
4.2.3. Entry certificate
4.2.4. Scaffolding request
4.2.5. Other risk assessments such as, manual handling, NORM scale.

4.3. Work permits are used for recording the controls for individual work tasks, for controlling the interfaces between work activities and to gain the correct approvals to start a job. However, a work permit itself is not a control for an individual work task and should therefore not be included in the task description.

5. Evaluate the Initial Risk

5.1. Once the members are all familiar with the scope of the task to be carried out, the team should list all the significant hazards. This should be done during group discussion, with the team leader making sure that each team member is given adequate opportunity to express his views.
5.2. Appendix D is a checklist of hazardous agents, critical activities and hazard effects which can be used to support this discussion. Hazard checklists are also included in other HSE Practices wherever possible, to help identify hazards specific to that activity. These lists should not be regarded as comprehensive, however, and the main input should come from the competency, knowledge and experience of the team members.
5.3. The risks created by each hazard on the list should be evaluated according to:
5.3.1. The potential severity of the hazard effects, should anything go wrong, and
5.3.2. The probability of the hazard being realized.
5.4. The risks created by each hazard on the list should be evaluated according to:
5.4.1. The worst credible severity of the hazard effects, should anything go wrong
5.4.2. The probability of the hazard being realised and resulting in the specified hazard effect
5.5. It is important to consider property damage and environmental impact and not just personal injury.
5.6. For each hazard the initial hazard effect (E) and probability (P) are defined based on the hazard and probability matrix.
5.7. The hazard effect (E) and probability (P) are then used to determine the risk (R), using the risk matrix**.**

6. Determine the Additional Controls Required

6.1. There are two types of control measures that will be identified from either the Level 1 or Level 2 TRA process:
6.1.1. Prerequisite controls are those which must be in place prior to the job starting
6.1.2. Supplementary controls are those which have to be applied during the job
6.2. The prerequisite control measures must be implemented prior to the job going live. This includes any training and/or special briefing of the PA and work party according to an agreed plan of action.
6.3. The supplementary controls, which will be applied during the job, must be understood fully by the PA and the work party before work commences.
6.4. The AA must satisfy himself that Competent Persons have been allocated the work; the required controls are in place, any additional paperwork is complete, and that all the individual risks are reduced to AS LOW AS REASONABLY PRACTICAL.
6.5. For L2RA, once the initial assessment of risk is complete, the team must work systematically through the list of Hazards and specify all the additional control measures needed to mitigate each associated risk, see Appendix E.
6.6. The hierarchy of controls is applied in the following order;
6.6.1. Eliminate
6.6.2. Reduce (Substitution, Engineering, Segregation)
6.6.3. Manage or Administration (Reduce Exposure, Procedures)
6.6.4. PPE – This must be the last control applied; remember that with PPE you are inside the hazard zone.
6.7. Wherever possible, measures higher in the hierarchy should be used, providing they are reasonably practical and emphasis should be placed upon control at source. A combination of measures will usually be necessary in order to reduce the level of risk as low as reasonably practical. It should also be considered that when specifying controls, any associated risk that they bring with them needs to be assessed and controlled.

7. Allocating Responsibilities for Control Actions

7.1. Once the control measures have been identified, each should be allocated to, where possible, both a role and a specific individual.

7.2. Action closed should not be completed until the work is about to commence.

8. Re-evaluate the Risks for Acceptability – Residual Risk

8.1. The team must then re-evaluate the risk for all those hazards for which controls have been determined. The new risk level should be determined and the team should consider whether the risk is now as low as reasonably practical.

8.2. If the risk is not as low as reasonably practical, the review team must decide what further safeguards need to be put in place. The higher the perceived risk for any particular hazard, the greater should be the number and/or quality of independent controls, which the team specifies as necessary. Consideration should also be given to the possibility of cumulative effects from the interaction of several different hazards.

8.3. If the team considers that there are insufficient independent controls available, or that the controls are likely to be ineffective against any particular risk, that risk must be judged to be unacceptable, and the team leader must record this decision. The task must then be abandoned or referred to higher management.

8.4. The team may also conclude that because of the complexity or degree of the risks involved, a more detailed engineering assessment is needed. In this case, the task must be suspended until the assessment is available.

8.5. As a final check, the team should ask itself the following questions about the proposed task:

8.5.1. Have all necessary control measures been fully and effectively identified?

8.5.2. Is there a need for engineering change to eliminate or reduce risk?

8.5.3. Is there a need to shut down the plant or process?

8.5.4. Is the residual risk rating acceptable?

- Only at this point can the team judge whether as low as reasonably practical has been achieved.

Appendix D: Level 2 Risk Assessment – Hazard Checklists

A - Hazards associated with plant and equipment

Category	Type of Harm	Examples of Hazards
Mechanical	Trapping (crushing, pressing, drawing in and shearing injuries)	• Two moving parts, or one moving part and a fixed surface • Conveyor belt and drive • V belt and pulley • Power press • "In running nips" • Mangle • Guillotine Scissors • Stapler , or Using hammer
	Impact (includes puncture)	• Something that may strike or stab someone or can be struck against • Moving vehicle, machine, ship, aircraft – including propellers and turbines • Drill, lathe • Sewing machine • Hypodermic needle • Pendulum • Crane hook or load
	Contact (Cutting, Friction or Abrasion)	• Something sharp or with a rough surface • Knife, chisel, saw, etc. • Fan blade • Circular saw blade, including meat slicer • Sanding belt • Abrasive wheel • Hover mower blade
	Entanglement (Rotating Parts)	• Drill chuck and bit • Power take-off shaft • Pipe threading machine • Abrasive wheel
	Ejection (of work piece or part of tool)	• Cartridge tool • Hammer and chisel • Abrasive wheel

A - Hazards associated with plant and equipment (continued)

Category	Type of Harm	Examples of Hazards
Electrical	Shock/Burn/Fire/ Explosion/ Ignition Sources	• Electricity above 240v, Electricity 240v, Electricity 110v • Extra low volt electricity • DC electricity, especially batteries when charging • Static • Batteries
Pressure	Release of energy (Explosion/Injection/ Implosion)	• Compressed air • Compressed gas • Process fluid • Steam • Vacuum • Hydraulic system
Stored energy	Flying/Falling materials	• Springs under tension • Springs under compression • Hoist platform cage • Conveyor tension weight • Raised tipper lorry body • Counterweight • Load carried by crane
Thermal	Burns/Fires/Scalds/ Frostbite	• Hot surface • Portable or fixed heater • Welding flame/arc • Refrigerant • Steam • Process fluid, heat transfer medium
Radiation Ionizing radiation	Burns, Cancer	• X Rays • α or β Radiation • Neutrons

A - Hazards associated with plant and equipment (continued)

Category	Type of Harm	Examples of Hazards
Non ionizing radiation	Burns	• Micro wave • Radio frequency • Laser • Ultra violet • Infra-red
Noise	Hearing loss, Tinnitus, etc.	• Noise > 85 dB(A) continues • Noise > ? dB impact
Vibration	Vibration white finger, whole body effects	• Pneumatic drill • Driving mobile plant • Using Jackhammer
Stability	Crushing	• Inadequate crane base • Fork lift truck on slope • Machine not bolted down • Mobile scaffold too high • Scaffold not tied
Overload/ Defective due to mechanical failure	Crushing	• Crane overload • Chain sling • Eye bolt overload • Scaffold overload • Hopper overload • Structure overload, esp. extreme weather

B - Hazards associated with materials and substances

Category	Type of Harm	Examples of Hazards
Fire/ Explosion/ Combustion	Burns	• Timber stack, Paper sore, Grease, Plastic foam
Increased Combustion	Burns	• Oxygen enrichment
Flammable substances (Inc. Highly and Extremely Flammable)	Burns	• Petrol, Diesel, Avgas • Crude oil, Natural Gas, LPG, LNG, Hydrogen • Carbon Monoxide
Oxidizing substance	Burns	• Organic peroxide, other oxidizing agents • Potassium permanganate • Nitric acid, Commercial explosive, Detonators
Gas explosions	Burns, structural failure	• Flammable gas or liquid above its flash point in a confined space • Similar in a congested area • Sudden failure of pressure system containing flammable liquid (BLEVE)
Dust explosions	Burns, structural failure	• Wood dust, Sulfur dust, Coal dust, Flour • Aluminum powder
Health Hazards (Corrosive/ Irritating materials)	Skin, esp. eye, effects Also lung effects	• Sulfuric acid, other acids – esp. hydrofluoric • Caustic soda, other alkalis • Ammonia, chlorine
Particles	Lung effects	• Asbestos fibers • Silica dust • Wood dust • Iron dust

B - Hazards associated with materials and substances (continued)

Category	Type of Harm	Examples of Hazards
Vapors	Acute and chronic effects on health	• Benzene • Toluene • Acetone • Some solvents
Fumes	Acute and chronic effects on health (local and systemic effects)	• Lead fume • Rubber fume • Asphalt fume
Gases	Acute and chronic effects on health	• Carbone monoxyde • Hydrogène sulfite • sulfura dioxyde
Mists	Acute and chronic effects on health	• Oil mist, Cutting fluids • Printing ink mist • Detergents • Aerosols
Asphyxiates	Acute and chronic effects on health	• Nitrogen • Carbon dioxide • Argon
Health hazard by ingestion	Burns to upper alimentary tract	• Toxic, Harmful, Corrosive and Irritant Liquids
	Poisoning	• All harmful aerosols • Polluted water • Contaminated food and drink
Hazards by contact	Cuts, abrasions	• Swarf • Rough timber • Concrete blocks
	Burns, Frostbite Also structural failure	• Molten metal • Frozen food • Cryogenic gases
Environmental hazards Hazardous waste storage and disposal	Groundwater / Soil pollution	• Crude/Condensate & product sea & road transportation and storage • Storage of hazardous sludge/material in pits • NORM waste (scales, sludge)

C - Hazards associated with the place of work

Category	Type of Harm	Examples of Hazards
Pedestrian Access	Tripping, slipping	• Damaged floors • Trailing cables • Oil, grease spills • Water on floors • Debris • Wet grass • Sloping surface • Uneven steps • Changes in floor levels
Pedestrian Access	Vehicle collision	• Poorly defined or un-segregated access routes – car parks, loading areas, docks, warehouses, etc.
Work at heights	Falls	• Fragile roof • Edge of roof • Work on ladder • Erecting scaffold • Hole in floor
Obstructions	Striking against	• Low headroom • Sharp projections
Stacking/Storing	Falling materials	• High stacks • Insecure stacks • Inadequate or overloaded racking • Stacking at heights • Damaged racking
Work over/near liquids, dusts, etc.	Fall into a substances, drowning, poisoning, suffocation, etc.	• Tank • Reservoir • Sump • Sewer • Work over water
Emergencies	Trapping in fire	• Locked exits • Obstructed egress • Long exit route • Lone working at height (crane, tower, etc.)

D - Hazards associated with methods of work

Category	Type of Harm	Examples of Hazards
Manual handling	Back injury, hernia, etc.	• Lifting • Lowering • Twisting • Carrying • Pushing • Pulling • Hot / Cold loads • Rough loads • Live loads – persons
Repetitive movements	Work related upper limb disorders	• Keyboard work • Using screwdriver • Using hammer and chisel • Bricklaying
Posture	Work related upper limb disorders, stress, etc.	• Seated work • Work above head height • Work at floor level

E - Hazards associated with the working environment

Category	Type of Harm	Examples of Hazards
Light (NB: Also increases risk of contact other hazards)	Eye strain, Arc eye and Cataracts	• Glare, reflections • Poor lighting • Stroboscopic effect • Arc welding • Molten metal
Temperature	Heat stress, Hypothermia	• Work in near/above furnace or oven • Cold room
	Heat stress, Sunburn, Melanoma, Hypothermia, etc.	• Outdoor work • Hot weather • Cold weather • Wind chill factor • Work in rain, snow, etc.
Confined spaces	Asphyxiassions, Explosion, poisoning, Claustrophobie, etc.	• Work in tank • Chimney stack • Pit, sewer, Basement, Unventilated room • Vessel ,Excavation
Ventilation	“Sick Building Syndrome”, Nausea, Tiredness, etc.	• Fumes, Odors , Tobacco smoke

F - Hazards associated with work organization

Category	Type of Harm	Examples of Hazards
All workers	Injuries and ill health to employees by contractors	• Work above or near others • Use of harmful substances • Welding
	Injuries and ill health to contractors 'by employees	• Process fumes • Services (e.g. underground electricity cables) • Stored hazardous materials
Organization of work	Injuries to employees	• Monotonous work • Stress • Too much work • Lack of control of job • Work too demanding
Work in public area	Injuries and ill health of public	• Trailing cables • Traffic/ Plant / Rig /Ship movement • Road transport • Work above public • Drilling, storage, production near dwelling area

Appendix E: Examples of Control Measures to be applied.

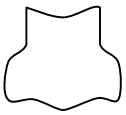
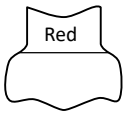
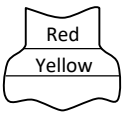
Typical Examples	Control Measure
1. Physical	Removal of fuses; Insert spade or blank flange in pipe work; Lock off valve; Erect mechanical barrier; Use locked enclosure; Keep people at a distance (e.g., signs, warning tape); Eliminate or substitute toxic substances; Substitute noisy machinery; Use mechanical handling equipment.
2. Procedural	Test for pressure build-up or leaks; Examination of flushing fluid; Test for hazardous chemicals in liquid, solid or gaseous form; Procedure for control of simultaneous or adjacent work; Prohibition of hot work; Equipment lock-out; Develop contingency plan,
3. Human	Use of independent specialist personnel; Regular or constant monitoring of the Task; Use of method statements / detailed procedures; Clear instructions and warnings to workforce; Clear definitions of roles and responsibilities during the Task; Adequate supervision; Ensure competency of personnel for the activity
4. Time	Limit duration of the Task or time of day when the activity occurs; Use time-saving measures such as hot-bolting, good work-site preparation and planning for the movement of materials, tools.
5a. Contingency (Control)	Emergency shutdown, deluge and blow-down systems, reduction of inventory.
5b. Contingency (Mitigation)	Temporary refuge, Emergency Response System, Fire/Blast Wall, Water Curtain, Provision of PPE, Rescue Equipment, etc.

18. Storage, Handling and Using of Compressed Gas Cylinders

1.0 Introduction

1.1 A variety of compressed gases supplied in cylinders is used in construction work, e.g. Acetylene, Oxygen, Compressed Air, Nitrogen, Argon and Liquefied Petroleum Gas (LPG). Where construction work is undertaken in operational factories or hospitals a number of other compressed gas cylinders may also be present in the work area (e.g. Hydrogen, Nitrous Oxide, Carbon Dioxide, Freon, Halon, Ammonia and Others).

Table (1) Color Bands to Denote Hazardous Properties of the Contents of the Container or Cylinders

Nature of gas or mixture	Color	Color of bands Color no. to BS 381C	Container neck
Non-flammable and non-poisonous	None	None	
Non-flammable and poisonous	Golden yellow	356	
Flammable and non-poisonous	Signal Red	537	
Flammable and poisonous	Signal Red and Golden Yellow[i]	537 and 356	

1.2 The purpose of this section is to ensure that those responsible for the handling and use of compressed gases in cylinders are familiar with the appropriate safety precautions.

2.0 Gas Cylinder Identification (British Standard BS 349:1973)

2.1 Under this British Standard, cylinders should be legibly and durably marked at the valve end (preferably not the main cylindrical part of the body) with the chemical formula and the name of the gas. For mixtures, the formulae, names and proportions of constituent gases should be given. For common organic refrigerants, the formula or symbol and designated refrigerant number to BS 4580 should be given.

2.2 The British Standard prescribes an appropriate color band or bands to be painted round the neck of each cylinder to denote hazardous properties of the contents; the principle being golden yellow for poisonous gas and red or maroon for flammable gas [see Table (1)].

2.3 When the valve of the cylinder is wholly protected by an extension of the cylinder body, the color band should be painted or otherwise durably marked on the extension.

2.4 Paints which contain aluminum and which constitute a fire risk should not be used.

2.5 Table (2) lists gases in common use and the cylinder color code for each. For gases or mixtures not listed, cylinders should be painted with any ground color except those specified in Table (2). Color bands, however, should comply with those specified in Table (1).

The red band should be adjacent to the valve fitting and the yellow band between that and the ground color of the container Source: BSI

Table (2) British Standard Colors for Gas Cylinders, Excluding Medical Cylinders

Gas		Ground Color of cylinder		Color of bands	
Name	Symbol	Color	Color no. to BS 381C	Color	British Standard Color no.
Acetylene	C_2H_2	Maroon	541	None	–
Air	–	French grey	630	None	–
Ammonia	NH_3	Black	–	Red and yellow[ii]	537 and 356
Argon	AR	Peacock blue	103	None	–
Carbon dioxide for temperature use	CO_2	Black	–	None	–
Chlorine	CI2	Golden yellow	356	None	–
Chlorine with internal dip pipes	–	Golden yellow	356	Black	–
Ethyl chloride: Flammable	C_2H_2CI	French grey	630	Red	537
Ethyl chloride: Non-flammable	–	French grey	630	None	–
Ethylene	C_2H_4	Dark violet	796	Red	537
Ethylene oxide	C_2H_4O	Dark violet	796	Red and yellow	537 and 356
Helium	He	Middle brown	411	None	–
Hydro-cyanic acid	HCN	Peacock blue	103	Yellow	356
Hydrogen	H2	Signal red	537	None	–
Methane	CH_4	Signal red	537	–	–

Gas		Ground Color of cylinder		Color of bands	
Name	Symbol	Color	Color no. to BS 381C	Color	British Standard Color no.
Methyl bromide	CH_3BR	Peacock blue	103	Black	–
Methyl chloride: Inflammable Non-inflammable	CH_3CI	 Green Green	 225 225	 Red –	 537 –
Neon	NE	Middle brown	411	Black	–
Nitrogen	N	French grey	630	Black	–
Oxygen	O	Black	–	None	–
Propane	**	Signal red	537	None	–
Sulphur dioxide	SO_2	Green	225	Yellow	356

3.0 Safe Transport and Handling

3.1 Where practicable, Gas Cylinders should be delivered to and dispatched from construction sites by the gas supplier.

3.2 If arranging collection/return of gases prescribed as dangerous, the driver must be properly instructed in the safe handling, loading and transport of cylinders, and in dealing with emergencies. The appropriate Transport Emergency Card or other suitable safety data sheet for each gas must also be carried on the vehicle.

3.3 Purpose-designed transport should be used when possible. Preference should be given to open vehicles or trailers. Cylinders must be secured, preferably vertical (and always vertical in the case of acetylene and LPG), valves shut and not leaking. If carried in closed vans or cars, there must be good ventilation and smoking should be banned. If the load compartment is not separate from the driver, poisonous gas cylinders (yellow marking) should not be carried.

3.4 The Gas Cylinders shall be so conveyed as to not project beyond the sides or ends of the vehicle. Adequate means shall be taken to prevent cylinders falling off the vehicle.' Cylinders should also not be loaded loosely so that they come into violent contact when the vehicle moves.

3.5 Travelling with equipment attached to the cylinders should be avoided. Valves must be shut and protective valve caps fitted where provided.

3.6 If the quantity of a dangerous gas in cylinders – propane, hydrogen, acetylene, ammonia, or gas prescribed as dangerous weights 500 kg or more, the vehicle used for carrying it must display prescribed reflectorized orange plates to front and rear; but only when actually carrying the relevant gas.

3.7 In the event of a road accident the emergency services must be advised as to the nature of the cylinders being carried by being shown the relevant Transport Emergency Card or other safety data sheet. (see paragraph 1.3.2 above)

3.8 Cylinders should not be lifted with magnets or chains. A rope or nylon sling may be used to lift one cylinder at a time provided it is correctly adjusted to prevent slippage. If more than one cylinder has to be hoisted, a properly designed cradle with chain/wire suspension should be used and each cylinder securely fastened.

3.9 Cylinders should never be lifted by their valve cap or guard unless the supplier states that they are designed for that purpose.

3.10 Cylinders should not be rolled along the ground as this may damage identification of the cylinder and may also cause the valve to be damaged or opened.

3.11 Oil, grease or other readily combustible substances must be prevented from coming into contact with cylinders of oxygen, their valves or other fittings. High pressure oxygen in contact with oil or grease may explode.

3.12 Vehicles carrying flammable gas should also carry at least one suitable fire extinguisher of adequate capacity (i.e. dry powder).

4.0 Storage

4.1 Storage areas should preferably be purpose-built compounds in the open air, fenced to a height of approximately 2 meters. The fence should be made of non-combustible material and should not inhibit natural ventilation; particularly at low level (steel mesh is particularly suitable).

4.2 Cylinders should be protected in cold weather from accumulations of ice and snow, and in hot weather from the direct rays of the sun. Tarpaulins or any other cover must not be used in direct contact with the cylinders. Cylinders should not be stood on materials which are likely to cause corrosion of the cylinder base.

4.3 If storage in open air is not reasonably practicable, then an adequately ventilated storeroom constructed of fire-resisting material may be used. It must also be in a safe position, and not, for instance, near cellars, drains or excavations where heavy gases (i.e. LPG) could accumulate in the event of cylinder leakage. Also avoid storage near corrosive influences such as battery charging shops.

4.4 No sources of ignition are allowed in stores or storage compounds where compressed flammable gas cylinders are kept.

4.5 Lighting for stores containing acetylene or other combustible gas cylinders should either be of approved flameproof type or should be outside the store so that the interior is lit through fire-resistant windows.

4.6 For flammable gas stores, electrical switches must be of approved flameproof construction and placed outside the store.

4.7 Stores or storage compounds for flammable gases should have at least two means of exit (if possible at opposite ends of the storage area). Gates or doors should open outwards and be operable from inside the store even when locked from the outside. Suitable firefighting equipment should be provided, and in the event of fire the cylinders should, if possible, be removable to a safe location.

4.8 For small quantities of flammable gases (less than 300 kg) a lockable wire cage in the open air may be provided.

4.9 Full and empty cylinders should be kept apart and FULL and EMPTY notices displayed accordingly. Different categories of Gas Cylinders (toxic, flammable, etc.) should be segregated and marked by signs in the storage area.

4.10 Oxygen and oxidants should not be stored with flammable gases such as acetylene or LPG, but in separate stores/storage compounds at least 6 meters away.

4.11 Acetylene and LPG cylinders must never be stacked horizontally in storage or use (except LPG when used as fuel for fork-lift trucks).

4.12 Cylinders should normally be stored upright and secured so that they will not fall. They should never be left free standing (unless designed to be stable in such circumstances – i.e. certain LPG cylinders), but securely lashed to an adjacent structure.

4.13 There cylinders contain gases which permit the safe storage of the cylinders in a horizontal position, they may be so stacked. Large wedges should then be used at each end of the stack. Large cylinders should be placed at the bottom of the stack and the stack should not be more than 4 cylinders high.

4.14 Particular guidance for stacking LPG cylinders (in the vertical position) is given in Table (3). Cylinders containing gases heavier than air (i.e. LPG) should not be stored near drain openings, excavations or other confined spaces where leaked gas may collect.

4.15 The cylinder valves should be tightly closed and where possible plugged and capped.

4.16 Cylinders should be stored well away from stoves, boilers, radiators and other heat sources. If cylinders are exposed to heat the cylinder walls may be weakened, and at the same time the gas content will increase in pressure and dangerous conditions may arise.

4.17 As already indicated, oil and grease can ignite violently in the presence of high pressure oxygen and an explosion may result. Cylinders and fittings should be kept away from all sources of contamination such as oil, sawdust, dust from overhead drive belts, etc. Desirably the same principles should be applied not just to oxygen cylinders but to all cylinders containing dangerous gases.

4.18 Personnel must not smoke, wear oily clothes, or have any naked light in any place where flammable compressed gases are stored (or where oxygen is stored).

4.19 Cylinder valves should be kept in good condition and grit, dirt, oil, grease or water should be prevented from entering them.

4.20 Should a cylinder become accidentally damaged it must be taken out of service, labelled as defective and the supplier notified at once.

4.21 Storage arrangements should ensure adequate stock turn-around. Periodic checks for general condition of cylinders and leakage should be made.

4.22 Storage compounds and storage rooms must have appropriate warning signs located so that persons both entering and working adjacent are aware of the gases stored and the safety precautions to be applied. LPG stores or storage compounds in particular should be provided with external signs reading ‘Highly Flammable LPG’ and ‘No Smoking or Naked Lights’.

Table (3) amount of LPG in columns of stacks

Amount of LPG in any vertical cylinder	Amount of LPG in any vertical column of stack	
Kilograms	Palletized (kilograms)	Non –palletized (kilograms)
Up to 6	35	30
Over 6 up to 15	75	45
Over15 up to20	80	50
Over20 up to 55	110	55

5.0 Care in the Use of Cylinders

5.1 The majority of dangerous incidents involving compressed gas cylinders result from mishandling during use. The incidents fall under a number of well-defined headings:

5.1.1 Cylinders may be subject to undue strain by blows or mechanical damage.

5.1.2 Pressure in the cylinder may be increased and the cylinder wall may be weakened by heat.

5.1.3 The gas may escape from the cylinder valve or apparatus attached to it and form a hazard by becoming concentrated in a confined or semi-confined space.

5.1.4 The gas in the cylinder may accidentally come into contact with some material with which it reacts violently or even explodes.

5.1.5 Faulty apparatus may be attached to the cylinder or, after attachment, may become damaged.

5.2 Cylinders should not be used as rollers or supports or for any other purpose than to contain the gas as supplied.

5.3 General precautions for handling are detailed in subsection 1.3 above. When in use cylinders should, wherever possible, be clamped vertically in a suitable trolley. If removed from the trolley they should not be left free standing, but should be secured with rope, wire or clamps of adequate size to prevent toppling if struck by a moving object or if pulled by attached hoses.

5.4 Cylinders must not be allowed to come into contact with electrical apparatus, especially arc welding tools, or live wires, since arcing may be set up which will heat or damage the cylinders.

5.5 As when stored, cylinders must be kept away from sparks, flames or slag from welding or cutting operations. They should not be used close to stoves, boilers, etc. LPG cylinders for bitumen boilers should be kept at least 3 meters from the burner and always upwind thereof.

5.6 If an acetylene cylinder is heated accidentally or becomes warm due to excessive or severe backfire from use of faulty equipment, it must be dealt with as follows:

5.6.1 Shut the cylinder valve. Drench the cylinder with cold water until cool, then detach the regulator or other fitting and take the cylinder to open air. Contact with the supplier for further advice is also recommended.

5.6.2 If the cylinder is too hot to touch, immediately evacuate the area. Call the fire brigade and advise them of the situation. Then, if possible, drench the cylinder with a spray of cold water from a protected position.

5.7 For an LPG cylinder which is leaking and on fire, if the valve can readily by closed this should be done and the fire thus extinguished. If the valve has been damaged; again evacuate the area and call the fire brigade indicating that LPG is involved.

5.8 For hydrogen cylinders leaking and on fire, do not attempt valve closure, but evacuate the area and call the fire brigade indicating to them that hydrogen is involved.

5.9 For cylinders containing compressed gases which have become heated by an adjacent outbreak of fire, evacuate the area. Call the fire brigade indicating to them what gas is involved, then try to fight the fire from a protected position, using copious amounts of water to cool the cylinders and control the fire.

5.10 Every effort should be made to avoid leakages. Tests should always be made with soapy water and a brush and NEVER by means of a naked flame (which is in any case ineffective in detecting leaks of non-flammable gas).

5.11 As observed under the rules for storage, oil, grease or other combustible materials should never be permitted to come into contact with oxygen cylinders, valves or other fittings.

5.12 Oxygen has no smell and whilst it does not itself burn, it renders already combustible materials even more combustible and accelerates a fire once it has started. Thus in an oxygen-enriched atmosphere material which are normally difficult to ignite may become highly combustible and burn with great intensity.

5.13 In a confined space all gases are potentially hazardous, whether they are toxic and / or flammable, asphyxiating or, as in the case of oxygen, capable of increasing the risk of fire. The importance of good ventilation cannot therefore be overstressed.

5.14 Personnel should never lubricate any valve or fitting. This should not be necessary. White or red lead, jointing compound or jointing tape should also not be used.

5.15 Acetylene can form explosive compounds in contact with certain metals or alloys, in particular those of copper and silver. Therefore, joint fittings or piping made of copper should on no account be used, and acetylene should never be allowed to come into contact with copper or any alloy containing more than 70% copper.

5.16 During use as well as storage, cylinders and valves should be kept clean. Grit, dust, oil or dirty water should not be allowed to contaminate valves or fittings and the common malpractice of allowing cylinders to lie in the mud on sites should always be prohibited.

5.17 Cylinder valves may be cleared of loose dirt by ‘sniffing’ some gas through the valve (except hydrogen), i.e. by briefly opening then closing the cylinder valve before attaching regulators or fittings. Stand clear of the cylinder valve outlet when ‘sniffing’, and with flammable gas ensure no source of ignition is in the vicinity. With all gases ensure good ventilation when carrying out the ‘sniffing’ operation.

5.18 Hydrogen should never be sniffed as it may ignite spontaneously.

5.19 The main cylinder valve should always be shut off when work has to be stopped for more than a few minutes or when the cylinder is empty.

5.20 Cylinders should be removed from working areas and put back into store at the end of the working period.

6.0 Valves, Regulators and Gauges

6.1 Valves

6.1.1 Cylinder valves should always be opened slowly. All cylinder valves close in a clock-wise direction, irrespective of whether the cylinder contains a fuel gas or a non-combustible gas.

6.1.2 An open valve should be left a half turn back from full open so that movement to the back stop indicates the valve is open.

6.1.3 The valve should be closed clockwise sufficient to stop the gas flow, but not wrenched shut.

6.1.4 Excessive force must not be used, and only the recommended cylinder valve key should be used. Increased leverage by use of spanners or longer keys should be prohibited.

6.1.5 If the regulator or cylinder valves become frozen, they may be thawed with hot water, never by flame.

6.1.6 If the valve spindle is too stiff to open by hand or is damaged or broken, the cylinder should be returned to the supplier unused. Removal of the gland nut should never be attempted.

6.1.7 Cylinders should not be moved from place to place with regulators and hoses fitted, unless a proper trolley or carrier is used. The main cylinder valve should always be shut during transit. Valve protection guards or caps should, where practicable, be fitted before moving cylinders.

6.1.8 Never use a needle valve in place of a regulator. A needle valve thus used may cause bursting of the hose if the gases are cut off at the torch, as the hose will be subjected to cylinder pressure.

6.1.9 Use needle valves for fine adjustment only downstream of the pressure regulator.

6.2 Regulators

Welding or cutting apparatus should not be used unless automatic pressure regulators are fitted to oxygen and fuel gas cylinders.

6.2.1 Before fitting a pressure regulator onto a full cylinder, the adjusting screw for regulating the outlet pressure should be set to zero, otherwise the regulator may be damaged.

6.2.2 The correct regulator must be used for the particular cylinder and the compatibility of threads checked accordingly.

6.2.3 The outlet of industrial gas cylinder valves feature screwed 5/8 in thread as follows:

6.2.3.1 Right-hand for oxygen and non-flammable gases.

6.2.3.2 Left-hand for acetylene, hydrogen and flammable gases.

6.2.4 Cross-threaded connections should never be forced, and worn threads, jointing compound or tape should not be used.

6.2.5 Where cylinders are connected to manifolds or headers, the equipment must be properly designed and installed, and fitted with one or more pressure regulators.

6.2.6 No attempt must be made to interchange regulators. Each is designed for use with a specific gas and should be marked accordingly.

6.3 Gauges

6.3.1 Only pressure gauges recommended by the supplier should be used. If the gauge attached to a regulator is defective the complete regulator should be exchanged and amateur repairs prohibited.

6.3.2 Gauges for oxygen should be marked 'OXYGEN' and must not be tested for leaks with oil – always with soap and water.

6.3.3 Gauges used to show content of oxygen, nitrogen and hydrogen cylinders should have a maximum dial reading of not less than 225 bar (3260 lb/in2).

6.3.4 Gauges used to show the contents of acetylene cylinders should have a maximum dial reading of not less than 40 bar (530 lb/in2).

NB: Acetylene is classed as an explosive when used at pressures in excess of 0.62 bar (9 lb/in^2). (Order in Council No. 30, as amended by the Compressed Acetylene Order 1947, made under the Explosives Act 1875). Acetylene should not therefore be used on site at pressures exceeding 0.62 bar (9 lb/in^2) unless permission has first been granted by the Explosives Branch of the HSE, which should always be consulted in such circumstances.

7.0 Hoses and Torches

7.1 Only hose that conforms to BS 5120 should be used to connect the torch to the gas cylinders.

7.2 Inferior quality hose tends to harden, crack and leak and may fire internally when oxygen passes through it.

7.3 Hose should conform to the accepted color coding set out in BS 3212 and BS 5120. In particular, the following colors apply:

(a) Blue – Oxygen

(b) Red – Acetylene

(c) Orange – Propane

7.4 Lengths of hose are supplied with ends firmly crimped to nipples having screwed unions suitable for connecting to standard regulator outlets and torch inlets. Makeshift connections should on no account be used.

7.5 Lengths of hose should be kept as short as possible. Where hoses must be joined, only approved couplings should be used and dismantled when the job is complete.

7.6 Joint fittings or piping made of copper should not be used where acetylene is used.

7.7 With oxy-fuel gas equipment, flashbacks can occur. One of the principal causes is back-feeding from a high pressure gas hose into a lower pressure gas hose. Non-return check valves should be fitted to each hose at the torch.

7.8 Approved flashback arrestors designed to quench the flashback and release pressure should be fitted to both fuel gas and oxygen regulators. In addition, they should incorporate cut-off valves for automatically shutting off the gas supply.

7.9 Frequent accidents occur due to leakages from supply hoses which have become loose or blown off. Hoses should not be dragged round sharp corners or placed where they can be run over by site vehicles. Hose connections, hoses and torches should be inspected at least daily before use.

7.10 Torch nozzles should be examined regularly. Blocked nozzles should be cleaned as recommended by the manufacturer or be exchanged by the equipment supplier.

7.11 Cylinders should not be used to support the work, nor should the torch flame be allowed to come into contact with the cylinder. The torch, when alight, should not be hung on the cylinder or the regulator, nor should the torch ever be left burning and unattended.

8.0 Light-up / Shut-down Procedure

Taking oxygen / acetylene as an example, the following procedure is recommended:

8.1 Check that the pressure adjustment screw on each regulator is wound out (anti-clock-wise). Check that the torch valves are closed. Slowly open the acetylene cylinder valve (the cylinder pressure gauge will then register the cylinder pressure).

8.2 Wind in (clockwise) the regulator adjustment screw until the outlet pressure gauge indicates the required working pressure.

8.3 Open the acetylene valve on the torch. Adjust the outlet pressure if necessary. Close the valve when the hose has been purged.

8.4 Repeat for oxygen.

8.5 Keep the torch nozzle away from any source of ignition. Open the acetylene valve on the torch. Ensure that gas is flowing freely from the nozzle. Ignite the gas preferably using a spark lighter held at right angles to the nozzle. Adjust the valve until the flame ceases to smoke. Slowly open the torch oxygen valve until the central core of the flame is sharply defined.

8.6 If the blowpipe flashes back on lighting up it because:

8.6.1 The regulators are not set to the correct pressure;

8.6.2 A light has been applied before the flow of fuel gas has been properly established.

8.7 If the flame snaps out when the blowpipe is in use it is because:

8.7.1 The regulator pressure and / or gas flow is / are incorrect (either too high or too low);

8.7.2 The nozzle has been obstructed;

8.7.3 The nozzle is held too close to the work;

8.7.4 The nozzle has become over-heated.

8.8 Completely shut both torch valves, check the regulator setting and cylinder pressures and relight in accordance with the above procedure.

8.9 In the case of [1.8.7 (d)] above, plunge the nozzle and torch head into cold water. Make sure the nozzle is tight before relighting the torch.

8.10 To shut down, first close the acetylene valve of the torch, and then the oxygen valve. Close the acetylene cylinder valve and then the oxygen valve. Open and close the torch valves to vent the system. Wind out the regulator screw (anticlockwise) of both regulators.

9.0 General Precautions

Personnel using compressed gas equipment should observe the following general precautions:

9.1 Inspect rubber hose periodically to see that it is free from cuts, cracks, burns and worn places, and arrange it so that it cannot be run over, cut by contact with sharp edges or corners, falling metals, sparks, or the torch flame.

9.2 Use hoses which are as short as possible and of equal length, and do not coil any surplus hose round regulators or cylinders.

9.3 Do not use odd bits of tubing and remember that copper or high copper content alloy should not be used in acetylene hose or other parts in contact with acetylene. Use a proper adaptor.

9.4 Be sure to observe carefully the maker's instructions for lighting and using torches.

9.5 Do not use pressures in excess of those recommended, or heavy-duty high delivery regulators where only low pressures are required.

9.6 Never attempt to light a torch until sufficient time has elapsed, after opening the torch acetylene valve, for the gas in the hose to normalize at the correct working pressure and all air to be blown from the hose.

9.7 Always follow the equipment manufacturer's instructions.

9.8 Do not site or use cylinders adjacent to the intake of air compressors or internal combustion engines.

10.0 Emergency Action Checklist

10.1 Where relevant, ensure drivers transporting cylinders containing prescribed dangerous gases carry the appropriate Transport Emergency Card or safety data sheet for each of the gases involved.

10.2 If involved in a road accident and the emergency services are called, ensure that they are advised that cylinders are being carried and show them the data on the Transport Emergency Card or safety data sheet.

10.3 Should a cylinder become accidentally damaged it must be taken out of service and the supplier notified.

10.4 On job completion and at the end of each work period, disconnect hoses attached to cylinders leading into confined spaces or remove hoses from confined spaces or remove hoses from confined spaces when not in use. Leakage of gas in a confined space can lead to a toxic and / or flammable atmosphere and oxygen enrichment if the gas involved is oxygen. In certain cases, the gas (even if inert) can also displace the ambient oxygen in the confined space and cause asphyxiation.

10.5 In the event of asphyxiation and collapse, remove victim to fresh air, apply artificial respiration if necessary, and seek medical help.

10.6 In the event of fire, follow the advice given in paragraphs 5.6 to 5.9 for the particular gas involved.

19. Hazardous Waste Operation

1.0 Introduction:

Inadequate waste management may lead to considerable environmental damage which is against GANOPE HSE policy goals.

No Accidents, No Injuries, No Harm to Environment

In addition, financial and legal liabilities, the purpose of this procedures are to effectively manage all controlled solid and liquid wastes. generated by GANOPE activities in a manner that reserve the environment.

2.0 Definitions:

Wastes defined as any unwanted scraps which there is no economic demand for it and should be disposed by reuse, recycling, land filling, incineration or other waste treatment and disposal process.

The following definitions will be used for differentiation between each type of wastes.

Burnable wastes; Paper, carton, small pieces of wood, wiping wastes, ...etc.

Metallic Scrap; Wires, metallic, chips ...etc.

Food Wastes; food scraps

Hazards Wastes; Empty paints, lube oil and cleaner cans, used paint brushes, oil and fuel filters, glass wool, broken glasses, electrical lamb...etc.

3.0 Application

Wastes covered by this practice includes:

- Solid wastes generated from company activity which routinely disposed by reuse, recycling, land filling.
- Liquid wastes which is the domestic swage water.
- **This application does not cover** the hazard wastes that could be produced from the routine activity of the company.

4.0 Responsibility

Implementing of this practices is the responsibilities:

- Administration Services Department.
- Maintenance Department.
- HSE Department.

4.1 Administration services:

- Committed with the obligations stated in this practice.
- Meet GANOPE HSE policy.
- Ensure the provision of appropriate number of waste collection container.
- Ensure labeling of these containers according to each type of waste.
- Ensure plastic bags for garbage collection, do not allow transfer of scattered wastes like (office, canteen and kitchen wastes).
- Keep the Maintenance of the disposal area in coordination
- Follow up the maintenance of trash truck with MTC Div.
- Ensure that all personnel are aware of their responsibilities with regards to waste management procedures.
- Ensure that records are kept of all waste management procedures.

4.2 Maintenance Dept.

- Committed with the obligations stated in this practice.
- Meet GANOPE HSE policy.
- Ensure segregation of all wastes and storage it in the suitable container such as lamb, battery, used chemical bottle…etc.

4.3 HSE Dept.

- Provide assistance when requested of waste management code and practices.
- Provide information on any new legislation of waste management.
- Review and maintain this Practice.
- Ensure that waste management program and practices are developed and regularly reviewed.
- Ensure waste management activities are included in audit programs.

5.0 Procedures

5.1 Waste Minimizing

- Waste minimization is a fundamental aspect of good waste management.
- All departments are expected to contribute in waste reduction.
- Managers must review their activity to identify opportunities for improvement as part of their Waste Management Program.

5.2 Waste Reuse

- Reuse means to use the solid waste again without treatment.
- Examples for wastes reusable are paper, broken glass, plastic bottle…. etc.
- Recyclable materials should be provided as possible

5.3 Waste Segregation

- Solid wastes should not mix to prevent risks to the environment or personnel during
- Wastes should be segregated and stored in labeled containers (drums) suitable to contain the waste.
- Wastes should be collected in plastic bags to avoid scattering.
- The following colors will be used for

Paper waste ---------- Red
Metallic waste ---------- Blue
Plastic waste ---------- Green

5.4 Waste Disposal Area

- The main waste disposal area is located at the exit of the basement B1.
- Three areas should be specified and labeled for each type of wastes.

5.5 Waste Transportation

- Only certified contractor will be used for collecting and transporting of solid wastes.
- Use suitable vehicle for Transportation of solid wastes.
- Avoid leakage or spill of wastes during transportation

6.0 Auditing

The debits stated in this document shall be audited annually by HSE dept. to verify commitment and compliance with Ganope policy.

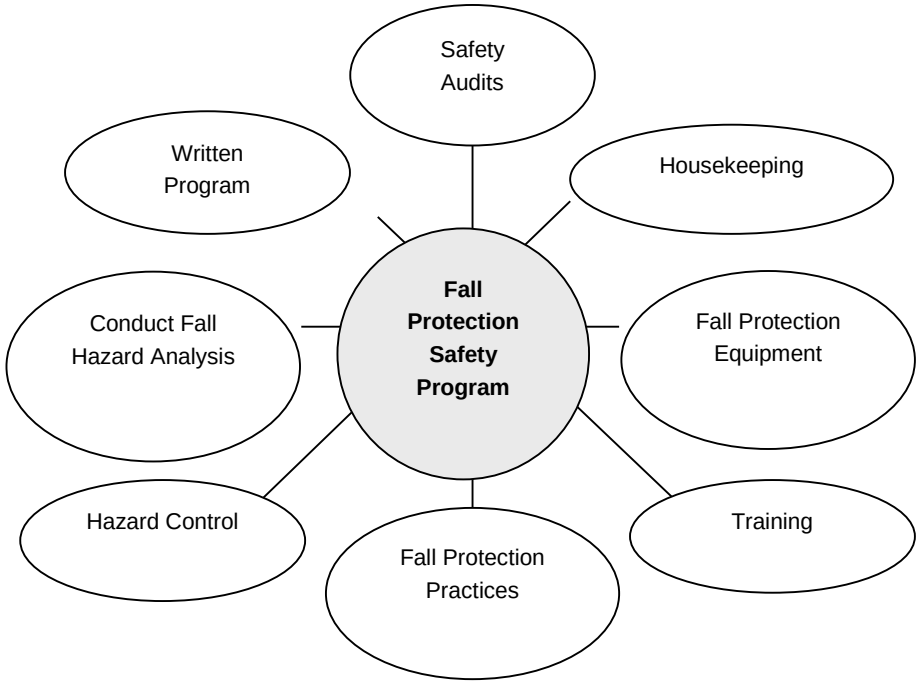
7.0 Training

All personnel should receive awareness training on waste management.

20. Fall Protection

1.0 Introduction

- Because injuries received from falls in the workplace are such a common occurrence, HSE Engineers not only need to be aware of fall hazards, but also of the need to institute a Fall Protection Safety Program that includes the components shown in Figure (1).



- The National Safety Council's annual report typically predict 1,400 or more deaths and more than 400,000 disabling injuries each year from falls. Falls are the leading cause of disabling injuries accounting for close to 18% of all workers' compensation claims.
- The construction industry (42% of all injuries result from falls) has the largest percentage of injuries.
- An NSC Accident Facts publication (1984 & 1985) reported that 70% of reported falls were from scaffolds, 14% from roofs, and another 14% were from barrels, boxes, equipment, or furniture.

2.0 Fall Protection: Defining the Problem

2.1 The actual needs of any type of fall protection program are going to be driven mainly by the type of work the organization does, the HSE department must first define their needs accordingly.

2.2 Falls in the workplace also include: slips, trips, and stair falls, as well as elevated falls. Slips and trips are falls on the same level.

2.3 Stair falls are falls on one or more levels. Elevated falls are from one level to another.

3.0 Physical Factors at Work in a Fall

3.1 Friction is the resistance between things, such as between shoes and the walking surface.

Without friction workers are likely to slip and fall.

Probably the best example of this phenomenon is a slip on ice.

On icy surfaces, shoes can't grip the surface normally, causing a loss of traction and a fall.

3.2 Gravity is (on Earth) the force of attraction between any object in the Earth's gravitational field and the Earth itself.

Simply put, gravity is the force that pulls you to the ground once a fall is in process.

3.3 If someone loses balance and begins to fall, they are going to hit the ground.

3.4 The human body is equipped with mechanisms that work to prevent falls (loss of balance or center of gravity).

3.5 These mechanisms include the eyes, ears, and muscles, which all work to keep the human body close to its natural center of balance.

3.6 If this center of balance shifts too far, a fall will occur if balance can't be restored to normal.

4.0 Slips: Falls on the Same Level

4.1 A slip is a loss of balance caused by too little friction between the feet and surface walked or worked on.

4.2 This slip (loss of traction), in turn, often leads to a loss of balance. The result is a fall.

4.3 Slips can be caused by a number of design factors and work practices, individually or in combination.

4.4 Design factors include: footwear, floor surfaces, personal characteristics, and the work task as follows:

- Footwear is an important consideration in the prevention of a slip-fall. Not only is the condition of the footwear important in fall prevention, but also the composition, shape, and style. Safety shoes should not only be designed to include toe protection; they should also include slip resistant soles.
- For floor surfaces, design, installation, composition and condition, gradient, modifications by protective coatings and cleaning / waxing agent and illumination are all important elements that must be taken into consideration in providing safe floor surfaces in the workplace. Common solutions used to make floor surfaces slip-resistant include grooving, gritting, matting and grating.

4.5 Slips can also be the result of work practices – work practices that cause walking surfaces to be constantly wet – wet from spills, or wet or slippery from weather hazards like snow and ice.

4.6 Workplace supervisors and workers (and the HSE Dept.) must follow safe work practices and exercise vigilance to ensure such conditions do not occur, or are remediate as quickly as possible when they do.

4.7 The common workplace safe work practice and housekeeping rule should be to clean up spills right away.

4.8 Another unsafe work practice that commonly leads to slip-falls is when the worker is in a hurry, rushing to finish whatever he is attempting to accomplish.

5.0 Trips: Falls on the Same Level

5.1 Trips normally occur whenever a worker's foot contacts an object that causes him to lose balance. However, you do not always have to come into contact with an object to trip.

5.2 Trips may be caused by too much friction between the foot or footwear and the walking surface.

5.3 Like slips, trips are commonly caused when the worker is rushing, hurrying to complete whatever it is he is doing. The problem with hurrying is, of course, is that the victim's attention is usually focused on anything but possible trip hazards.

5.4 Another common factor that leads to a trip is the practice of carrying objects that are too large for the worker to adequately see the walking surface in front of him.

5.5 Lighting also plays a critical role in preventing trips. Inadequate lighting fixtures, burned-out bulbs, and lights that are turned off all increase the opportunity for trips to occur.

5.6 Again, as in the prevention of slips, housekeeping plays an important role in prevention. Good workplace housekeeping practices include keeping passageways clean and uncluttered; arranging equipment so that it doesn't interfere with walkways or pedestrian traffic; keeping working areas clear of extension or power tool cords; eliminating loose footing on stairs, steps, and floors.

6.0 Stair Falls: Falls on One or More Levels

6.1 For example, it is widely known and accepted that stairs are a high-risk area. It is also accepted that a loss of balance can occur from a slip or trip while someone is travelling up or down a stairway.

6.2 Loss of traction is the cause of most stairway slipping and falling accidents.

6.3 Many of the stairway slipping and falling accidents happen because of water or other liquid on the steps.

6.4 Along with improper housekeeping practices, stairs can also become hazardous whenever they are improperly designed, installed, and/or neglected.

7.0 Elevated Falls: Falls from One Level to Another

7.1 The risk of serious injury from an elevated fall is increased exponentially whenever the worker has a loss of balance resulting from a slip or trip.

7.2 Unfortunately, experience has shown that often the practice of various companies and supervisors requiring workers to perform work from elevated areas is to use some type of device (handrail or hand-line), which they are supposed to grab in order to break their fall.

7.3 These types of jerry rigged devices are not acceptable substitutes for guardrails, appropriate mid-rails, and toe-boards. OSHA requires guardrails to be 41" nominal, mid-rails 21" and toe-boards 4"

21. Combustible and Flammable Liquid Storage and Handling

1.0 Introduction

Combustible gas indicators are an important segment of a total fire protection program. They are primarily considered an indicator or early warning system to potentially hazardous conditions which will allow immediate corrective actions to be taken and possible process shutdown, if found necessary.

2.0 Objectives

The objectives of a combustible gas indicator program are:

2.1 To ensure a safe working environment through combustible monitoring.

2.2 To emphasize the need for a proper maintenance program.

3.0 Guidelines / Strategies

Combustible gas indicators are divided into two main categories, portable and fixed. Both types will be described in the following sections.

3.1 **Portable Combustible Gas Indicators**

3.1.1 Portable combustible gas indicators are as the name implies, “portable” which means they can be carried anywhere. It tests primarily for flammable gases. It uses a set of batteries to measure the oxidation rate of the gas, which is then read from a meter calibrated to show the combustibility of the gas concentration.

3.1.2 Portable combustible gas indicators, sometimes called explosimeters, shall be used in accordance with the manufacturers’ recommendation for determining the lower explosive limit (LEL) of combustible gas in the air. The LEL is also commonly referred to as the lower flammable limit (LFL). The operating supervisor shall be responsible for ensuring the requirements of this program are implemented and enforced.

3.2 **Calibration**

3.2.1 Portable combustible gas indicators shall be inspected and field calibrated, in accordance with the manufacturers instruction, prior to use. All field calibration tests will be done upwind, in a clean fresh air environment, away from the area to be tested. The reasons for testing in this area are:

3.2.1.1 The instrument is not contaminated and therefore may give false readings.

3.2.1.2 So that the personnel are in a safe working environment.

3.2.2 If the instrument is to be used numerous times during a shift, it may only be necessary to calibrate prior to the initial use unless the instrument has been dropped or moved which may affect the calibration of the unit.

3.2.3 Field calibration and maintenance records must be documented by operating personnel and maintained on file at the local field office / or safety office.

3.3 **Uses**

Portable combustible gas indicators shall be used when:

3.3.1 Lighting fired heaters.

3.3.2 Issuing hot work permits.

3.3.3 Doing all confined space entry work.

3.4 **Training**

Personnel required operating portable combustible gas indicators shall receive initial and refresher training on the use, limitations, and care of the instruments per the manufacturer's operating instructions.

All training will be conducted by qualified personnel only and will be documented and kept on file.

3.5 **Testing**

Testing procedures must conform to certain criteria.

3.5.1 The test must be valid and accurate which means that the correct instrument of known accuracy was used in such a manner as to give the true picture.

3.5.2 The person using the instrument must make sure that the instrument is giving reliable information and that it is interpreted correctly.

3.5.3 The goal of the test is not to show vapors within certain limits but to show the actual picture of the entire contents of the space. If the presence of vapor is indicated, the space or area must be re-evaluated to determine why, and that corrective measures taken before work proceeds.

3.6 **Exposure Protection for Personnel Conducting the Test**

It must be understood that testing an area because there is a possibility of a hazardous condition, the person conducting the test must be protected from the potential hazard and be properly equipped with the necessary safety equipment.

3.7 **Where to Conduct Tests**

Location is important because the hazard may be restricted to a small portion of the entire volume, therefore, TEST THE WHOLE VOLUME! If the vapor or gas has a specific gravity which is different from that of air to any degree, there may be lighter gases collecting at the top while the heavier ones will hug the floor and collect in pits and sumps.

3.8 **Interpretation of Readings**

3.8.1 The operator must always watch the meter while testing. The needle can quickly rise and fall in a high concentration and come to rest on that part of the scale that would indicate a safe reading, yet in actual fact, an extremely dangerous concentration could exist. This is particularly evident when strong concentrations of explosive vapor are in an oxygen deficient atmosphere.

3.8.2 Personnel operating combustible gas indicators must be required to study the instruction manual on the device regularly so they can be aware of the limitations and characteristics of the instrument.

3.8.3 Unless instruments are maintained and checked at regular intervals by competent and qualified personnel, the usefulness of both instrument and operator is significantly reduced and those person's dependent upon accurate readings may be unnecessarily placed in jeopardy.

3.9 **Check Points for Tester**

3.9.1 <u>Do's</u>

3.9.1.1 Do select the correct sampling hose for the specific application.

3.9.1.2 Do follow the proper instructions for the care and maintenance of the instrument.

3.9.1.3 Always use the shortest length of sampling hose, this will minimize the possibility of vapors condensing in the hose.

3.9.1.4 Whenever a reading is obtained, purge the instrument in fresh air, and take a second test to be certain of an accurate reading.

3.9.1.5 Purge the indicator by drawing in fresh air, even if another sample is not to be taken right away, as this removes any possibility of contamination by corrosive gases in the combustion chamber.

3.9.1.6 Do check the calibration of the instrument to be sure it is reading accurately.

3.9.1.7 Do check the battery voltage and/or zero adjustment periodically.

3.9.1.8 Do check the instruments for tightness.

3.9.2 **Don'ts**

3.9.2.1 Don't sample high temperatures with a cold instrument. Condensation may occur and give a false reading. Whenever possible, the instrument must be at the same temperature as the vapor being sampled.

3.9.2.2 Don't remove the flashback arresters from the instrument. They prevent the explosion which occurs in the combustion chamber from passing back to the mixture being sampled.

3.9.2.3 Don't use the indicator for sampling gasoline vapors containing TEL (tetraethylead, liquefied lead additive) unless the indicator has been approved for this specific application.

3.9.2.4 Don't let the sampling hose or probe reach into a liquid.

3.9.2.5 Don't adjust the voltage when a sample is in combustion chamber.

3.10 **Fixed Combustible Gas Detectors**

Fixed combustible gas detectors are detectors which are permanently placed at strategic locations to monitor conditions on a continuous basis.

Fixed or automatic combustible gas detectors / systems shall be used to initiate alarms and shutdowns in company facilities where hazardous levels of combustible gas could accumulate and where deemed appropriate by local management, e.g.

3.10.1 Any malfunction or abnormal condition which prevents safe operations of the plant shall initiate appropriate action to automatically shut down the facility.

3.10.2 When the facility operates on purchased electrical power, shutdown features must incorporate adjustable time delays to prevent plant shutdown from short duration power outages. Automatic restart systems shall be overridden by the shutdown system.

3.10.3 Partially attended plants, those which are not manned 24 hours a day, must have suitable provisions incorporated so the unit(s) can be automatically shut down for 24 hours without causing damage to the facility.

3.10.4 In partially attended facilities, each condition that actuates a shutdown must also actuate a visual annunciator. A remote signaling device must be actuated during unattended periods.

3.10.5 In fully attended facilities, each condition that actuates a shutdown must actuate a visual and audible alarm prior to the shutdown. These alarms must actuate sufficiently ahead of each shutdown point to give time for corrective measures to prevent a shutdown.

3.10.6 Concentrations of combustible gases that will trigger alarms and shutdowns shall be as follows. These are maximum set values. Set points may be lower.

3.10.6.1 10 % LEL – Low alarm, actuate alarms / annunciator

3.10.6.2 50 % ELL – High alarm, may or may not actuate shutdowns, depending upon the capability of the facility.

3.10.7 Combustible gas detection systems shall be calibrated in accordance with the manufacturer's recommended procedures or at least every three (3) months, whichever is more frequent.

3.11 **Records**

Records must be maintained on the calibration of these instruments at the office of the person in-charge.

22. Compressed Air Use and Storage

1.0 Introduction

Compressed air is occasionally used throughout the oil and gas industry as a method of cleaning. However, it is potentially dangerous and must be treated with due care and respect.

2.0 Objective

The objective of a compressed air use and storage program is to highlight general practices that must be followed when using compressed air.

3.0 Guidelines / Strategies

3.1 All compressed air outlets used for parts cleaning will be posted with a sign and regulated to no greater than (30 psi). If air outlets have a self-regulated cleaning tip [regulated to (30 psi) or less] then the sign will not be necessary.

3.2 Compressed air must only be used for cleaning parts when no other acceptable means is available.

3.3 Before using compressed air for parts cleaning, make sure that debris will not be blown onto someone else. To prevent debris from flying, cover equipment with a canvas.

3.4 Never use compressed air for cleaning clothes or body parts.

3.5 Eye and face protection shall be worn to prevent injury from flying particles.

3.6 Before operating an air hose, examine all connections to make sure they are tight and will not come loose under pressure, hold nozzle when turning the air on or off.

3.7 Do not kink the hose to stop the air flow; always turn off the air at the control valve.

3.8 Check hoses regularly to ensure that they are in good condition and free of leaks.

3.9 Never use hoses to raise or lower tools.

3.10 Be sure not to leave hoses lying around where they can become a stumbling hazard.

3.11 Never point a compressed air nozzle at another person and never use compressed air for practical jokes.

3.12 Never use excessive lengths of hoses as they can create a tripping hazard on work platforms, access ways, and possible escape routes.

3.13 Always rout lines to the sides of walkways.

3.14 Cylinders must be stored properly and securely, not left lying around where they could be damaged by falling objects or tripped over by fellow workers.

Under no circumstances must a burst hose be taped over. Cut out the damaged piece of hose and affect a proper repair, or replace the hose at once.

23. Excavation / Trenching / Shoring

1.0 Introduction

1.1 Excavation is an essential element of the construction process particularly in relation to the construction of foundations, drainage work and site regarding of all kinds.

1.2 In carrying out an excavation, the soil conditions can vary widely, often in short distances. No soil, whatever its nature, can be relied upon to support its own weight for any length of time.

The excavation can be battered to a safe slope, the sides will need supporting to prevent the possibility of collapse and thus:

1.2.1 Provide safe conditions for persons working in or adjacent to the excavation;

1.2.2 Enable the works to be carried out without interruption and;

1.2.3 Protect adjacent property and/or public services.

1.3 The Health and Safety requires that a safe place of work and safe means of access to and from it must be provided. The property of others must also be safeguarded. Whenever excavation has to be undertaken, therefore, adequate prior consideration needs to be given to the soil conditions that will be met, the method of excavation to be used and the manner in which any necessary support will be provided.

1.4 Traditionally, timber has been used in the support of excavations. However, modern methods incorporate steel.

1.5 All excavation work within or near existing plant will require a work permit in addition to the usual hot and/or cold work permits. This will normally be a specific excavation permit but, if the excavation is to exceed a stipulated depth, a confined space entry permit will also be required. Whilst any excavation remains open, a confined space entry permit will usually be required before any person is allowed to enter that excavation.

2.0 Definitions

Benching:	A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or series of horizontal levels or steps, usually with vertical or near vertical surfaces between levels.
Cave-in:	The separation of a mass of soil or rock materials form the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by failing or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.
Competent Person:	One who is capable of identifying existing and predictable hazards in the surroundings or working conditions, which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
Angle of Repose:	The greatest angle above the horizontal plane at which a material will lay without sliding.
Cleats (Scabs):	Pieces of wood that solidly connect the crosspieces to the horizontal members (wale's).

Excavation:	Any man-made cavity or depression in the earth's surface, including its sides, walls or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation. If installed forms or similar structures reduce the depth-to-width relationship, an excavation may become a trench. (Put another way, a trench is always an excavation, but an excavation is not necessarily a trench).
Sheeting:	Material (wood, steel, or concrete, which may form a continuous line) placed in close contact and providing a wall to resist the lateral pressure of water, adjacent earth, or other materials.
Spoil:	The material resulting from an excavation.
Struts (Braces):	The horizontal members of the shoring system whose ends bear against the uprights or stringers.
Tight Sheeting:	Sheeting that is butted close together to form a continuous solid wall to resist the lateral pressure of earth, water, or other material.
Trench:	A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.
Trench Shield:	A shoring system composed of steel plate and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom, and which can be moved along as the work progresses.
Wale's (Stringers):	The horizontal members of a shoring system whose sides bear against the uprights or earth.
Protective System:	A method of protecting employees from cave-ins, from material that could fall or roll from an excavation, or from the collapse of adjacent structure. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide necessary protection.
Sloping:	A method of protecting workers from cave-ins by excavating to form sides of an excavation that is inclined away from the excavation to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences such as soil type, length of exposure, and application of surcharge loads.

3.0 General Requirements

3.0 The following specific site conditions should be taken into account for safe excavations:

3.1.1 Traffic.

3.1.2 Nearness of structure and their conditions.

3.1.3 Soil.

3.1.4 Surface and ground water – the water table.

3.1.5 Overhead and underground utilities.

3.1.6 Weather.

3.1 Before any excavation actually begins, the standard requires the employer to determine the estimated location of utility installations: Sewer, telephone, fuel, electric, water lines or any other underground installations that may be encountered during digging.

3.2 No employee should operate a piece of equipment without first being properly trained to handle it and fully alerted to its potential hazards.

3.3 The standard requires that a competent person inspect, on a daily basis, excavations and the adjacent areas for possible cave-ins, failures of protective systems and equipment, hazardous atmospheres, or other hazardous conditions.

3.4 Adequate protective systems will be utilized to protect employees. This can be accomplished through sloping, shoring, or shielding.

3.5 Workers must be supplied with and wear any personal protective equipment deemed necessary to assure their protection.

3.6 All spoil piles will be stored a minimum of two (2) feet from the sides of the excavation. The spoil pile must not block the safe means of egress.

3.7 If a trench or excavation is 4 feet or deeper, stairways, ramps, or ladders will be used as a safe means of access and egress. For trenches, the employee must not have to travel any more than 25 feet of lateral travel to reach the stairway, ramp, or ladder.

3.8 No employee will work in an excavation where water is accumulating unless adequate measures are used to protect the employees.

3.9 A competent person will inspect all excavations and trenches daily, prior to employee exposure or entry, and after any rainfall, soil change, or any other time needed during the shift. The competent person must take prompt measures to eliminate any and all hazards.

3.10 Excavations and trenches 4 feet or deeper that have the potential for toxic substances or hazardous atmospheres will be tested at least daily. If the atmosphere is inadequate, protective systems will be utilized.

3.11 If work is in or around traffic, employees must be supplied with and wear orange reflective vests. Signs and barricades must be utilized to ensure the safety of employees, vehicular traffic, and pedestrians.

- The Safety Supervisor responsibilities includes:

- Supporting the operation and the effective implementation
- Monitoring compliance with this practice
- Signing permits in accordance with Egyptian regulations (Labor Law)

4.0 Ground Conditions

4.1 General

Before commencing any excavation, it is important to identify the type of ground in which the excavation is to be carried out.

4.1.1 When examining boreholes or trial pit information, particular importance should be paid to the location of any water table. If the water table is going to be exposed by the excavation, careful consideration will need to be given to how it may affect the stability of the excavation sides. Ground water can greatly affect the stability of any soil and, in particular, non-cohesive materials. Water can also enter an excavation as surface run-off.

4.1.2 Whatever the source of water, effective action is necessary, either to stop the water from surface sources entering altogether or, in the case of ground water, minimizing its effect to the greatest possible degree.

4.2 Surface Water

Surface ditches, streams, etc., likely to be interrupted by the excavation, may need diversion. Where the excavation is across a slope in the ground, cut-off ditches should be considered if the work is to be carried out in a rainy period. Where the location of filed drains is visible, they should be cut off and diverted before the main excavation starts.

4.3 Ground Water

4.3.1 The presence of ground water is more difficult to deal with than surface water. It may affect the sides of the excavation to the extent that, even if supported, wash out of material will occur between the sheeting. In certain soil conditions, the bottom of the excavation can become unstable and 'boil', with the inevitable total collapse of the trench. The relationship of ground water to the soil conditions needs careful analysis before a decision is made as to the support method to be used.

4.3.2 If the ground is suitable, one of several ground de-watering techniques may be used. Such methods involve either shallow well pumping or well-pointing. In either case, the pumping out of water has the effect of lowering the ground water table to a level below that to which the excavation is to be taken.

5.0 Soil Classification and Identification

5.0 The OSHA standards define soil classifications within the simplified soil classification systems, which consist of four categories.

5.1.1 Stable Rock

5.1.2 Type (A) Soil

5.1.3 Type (B) Soil

5.1.4 Type (C) Soil

5.1 Stability is greatest in stable rock and decreases through type (A) and (B) to type (C), which is the least stable.

5.2 Stable Rock: is defined as natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed. (Example: granite or sandstone).

5.3 Type (A) Soil: are cohesive soils with unconfined compressive strength of 1.5 tons per square foot or greater. (Example: clay, silty clay, sandy clay, clay loam).

5.4 Type (B) Soil: are cohesive soils with an unconfined compressive strength greater than 0.5 tons per square foot but less than 1.5 (tsf). (Example: angular gravel, silt, silt loam).

5.5 Type (C) Soil: are cohesive soils with an unconfined compressive strength of 0.5 tsf or less. (Example: gravel, sand and loamy sand, submerged soil, soil from which water is freely seeping).

6.0 Soil Test & Identification

Many kinds of equipment and methods are used to determine the type of soil prevailing in an area, as described below:

6.1 **Pocket Penetrometer:** Penetrometers are direct - reading, spring-operated instruments used to determine the unconfined compressive strength of saturated cohesive soils. Once pushed into the soil, an indicator sleeve displays the reading.

6.2 **Visual Test:** If the excavated soil is in clumps, it is cohesive. If it breaks up easily, not staying in clumps, it is granular.

6.3 **Thumb Penetration Test:** The thumb penetration procedure involves an attempt to press the thumb firmly into the soil in question. If the thumb makes an indentation in the soil only with great difficulty, the soil is probably type (A). If the thumb penetrates no further than the length of the thumb nail, it is probably Type (B) soil, if the thumb penetrates the full length of the thumb it is type (C).

6.4 **Dry Strength Test:** Try to crumble the sample in your hands with your fingers. If it crumbles into grains, it is granular. Clay will not crumble into grains, only into smaller chunks.

6.5 **Wet Manual Test:** Wet your fingers and work the soil between them. Clay is a slick paste when wet, meaning it is cohesive. If the clump falls a part in grains, it is granular.

7.0 Excavation Protection Systems

There are three basic protective systems for an excavation and trenches:

7.1 Sloping and Benching Systems

7.2 Shoring Systems

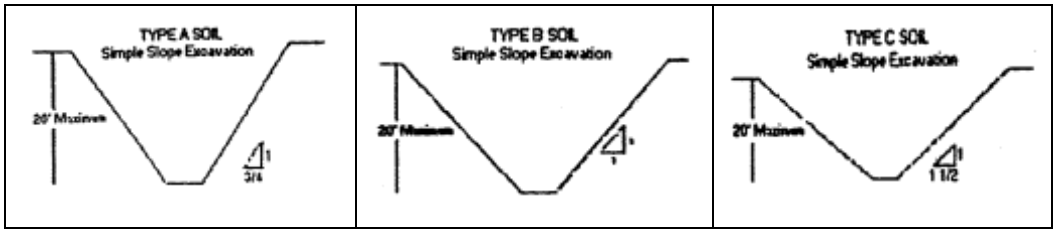
7.3 Shields Systems

The protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied to or transmitted to the system.

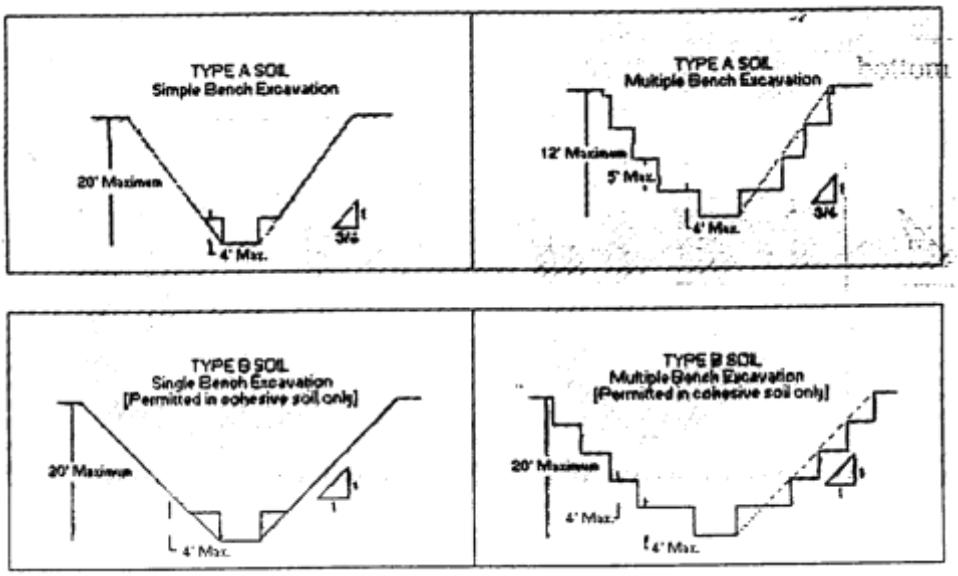
7.1 Sloping and Benching Systems

7.1.1 **Sloping Systems:** Maximum allowable slopes for excavations less than 20 feet (6.09 m) based on soil type and angle to the horizontal are as follows:

Soil Type	Height / Depth Ratio	Slope Angle
Stable Rock	Vertical	90 deg.
Type (A)	¾ : 1	53 deg.
Type (B)	1 : 1	45 deg.
Type (C)	1 ½ : 1	34 deg.

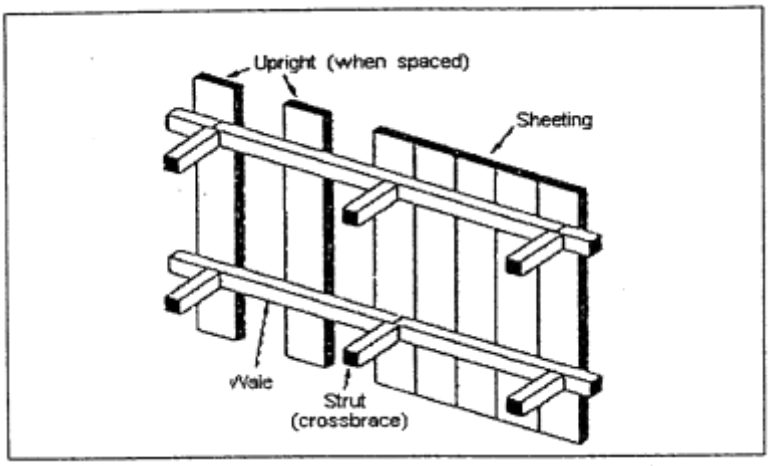


7.1.2 **Benching Systems:** There are two types of benching, simple and multiple. The type of soil determines the horizontal to vertical ratio of the benched side. As a general rule, the bottom vertical height of the trench must not exceed 4 feet (1.2 m) for the first bench. Subsequent benches may be up to a maximum of 5 feet (1.5 m) vertical in Type (A) soil and 4 feet (1.2 m) in Type (B) soil to a total trench depth of 20 feet (6.0 m).

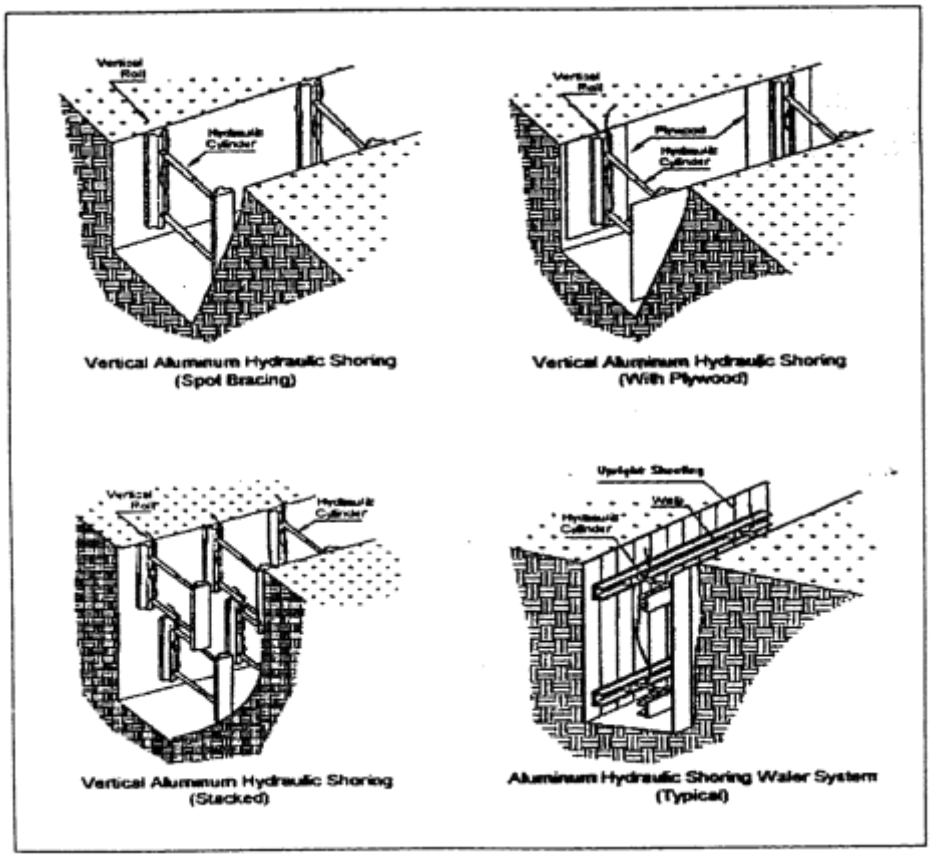


7.2 Shoring Systems

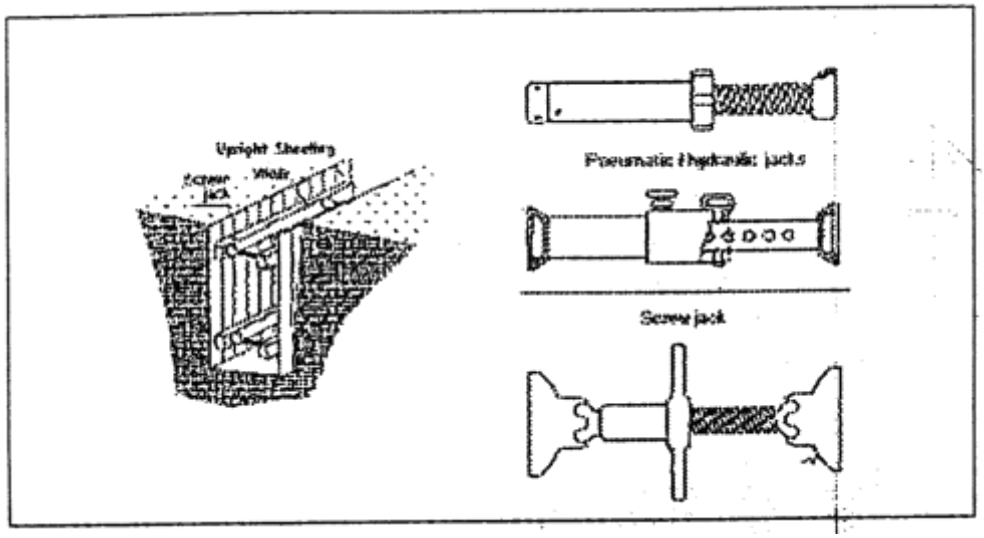
Shoring is the provision of a support system for trench faces used to prevent movement of soil, underground utilities, roadways, and foundations. Shoring is used when the location or depth of the cut makes sloping back to the maximum allowable slope impractical. Shoring systems consist of posts, wales, struts, and sheeting. There are two basic types of shoring, timber and aluminum hydraulic.



7.2.1 **Hydraulic Shoring:** Are a prefabricated strut and/or wale system manufactured of aluminum or steel. Hydraulic shoring provides a critical safety advantage over timber shoring because workers do not have to enter the trench to install or remove hydraulic shoring. All shoring should be installed from top down and removed from bottom up.

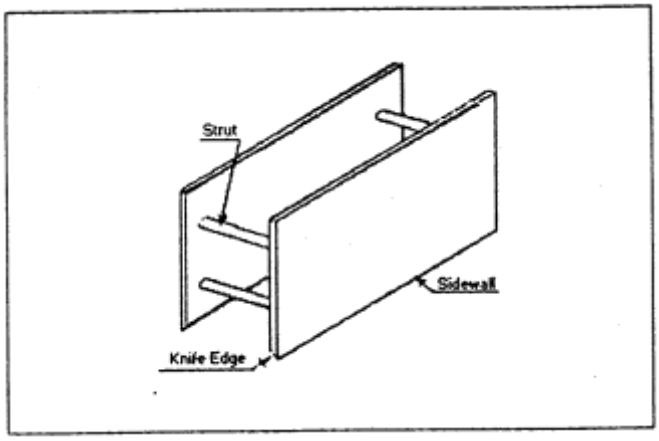


7.2.2 **Pneumatic Shoring:** works in a manner similar to hydraulic shoring. The primary difference is that pneumatic shoring uses air pressure in place of hydraulic pressure. A disadvantage to the use of pneumatic shoring is that an air compressor must be on site.

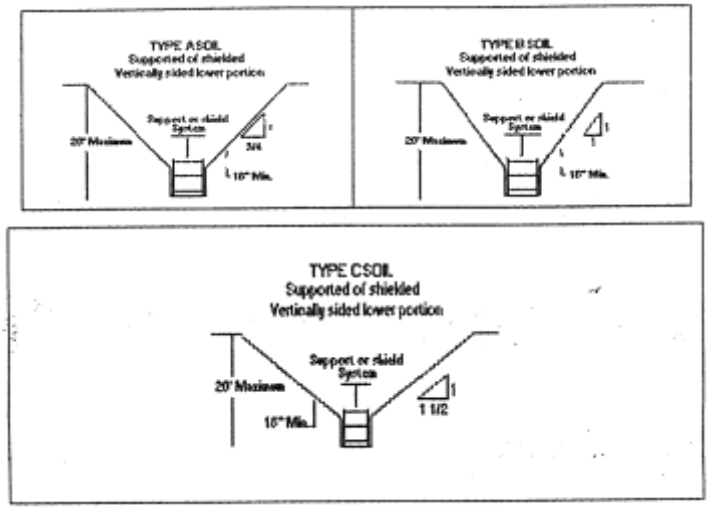


7.3 Shielding Systems

7.3.1 **Trench Boxes:** are different from shoring because, instead of shoring up or otherwise supporting the trench face, they are intended primarily to protect workers from cave-ins and similar incidents. The space between the outside of the trench box and the face of the trench should be as small as possible. The space between the trench boxes and the excavation side are backfilled to prevent lateral movement of the box.

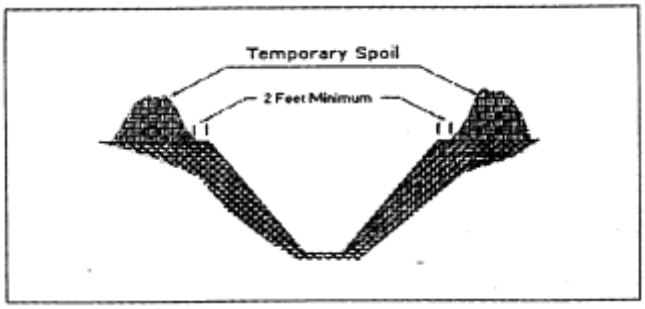


7.3.2 **Combined Use:** Trench boxes are generally used in open areas, but they may also be used in combination with sloping and benching. The box should extend at least 18 inch (0.45 m) above the surrounding area if there is sloping toward excavation. This can be accomplished by providing a benched area adjacent to the box.



8.0 Spoil

Temporary spoil must be placed no closer than 2 ft. (0.61m) from the surface edge of excavation.



24. Power Tools

1.0 Introduction

1.1 The majority of power driven hand tool accidents are caused by improper handling and poor maintenance of the equipment. Both of these can be overcome by supervision and proper training of the tool operators.

1.2 Power for hand tools is usually electricity, compressed air or explosive cartridges. Accidents with the first are commonly due to electric shock; with the second to poor maintenance of hose connections and the tool head, to noise and to horseplay with the high pressure hose; and with the third to inadequate instruction and careless operation. The following rules apply to all power tools.

1.3 Good housekeeping is essential for good workmanship and safety. All tools must be neatly and correctly stowed when not in use. Work areas must be maintained in a clean and orderly fashion.

1.4 Maintenance of the tools should be systematic. All tools should be cleaned and inspected regularly and those which are worn or damaged should be replaced or repaired immediately.

1.5 Safety equipment, such as guards and fuses must always be kept in position.

1.6 Protective clothing and equipment must be worn when necessary.

1.7 Only authorized and competent persons should be permitted to operate power tools.

2.0 Electric Tools - General

2.1 Portable electric tools, when used in normal industrial conditions, should be the 110 volts' type with single-phase supply from a double-wound transformer having the center tap of the secondary winding earthed so that the maximum voltage to earth is 55 volts (Fig. 1). Where more hazardous conditions exist, i.e., where men have to work within boilers or metal tanks, the power supply should be 50-volt single-phase from a double-wound transformer having the center tap of the secondary winding earthed so that the maximum voltage to earth is only 25 volts.

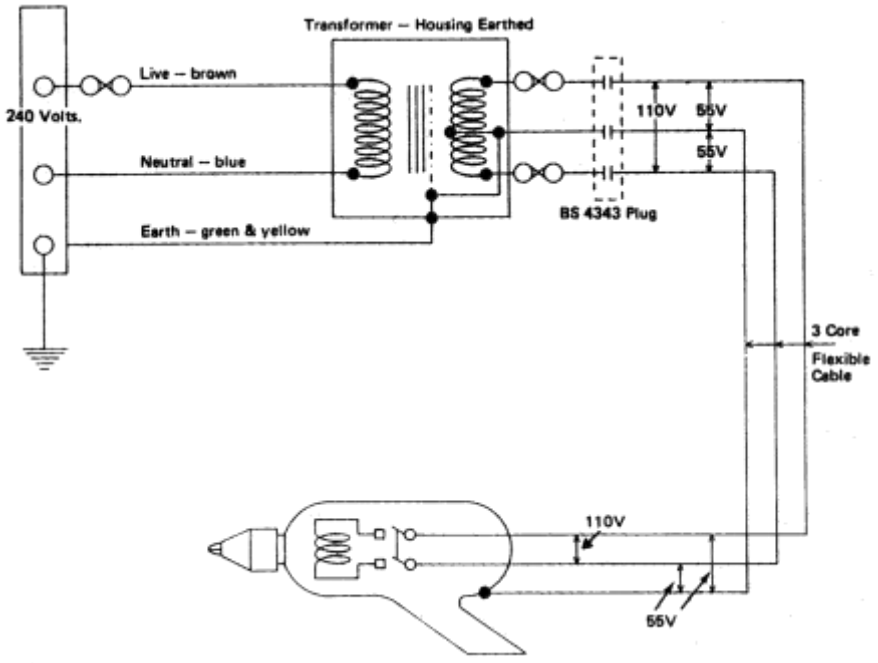


Fig. 1 - Connection Diagram for 110 Volt Transformer and Portable Drill

2.2 Metal-clad portable electric tools are normally connected by three core flexible cables in which one of the cores, colored green and yellow, forms the earthling connection to the metal casing (Fig. 2). It is most important that such cables be kept in good condition and that the earthling connection is efficiently maintained at all times. Testing the earth is the only way to satisfy this requirement.

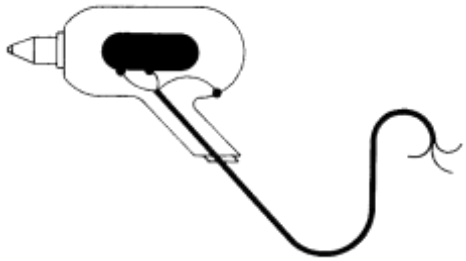


Fig. 2 – Connection for Metal-clad Portable Drill

2.3 All cables and plug and socket connectors must be maintained in good condition. Cables must be effectively attached to the plug connectors by efficient cord grips to relieve all strain on the flexible cable. Damaged cables should be replaced at once.

2.3.1 Some metal-clad portable electric tools are so constructed with special means of insulation that earthling of the metal casing is not necessary. Such tools are provided with two core cables which are connected to the line and neutral terminals only in the plug connector. Such tools must be tested and approved and carry the special rectangular double insulation symbol shown in Fig. 3 and comply with the requirements of BS 2769.

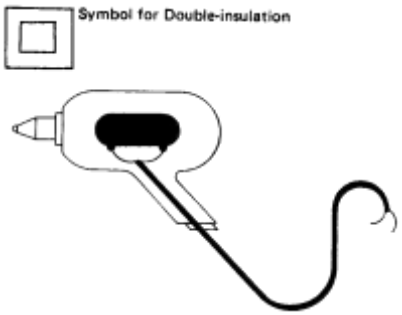


Fig. 3 – Connection for Double Insulated or All-insulated Portable Drill

2.3.2 Some light duty portable electric tools are enclosed in molded cases of insulation and, apart from the chuck, no metalwork is exposed or accessible. Many pieces of domestic and laboratory equipment take this form.

The tools described in this sub-section are known as double-insulated or all-insulated.

2.4 The use of several short leads to reach the power source increases the likelihood of electrical fault. A single extension lead must be used in all cases.

2.5 Electrical tools should be isolated from the source of supply when changing attachments, making minor adjustments, or repairing.

2.6 If an extension lead has to be used, make a proper connection beginning at the tool and working toward the power source. An improper connection or faulty tool will blow the fuse rather than shock the user if this procedure is followed so long as there is a good connection to earth.

2.7 When electric tools are used in wet areas, the operator is exposed to greater hazard of shock. All insulation must be sound, and insulating platforms, rubber gloves, etc., must be used.

2.8 All portable tools must be tested and inspected by a competent person when first received at any site and the results logged.

2.9 All portable tools must be physically inspected regularly and defects rectified and logged.

2.10 All portable tools must be checked thoroughly and re-tested every three months by a competent person and the results logged.

3.0 Portable Electric Saws

3.1 All portable saws are equipped with a fixed guard over the upper half of the blade and a moveable guard which automatically covers the lower half of the blade. Both of these guards must be kept in place; blocking of the lower guard to prevent closure must be prohibited.

3.2 Small pieces of timber must be secured by bench clamps or some other secure means before being cut.

3.3 Saw blades must be regularly checked and kept in good condition.

3.4 Blades used must be those recommended for the material being cut.

3.5 If a portable saw is adaptable for bench top use it must be securely clamped before use.

3.6 A saw should not be jammed or crowded into the work. Green or wet materials should be cut slowly and with extra caution.

3.7 Operators exposed to harmful dust, as when cutting concrete, tile, lead or stone, should wear approved type respirators.

3.8 Check all material being cut for nails, hard knots, etc.

4.0 Portable Electric Drills

4.1 Always provide a ‘starter’ mark for the drill point.

4.2 Always select correct bit for material being drilled.

4.3 If bit is long enough to pass through material, protect against damage and injury on the far side.

4.4 Small pieces of work should be clamped or held down to prevent spinning by the drill and a warning notice to this effect must be displayed.

4.5 Care must be taken to prevent sleeves and other clothing from being wound around drill. It is recommended that sleeves be rolled up above the elbow.

4.6 Telescopic or similar guarding must be used when operating a bench drill.

5.0 Portable Electric Grinders

5.1 Grinder operators must be equipped with eye shields and these must be worn.

5.2 The wheel must be inspected and dressed regularly. Eye shields and respirators must be worn when dressing. A cracked stone may fly to pieces and should be discarded.

5.3 Tool rests should be used and adjusted correctly. The rest should not be adjusted when the grinder is in motion.

5.4 Grinding wheels should have the same maximum permissible working speed as the grinder or a higher safe speed.

6.0 Portable Electric Sanders

6.1 Operators must be equipped with eye shields and these must be worn.

6.2 Where it is not practicable to guard the working surface of an abrasive belt or disc the only way to avoid injury is to exercise caution.

6.3 Sanders should be moved away from the body when in use.

6.4 Dust may create an explosion hazard, and should be exhausted if necessary. Open flames and sparks should be guarded against. Respirators and goggles should be provided.

7.0 Compressed Air Tools

7.1 A variety of tools, including hammers, drills, saws and vibrators are powered by compressed air usually provided by a mobile or fixed compressor at or near the worksite.

7.2 Proper fire precautions should be observed in connection with the operation of compressors; if housed in a closed building, adequate ventilation must be provided and the exhaust taken to atmosphere.

7.3 Air supply lines should be protected from damage by vehicles, materials, etc. and should be carried across walks and roads overhead or in protected channel-ways.

7.4 Supply hoses, pipes and couplings must be inspected regularly and damaged items must be promptly replaced or repaired.

7.5 Air supply hose carried overhead or vertically should be supported with a messenger cable, bridging or otherwise. It is not advisable to depend on an air hose providing its own support over a long span.

7.6 Noise may be a serious hazard. Ear protection shall be provided.

8.0 General Safety Requirements for Power Tools

8.1 General

8.1.1 All belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains or other reciprocating, rotating or moving parts of equipment shall be guarded.

8.1.2 All machine guards shall be kept in good condition and appropriate guards shall be fastened in place.

8.1.3 All hand tools shall be guarded at point of operation.

8.1.4 Employees are not to operate tools or machines unless guards are in place.

8.1.5 All power tools and machines shall be stopped and power supply shall be turned off or disconnected and lockout tag attached, before they are adjusted, lubricated or repaired.

8.1.6 All portable, power-driven, circular woodworking saws shall be equipped with guards above and below the base-plate or shoo. The lower guard shall automatically and instantly return to the covering position after the cut is made.

8.1.7 All portable abrasive wheels larger than 2 inches in diameter shall have safety guards covering the spindle and 180 degrees of wheel. Guards are not required on wheels while they are being used for internal work only.

8.1.8 All abrasive wheels shall be checked before mounting to be sure the spindle speed is not greater than that for which the wheel is designed.

8.1.9 Grinding wheels shall fit freely on the spindles. If a bushing is used, it must be shorter than the width of the wheel so it does not contact the flanges.

8.1.10 All hand and power tools and similar equipment are to be maintained in good condition.

8.1.11 Employees using hand and power tools who are exposed to the hazards of falling, flying, abrasive or splashing objects, or may exposed to harmful dusts, fumes, mists, vapors or gases, must use the particular personal protective equipment which is provided to protect them from the hazard involved.

8.1.12 Wrenches should not be used as extensions on valve wheels.

8.1.13 When using pipe wrenches or end wrenches, the pull should always be in the general direction the jaws face.

8.1.14 Extension handles, (other than one designed for the wrench), or "cheaters" will not be used except when absolutely necessary and their use is approved by the supervisor in charge of the operation.

8.1.15 Wrenches shall not be used as hammers, and only "hammer wrenches" are to be struck with a hammer or maul.

8.1.16 If power tools are not available, only circle wrenches will be used to put torque in rods.

8.1.17 Flanges shall never be knocked apart with a hammer. Always use a wedge or flange spreader.

8.1.18 Bolts on weed cutters shall be kept tight to make the blade secure.

8.1.19 In work requiring several men to use shovels, picks, weed cutters, etc., a safe working distance between each must be maintained.

8.1.20 Work areas should be freed of flammable gases or liquids prior to commencing work with metal tools if at all possible.

" It has been found that even "non-sparking" tools can, under certain conditions, cause ignition of flammable or explosive atmospheres. Impact of any metallic tool against certain types of rock or against iron or steel which has been coated with a light metal, such as aluminum, is particularly hazardous, especially if the coating was applied over rust. Such works surfaces should be kept wet ".

8.1.21 Hooks on all blocks, including "snatch blocks" shall be provided with safety bridles or safety latches.

8.1.22 All oil cans should have flexible spouts.

8.1.23 All hand-held powered platen sanders, grinders with wheels 2 inches or less in diameter, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with shanks one-fourth inch wide or less may be equipped with only a positive on-off control.

8.2 Electric Driven Hand Tools

8.2.1 All electrical portable tools shall be grounded by use of three-conductor cord and polarized plug and receptacle or be of approved double-insulated type.

8.2.2 Electric cords shall not be used for hoisting or lowering tools.

8.2.3 Electric cords shall be repaired or replaced if terminals become loose or insulation is cracked or broken.

8.2.4 Only explosion proof electric tools shall be used in gas hazardous areas.

8.3 Air Driven Hand Tools

8.3.1 When compressed air is used for cleaning purposes, the nozzle pressure shall be reduced to 30 psi. or less.

8.3.2 Effective chip guarding shall be provided when compressed air is used for cleaning purposes.

8.3.3 Proper personal protective equipment such as goggles, face shields, respirators, etc., as applicable, shall be worn when using air for cleaning purposes.

8.3.4 All abrasive blast cleaning nozzles shall be equipped with "dead man" controls.

8.3.5 Air hoses and connections used for air tools shall be designed for the service for which they are used.

8.3.6 When connecting the air hose to the tool, the supply end shall be connected first and the hose blown clear of any moisture or foreign matter before connecting the tool.

8.3.7 Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tools from being accidentally disconnected.

8.3.8 Safety clips or retainers shall be securely installed on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

8.3.9 Only heavy duty impact-type sockets shall be used on powered impact wrenches. Ordinary sockets designed for hand tools will not withstand the shock loading of the power tool.

8.3.10 When using powered tools, the operator should be aware of any torque exerted by the tool and position himself to overcome the shock should the driven element hang or stick.

8.3.11 Chisels, chippers or the like shall be removed from power tools when they are not in use.

8.3.12 Power tool heads such as chisels, chippers, etc., shall not be struck with a hand hammer or used for anything other than their intended purpose.

8.3.13 All pneumatically driven nailers, staplers, and other similar equipment provided with automatic fastener feed, which operate at more than 100 psi pressure at the tool, shall have a safety device on the muzzle to prevent the tool from ejecting fasteners unless the muzzle is in contact with the work surface.

8.3.14 Airless spray guns which atomize paints and fluids at high pressure shall be equipped with automatic or visible manual safety devices, or their equivalent protection, which will prevent release of the fluid until the safety device is manually released.

8.3.15 Air hoses exceeding ½ inch, inside diameter, shall have a safety device at the source of supply or branch line that will reduce pressure in case of hose failure.

8.3.16 Air hoses shall not be used for hoisting or lowering tools.

8.4 Hydraulic Hand Tools

8.4.1 All hydraulic jacks shall have the rated lift legibly and permanently affixed on the jack.

8.4.2 All hydraulic jacks shall be thoroughly inspected at least every six months. If used at other locations, it shall be inspected each time it is sent out and returned.

8.4.3 All hydraulic jacks shall be properly maintained and lubricated.

8.4.4 Fluid used in hydraulic jacks shall be fire resistant.

8.4.5 All jacks shall have a positive stop to prevent over-travel.

8.5 Fuel Powered Hand Tools

8.5.1 Fuel powered hand tools shall not be operated in a flammable atmosphere.

8.5.2 Fuel powered tools such as chain saws, lawnmowers; edges and the like are only to be operated by persons thoroughly familiar with their hazards.

8.5.3 Engine-mounted fuel tanks are not to be re-fueled until the engine has been stopped and allowed to cool.

8.5.4 No maintenance, repairs or mechanical adjustments shall be made on fuel powered hand tools unless the engine has been stopped.

8.5.5 Newly purchased power lawnmowers shall meet the latest ANSI Standard B71.1, Specifications for Power Lawnmowers.

25. Hand Tools

1.0 Care of Tools

1.1 All tools should be kept in safe working condition. Tool stores with suitable storage racks and bins should be provided. Men assigned to tool stores should be held responsible for the inspection and repair of tools. Defective tools should not be issued.

1.2 All tools should be kept clean, and protected against corrosion and damage. Cleaning procedure: Wipe off accumulated grease and dirt. Thoroughly clean with cleaning fluids or solvents when necessary and wipe clean. Moving and adjustable parts to be lubricated to prevent wear and misalignment.

1.3 Cutting edges must be kept sharp. Sharp tools improve accuracy and are safer than blunt tools. The oilstone *or* grindstone should be used for tool sharpening. If an abrasive wheel must be used for this task grind only a small amount at a time, with tool rest as close as possible to the wheel. The tool must be held lightly against the wheel to prevent overheating and dipped frequently in water to keep cool. This retains metal hardness and the cutting edge.

1.4 When not in use, tools should be stored in suitable boxes or containers, or hung on racks. Cutting edges should be protected, and tools should not be placed where they will roll off benches or tables. Storage area must be moisture free to prevent corrosion. Heavier tools should be placed where they will not be tripped over.

1.5 All damaged *or* worn tools should be promptly and soundly repaired. Temporary and makeshift repairs should be prohibited. If tools cannot be repaired on the job they should be sent to the shop or factory, not kept on the job.

2.0 Safe Use of Tools

2.1 Use the right tool for the job. The weight, size and type of tool should be selected to fit the job at hand. Do not substitute pliers for hammers, screwdrivers for pinch bars, chisels for screwdrivers, etc.

2.2 All handles should be tightly fitted. Wood handles should be checked carefully and tightened with wedges when necessary, also checked for splitting and cracking.

2.3 Most hand tools are conductors of electricity. Extreme caution must be used when working around electrical circuits. Insulated and non-conducting tools should be tested frequently, under expert supervision.

2.4 In the presence of flammable materials or explosive dusts and vapors, non-sparking tools should be used.

3.0 Hammers

3.1 Points of clinched nails should be turned up before drawing is attempted. When a nail has been partly withdrawn, a small block must be placed under the head of the hammer.

3.2 The head of the hummer should be firm, the haft not spilt, the face true and not chipped.

4.0 Wrenches

4.1 For safety and efficiency, the use of Socket Spanners, Ring Spanners, Tubular Spanners, and Open-end Spanners in that order are preferred to the use of wrenches. If wrenches must be used, select the right size and type for each job. Do not extend the wrench handle with pipe as jaws will spread.

4.2 A wrench must never be used as a hammer.

4.3 Pipe or stilson wrenches should not be used as monkey wrenches.

4.4 Jaw corrugations on stilson wrenches must be kept sharp and clean, and handles and adjusting screws (on all wrenches) must be kept in good condition.

4.5 Wrenches should always be placed on nuts with the jaw opening facing the direction the handle will move. Pull, do not push.

5.0 Chisels

5.1 A chisel should be large enough for the job, and should be driven with a hammer of sufficient weight.

5.2 Use the proper chisel for the material being cut.

5.3 A chisel should be held with steady but relaxed grip.

5.4 The eyes should be kept on the cutting edge of the chisel.

5.5 If chisels are being struck by other persons, they should be held by tongs or some other fixing or holding device.

5.6 Mushroomed chisels and cracked or broken chisel handles should be repaired or replaced.

5.7 Metal cuts must not be made too- deep. One-sixteenth inch (1/16" - 1.6 mm) for rough cuts is sufficient depth, finished cuts not more than half that depth.' Cut depth can be controlled by the chisel angle.

5.8 Goggles should be worn when chipping, which must be away from the person undertaking the chipping. Both the person working and other person may be protected with adequate screening.

5.9 When sharpening, original shape and angle must be maintained.

6.0 Punches

6.1 Punch should be straight and should be suitable and heavy enough for the work.

6.2 Points of center punches should be accurately ground at all times; starting and pin punches should be squared.

6.3 Punches should be started with light taps, and held securely, especially on rounded surfaces.

6.4 When knocking out rivets and pins work must begin with starting punch and finish with a pin punch.

7.0 Screwdrivers

7.1 Do not use a screwdriver as a chisel, pry-bar, or for any other purpose than that intended.

7.2 Keep tip ground properly, squared across, and with square rather than tapered sides.

7.3 Select screwdriver to fit size of screw being driven. Do not grind to a fine point to fit all sizes of screw heads.

7.4 Handles should fit shank tightly.

7.5 Keep shanks directly over screw being driven. Do not lean on screwdriver, or push with any more force than necessary to keep contact with screw. A screw properly piloted and fitted will draw itself into proper position when turned.

7.6 Wood screws must not be hammered into place.

8.0 Files

8.1 Files should be equipped with handles of proper size for file tang.

8.2 Cut should be on forward pass of file. When teeth become clogged they may be cleaned with a file card. Clogged teeth may cause a file to slip, thus exposing hands to injury. The file may be

tapped in *to* the handle by striking the handle on a flat surface. The handle must not be driven onto the file with a hammer.

8.3 When small objects are filed, they must be clamped securely, or a vice used.

8.4 Files must not be used for pry-bars, punches, etc., as file metal is usually very brittle and will snap.

9.0 Hand Saws

9.1 The proper shape and size of saw must be used, with correct *teeth* for size of cut and material being sawn. Teeth and blades must be kept properly set, and teeth protected when not in use.

9.2 The saw must be held firmly, and the cut started carefully and slowly to avoid jumping of blade.

9.3 To start a cut, a rip saw is held at a 60° angle with board, a cross-cut saw at a 45° angle.

9.4 When starting a cut, the fingers are placed to the side of cut mark with thumb upright and pressed against blade. The saw is pulled upwards until blade bites; the first cut is a partial cut; the saw is then set at the proper angle.

9.5 The material being cut must be checked for nails, knots and other objects that may damage the saw or cause it to buckle. Pieces being cut should be firmly held in place.

9.6 If long pieces are being cut, a helper or a supporting bench should be used to prevent pinching at the cut.

10.0 Two-Man Saws

10.1 The saw must not be pushed or forced, but pulled only, in teamwork with partner. The cut must be kept straight to avoid buckling.

10.2 Horizontal cuts, as in a standing tree, should be wedged to prevent pinching of the blade.

11.0 Hacksaws

11.1 The correct blade should be selected for the material to be cut; the blade teeth should point forward. The blade should be rigid and the frame should be properly aligned. Strong, steady strokes, directed away from the user, should be employed. The entire length of blade should be used each stroke. Harder materials should be cut more slowly than soft materials.

11.2 Thin flat pieces should not be cut from edge to edge, but should be securely clamped and cut so that several teeth are cutting at all times.

12.0 Pliers

12.1 Pliers should be used only when no other tool will do the job.

12.2 Never use pliers as wrenches.

12.3 Cutting pliers should be used only for cutting soft metals, never hardened metals or as nail pullers.

12.4 Approved insulated pliers must be used for electrical work.

13.0 Picks and Mattocks

13.1 Handles should be free of splinters, splits and cracks.

13.2 The head should be firmly affixed to handle.

13.3 When in use, it must be ascertained that the area at rear and to the sides is clear when swinging the pick or mattock.

14.0 Shovels and Spades

14.1 Handles should be free of splinters, cracks and splits.

14.2 Blades should be sharp and free of jagged and split edges.

15.0 Trucks Wheelbarrows

15.1 Hand-trucks and wheelbarrows should be selected for the job.

15.2 Their frames should be strong and straight.

15.3 Wheels of hand-trucks and wheelbarrows should be strong and well secured to frame.

15.4 The bodies must be kept clean and free of jagged edges. Extreme care must be exercised when using ramps and walk- ways.

16.0 General Safety Precautions for Hand Tools

16.1 Every tool is designed for a particular purpose. All tools shall be used only for the purpose for which they are designed.

16.2 All tools shall be inspected regularly and be kept in a clean, safe condition.

16.3 Unsafe tools shall be repaired or discarded.

16.4 Tools should not be thrown from one person to another, particularly to a higher or lower level. They should be carried or sent up or down in a suitable container or on a line.

16.5 Hands should be kept as free from oil and grease as possible to prevent slippage when using-hand tools.

16.6 After cleaning tools with approved cleaning fluids, employees should wash their hands with soap and water or a suitable hand cleaner.

16.7 Employees should not climb ladders with tools in pockets or hands.

16.8 Employees should be especially careful not to drop or knock tools off platforms. Tools should be handled deliberately.

16.9 Employees should avoid working in places where tools are being used overhead. If it is necessary to work in such a place, employees shall wear safety hats.

16.10 When laying tools down, be sure they are put in a place where they will not be jarred or knocked from an elevated level and where they will not create a stumbling hazard.

16.11 Tools should be kept in an assigned place on a tool board or work bench so that they will be readily accessible when needed.

16.12 Regularly inspect the driving faces of hammers, chisels, drift, pin, wedges, bars and other impact tools and keep them free of mushroomed heads, burrs, broken faces and other defects.

16.13 A tool with a hardened surface should never be struck against another such tool. Even new tools may splinter or shatter under such circumstances.

16.14 Chisels, draw-knives, hatchets, axes, adzes, picks, saws, etc., should be kept sharp for safety as well as efficiency.

16.15 Extra care should be taken when using and storing sharpened tools.

16.16 Crowbars, chain tongs, large wrenches, shovels, rakes, hoes, etc., should be placed in. proper racks or laid in a safe place on the ground or floor. They should never be leaned in corners or against walls.

16.17 Handles should be removed from picks, scythes, adzes and similar tools when they are hauled or stared unless special racks or other safe means are provided.

16.18 Handles shall be removed from all types of jacks when they are not in use.

16.19 Holders should be used on hammer wrenches, chisels, punches, rods, posts and like objects, when they are being struck, to prevent hand injuries.

16.20 All files should be equipped with protective handles, and with protective guards when applicable.

16.21 Wood handles should be sound of splinters and securely wedged or fastened to the tool. Cracked or split handles should not be taped to reinforce them.

16.22 Hammers are not to be used on pipe or rods to break connections. If it does become necessary to use a hammer for such a purpose, goggles shall always be worn.

16.23 Never use a screwdriver on a small object held in your hand. A screwdriver should be used in such a way that if it slips, it cannot strike any part of the body.

16.24 Small tools, screws, nails, tacks, etc., should never be held in the mouth.

16.25 Non-adjustable wrenches or other tools which become worn or sprung to the extent that they do not properly fit the item to be manipulated or held should be discarded. Straightening or building up the jaws, mouth or socket is not considered to be a satisfactory repair.

16.26 Replaceable jaws of adjustable wrenches shall be replaced when they become worn. If the worn jaws are not replaceable or it they are sprung, the tool shall be discarded.

16.27 When using a tool, the body position should be such that a fall will not result if the tool slips or fails.

16.28 The hand hold on a tool should be such that fingers, hands and arms will not be injured if the tool slips or fails.

26. Ladder Inspection and Scaffolding Use

1.0 Ladders

1.1 General Requirements

1.1.1 Use

- Steps on ladders shall have a minimum load capacity of 250 pounds.
- All ladders shall be inspected for damage prior to use.
- Ladders shall not be placed against movable objects.
- Ladders shall be placed to prevent movement by lashing or other means.
- Employees shall insure their shoes are free of mud, grease, or other substances that could cause a slip or fall.
- Ladders shall not be placed on unstable bases such as boxes or barrels.
- Employees shall not stand on the top two steps of a stepladder.
- No ladder shall be used to gain access to a roof unless the top of the ladder extends at least 3 feet above the point of support, at eave, gutter, or roof line.
- Stepladders shall be fully opened to permit the spreaders to lock.
- All labels shall be in place and legible.
- Always move the ladder to avoid overreaching.
- Single ladders shall not be more than 30 feet.
- Extension ladders up to 36 feet must have a 3-foot overlap between sections.
- Extension ladders over 36 feet and up to 48 feet shall have a 4-foot overlap between sections.
- Extension ladders over 48 feet and up to 60 feet shall have a 5-foot overlap between sections.
- Two-section extension ladders shall not exceed 48 feet in total length. Over two-section ladders shall not exceed 60 feet in total length.
- Ladders shall not be used horizontally as scaffolds, runways, or platforms.
- The area around the top and base of ladders shall be kept free of tripping hazards such as loose materials, trash, cords, hoses, and leads.
- The base of straight or extension ladders shall be set back a safe distance from the vertical or approximately ¼ of the working length of the ladder.
- Ladders that project into passageways or doorways where they could be struck by personnel, moving equipment, or materials being handled, shall be protected by barricades or guards.
- Employees shall face the ladder when ascending or descending.
- Employees must use both hands when going up or down a ladder. Materials or equipment shall be raised or lowered by way of lines.
- Employees shall be trained and educated on the proper use of ladders.

1.1.2 Maintenance

- Repairs shall be done professionally.
- Inspections shall be conducted before each use and defective, broken, or damaged ladders shall be pulled from service tagged and marked **"Dangerous. Do Not Use."**
- The rungs shall be tight in the joint of the side rails.
- All moving parts shall operate freely without binding.
- All pulleys, wheels, and bearings shall be lubricated frequently.
- Rungs shall be kept free of grease and oil.
- Rope that is badly worn or frayed shall be replaced immediately.
- All ladders shall be equipped with slip resistant feet, free of grease, and in good condition.

1.1.3 Portable Wood Ladders

- All wood ladders shall be free of splinters, sharp edges, shake, wane, compression failures, decay, and other irregularities.
- Portable stepladders shall be no longer than 20 feet.
- The step spacing shall be no more than 12 inches apart.
- Step ladders shall have a metal spreader or locking device of sufficient strength and size to hold the front and back when open.

1.1.4 Portable Metal Ladders

- Inspect ladders immediately when dropped or tipped over.
- The step spacing shall be no more than 12 inches apart.
- Metal ladders shall not be used for electrical work or in areas where they could contact energized wiring.

1.1.5 Fixed Ladders

- Steps shall be no more than 12 inches apart.
- Job made ladders shall be constructed to conform with good engineering standards.
- All fixed ladders shall be painted or treated to prevent rusting.
- Fixed ladders 20 feet or higher shall have a landing every 20 feet if there is no surrounding cage. If it has a cage or safety device, a landing is required every 30 feet.

2.0 Scaffolding

The purpose of this section is to provide a guideline for the erection and safe use of tube and coupler scaffolding. There are many types of scaffolding not mentioned in this section. It is the responsibility of the company to investigate the different rules that apply to the different types of scaffolding.

2.1 General Requirements

- All personnel working on scaffolding shall be required to wear fall protection.
- Scaffolding over 125 feet shall be designed by a professional engineer.
- Scaffolding less than 125 feet shall be erected by competent and experienced personnel.
- All scaffolding shall be built on a solid foundation and capable of supporting 4 times the intended load.
- An access ladder or equivalent form of safe access shall be provided.

- All scaffolding is required to have guardrails and toe boards installed.
- All walking platforms shall overlap at least 12 inches and be secured from movement.
- Employees shall not work on scaffolding during bad weather.
- When hoisting materials onto scaffolding, it shall have a tag line.
- Overhead protection shall be provided to all employees working on or near erected scaffolding.
- Tools, materials, and debris shall not be allowed to accumulate on scaffolding.
- Scaffolding shall be secured to a permanent structure.
- Scaffolds cannot be used for storage of stone or other heavy materials.
- All scaffolding shall be cross braced.
- All scaffolding shall be longitudinal and braced.
- Scaffolding shall be tied and securely braced against the building at intervals no greater than 30 feet horizontally and 26 feet vertically.
- Scaffolding shall be inspected every day before work begins.
- If any problems are found with the stability of the structure, repairs shall be made before use.
- If cracks or wrapping is found on planks, they shall be replaced before use.
- Any sharp edges, burrs, or other safety hazard shall be eliminated.

3.0 Training

Training shall be completed upon initial employment and maintained on an annual basis in the areas of scaffolding erection, use, and fall protection.

4.0 Record Keeping

Records shall be in-place for the following:

- Inspections (daily).
- Training.

27. Forklift and Industrial Truck Operations

1.0 Introduction

1.1 A forklift is a workplace vehicle designed to lift, carry and stack heavy loads using two forks situated at the front of the vehicle.

1.2 Loads are usually secured on wooden pallets that fit over the forks.

1.3 A forklift is not a recreational vehicle. It is not designed for any purpose other than work and it must be operated according to safe operating procedures.

2.0 Requirements

2.1 Only trained and authorized personnel are permitted to operate a forklift.

2.2 Do not stand or pass under the elevated portion of any forklift.

2.3 Passengers are prohibited from riding on forklifts.

2.4 Do not place arms or legs between the uprights of the mast or outside the running lines of the truck.

2.5 Maintain a safe distance from the edge of ramps or platforms while on any elevated dock or platform.

2.6 Forklifts are not to be used to open or close freight doors.

2.7 Set breaks and block wheels to prevent movement of trucks and trailers when loading or unloading.

2.8 Check the flooring of trucks and trailers for breaks and weakness before loading or unloading.

2.9 Use only approved forklifts in hazardous locations.

2.10 Park forklifts in designated locations to minimize the trip hazard presented by the forks.

2.11 Electric forklifts must be parked indoors when not in use.

2.12 Forklift operators are responsible for fueling the forklift.

2.13 When a forklift breakdown or is damaged in an accident, it shall be tagged and locked out of service by the division/section responsible for the forklift.

2.14 Whenever a truck is equipped with a lifting carriage or forks for lifting personnel take the following precautions:

- 2.14.1 Use safety platform firmly secured to the lifting carriage and/or forks.
- 2.14.2 Provide means whereby personnel on the platform can shut off power to the truck.
- 2.14.3 Provide protection from falling objects.
- 2.14.4 Keep free aisles, access to stair ways and fire equipment clear.

2.15 Only pick up stable and safety arranged loads within the rated capacity of the forklift.

2.16 Avoid running over loose objects on the roadway surface.

2.17 Reduce speed and sound horn at cross aisles and other locations where vision is obstructed.

2.18 Never make a turn at normal travelling speed, always slow down to maintain balance.

28. Cranes, Chain Hoist and Sling / Rope Inspection Program

1.0 Introduction

- Accidents with cranes and lifting equipment can be both costly and spectacular. This is particularly so in oil and gas handling areas where an accident can fracture an oil or gas line, causing serious loss of product with the ever-present danger of fire and release of hydrogen sulphide.
- Cranes cannot create accidents by themselves. They are inanimate objects, designed and operated to raise and lower loads efficiently and safely within their stated capacities. Accidents with cranes can only be caused by man's actions or inactions. Therefore, it is essential that all supervisors be familiar with the general characteristics and capabilities of cranes and that all operators and attendants be properly trained to an agreed standard.

2.0 Work Permits

- A crane shall not enter a Restricted Area, or operate within one and a quarter boom lengths of an oil line, gas line, or overhead power line, until a Work Permit for that particular crane has been issued.
- The permit issuer will check the operator's license, the crane inspection sticker, the spark arrestor. If any of these is not in order, the Permit will not be issued.

3.0 Man Lift Operations

In the case of man lift operations, the following rules shall apply:

- Work supervisor in charge of the crane operator shall obtain a valid Work Permit for any lift or person(s) in a basket signed by the operations and maintenance Supervisors and Work Permit receiver before job starts.
- Safety basket shall be doubling slinged with one safety wire. Safety lifelines shall be worn by each person in the basket and the lines shall be connected to the safety line attached to the crane line above the ball.

4.0 Cranes

General Operating Procedures

It must be recognized that written rules cannot cover all situations that may arise during the operation of the machine. The operator must be prepared to use his own judgment.

4.1 Prior to Lifting

4.1.1 Never use or allow the use of any crane not in perfect mechanical condition. No one who has reasonable cause to believe that any crane or part of the machinery or structure is unsafe because of its condition or suitability should use or operate it until he has reported the defect to his Supervisor and safe conditions have been assured and all hazards rectified.

4.1.2 Before starting operations inspect, test, and maintain the crane in accordance with the recommendations in this manual, and the manufacturer's handbook.

4.1.2.1 Check all wire ropes and rigging components in accordance with the Rigging Manual.

4.1.2.2 Keep the machine clean and in good working order. Oil, grease, or mud on floors can cause serious falls, and dirt in working parts will cause excessive wear and consequent possible failure.

4.1.2.3 Check that all protective guards and panels are secure before operating.'

4.1.2.4 Check the fuel, oil, radiator, and battery levels.

4.1.2.5 Check all hydraulic hoses for chafing, bulging, leaks, or other damage.

4.1.2.6 Visually inspect all gear cases for leakage or damage. If leakage is evident, fill the case to the proper level before operating.

4.1.2.7 Check all control for correctness and ease of operation.

4.1.2.8 Check tire pressures and wheel studs. Tire wear can be greatly reduced and stability of the machine increased by matching tires carefully for size and degree of wear. Maintain proper inflation at all times. This is particularly important when working without outriggers.

4.1.2.9 Check brake air pressure.

4.1.2.10 Check low air pressure warning devices.

4.1.2.11 Check foot brake operation.

4.1.2.12 Check headlights, clearance lights, turn signals, parking lights, tail and stop lights, windshield wipers, horn, etc.

4.1.2.13 Check all instrument panel gauges.

4.1.2.14 Visually inspect the entire machine for loose or missing bolts, or cotter pins, cracked welds, frayed or damaged ropes, dented or damaged boom chords or lattice, etc.

4.1.2.15 Visually inspect all clutch and brake linings for evidence of wear, or grease and oil on the linings. Serious injury to ground personnel or damage to property and equipment could result if adjustments are neglected.

4.1.2.16 Keep fingers, feet, and clothing away from gears and ropes, unless the machine is shut down and everyone knows what you are doing. Never place hands on lines when climbing to the top of the cab. A sudden movement may pull them into the sheaves. Be especially careful to keep hands clear of moving cables.

4.1.2.17 Read of the maintenance sections of the manufacturer's manual, protective maintenance may allow the operator to spot a malfunction in the machine before an accident occurs.

4.1.2.18 All cranes should be inspected and certified by a 3rd party on annual basis.

4.1.2.19 <u>All lifting gears should be inspected and certified by a 3rd party every 6 months.</u>

4.1.2.20 <u>A lifting plan should be developed for each lifting activity.</u>

4.1.2.21 <u>The color code system should be applied for all the lifting equipment.</u>

4.1.3 The operator should remain alert to possible malfunctioning of the machine while operating. If the machine does malfunction, shut it down until the problem is found and corrected. During operation the operator should:

4.1.3.1 Remain alert to any unusual noises, loss of power, or bad response to control of the engine.

4.1.3.2 Watch for any gauges showing incorrect readings. If any appear to be wrong shut the machine down and determine the cause.

4.1.3.3 Check the master clutch for slipping or jumping out of engagement.

4.1.3.4 Make sure all controls work freely and easily with no sticking or binding.

4.1.3.5 Listen for any unusual noises from the hydraulic system or the gear train.

4.1.3.6 Watch for oil leaks. If any develop, correct them before continued operation.

4.1.3.7 Test the winch brakes when a load is first lifted, and when the load is only a few inches above its starting position, to assure the ability of the brakes to hold the load while it is aloft.

4.1.3.8 The operation of any machine not in first class condition in any respect may be hazardous and can result in unnecessary wear or breakage, or may result in immediate or eventual accident.

4.1.3.9 If the crane is being operated by more than one operator, be sure to notify the next operator of any defects when changing shifts.

4.1.4 Never use or allow the use of any crane when the weather conditions are such that hazards to personnel, property, or the public are created.

4.1.5 If the visibility of the operator is impaired by dust, darkness, snow, fog, or rain, strict supervision of the crane operation must be exercised, and if necessary, the crane should be withdrawn from service.

4.1.6 Never operate or allow anyone to operate any crane until that person is thoroughly familiar with the machine, its operation, and proper care.

4.1.7 When refueling the machine ensure that:

4.1.7.1 The engine is stopped and the carrier and cab heaters are off.

4.1.7.2 The fuel is stored in containers that meet the requirements of the fire protection.

4.1.7.3 There are no flames, or spark producers nearby.

4.1.7.4 No one is smoking.

4.1.7.5 No smoking signs are posted in all fueling or fuel storage areas.

4.1.7.6 There is a fire extinguisher nearby and that whoever is refueling the machine knows how to use it.

4.1.8 Before putting the crane into operation check, that it has not moved and that it remains level. Ensure also that all guards, controls, clutches, brakes, gears, and the like are properly set and that putting the equipment into operation will not endanger property, the public, or personnel.

4.1.9 If there is a warning sign on the switch or engine starting controls, do not start the engine until the warning sign has been removed by the person who placed it there.

4.1.10 Before starting the engine make sure that all personnel are well clear of the machine.

4.1.11 When starting the engine, it is necessary to reduce the starter load by disengaging the clutch before starting. After starting the engine this way, throttle down to idle speed before engaging the clutch. This reduces the shock load on the pump shaft.

4.1.12 Let the engine warm up for a few minutes to give the oil in the pumps a chance to circulate. Do not operate the machine under load until the hydraulic oil has warmed to the minimum operating temperature specified in the manufacturer's manual. Operate the winches, boom hoist cylinders, boom extension cylinders, and swing mechanism to circulate the oil.

4.1.13 When the carrier engine is idled for long periods during crane operation, ensure that the idle speed is sufficient to show a positive reading on the ammeter indicating that the generator or alternator is charging the battery at a satisfactory rate.

4.1.14 Keep the crane engine at or near maximum governed speed during normal operation, especially when lifting a load. This gives maximum fuel economy, operating efficiency, safety, and power.

4.1.15 Before shutting down a heavily worked engine, let it run without any load at part throttle for a little while to cool off.

4.1.16 The engine should not be operated in an excavation unless provision is made to ensure that exhaust gases or fumes will not accumulate in the excavation, or in a building or other structure that is enclosed, unless there is an adequate supply of air for combustion and adequate ventilation.

4.1.17 If an overheated condition necessitates an engine shutdown, use extreme care when checking the radiator. If possible, wait for it to cool. Use a heavy cloth and gloves to protect yourself while slowly loosening the cap. Wait until the sound and fluid flow stops. Then remove the cap.

4.1.18 Know the location and use of all emergency shutdowns.

4.1.19 Never back up the machine without first making certain that no one will be endangered. When clear vision of the area behind the crane is impossible, use a signalman. Sound the horn before moving the machine and intermittently during travel, especially when approaching personnel.

4.1.20 Never work alone – use the buddy system.

4.1.21 Never get on or off a machine when it is in motion and always use both hands when climbing onto or around the machine. Never jump from the machine except during emergencies – step down.

4.1.22 Wear all necessary protective clothing such as hard hats, safety glasses, safety shoes and gloves when working on or around the machines.

4.1.23 Never attempt to adjust, repair, or lubricate moving machinery. Always lower off the load to the ground, lock or support the boom, and stop the engines.

4.1.24 With the exception of those involved in the operation of the crane, no one should be permitted to get on, leave, or ride on the equipment when it is in motion or in operation.

4.1.25 The operator must never allow his attention to be diverted from the operation of the crane. When possible he should practice operating all controls to get the feel of the equipment, particularly if this is not the machine he usually operates.

4.1.26 Always use the shortest boom possible. Never use more boom than is necessary.

4.1.27 Know the exact location of utility lines, pipelines, sewers, and other underground obstructions, and avoid them with room to spare. Mark locations clearly to prevent having to make estimations.

4.1.28 Ensure that, whenever possible, the machine is operated in its most stable position and in the area of highest capacity.

4.1.29 Never, unless otherwise specified by the manufacturer, lift or swing over the front of the machine.

4.1.30 Position the crane as close to the load as possible and in such a way as to minimize the swing.

4.1.31 Be sure there is adequate clearance for tail swing of the revolving frame, especially when people or vehicles may enter the area. The crane should be positioned so that no part of the superstructure comes within 2 feet (0.6 m) of any obstruction in which a workman could be trapped and crushed. If this is not possible then entry to the obstructed area must be prevented by barriers or fences.

4.1.32 Regardless of the size or weight of the load to be lifted use the crane's outriggers. Extend the beams fully and get the wheels off the ground.

4.1.33 The revolving portion of the superstructure of the crane must be dead level before making the lift.

4.1.34 When organizing to make a lift ensure that no one is within the radius of rotation of any part of the crane or load unless he is authorized by the person in charge of the work to be in that area, and insofar as practical, ensure that no one is ever directly beneath the load.

4.1.35 Ensure that the swing lock is disengaged before starting to operate.

4.1.36 If the machine is equipped with a manually operated boom hoist drum pawl, then it must be engaged at all times except when lowering the boom. If the machine is equipped with

automatically engaged boom hoist drum pawls, the operation of the pawls should be checked at regular intervals.

4.1.37 Engage the boom hoist lever lock (where provided) whenever the boom hoist is not in use.

4.1.38 Before performing any type of crane work, be sure that the machine is secured against travel. If necessary, block the crane to prevent movement. Remove blocking before attempting to travel.

4.1.39 When operating a truck crane, be sure the carrier transmission is placed in neutral. Otherwise the rocking or tilting motion can be transmitted to the locked transmission, and may cause severe damage.

4.1.40 If lifts have to be made on rubber be sure the transmission shift lever is positioned in neutral, the air brakes are applied, and wheel chocks are used to block the wheels. Check the air brake pressure frequently.

4.1.41 Watch out for the carrier cab on truck-mounted units when swinging the boom. Keep the boom high enough to swing well clear of the cab.

4.1.42 Make a dry run, especially in areas which are really tight. Go through all the motions without a load, anticipating what actions you will take to make a safe lift, and a smooth operation.

4.1.43 One of the most important precautions is to determine the weight of all loads before rigging them or attempting to lift them, making ample allowance for unknown factors and determining the available capacity of the equipment being used. In cases where the assessment of load weight is difficult, safe load indicators or weighing devices should be fitted.

4.1.44 In figuring the total weight of the lift, be sure to include the block, hook, and any slings or other rigging devices between the boom peak and the load. When making near capacity lifts, calculate the entire load carefully and check it against the rated lifting capacity of the crane.

4.1.45 Before making any lift that exceeds 75% of the rated capacity of the crane it is recommended that in addition to the usual precautions that the load radius be measured to avoid any possibility of error.

4.2 Transporting The Crane

4.2.1 The procedures involved in getting a mobile crane ready to move from one site to another and the precautions that must be observed while transporting it are as different as the machines themselves; however, there are general recommendations that apply to most machines.

4.2.2 The single most important consideration is to avoid damaging the machine because it does not usually show up until sometime in the future when it is making a lift.

4.2.3 When loading crawler cranes onto floats the ramp must be long enough to make the angle low. If it is carrying boom sections, put the boom over the front and keep it low so as to prevent kick back or overturning. The crane must be securely shackled to the vehicle to prevent movement. Operational brakes should not be relied upon to cope with the accelerations and decelerations of the vehicle. For similar reasons it is advisable to cross-chain the upper-works of the crane against rotation in addition to setting the swing brake and swing lock of the machine.

4.2.4 Ensure that the swing brakes and swing lock are properly set and that all loose parts are secure and that the outriggers are locked in the travelling position before moving any carrier mounted crane.

4.2.5 Always check height, width, and weight restrictions for the locality and be sure the machine will not exceed these limitations. Removable counterweight and outrigger assemblies are provided for weight reduction as required.

4.2.6 Adequate lighting, flags, flares, and other safety equipment should be on the machine and in good condition at all times.

4.2.7 Before moving the carrier ensures that the seat belt is used and that there is adequate oil and air pressure. Do not attempt to move the machine until the air pressure is up.

4.2.8 Off-the-road operation requires extreme caution and good judgment on the part of the operator, particularly in the selection of gear ranges and path of travel to help assure complete control of the machine. Avoid holes, obstacles, soft ground, and slopes, which may subject the carrier to unnecessary stresses or possibly overturn the machine.

4.3 Pre-Operational Check

4.3.1 Check the security of track, foundations, and ties as applicable.

4.3.2 Check all cotter pins, lock nuts, joints, etc.

4.3.3 Check the completeness and security of all ballast and counter-weights.

4.3.4 Check the correct alignment and free-running of all ropes.

4.3.5 Check the proper fitting and calibration of all load / radius indicators.

4.3.6 Check the operation of all limit switches, overload switches, warning horns, brakes, etc.

4.3.7 Check that there are adequate looped access ladders.

4.3.8 Check that all machinery is properly guarded.

4.4 Routine Checks – Daily Before Work Commences

4.4.1 Check that there are no obstructions on tracks.

4.4.2 Check that the track is in good condition.

4.4.3 Check that all rail clamps or anchorages are released.

4.4.4 Check that the ballast or counterweight is complete and secure.

4.4.5 Check that the warning horns operate.

4.4.6 Check that the limit and overload switches work.

4.4.7 Check that all crane motions are operating correctly.

4.4.8 Check that the wind speed is within the manufacturer's recommended limit. It is advisable to fit all cranes with wind speed indicators.

4.5 Shut Down Procedures

4.5.1 Ensure load, if any, is removed from the hook and the hook is raised to the highest operating position.

4.5.2 Lock or chock the bogies on track mounted cranes.

4.5.3 Leave the boom in the "free swing" position so that it will "weathercock" in the wind.

4.5.4 Close and lock all doors and windows to the cab.

4.5.5 Shut off the power supply.

5.0 Safe Use of Manila Rope Slings

5.1 Introduction

Manila rope slings are used for many different kinds of service and under varying conditions that affect their safe use. The safety of a sling is determined by these factors:

5.1.1 Use of rope and fittings of suitable strength for the load;

5.1.2 The method of fastening the rope to the fittings;

5.1.3 The type of sling;

5.1.4 Regular inspection and maintenance.

5.1.5 Two types of manila rope slings are in general use:

5.1.5.1 One type has a hook spliced at one end of a length of high-grade manila rope, and a ring or hook at the other end.

5.1.5.2 The second type is a length of rope spliced into a continuous loop.

5.2 Inspection

Manila rope slings should be examined for cuts, excessive wear, or other damage. Discard and destroy defective rope slings as their continuous use will ultimately result in failure and possible serious injury, property damage, or both. Internal defects can be detected by separating the strands and checking for broken fibbers or a powdery substance that indicates internal friction and damage.

5.3 Safe Loads

5.3.1 Before attempting to lift a load with a manila rope sling, care must be taken to make sure that the sling is of sufficient strength to lift the load. This means that the hooks, rings and other fittings must be correctly spliced to the sling legs, the weight of the load to be lifted must be carefully estimated, and the proper size of sling must be used [Table (1)].

5.3.2 When a rope sling has been in use for six months or longer, even though it shows no sign of wear or other damage, the loads placed upon it should be limited to one-half those given in Table (1).

5.3.3 All users of manila rope slings should be carefully instructed regarding the safe loads for slings under various conditions, and copies of Table (1) showing such loads should be posted in conspicuous places about the shop.

5.3.4 To avoid damaging manila rope slings and weakening their safe load strength, they should not be used:

5.3.4.1 For lifting ladles of molten metal or other loads where the rope will be subjected to unusually high temperatures. To do so may char the rope or do other damage which is hard to detect easily and which may cause the sling to fail under load.

5.3.4.2 If the load to be lifted has sharp corners, unless corner pads are placed between the load and the rope to prevent cutting the rope fibbers.

5.3.4.3 To lift a load where there will be sharp bends of rope over an unyielding surface, since these bends cause extreme tension of the outside rope fibbers, and may seriously injure the rope.

5.3.4.4 If there is danger of getting acid or strong alkali on the rope because such chemicals cause immediate damage to fibbers, making the rope, absolutely unsafe for further service.

5.4 Storage

5.4.1 Manila rope slings deteriorate very quickly if they become wet and are not properly dried out. Whenever they have become wet or dirty, they should be cleaned and hung up, so that they may thoroughly dry. They should not be thrown into a corner or covered with material so that air cannot circulate through them.

5.4.2 Slings should not be stored in a damp place because rot may result. However, if stored in too dry or too warm a location, the rope fibbers will become brittle and lose much of their strength.

5.4.3 Rope slings should not be allowed to freeze after becoming wet, because frozen rope breaks easily. Frozen slings should not be piled against radiators, steam pipes, or other sources of concentrated heat, as this will tend to dry out the oil in the rope and destroy the life of the rope fibbers.

5.4.4 Since acid and alkaline fumes cause rapid deterioration of manila rope fibbers, slings should not be stored in areas where these fumes are present.

Table (1) - Safe Loads* in Pounds for New, Standard, Medium Lay, Three-Strand Manila Rope Slings (Spliced for Hook at One End and Hook or Ring at Other End)

Approx. Diam. of Rope (in.)	Safe Load for Single-Leg Vertical Sling (pounds)	Safe Load for Two-Leg Sling at Angle with Horizontal		
		60 degrees	45 degrees	30 degrees
3/16 (6 yarns)	80	135	110	80
1/4 (6 yarns)	105	180	150	105
5/16 (9 yarns)	180	310	250	180
3/8 (12 yarns)	240	415	340	240
7/16 (15 yarns)	315	550	450	315
1/2 (21 yarns)	475	820	670	475
9/16	620	1,075	875	620
11/16	790	1,370	1,115	790
3/4	970	1,675	1,375	970
13/16	1,170	2,025	1,650	1,170
15/16	1,385	2,400	1,960	1,385
1	1,620	2,800	2,290	1,620
11/16	1,890	3,275	2,675	1,890
13/16	2,160	3,740	3,050	2,160
11/4	2,430	4,200	3,435	2,430
15/16	2,700	4,675	3,820	2,700
11/2	3,330	5,765	4,700	3,330
15/8	4,050	7,000	5,725	4,050
113/16	4,770	8,260	6,750	4,770
2	5,580	9,665	7,900	5,580
2 ¼	7,380	12,775	10,435	7,380
2 5/8	9,360	16,200	13,235	9,360
3	11,520	19,950	16,300	11,520
3 ¼	13,860	24,000	19,600	13,860
3 5/8	16,380	28,375	23,150	16,380
4	18,900	32,725	26,725	18,900

6.0 Wire Rope Slings

6.1 Recommended Loads for Wire Rope Slings

6.1.1 Wire rope made from improved plow steel and extra plow steel is recommended for slings.

6.1.2 The breaking strengths of plow and mild plow steel rope are respectively 12 and 25 percent less for the corresponding size of improved plow steel rope.

6.1.3 Allowances should be made for the lower strengths of plow and mild plow steel ropes in improvising slings from them in the field.

6.1.4 Furthermore, broken wires, corrosion, and kinks are important causes of loss of strength; therefore, only wire rope in first-class condition should be used in an improvised sling.

6.1.5 Ropes used for slings vary in size from ¼ inch to 4 inches. Since flexibility is essential, the 6 by 19 classification is used when the service requires a rope 11/8 inches or smaller.

6.1.6 The 6 by 37 classification is used for slings made from larger rope. The larger wires in the 6 by 19 construction resist abrasion more effectively than the smaller wires in the 6 by 37 construction.

6.1.7 Since preformed wire rope does not unravel, it has advantages for use in slings.

6.1.8 It is less likely to set or kink, and broken wires do not "wicker" or stick out, creating a hazard to the hands when handling the slings.

However, closer inspection is necessary to detect broken wires in preformed wire rope.

6.2 Types of Slings

6.2.1 Two, three, or four single-leg slings make up a bridle sling. The safe lifting capacity depends on the number of legs and the angle formed by the legs.

6.2.2 The capacity of a two leg sling, with each leg vertical, is twice the load for a similar single-leg vertical lift.

6.2.3 A basket hitch, made by attaching one end of a single rope sling to the crane hook and passing the sling around the load and then attaching the other end to the crane hook, has equal capacity when both legs form a U; providing the minimum radius of bind in the rope at the point of load contact is 20 times the diameter of the rope.

6.2.4 The larger the spread of the legs of a two-leg bridle sling or basket hitch, the greater the stress on each leg, and therefore, the lower the capacity.

6.2.5 If the spread of either sling is 60 degrees, each leg forms a 30-degree angle with a line projected vertically downward through the hook. The safe load limit for the 30-degree angle is 13 percent less than if both legs were vertical. The safe load limit drops 29 percent when the vertical angle formed by a leg and vertical line through the crane hook is 45 degrees, and for a spread of 120 degrees or a vertical angle of 60 degrees, the safe load limit is decreased 50 percent.

7.0 Alloy Steel Chains for Overhead Lifting

7.1 Introduction

7.1.1 Wrought iron chains, heretofore used for industrial lifting applications, were regarded as the only chains to be used for hazardous overhead lifting.

7.1.2 These chains had greater visible stretch and resistance to damage, by impact loading, than did other types of handmade chains.

7.1.3 Periodic annealing of iron chains was essential for continued safe operations. However, the introduction of electrically welded, carbon-steel chains, after World War I, did not alter the situation materially.

7.1.4 Alloy steel chains were introduced in 1933, and due to their durable strength (twice as strong, size for size, as wrought iron) became the standard for slings.

7.2 Properties of Alloy Steel Chains

7.2.1 Alloy steel chains are produced from heat-treatable alloy steel in conformance with ASTM specifications.

7.2.2 Types and amounts of the alloying elements may vary according to requirements of the individual chain manufacturer.

7.2.3 After heat treatment each chain will have the following typical mechanical property:

Tensile Strength

125,000 psi minimum

Elongation 15 percent minimum

7.2.4 Strength and hardness of the chain material are important factors, but are not the only criteria for selection.

7.2.5 Acceptable chain material must also have toughness, be resistant to shock loading, and possess sufficient ductility to provide ample visual evidence of damage caused by excessive overloading.

7.2.6 Working load limits for commonly used sizes of alloy chains are listed in Table (2).

7.2.7 The working load limit is the maximum load in pounds which should be applied in direct tension to a straight length of chain.

7.2.8 To obtain the working load limit (safe load strength) divide the breaking strength (ultimate strength) by a safety factor specified by the manufacturer.

Table (2) - Working Load Limits and Break Test Limits for Alloy Steel Chain*

Nominal Size of Chain Bar in Inches	Working Load Limits in Pounds	Minimum Break Test in Pounds
¼	3,250	10,000
3/8	6,600	19,000
½	11,250	32,500
5/8	16,500	50,000
¾	23,000	69,500
7/8	28,750	93,500
1	38,750	122,000
1 1/8	44,500	143,000
1 ¼	57,500	180,000
1 3/8	67,000	207,000
1 ½	80,000	244,000
1 ¾	100,000	325,000

7.2.9 Stress on each leg of a multi-branch sling is increased appreciably when the angle between the chain and the horizontal is decreased.

7.2.10 Alloy chains do not work-harden or become embrittled in service. Strength of alloy chains are developed by proper heat treatment.

7.3 Attachment

7.3.1 As a general rule, hooks, rings, oblong links, pear-shaped links, coupling links and other attachments should be made of the same, or equivalent, heat treatable alloy steel as the chain itself.

7.3.2 In most cases, attachments should be installed on the chains by the chain manufacturer, who will then heat treat and proof-test each assembly.

7.3.3 If emergency conditions make it necessary for the user to replace an attachment, he should select the grade and size with extreme care.

7.3.4 Unalloyed carbon-steel hooks, repair links, rings, pear-shaped links, and other attachments should not be used. Homemade or makeshift bolts, rods, shackles, or other attachments should never be used.

7.3.5 Standard items produced from alloy steel include sling hooks, grab hooks, foundry hooks, grab links, rings, oblong links, pear-shaped links, and repair links. All such attachments

used with the recommended chain size provide a safety factor equal to or greater than that of an alloy chain itself.

7.3.6 Much "nipping" type of injuries has resulted when employees have allowed their fingers to become caught between the hook attachment and the load.

7.3.7 To prevent such injuries, handles can and should be attached to the assembly hook or end attachments.

7.3.8 To increase operating efficiency, handles are also frequently used on large hooks, master links, and other attachments.

7.3.9 Handles should be welded to the attachment prior to heat treatment.

7.3.10 Welding heat treated attachments is not recommended unless the entire attachment is heat treated again after welding.

7.3.11 The weldments should be inspected critically for possible zones of high-stress, and concentration caused by welding, that would lower the strength of the entire attachment.

7.4 Identification

7.4.1 Alloy chain slings supplied by chain manufacturers usually have a long-wearing identification link inserted in one of the coupling links.

7.4.2 The registration number of the assembly, together with the manufacturer's name and the other information he may consider necessary, is stamped on the identification link.

7.4.3 For in-plant numbering of assemblies made on the job, a readable identification link should be inserted in the connecting link.

7.4.4 Serial numbers should not be stamped on any portion of the assembly.

7.4.5 Stamping reduces the effective cross section of the link, and the numbers become stress risers or zones of potential weakness.

7.5 Inspection and Records

Most of the causes of chain failures can be detected before they occur, if the proper inspection procedure is followed.

7.5.1 Alloy sling chains should be inspected periodically by an experienced person who has the authority to remove damaged assemblies from service for reconditioning or replacement.

7.5.2 Frequency of such inspections depends upon service conditions.

7.5.3 Where slings are used in critical service, they should be given a brief routine inspection at the beginning of each work period by the area supervisor and a link-by-link inspection at least once a month.

7.5.4 Detailed inspection of slings used only intermittently for loads below their safe load strengths need not be made as often.

7.5.5 A good record system is an important factor during inspection and maintenance of chains. The time and effort spend on records will result in lowered maintenance costs and increased safety.

7.5.6 Each company storeroom should be responsible for the record system.

7.5.7 As soon as a new chain is received a record card should be filed, showing the name of the manufacturer, the type, size, length, working load limit, date received, and identification number.

7.5.8 The record card should also contain space for repair instructions.

7.5.9 Authorization tickets for repair work should be issued only by the record and inspection control office.

7.5.10 So records may be kept up-to-date, all repaired or reconditioned chains should pass through this office before being placed into service again.

7.5.11 When chains are issued to departments on a permanent basis, the date of issue and the name of the department should be entered on the card.

7.5.12 Chains issued on a temporary basis should be examined along with other pieces of equipment. An excellent opportunity for inspection is provided when the chains are brought in for storage.

7.6 Storage

7.6.1 Proper storage of chains can serve two purposes.

- First, if the chains are hung on racks inside buildings, having reasonably dry air and no extremes in temperature, disintegration through rusting will be prevented.
- Second, good storage facilities and practices will impress upon the workers, that chains must be given proper care at all times.

7.6.2 Racks should be arranged so that no employee, when storing the chains, will be exposed to lifting hazards.

7.6.3 Exceptionally heavy chains may be stored in neat piles, on a raised surface, or on the floor, if the floor is kept dry at all times.

7.6.4 Under no circumstances should chains be stored where they will be run over by trucks or exposed to the corrosive action of chemicals.

7.7 Lubrication

7.7.1 Lubrication of alloy sling chains, while in use, is suggested by some chain manufacturers.

7.7.2 However, slippery chains increase the hazard of alloy chains broken in service, because in the event of a break, damage seldom is restricted to the link that failed.

7.8 Safe Operating Practices

7.8.1 Chain slings should be preferably purchased fully completed from the manufacturer and whenever repair is needed, return to the manufacturer.

7.8.2 The manufacturer should also be queried for details of strength and specifications of the slings.

7.8.3 Employees who use alloy chains for overhead lifting should be thoroughly instructed in the following safe practices;

7.8.3.1 Estimate weight of load carefully.

7.8.3.2 Select chains with suitable load strength.

7.8.3.3 Permanent identification tags should be attached to the chain slings by the manufacturer and should never be removed.

7.8.3.4 Never decrease the angle between the legs of a chain sling and the horizontal. This will increase the load in the legs.

7.8.3.5 Examine each chain for defects.

7.8.3.6 Hitch the chain securely to the load.

7.8.3.7 Pad sharp corners.

7.8.3.8 Use chain attachments (rings, shackles, couplings, and end links) designed for use with the chains to which they are fastened.

7.8.3.9 Make certain that the load is always properly set in the bowl of the hook. Overloading on or toward the point (except in the case of grab hooks or others especially designed for the purpose) weakens the hook and may lead to a possible failure.

7.8.3.10 Do not use a hammer to force a hook over a chain link.

7.8.3.11 Never put a strain on a kinked chain. Workmen should be trained to take up the slack slowly and see that every link in the chain seats properly.

7.8.3.12 Keep hands and fingers from between the chain and the load.

7.8.3.13 Lift without sudden stops.

7.8.3.14 Stand clear of the load while it is being lifted.

7.8.3.15 Never drag chains on the floor.

29. Safety Relief Valves, Rupture Disks and Shutdown Equipment Tests

1.0 General

- All safety relief valves and shutdown devices shall be tested at regular intervals to determine whether they are in good operating condition. The operating supervisor will be responsible to ensure that the inspection and maintenance are performed in accordance with this program so that all safety valves and shutdown equipment are in proper operating condition.

2.0 Safety Relief Valve Testing

- A testing frequency schedule for pressure safety relief valves has been established. This schedule may be lengthened to two years (except where regulatory agencies require more stringent testing) for critical service valves if the operating location management feels the valves have demonstrated a reliable service record. This determination must be based on the last three years documented test records. The testing frequency schedule shall be as follows:

  (a) ***Critical Service*** - every 12 months. Critical service is defined as service where the likelihood of personnel injury is high should the valve fail to function properly. Examples of critical service would be relief valves within a manned production facility or plant; production facilities within city limits or residential areas.

  (b) ***Non-Critical Service*** - every 60 months. Non critical service where the likelihood of personnel injury is small should the valve fail to function properly. An example of non-critical service would be relief valves serving field or lease facilities where personnel are present less than three (3) hours per day.

  NOTE: Where testing is impossible without shutting down the unit or facility, the supervisor in charge shall schedule the valve(s) for testing at the next shutdown or turnaround.

- If the safety relief valve fails to open at the test pressure or fails to close off tightly after the test, remove valve for full breakdown inspection and repair.
- If valves are inoperative because of dirt, corrosiveness, or other environmental conditions between scheduled testing, increase the testing frequency as necessary to assure that they are maintained in working condition.
- Verify that the fluid relief volume designed in each valve is adequate for the protected equipment.
- Test power boiler safety valve, if applicable.
- Safety relief valves in plants and processes lines should be equipped with block valves or in-line test ports ahead of the valve to facilitate their removal for bench testing or testing in place. These block valves must be kept locked during normal operations. Block valves located on field lines shall be locked or car sealed open during normal operations. Their closure may only be done for testing and only if another relief valve is available to replace it in the event of delay in repairing original valve.
- Relief valves that connect to a flare header which do not have a block valve between the relief valve and the header must not be removed for servicing until the flare header is blinded off.
- The test performance shall be documented and kept on file at each field or plant location.

3.0 Shutdown Equipment

- There shall be two types of shutdown equipment designations. They are defined as:

  (a) ***Type I*** - Devices used for the protection of operating equipment where injury to personnel could occur should equipment malfunction. For example, in a plant where operations and maintenance personnel are continuously present, or where failure of equipment would adversely affect the public.

  (b) ***Type II*** - Devices used for the protection of operating equipment where injury to personnel would probably not occur should equipment malfunction. For example, in field operations where personnel are not normal present.

- Scheduled Testing of Shutdown Equipment:

  (a) Test Type I, including Emergency Shutdown Systems, at least annually.

  (b) Test Type II equipment during each major overhaul or more frequently when conditions warrant.

  (c) Should the above schedules indicate inoperative shutdown devices, increase testing frequency as necessary to assure that equipment is maintained in operable working condition.

  (d) Thoroughly check shutdown devices subject to periods of in-operation (no movement of liquid level floats or pressure elements) or excessive operation (rapid fluctuation of pulsating pressures on pressure gauge) for worn or sticking parts, when tested.

4.0 Rupture Disks

- The following specification outlines the use of rupture disks in operating areas. It will apply towards all existing and new installation. Facilities where rupture disks are currently in use must be modified to comply with this specification.
- Town-site Operations: Rupture disks shall not be used in any applications within town-sites. Properly sized safety relief valves are the recommended device for relieving excess pressure. The governing reason in this utilization is the safety of both company employees as well as the general public. The discharge side of the safety relief valve must be piped to a containment tank located 150’ away from any fired vessel. The tank, which will be netted, if it is open-topped, will be used as a blow-down tank to retain any discharged fluid.
- Non-Town-site Operations: Rupture disks, with the following modifications, shall be used: epoxy coat the unions and install a Teflon seal on the process side of the disk. The discharge side of the rupture disk must be piped to a containment tank located 150’ away from any fired vessel. The tank, which will be netted, if it is open-topped, will be used as a blow-down tank to retain any discharged fluid.

  NOTE: The containment tank stipulation applies only to specific areas of operation. Existing safety relief valves will not be substituted with rupture disks.

- Rupture disks shall not be installed upstream of a relief valve unless there is a means of monitoring and relieving the pressure between the rupture disk and relief valves.

30. Evaluation of Compliance

1.0 Purpose

To evaluate GANOPE compliance with applicable legal requirements and national and international standards relevant to Health, Safety and Environmental.

2.0 Scope

All company's activities which interact with Health and Safety.

3.0 Procedures and Responsibilities

3.1 Sources of the commitment towards HSE management system

- Egyptian legislation and regulations related to company's activity.
- Requirements of solid international standards and codes of practice.

3.2 Identifying and accessing the updated versions of legislation and regulations and other HSE requirements.

3.3 Monitoring and measurement plan for evaluating this compliance is placed on regular periodic basis and the records are maintained.

3.4 In case of developing a new project or activity, a discussion between concerned departments and HSE management representative must be taken to verify its compliance with Egyptian Health, Safety and Environmental legislation and regulations and other requirements.

31. Training and Awareness

1.0 Purpose

The purpose of this document is to provide an effective HSE inductions and training procedures.

2.0 Approach

2.1 New / Transferred Employee Safety Orientation

Managers should provide for the training of new / transferred employee stressing safety, work methods and job hazards.

- **Requirements:**
  - When an employee is recruited (new employee) a training program shall be established for him, for orientation with company policy, and rules, and would include safety rules and regulations. This training program shall be conducted in the first week of employment, either a technical one or administrative.
  - HSE Department should establish a fixed program for new employees, where it should include all rules, practices and information indicated in the Safety Booklet. This in addition to practical training on basics of firefighting and how to use fire extinguishers, general information about emergency plan, and duties of every person in case of emergencies.
  - Upon completion of orientation training program for any employee, and assigned to his job at his section or department, another time shall be determined by his direct supervisor in coordination with Safety Department for a specific training session relative to his work, and hazards associated with, also company's safety rules and regulations related to his job, in addition to a practical training on fire fighting and use of fire extinguishers.
  - Experience have shown the importance of six steps to successful employee training:
    - Pinpoint training needs
    - Set training objectives
    - Decide how best to meet the training objectives
    - Secure and/or develop the training program
    - Do the training
    - Evaluate and follow-up the training.

- **Typical Topics**
  - Here are some of the typical topics that may be find necessary to meet employee training needs:
    - How to fulfil relevant safety and health laws
    - Rules education and review
    - How to operate equipment properly?
    - Proper use of tools
    - Effective use of operator's manuals, checklists forms and required records
    - Proper work procedures and practices
    - Proper use of protective equipment
    - Safe handling practices for hazardous substances
    - What to do in emergency and disaster situations
    - Firefighting skills
    - Proper materials handling techniques
    - Good accident/incident reporting investigation and correction
    - How to contribute to safety meetings
    - First aid skills
    - Techniques and benefits of housekeeping and order
    - Individual and group problem solving techniques
    - Safety on and off the job

2.2 Departmental HSE Orientation

Each manager orientates its new employees assigned to their department in rules and regulations specific to their type of work activities.

Managers shall document the contents of their orientation and furnish copies to the HSE department and shall keep attendance records of these orientation.

2.3 Training for Specific Jobs/ Operations and Activities

Specific HSE training is mandatory and shall be conducted in accordance to a training plan.

Written records must be maintained documenting all training performed during the contract of personnel. These records must be maintained by the HSE department.

All trainings shall be conducted by a competent person designated and approved by the HSE manager.

32. Accident Investigation and Reporting

1.0 Introduction

1.1 Safety Reporting Philosophy

"...we will openly report our performance, good and bad...."

1.2 Purpose of the Safety Performance Information

Safety performance data collected by GANOPE HSE Team is used to:

- Evaluate monthly and annual performance trends
- Monitor performance against targets
- Selectively share with our benchmarking partners to compare performance between companies and sectors when available

2.0 Scope of Reporting

We will openly report our performance, good and bad - We will work with others - our partners, suppliers, competitors and regulators - to raise the standards of our industry. To influence that performance, reporting of HSE performance data is an important first step.

3.0 Lagging Indicators to be Reported

- Fatalities
- Days away from work (DAFW) injury and illness cases
- Total recordable injury and illness cases (Days Away from Work – Restricted Workday – Medical Treatment
- First aid cases
- Near Misses

4.0 Leading Indicators to be Reported

- Safety observations
- Tool Box Talk
- Risk Assessment
- Work Permits
- Safety training hours
- Closure of actions on time

5.0 Lagging Indicators

5.1 DEFINITIONS (Source: OSHA 300)

5.1.1 Occupational Illness

Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases, which caused by inhalation, absorption, ingestion or direct contact.

5.1.2 Fatality

A recordable, work related fatality.

5.1.3 Days Away From Work Case

A work related injury or illness other than a fatal injury which results in a person being unfit for work on any day after the day of occurrence. Restricted work cases are not included in this category.

5.1.4 Restricted Workday Case

A work related injury or illness other than a fatality or days away from work case which results in a person being unfit for full performance of the regular job on any day after the injury or illness. Work that can be performed might be:

- An assignment to a temporary job
- Part-time work at the regular job
- Continuation at the regular job but not performing all the usual duties of that job where no meaningful restricted work is being performed, the incident is recorded as a DAFW.

5.1.5 Medical Treatment Case

Cases that are not severe enough to be reported as fatalities or DAFW cases or restricted work day cases but are more severe than requiring simple first aid treatment.

5.1.6 First Aid

A treatment for a work related injury or illness that does not ordinarily require medical care, regardless of who provides treatment. OSHA considers only the following types of treatments as first aid cases (any other type of treatment is to be considered a Medical Treatment or a Restricted Injury):

1- Nonprescription medications.
2- Tetanus shots.
3- Cleaning surface wounds.
4- Bandages, butterfly bandages and steri-strips.
5- Hot/cold therapy.
6- Non-rigid support.
7- Temporary immobilization devices while transporting
8- Drilling of nail.
9- Eye patches.
10- Removing foreign bodies from eye by using only irrigation and cotton swab.
11- Removing splinter from other than eye by irrigation, tweezers or other simple means.
12- Finger guards.
13- Massages.
14- Drinking fluids for relief of heat stress.

5.1.7 **Near Miss**

An undesired event, which, under slightly different conditions, could have resulted in harm to people, damage to the environment & property loss.

5.1.8 **Initial Incident Announcement**

An incident or near miss, where the most probable outcome is an Accident.

5.1.9 **Major Accident Announcement (MAA)**

An accident including:

- Fatality
- Multiple SERIOUS injuries
- Significant adverse reaction from authorities, media or general public.
- Cost of accident damage exceeding $1,000,000
- Oil spill more than 100 barrels release of more than 10 tons of Chemicals

6.0 Leading Indicators

6.1 Safety Observations

A documented observation of safe and an unsafe acts and conditions by the workforce. Examples include:

- Behavior-based programs
- Inspection programs

The rule to be followed for counting observations is that multiple observations can be counted separately as long as the observations are distinctly different. For example, a card that documents two observations regarding an unclean worksite should be counted as one, whereas two separate observations of an unclean workplace and a worker not wearing proper PPE captured on one card can be counted as two observations.

6.2 Safety Training

Hours of safety training led or sponsored by GANOPE. Examples include:

- Safety Orientations
- GHSER(HSE Management Training)
- Safety-Behavior programs
- Technical Training (Lifting/Vehicle/…)
- First Aid
- Confined space entry
- Energy isolation
- Working at heights
- Risk management processes
- Defensive driving
- Ground disturbance
- Management of change
- Personal protective equipment
- H^2S
- Proper lifting techniques

Basic awareness discussions conducted during routine safety meetings should not be included. Training of contractors should not be included unless training is conducted by a GANOPE employee or consultant

6.3 Closure of Actions

Closure of actions resulting from HSE incident investigations and HSE Audits.

7.0 Transportation Definitions

7.1 Vehicle Incidents:

Any unplanned incident involving:

7.1.1 All Motor Vehicles:

Includes heavy vehicles (3.5 tons and heavier), light vehicles (under 3.5 tons), self-propelled mobile plant. This includes accidents when using a hire/rental vehicle on company business, or when using a private vehicle on company business for which a member of the workforce is reimbursed.

7.1.2 Work Related Kilometers:

The number of kilometers driven during work related activities. This includes all work related kilometers driven in hire/rental vehicles, or private vehicles (see all motor vehicles definition above).

7.1.3 Motor Vehicle Accident

An accident involving a motor vehicle resulting in injury, or loss/damage, or harm to the environment, whether this impacts GANOPE and or/its contractors directly, or impacts the third party. This is irrespective of whether the accident was preventable or non-preventable. It excludes all accidents where:

- The GANOPE workforce vehicle was legally parked
- The journey is to or from the driver's normal place of work
- Minor water wear and tear is the case (e.g.: stone damage to a windscreen, minor paintwork damage)
- An incident is the result of vandalism, or theft
- A company provided vehicle is being driven on non-work related activities (e.g. Private business, leisure)

8.0 Spill Definitions

8.1 Spills:

The unplanned or accidental loss of primary containment from any operation owned or operated by GANOPE or managed by a contractor on behalf of GANOPE, irrespective of any secondary containment or recovery. In all cases, if a spill or release reaches or is likely to reach surface water, the event will be reported.

8.1.1 Oil, Condensate, Produces Water Spill:

An oil, condensate, or produced water spill is defined as a release from primary containment of any form of oil, condensate, or produced water. Oil is defined as crude oil, lubricating oils, hydraulic oil, gasoline and diesel fuels, aviation fuel, kerosene, and any other products refined from crude oil. Synthetic lube oils are included.

8.1.2 Chemical Spill:

A chemical spill is defined as a release from primary containment of any pure chemical, chemical mixture or compound (excluding gaseous releases to the atmosphere) for which an MSDS is required.

8.2 Hydrocarbon Gas Releases:

Any unplanned or accidental hydrocarbon gas release in any quantity that escapes primary containment and is determined to be an immediate HSE hazard to workers or the general public.

9.0 Fire Definition

9.1 Fire and Explosions:

Any unplanned incident involving GANOPE property, equipment or operations that results in a flame, excessive heat or combustion resulting in a fire or explosion.

10.0 Actions Closure Procedures

- Investigation, near miss reports, audits, etc. should be identified and agreed by Project management and sent to the concerned department (HSE) once the event report is completed.

The site HSE department will track those actions and ensure their closure.

- Five days ahead of each month the HSE representative in each site will send a communication to the concerned department reminding of the actions due in the following month.

- By the end of each month the HSE representative Onsite will collect /follow up on the status of all the actions due / closed /open of the current month and report it to the main offices in Cairo. All corrective actions resulting from incident

11.0 Timelines for Data Reporting

نوع التقرير Type of report	متى When	الجهة المسئولة Responsible Party	الوصف Description	طرق الإبلاغ Means of Reporting
التقرير يومي **Daily Report**	• ملاحظات السلامة Safety observations • محادثات قبل العمل Tool Box Talk • تقييم المخاطر Risk Assessment • تصاريح العمل Work Permits • ساعات تدريب السلامة Safety training hours • إنهاء الأعمال (توصيات اجتماعات السلامة والأفعال التصحيحية) في الوقت المحدد لها Closure of actions on time	- ممثل السلامة والصحة المهنية وحماية البيئة بالموقع The site HSE Rep	يومياً Daily	البيانات المدخلة Inputs Data
الخطر الوشيك **Near Miss**	الحدث غير المرغوب فيه، الذي من الممكن في ظروف مختلفة اختلافا بسيطاً أن ينتج عنه ضرر للأفراد أو تلف للبيئة أو خسارة للممتلكات. An undesired event, which, under slightly different conditions, could have resulted in harm to people, damage to the environment & property loss .	- يمكن للفرد الذي يلاحظ ويحدد الحادث الوشيك أن يبلغ عنه باستكمال بطاقة الحادث الوشيك ويسلم البطاقة إلى الطرف المسئول عن المنطقة. - الطرف المسئول عن المنطقة يكون بدوره مسئولاً عن دراسة الحادث الوشيك وتعريف الفرد الذي قدم البطاقة بأعمال التصحيح الواجب تنفيذها. - يجب إعلام جميع العاملين بجميع المعلومات المتعلقة بهذه المشكلة في أقرب فرصة. Any observer, who identifies a Near Miss can report it by filling out a Near Miss card and hand it to the responsible party in the area. The responsible party is to handle the Near Miss as he sees fit, then provide feedback to the observer. All appropriate information shall be cascaded to the general workforce at the earliest opportunity .	- في أسرع وقت ممكن As Soon As Possible	تقرير مكتوب / بطاقة مكتوبة A written Report/Card..

نوع التقرير Type of report	متى When	الجهة المسئولة Responsible Party	الوصف Description	طرق الإبلاغ Means of Reporting
بيانات المخرجات Outputs Data	حالة الإصابة بغياب أيام عن العمل، إسعافات أولية، علاج طبي، الإصابة بعمل مقيد (عمل خفيف)، حادث المركبات، & حادث جسيم DAFWC, First Aid, Medical Treatment, Restricted Injury, vehicle accident, and Major Accident	- ممثل السلامة والصحة المهنية وحماية البيئة بالموقع The site HSE Rep	- في أسرع وقت ممكن As Soon As Possible	يتم الإبلاغ عن طريق الآتي: - هاتفياً في أسرع وقت ممكن. - عمل تقرير حادث مبدئي. (يرسل في خلال ساعات من الحادث)، حتى يتم عمل تقرير نهائي للتحقيق في الحادث (ويرسل لاحقاً فور الانتهاء منه) Quickest possible mean phone and Initial Incident Announcement till preparing the Investigation Report
تجميع بيانات السلامة Collective HSE Data	عدد المدخلات والمخرجات المذكورة عالية، بالإضافة إلى عدد ساعات العمل والمسافة المقطوعة بالكيلومترات Total numbers of inputs and outputs described above in addition to number of man working hours and kilometer driven..	- ممثل السلامة والصحة المهنية وحماية البيئة HSE Rep - ممثل المشروع Project Rep	- اليوم السابع من كل شهر By the 7th of each month	- بواسطة البريد الالكتروني by Emails
تقرير إنهاء الإجراءات Action Closure Report	جميع الاجراءات الشهرية الناتجة من تقارير التحقيق في الحادث، توصيات اجتماعات السلامة ومراجعات السلامة والصحة المهنية وحماية البيئة.. الخ All monthly actions due from investigation reports, safety meetings & HSE audits..etc.	- ممثل السلامة والصحة المهنية وحماية البيئة بالموقع The site HSE Rep	- اليوم السابع من كل شهر By the 7th of each month	- بواسطة البريد الالكتروني by Emails

نوع التقرير Type of report	متى When	الجهة المسئولة Responsible Party	الوصف Description	طرق الإبلاغ Means of Reporting
تقرير التحقيق في الحوادث Incident Investigation Report	يدرج في تقرير التحقيق في الحادث الآتي: - - وصف تفصيلي/موجز للحادث - الإجراءات التصحيحية - تحليل شدة الحادث والأسباب الجذرية To include short/long description of the incident, corrective actions, severity and root cause analysis	- ممثل السلامة والصحة المهنية وحماية البيئة بالموقع The site HSE Rep	- فور الانتهاء منه Once completed	- تقرير التحقيق في الحادث Investigation Report
الإبلاغ عن حادث جسيم Major Accident Announcement	انظر التعريفات See definitions	- مدير المشروع Project Manager	- خلال24 ساعة من الحادث Within 24 hrs. of the accident	- نموذج الإبلاغ عن حادث جسيم Major Accident Announcement Form

12.0 GANOPE Incident Investigation Eelements and Minimum Requirements

❖ Element 1: Be ready to investigate

1. Any incident (defined as Ganope reportable) occurring at a GANOPE entity shall be investigated.

2. GANOPE Leaders shall select a pool of people to serve as incident investigation team leads in the event of a reported incident.

3. GANOPE Leaders shall ensure that persons assigned to the pool of incident investigation team leads are trained to a basic competence level and their skills developed to conduct a thorough incident investigation.

Recommendations:

- Incident investigation team leads are considered "trained" upon completion of a standardized 8-hour training program that instills basic level competency for Root Cause Analysis.

- Because the skills required for effective incident investigations are best developed by practicing on actual incident investigations, employees and their supervisors should work together to ensure development opportunities after training.

- The pool of incident investigation team leads should be such that incident investigation team leads have active participation in two incident investigations per year after training to develop and maintain the skillful application of investigative techniques

- Incident investigation teams should be led by trained incident investigation team leads; however, they may draw on the knowledge of subject-matter experts and others who have not been formally trained, but who demonstrate a general awareness of Root Cause Analysis techniques and terminology from participation in routine safety activities, such as reading lessons learned reports, discussing past incidents in safety meetings and reviews, and by participating in incident investigations–as either a witness or a junior team member.

- Untrained people should not lead incident investigation teams.

❖ Element 2: Get Mobilized

4. In the event of an incident requiring investigation, GANOPE Leaders/HSE Management team shall select incident investigation team leaders from the pool of incident investigation team leads.

5. Incident investigation team leads shall be given adequate relief from their normal duties to complete the incident investigation.

6. The incident scene shall be released for resumption of work only at the direction of the incident investigation team and any involved regulatory or law enforcement bodies.

7. The incident investigation team shall consult with GANOPE Legal at the start of all investigations of Level A-E incidents, and in any other incident investigation where the possibility of regulatory action or litigation exists.

8. The incident investigation team shall conduct the sole GANOPE incident investigation into the facts leading to the incident, and shall pursue any reasonable line of inquiry to establish evidence addressing what happened, how it happened and why it happened

Recommendations:

- First responders from GANOPE emergency services should be trained in scene preservation.

- The entity's GANOPE Leader should retain full responsibility for managing all post-incident aspects other than the incident investigation itself.

- Regardless of whether the first responders are municipal or from GANOPE, the GANOPE personnel should take all reasonable steps to identify and preserve evidence, consistent with the response necessary to prevent further injury, to protect the environment, to protect assets and to meet regulatory requirements. This may include barricading the scene, posting a guard, creating chain of custody documents, or similar actions. Special attention should be given to time sensitive information, such as computer data files and photography of the site.

- All such evidence collected should be held for the incident investigation team.

- An agreed upon Terms of Reference should be created to guide incident investigation activities.

- The incident investigation team leader should brief incident investigation team members who have not been trained as incident investigation team leads on incident investigation tools and techniques before the incident investigation starts.

❖ Element 3: Conduct the investigation

9. The incident scene shall be properly preserved upon completion of first responder activities.

10. The incident investigation team shall conduct their incident investigation independently, without interference from other parties.

Recommendations:

- At the time of the incident, an entity's GANOPE Leader should utilize their best judgment as to incident severity, and investigate as per that protocol. If the incident severity level is not clear.

- The incident investigation team should maintain the confidentiality of the investigation materials, controlling the flow of information regarding the incident investigation and releasing information only when they find it prudent or necessary to do so. However, the incident investigation team leader should periodically update the entity's GANOPE Leader as necessary to maintain site operations and fulfill other responsibilities.

- The decision to release materials related to the incident investigation, i.e. machinery or access to roads, should be made with the concurrence of the incident investigation team.

- The basic RCA training program, including the CLC and glossary, are recognized as GANOPE's preferred method for conducting an incident investigation, as it results in a quality investigation that identifies and provides for the correction of root causes that allowed the incident to occur.

- Where the entity's Local Operating Management System does not require a formal incident investigation of a particular level of incident, incident investigation team leads shall utilize techniques appropriate to the severity of the incident.

❖ Element 4: Report the findings

11. An Incident investigation report, consistent with GANOPE's preferred format, shall be made of the incident investigative team's findings and conclusions.

12. The incident investigation report shall include proposed corrective actions.

Recommendations:

- An entity's Local Operating Management System should establish expectations for the nature and extent of information required in incident investigation reports based on each level of incident severity. The requirements should change based on the level.

- The timing for completion of the incident investigation and production of the incident investigation report should be identified in the Management System. Generally, these activities should be completed within 15-30 days of the incident. When extraordinary circumstances exist which would delay the report the management practice should describe the additional approvals and mitigations necessary.

❖ Element 5: Act on the findings

13. The incident investigation team shall address their report to the GANOPE Leader with accountability for the area or operation where the incident occurred.

14. The report recipient shall determine and document with reasons which of the proposed corrective actions shall be accepted, which shall be modified and which shall be rejected.

15. For those actions accepted or modified, the report recipient shall establish a project schedule and assign personnel to complete those actions.

16. The report recipient shall obtain progress reports from assigned personnel and ensure completion of the tasks required to meet the proposed corrective action.

17. The report recipient shall complete an investigation summary report for any MAA or HIPO investigation and circulate to the MAA and HIPO distribution list.

Recommendations:

- The incident investigation report should be addressed to the GANOPE Leader having area of responsibility for the incident, who has the authority to address all proposed corrective actions.

- The incident investigation report should reflect the findings of the incident investigation team and should represent a consensus among incident investigation team members.

- Tracking system should be used to establish schedules and assign personnel to complete recommended corrective actions.

- GANOPE Leaders should establish a process in the Management System for tracking tasks arising from accepted corrective actions and to verify that all necessary tasks have been completed.

13.0 Roles And Responsibilities

13.1 Senior Management (GANOPE Leaders)/HSE GM

The most senior person who is responsible for the Facility/District/Project where the incident occurred is the Owner of the Investigation. This individual will:

- Appoint Investigation Team members, for MAA and HiPo incidents to ensure an independent assessment of the root causes as soon as practicable.

- Provide resources & support as appropriate to ensure the Team delivers an investigation report on time.

- The entity's GANOPE Leader should issue the Major Accident Announcement when appropriate.

- The HSE GM shall take steps to properly preserve physical and paper evidence of the incident pending the appointment of the incident investigation team.

- The entity's GANOPE Leader shall provide access to the scene, the people involved and other evidence necessary for the incident investigation team's work.

- The entity's GANOPE Leader shall coordinate other investigations into the incident, such as regulatory agency or police investigations.

- The entity's GANOPE Leader should review the draft incident investigation report to identify any factual errors.

- The HSE GM should work jointly with the incident investigation team to create an appropriate "Lessons Learned" communication.

- The entity's GANOPE Leader to whom the incident investigation report is addressed shall be responsible for considering and acting on the recommendations contained in the incident investigation report.
- The entity's GANOPE Leader should maintain all materials related to the incident and its investigation in accordance with documentation requirements until legal approval to destroy is obtained.

13.2 The Investigation Team Leader

The Investigation team leader will ensure the following:

- Reports directly to the 'Owner' of this investigation
- With the Owner, appoints an investigation team
- Represents the investigation team when communicating information
- Provides a daily update to the Owner
- Ensures that GANOPE processes for reporting incidents have been met (MAA, HiPo, etc.)
- Is responsible for seeking legal advice prior to issue of any documentation
- Delivers the investigation report within the agreed time frame

13.3 The Root Cause Specialist

- Provides guidance to the investigation team on the strategies & methodologies to be used throughout the investigation.

13.4 The Investigation Team

The Investigation Team will ensure the following:

- An incident investigation team leader and a Root Cause Specialist shall be appointed in line with procedures.
- The balance of the incident investigation team members should be drawn from the local entity, with the concurrence of the incident investigation team leader.
- The incident investigation team generally should include members of the GANOPE Workforce, but should not include people who were directly involved with the incident or people who supervise the area where the incident occurred.
- The incident investigation team leader should add additional incident investigation team members for specifically needed expertise.
- Contractor representatives should be encouraged to participate if a contractor was involved in the incident.
- Incident investigation team size should be kept as small as is reasonable—generally not more than 4 to 6 members are recommended.
- The incident investigation team shall conduct the sole GANOPE investigation into the incident.
- The incident investigation team should generally limit their efforts to the conditions and circumstances leading to the incident, and should avoid doing a general safety audit.
- The incident investigation team shall pursue any reasonable line of inquiry to establish evidence addressing what happened, how it happened and why it happened.
- · The incident investigation team leader should provide periodic updates to the entity's GANOPE Leader and/or the HSE GM on the progress and findings of the incident investigation.
- The incident investigation team shall utilize appropriate Root Cause Analysis techniques in performing the incident investigation.

- The incident investigation team should create a draft report and review it with the entity's GANOPE Leader, HSE GM and legal, if appropriate, before issue.
- After considering the comments on the draft report, the incident investigation team shall complete a final report utilizing the preferred template provided.
- The incident investigation team should collate all investigation materials and secure them per local procedure.
- The incident investigation team should work jointly with the entity's GANOPE Leader/ HSE GM to create an appropriate "Lessons Learned" communication.
- The incident investigation team's report will be addressed to the GANOPE Leader with accountability for the area or operation where the incident occurred.

13.5 Line Managers

- Communicate immediately to the Senior Managers and HSE General Manager of any incidents.
- Ensure that a preliminary written MAA / HiPo report has been prepared and sent to the HSE General Manager.
- Participate and facilitate in the investigation process.
- Ensure an Incident Investigation Form and if required, a formal investigation report is submitted to the concerned senior manager & HSE General Manager within 24 hours and 10 days (respectively) after the event. If the investigation is on progress, in which case an interim status report of the investigation shall be sent to them.
- Ensure findings, recommendations and lessons learned from incident investigations are widely communicated, understood and implemented by all personnel.

13.6 Site Managers (Entity GANOPE Leader)

- The entity's GANOPE Leader/HSE GM should issue the Major Accident Announcement when appropriate.
- The entity's GANOPE Leader shall take steps to properly preserve physical and paper evidence of the incident pending the appointment of the incident investigation team.
- The entity's GANOPE Leader shall provide access to the scene, the people involved and other evidence necessary for the incident investigation team's work.
- The entity's GANOPE Leader shall coordinate other investigations into the incident, such as regulatory agency or police investigations.
- The entity's GANOPE Leader should review the draft incident investigation report to identify any factual errors or omissions.
- The entity's GANOPE Leader/HSE GM should work jointly with the incident investigation team to create an appropriate "Lessons Learned" communication.

- The entity's GANOPE Leader to whom the incident investigation report is addressed shall be responsible for considering and acting on the recommendations contained in the incident investigation report.

- The entity's GANOPE Leader should maintain all materials related to the incident and its investigation in accordance with documentation requirements until legal approval to destroy is obtained.

13.7 Team Leaders / Supervisors

- Notify senior Manager of any incidents immediately.

- Accountable of the preservation of evidences at the scene, as well as any related documents and registers.

- Participate in incident investigation activities as required by senior Manager.

- Ensure all recommendations resulting from incident investigation reports are communicated to all personnel (including contractors).

13.8 Site HSE Advisor / MGR

- Maintain the incident investigation and reporting procedure and standard forms to be used to reporting.

- Provide incident investigation training and support to those likely to be assigned to an investigation team.

- Ensure an administration system for Incidents documentation control. Keep records of all incidents (despite severity) and the report forms.

- Monitor status of all recommendations until they are completed.

- Preserve document files with reports as well as any additional documentation on site.

- Maintain and submit daily and monthly statistical data to HSE Manager.

- Assist HSE Manager in monitoring of first aid, medical cases, property damage, and contractor performance reports; ensure all incidents are being reported and investigated appropriately.

14.0 Investigation Process –Root Causes Analysis (CLC)

The Investigation Team shall perform a methodical examination of the event. Investigation activities shall be directed toward defining the facts and circumstances related to the event, determining the causes and developing remedial actions to control the identified risks.

As main investigation tool, the Team will use *Root Cause Analysis Techniques*, which includes the Comprehensive List of Causes as well as the "Incident Outcome, Actual & Potential Severity Matrix".

The Root Cause Analysis sequence is:

- Investigation planning
- 4P technique (people, positions, parts, paper)
- Interviewing
- Use of building blocks
- Determination of Critical Factors
- Use of the List of Causes to determine immediate, basic and system causes.
- Selection of Corrective Actions
- Reporting

The investigation shall be aimed to clarify:

- The sequence of events and consequences
- Other potential events and consequences (what else could have happened)
- Deviations from requirements, plans and procedures
- Human, technical and organizational causes
- Which barriers failed, why they failed and which barriers should have been established
- Which barriers worked, i.e. what stopped the incident and its further escalation

15.0 Administration Rules

15.1 Investigation Report Completion Time & Content

The initial notification of any incident

Shall be completed & distributed according to the incident severity. The Investigation Report Form shall be completed and distributed within 48 hours after the incident.

A formal Investigation Report shall be available within two to four weeks after the incident if an external Investigation Team is required. All documentary and photographic evidence collected shall be included as appendix.

The content of any formal report should be:

Introduction

Summary

Investigation

Sequence of Events

Investigation Methodology

Immediate causes

System causes and corrective actions

Additional Findings

Corrective actions

Appendices

15.2 Distribution and Filing of the Investigation Report

The HSE General Manager will decide on the distribution of the full report, in particular which findings and "lessons" learned" are to be shared with others both inside and possibly outside Ganope .

The Investigation Report shall be distributed according to the GANOPE Incident Distribution Protocol. The original Investigation Report and Evidence File shall be kept by the HSE Department in Cairo; copies might be distributed at the site HSE Advisors in different department & sites.

15.3 Recommendations and Follow Up

Once the report is available, HSE General Manager should review the findings and recommendations and agree on their course of action. The final report should contain management responses to all recommendations with clear delegation of responsibilities for actions. A time scale for review or completion is essential.

Persons who have been assigned with actions shall provide regular reports to the HSE Central Team to ensure follow up and further close out.

The HSE Department shall issue a monthly report with the information of actions closed, overdue, and open, etc., and recommend different approach to closeout.

Sharing Learning's Lessons

Investigation resumes will be distributed to all the departments, with approval from the HSE General Manger. It is the responsibility of the Line & Senior Managers to share learning's and implements related actions as appropriate in their own.

Trend Analysis

The HSE Department shall issue monthly, quarterly and annual statistics on incidents and causes.

33. Contactor Safety

1.0 General

Today virtually all parts of an organization's operation are subject to consideration for outside contracting.

This practice can have a dramatic effect on the safety environment of a workplace. Contractors are no longer working within a barricaded area at the side of a facility. They are working hand-in-hand with the regular employees.

The behavior of all employees, regardless of their employment status, now determines the HSE in which work gets done. And, although each employer is responsible for its employees, the senior manager must be responsible not only for its own employees but also for the way contracted employees discharge their safety responsibilities.

The coordination and safety management task has become far more complex than in the past. Organizations have attempted to cope with this task in a variety of ways.

1.1 Reviewing the safety performance of prospective contract organizations prior to putting the organization on the bidder's list.

1.2 Establishing contractor safety handbooks that are a part of the contract agreement and with which, therefore, all contract personnel must conform.

1.3 Providing in the contract language that site HSE rules, procedures and standard operating procedures will be the standards by which the contractor will conduct its work – that is, no separate contractor rules or procedures.

1.4 Establishing evaluation procedures to assure that contract personnel have the requisite skill and knowledge.

1.5 Establishing clear contractual terms regarding the need to work safely as a contractual necessity and specifying the consequences of failing to do so.

1.6 Establishing performance monitoring procedures.

1.7 Including contractor personnel in the organization's safety program by including contractor personnel on the Central Safety Committee and its subcommittees, Management Audit Teams, Injury/Incident investigations, and 'crew' safety meetings.

2.0 Objectives

2.0 To lay down suggested procedures for the careful selection and assessment of subcontractors on health, safety and environment, if they are to work under, or for, a main contractor, managing contractor, client, etc.

2.1 To outline suggested procedures for the practical HSE management of sub-contractors when they are working under, or for, the aforementioned parties.

3.0 Selection and Assessment of Contractors

3.1 As a matter of policy and good practice, it is recommended that potential contractors be evaluated on the basis of HSE criteria in addition to their technical and general competence to carry out the work at their tendered price.

3.2 Construction safety officers have the responsibility for achieving high standards of health and safety on site as a matter of company policy.

3.3 The relevant company department should therefore be made responsible for maintaining a list of approved contractors. This list should be arrived at only after the contractors placed upon it have been subjected to a pre-qualification procedure. this may be used in conjunction with the model HSE assessment, which involves health and safety as one of the major criteria upon which approval depends).

3.4 The above procedure should be used in relation to all new bidding contractors, and on all new major projects to ensure that information held on file is up to date. The relevant company department, which must be responsible for ensuring that up to date information is kept on file.

3.5 On completion and return by contractors of health, safety and environment assessment data, the relevant company department should consider the information given, and if any of the data is considered doubtful, the company safety officer should be consulted. If should then be his duty to satisfy himself as to the information presented and to advise his company accordingly.

3.6 Where health and safety information given to relevant company departments by a contractor is found to be inadequate (and no undertaking is forthcoming from the contractor concerned to put matters right) this must be regarded, as a major reason for not giving that contractor the work, and he should be placed on a 'non-approved' file together with relevant data.

4.0 Standard Rules and Conditions for Contractors on Health, Safety and Environment

It is normally difficult to include comprehensive HSE rules of this sort in contracts with direct contractors or sub-contractors. An alternative is to provide a set of standard rules, to request the contractor being assessed to acknowledge that he will comply with these rules.

5.0 Standard Clause for Insertion in Contacts with Contractors

Wherever practicable, it is recommended that the model clause should be inserted by the relevant company department, in all contracts with direct contractors or subcontractors.

In cases where deviations from the standard clause are considered necessary, such deviations should be agreed with the company safety officer.

6.0 Written Method Statements for High Risk Activities

For certain high risk activities (e.g. steel erection, cladding, demolition, industrial painting, work with asbestos, major lifts, work in confined spaces, etc.) it is advisable that the relevant company department insists on a written method statement by the bidding contractor.

This should detail, the personnel designated to do the work together with their training/experience, a description of each stage of the work, the access and other equipment to be used (including personal protective equipment) and, where appropriate, plans and drawings should also be provided.

Where the relevant company department is in doubt as to the adequacy of what is detailed in the written method statement it should confer with the company safety officer.

7.0 Health, Safety and Environmental Management of Contractors

7.1 As already indicated, all contractors being considered for work should be subject to 'standard rules and conditions for contractors'. These rules can be produced in booklet form and should additionally be used by company management and safety officers as the basis for HSE management of contractors on site.

7.2 In managing contractors for HSE, company construction management may also consider making use of the following methods:

7.2.1 For formal communication of HSE instructions to contractors, use of a site safety directive. For legal and record purposes, site management should retain the record copy of the form and on return by the contractor of the 'confirmation of action' tear off slip the latter should be pinned to the top record copy.

7.2.2 Regular inspection by site management/supervision and company or resident safety officers of the operations of contractors as appropriate to the circumstances and covering HSE (including where relevant the keeping of statutory records) and fire protection.

7.2.3 Inclusion of occupational HSE as an integral part of the agenda of all relevant site management meetings with contractors.

7.2.4 Insistence, where appropriate, on the provision of a written method statement from the contractor before he commences high risk activities.

7.2.5 The setting up on site of a suitable safety committee.

7.2.6 Good personal example by all site management and supervision in the wearing of a full personal protective equipment and insistence that contractor' employees do likewise.

7.2.7 Use of safety posters either designed 'in house' or as supplied by the safety organizations.

7.2.8 Insistence that contractors report all lost-time accidents, cases of ill health and dangerous occurrences to site management or, where appropriate, the resident safety officer.

7.2.9 Inclusion, wherever possible and appropriate, of contractor's employees in any health and safety training program particularly at induction.

7.2.10 Pre-inspection of statutory records of examination of lifting appliances before contractors are allowed on site to carry out lifting operations, together with proof of the adequate training and experience of drivers of cranes and lifting appliances.

8.0 Adverse Reports on Contractors

8.1 It should be a duty both of site construction management and/or relevant safety officers to oversee the HSE performance of their contractors.

8.2 In any case of persistent poor safety performance and failure to respond to site safety directives, safety officers should raise a contractor's adverse safety report.

8.3 In addition to placing a copy on their own files for record purposes, safety officers should send copies of such reports not only to relevant site construction management but also to the relevant company department.

8.4 A decision should then be reached by the latter department as to whether to take the sub-contractor concerned off the approved list, and the adverse report should in all cases by placed in the sub-contractors' file.

34. Communication, Participation and Consultation

1.0 Purpose

- To define internal communications among the company's different activities and departments regarding HSE management system
- To ensure employee's involvement and consultation in HSE systems
- To state external communication method with external authorities, aiming at solving HSE problems.
- To consulate with the interested parties and the contractors about HSE matters

2.0 Scope

All internal and external communication, consultation and participation concerning HSE matters and management system.

3.0 Communication forms

3.1 Internal Communications

3.1.1 Posters

3.1.1.1 Functions and Purposes

- The primary function of safety posters is to stimulate and maintain interest in safety. They aid a well-rounded safety program. They cannot compensate for lack of guards, unsafe equipment, lack supervision (which permits unsafe practices).
- Posters stimulate more free interchange of conversation than do leaflets.
- Posters are especially important because they are the primary means of reaching the persons who are not particularly safety conscious.

3.1.1.2 Effective Display of Posters

- Bulletin boards are generally used for effective display of posters. Moreover, workers are accustomed to looking at the board for official notices, news, and other subjects of real interest to them. Therefore, safety posters on bulletin boards are apt to have good impact and good readership.
- Posters not necessarily used on a bulletin board and displayed near a hazard or in a department, such as the first aid room where there is a particular problem, should also be effective. Obviously a maintenance or working shop would be a good location to display posters reminding employees to use guards or of rules against smoking.
- Stairways or aisles would suggest posters cautioning against running, but the display itself should not be placed where it might draw attention away from the hazard itself, i.e. at an intersection of aisles or on a stairway landing where a person trying to read the poster might contribute to the accident itself.

- General and easily changed posters can be displayed in areas where employees congregate, such as lunchrooms, washrooms, employee entrances. Displays in heavy traffic aisles or near time clocks, parking lot exits, etc. also reach large numbers of viewers.

3.1.2 Bulletin Boards

3.1.2.1 Locations

Bulletin boards may be built and located specifically for safety displays but more often they serve as combination boards for safety and non-safety material. Therefore, they are located for maximum exposure near time clocks, in lunchrooms, near drinking fountains, vending machines, or other areas where employees congregate, or outdoors where their large size and conspicuous location attracts attention.

3.1.2.2 Construction

- Bulletin boards can range from large, elaborate boards complete with indirect or multi-coloured lighting to very simple wooden or cork boards on which one poster at a time can be pinned.
- In any case, the board should be well illuminated without distracting glare from glass enclosure or lights. If outdoors, it should be located where the readers will be protected from the weather, where it will not create traffic or pedestrian hazard, and where viewers will have a reasonable amount of time to notice and read the material on it.
- Boards should be durable. If there is any danger of unauthorized tampering, they should be equipped with locking devices that permit easy change of material by an authorized person.
- Under extreme changes of temperature or humidity, boards might have to be ventilated to prevent fogging or deterioration of posters and display material.
- Boards can be fitted with flashing lights, overhead spotlights to highlight certain displays, and even ‘black’ (ultra-violet) light used in combination with fluorescent paper or inks.
- A small poster might be mounted on a large coloured background to accentuate the poster design or message. Ideally, boards should be large enough to permit the display of more than one size poster.

3.1.3 Safety Scoreboards

- Safety scoreboards or safety contest displays may be combined with regular bulletin boards or may be on their own special boards. Animated displays may include revolving signs or messages on illuminated continuously moving tape.

- Scoreboards showing the following data can be used:
    - Number of Days since Last Disabling Injury.
    - Minor injuries or first-aid injuries.
    - Disabling injuries.
    - Frequency rate (last year) and year target.

- Colored effects or lights for such scoreboard usually follows the pattern for traffic lights:
    - GREEN indicates injury free period,
    - YELLOW indicates minor injuries and
    - RED for disabling injuries

3.1.4 Access to Internal Telephones and Computer Networks

3.2 Communications with external interested parties

Including: EGPC/ EEIA / Labor office / Ganope Subsidiaries

4.0 Workers Participation

4. 1 Ganope workers are encouraged in participation in HSE matters as follows:

- Involving them in preparing risk assessments for their activities and reviewing the existing control measures.
- Involving workers in accident investigation to obtain root causes and lessons learned.

4.2 Specific HSE trainings are conducted regularly to all Ganope workers.

5.0 Workers Consultations:

5.1 HSE Committee's Periodical Meeting

- Safety group meetings are important method of ensuring effective communications between supervisors and employees.
- All supervisors and managers are encouraged to hold regular well prepared, although brief, informal meetings at which HSE topics are discussed.
- When properly planned, these meetings make efficient use of time, they encourage participation, and they give everyone the same exposure to vital information.
- They also help to foster team spirit and create a co-operative atmosphere.
- Material for the discussions should be devised and made available to supervisors and managers, and a library of visual aids should be built-up to improve the effectiveness of presentations.
- A standard should be established for conducting these meetings, with specified points such as the minimum frequency of the meetings, their minimum duration and who is to conduct them.
- It should make provision for a follow up, to check that agreed points have been dealt with.

- Weekly safety meetings of 10-15 minutes' duration and conducted by supervisors are recommended, but managers should also be visibly involved, to demonstrate their commitment.

- Typically, a standard might cover:

  - Weekly meetings conducted by supervisors.

  - Monthly meetings involving middle managers.

  - Quarterly meetings involving upper managers.

  - Annual presentations by top-level management on relevant HSE topics.

- The size and composition of the group attending the meeting should be chosen to suit the speaker and his message.

- A factor essential to the maintenance of high standards is that the regular safety meetings should involve every employee in some form of pro-active activity.

- Topics for such meetings should generally be planned in advance, and timely topics such as recent accidents should be a feature.

- The meetings should be minuted in a brief note outlining the topics, the date, the names of the person conducting and those attending, and any action arising.

5.2 Department's Periodical HSE Meetings

- Conducted by department head
- Review the current HSE performance within the department and take corrective actions
- Define roles, responsibilities, authority within the department
- Ensure all the corrective actions assigned to their staff arising from audits, incidents and HSE reviews are implemented on time

35. Medical Examinations

1.0 General

- There are certain medical examinations required for employees from a safety standpoint. These examination requirements vary based upon the employees' job duties and exposures.
- The medical department shall specify what examinations must include and they shall evaluate the results and report them back to the employee. Medical records shall be strictly confidential within the requirements of the law. Medical records shall be maintained for thirty (30) years.
- The administrative group is responsible for coordinating examinations. The safety engineer will provide input to ensure that employee receives the proper examination based upon their job exposures.

2.0 Special Examinations and Examination Criteria

- All employees must undergo a pre-placement physical examination before beginning work for GANOPE.
- Employees included in the Hearing Conservation Program must receive an annual audiometric evaluation. A baseline audiogram must be established within the first six months of their exposure to noise at or above 85 dBA based on a time weighted average. Ideally, employees should have a 14-hour quiet period with no noise exposure before the audiometric examination. If this is not possible, then hearing protection must be worn when working in high noise areas (especially prior to audiometric tests).
- Employees who are required to wear respirators at least monthly or as a condition of employment must have an initial (pulmonary function) examination before using the respirator. This should be done during the pre-employment examination.
- Employees, who wear respirators, including air purifying respirators, must have an annual pulmonary function evaluation. Other employees will be medically evaluated during their normal physical as determined by the medical department.
- A summary sheet of individuals that do not meet the physical qualifications for the use of breathing apparatus will be maintained at the local office by the Safety Engineer.
- Employees exposed to certain regulated substances, such as asbestos or benzene, above specified limits shall be included in a medical surveillance program. Exposures will be based on workplace monitoring coordinated by the safety engineer.
- Employees working in field environments shall participate in the substance abuse testing program before employment and on an annual basis.

36. Energy Consumption Reduction

1.0 Purpose

This procedure supports the management and implementation of energy efficiency measures to reduce energy consumption, improve energy conservation, and reduce greenhouse gas emissions for a sustainable organization and environment.

2.0 Responsibilities

Proactively support the sustainability measure to reduce energy consumption, and with it greenhouse gas emissions, and to meet mandatory targets for government buildings.

2.1 Implement Procedures for Staff to:

- Switch appliances off at the wall e.g. computers, monitors, printers, scanners, photocopiers, at the end of each working day and during vacation periods.
- Install energy efficient lights and energy efficient hot water systems at time of replacement.
- Maintain regular routine maintenance of electrical appliances such as air-conditioners, in particular, checking seals on refrigeration equipment and cleaning accessible filters on air conditioners, etc
- Monitor air conditioners at a pre-set temperature (24 degrees Celsius)
- Promote energy efficiency education and programs in the wider community.
- Advise, promote and assist subsidiaries regarding energy management and conservation.
- Liaising with other government agencies on energy-related issues as required.

37. Management of Change

1.0 Purpose

To develop indicators for effective change management during radical organization restructuring, to develop a guided practice for Facility Change Process.

2.0 Parameters for Effective Change Management

The core assumptions are briefly summarized as followed:

1. Fundamental changes are often necessary in order to cope with changing external demands and conditions.

2. Major organizational change can be linked to the process safety and risk quality of the organization(s) involved.

3. Fundamental changes leading to massive reduction in personnel and high insecurity to the remaining employees can have strong effects on how conscientiously and safely work is carried out.

4. The way the change is carried out is of importance for assessing the effects of change: if such a change is implemented with little care for the affected employees the safe operations of the production process may be jeopardized.

5. The audit instrument should help to assess how well change is handled in an organization, thereby helping the participating company to review their own change program and to discuss best practice regarding change management

3.0 Types of Organizational Change

Organizational changes during the restructuring were classified in order to determine how best to address them. The kinds of changes that were being considered as part of the restructuring included:

- Moving people in and out of positions or roles
- Creating and moving people into new positions
- Changing existing roles
- Adding new structures to the organization
- Changing the functionality and management of regulatory support systems
- Changing corporate sponsors of strategic systems

- Changing reporting structures
- Changing management or regulatory accountability

These were grouped into two change types: personnel and structural based on whether a person or the position was being changed. The following sections detail these definitions with consideration of how they were applied.

3.1 Personnel Changes

For each personnel change:

- Tasks were reassigned
- Critical knowledge was documented and
- All other duties were accounted for

There was often a gap between the formal, documented requirements for a position, and the activities actually performed by the person in that position. A person acquired these additional responsibilities:

- Via assignment e.g.
    - A person, say in Maintenance, may also be a member of the Emergency Response Team. This tends to be officially recognized and documented
    - A person, say in Safety, creates a monthly environmental report. This tends to be an informal assignment, with the only logic being “we are short staffed, and someone has to do this”
- Via personal expertise e.g.
    - A person, say in Operations, may be the local expert on pressure safety valve design, perhaps due to prior experience in this field
    - A person may be called upon as a relief or backup operator, even though they don’t currently work in Operations

To ensure that each personnel change comprehensively covered the duties and responsibilities, interviews with both the incoming and outgoing person were conducted as part of the MOC process.

Careful attention was given to the transition of the incoming person when additional training may be required and critical safety tasks may get overlooked. In several cases, critical tasks were temporarily covered by the previous incumbent until proper training and experience had been obtained. Although, this wasn't always possible as the outgoing person was often also involved in transitioning into another position. This ripple effect delayed backfilling of some critical positions as well as creating situations where one person had to cover more than one position which they often did by working extra hours. The practice of the latter was effective but not sustainable for extended periods of time.

The effort needed to assess impacts and mitigate risks was substantial, given the hundreds of changes taking place. The resources were simply not available to conduct a comprehensive assessment on ALL changes. So all proposed changes were prescreened to determine their potential severity:

3.2 Structural Changes

Structural changes were the most difficult and challenging type of organizational change to manage. These changes primarily covered the situations when positions were added, removed or changed in organization's structure

There were other supporting processes that included:

- On-boarding
- Recruitment
- Head count approval
- Organizational design
- Restructuring processes
- HR announcements
- (Traditional) Change management, including communication and addressing employee concerns.

3.2.1 Challenges in Implementing an Organizational Change

As previously mentioned, the MOC process needed to produce consistent results for similar changes across any part of the organization. Achieving consistent results was frustrated by three factors:

1. Change type: personnel changes are inherently different from structural changes
2. Duration: some changes were short duration, others long duration
3. Complexity: some changes were small, others large and complex

3.2.1.1 Change Duration Issues

Consideration for determining scope particularly for structure changes was influenced significantly by the timing of the implementation. Organizational changes in general can seldom be done all at once. There is always a transition period between the current As-Is structure of the organization and the new To-Be structure that is being built, this is easy to overlook and is of particular concern during structural changes that take an extended period of time to implement**.**

38. Facility Change Process Practice

1.0 Introduction

1.1. This document provides a detailed procedure and a common process adopted by Ganope for controlling facilities changes (i.e. modifications) to all their operating facilities.

1.2. The Facilities Change Process (FCP) is designed to address the Health, Safety and Environmental (HSE) expectations. In particular, addressing the following Elements:

1.2.1. Risk Assessment and Management

1.2.2. Facilities Design and Construction

1.2.3. Operations and Maintenance

1.2.4. Management of Change

1.2.5. Information and Documentation

1.3. The objective of the FCP is to ensure that:

1.3.1. The Safety and integrity of the facility is not compromised

1.3.2. The potential risks associated with the proposed modification are adequately assessed

1.3.3. Engineering documentation is updated and maintained

1.3.4. The proposed modification is communicated to the relevant departments and interfaces with all discipline are understood and taken into account.

1.3.5. The Integrity of the modification process remains intact and is auditable.

1.3.6. All facilities change as defined below must be subject to this process and authorized accordingly.

2.0 Facilities Change Definition

2.1 The facilities change covers all modifications to existing operated facilities. A 'facilities change' is defined as a change, either temporary or permanent, to an existing facility or installation, up to the well interface, where one or more of the following criteria apply:

2.1.1 Change in specification of materials

2.1.2 Change in duty or operation (including operating procedure) or process control where the original design intent is infringed

2.1.3 Repair or replacement of original manufacturers' equipment using non-standard parts or processes (except where the Original Equipment Manufacturer (OEM) has provided written approval/acceptance to the satisfaction of the Technical Authority)

2.1.4 Introduction of a new item of plant, addition to existing item of plant/facility (permanent or temporary), or part thereof

2.1.5 Removal or permanent isolation of plant/facility or part thereof

2.1.6 Replacement of existing parts or equipment, that is not like-for-like, which requires design work, and alteration to Plant Technical Records

2.1.7 Change to control system logic and Emergency Shutdown (ESD) systems where the original design intent is infringed

2.1.8 Change to any safety equipment or safety-related device or system

2.1.9 Change to relief valve and pressure control valve set pressures, and to trip settings

2.1.10 Change in chemicals, type and inventory

2.1.11 Constructing a new, or a removing old building located offshore or onshore, which is intended for either part time or full time occupation.

2.2 The following changes do not fall within the scope of this procedure. It is intended to set up specific processes to manage these separately where they are not currently in place.

2.2.1 Changes to planned maintenance

2.2.2 Changes to planned inspection

2.2.3 Software change control

2.2.4 Alarm and trip overrides

2.2.5 Temporary facilities to facilitate planned maintenance, construction activities or operating procedures, and which are controlled via the Risk Assessment/Permit to Work/Isolation Control Certificate (ICC) system, are not classified as modifications

3.0 Roles and Responsibilities

3.1 The key roles in the implementation of the FCP are described below:

3.1.1 Initiator

3.1.2 Technical Authority (TA)

3.1.3 HSE Technical Authority

3.1.4 Approval Authority (AA)

3.1.1 Initiator

The initiator or originator of a modification can be any person with relevant technical or engineering knowledge. He must ensure that the proposal or idea has been discussed with his line manager and the Approval Authority for the area of concern.

The initiator is responsible for completing Facilities Change Proposal in "Part A", including:

- Selection of Line Manager with the agreement of the Approval Authority.
- Determines if this FCP or modification is a temporary or permanent modification and if this FCP modification because of HIPO, Potential Hazard / Near Miss, Incident Investigation Recommendation, Audit.

3.1.2 Technical Authority(TA)

Technical Authorities are appointed for each discipline. The role of the Technical Authority is described below:

- Responsible for technical approval of modifications related to his discipline.
- Being the arbitrator on all technical issues in their area of expertise.
- Apply the appropriate engineering codes of practice, standards and specifications.

- Ensures that the modification does not jeopardize the technical integrity of the facility.
- Provides independent input into the assessment of risk for the FCP.
- Responsible for defining key documentation requirements needed to support technical integrity.
- Updates all discipline related documentation affected by the modification.
- Development of an agreed Statement of Requirements which should be supported by preliminary engineering documentation and drawings
- Follow-up and move the FCP forward throughout the process.
- Responsible for the safe implementation of the modification, ensuring that the relevant operational and safety reviews (including HAZOPs/HAZIDs) of the modification are carried out.
- Ensures suitable resources and systems are available for the successful implementation of the modification, including finance, cost control, planning, engineering design, procurement, construction, commissioning and close out.
- Coordinates with the relevant department(s) to purchase necessary materials.
- Performs the close out of the FCP modification, and coordinates the update of all relevant documentation (as built drawings, etc.).
- Ensures that all facilities are back to normal operation

3.1.3 HSE Technical Authority

The role of the HSE Technical Authority is described below:

- Provides assurance that the Ganope safety management system and environmental requirements are being complied with.
- Reviews all modifications proposals for HSE implications and ensure that the appropriate level of risk assessment and specialist reviews is undertaken for each stage of the modification.
- Provides assurance that the FCP process is adhered to and carries out system audits.

- Updates HSE related documentation affected by the modification.

3.1.4 Approval Authority (AA)

The role of Approval Authority is described below:

- Approves FCP concept
- Provides input for the FCP risk ranking and prioritization if requested.
- Reviews and approves detailed engineering work performed and ensures that all review and approvals are completed.
- Assigns Implementation Authority

4.0 Implementation

4.1 The purchase of all materials is coordinated with the relevant departments and is accountable for timely delivery.

4.2 The preparation of site work packs which include:

- Scope of work
- Engineering drawings
- Material take-off
- Discipline work procedures
- Discipline function test certificates
- Site risk assessments
- Permits
- Overall Completion certificate

Then site installation and commissioning is carried out.

5.0 Documentation

Documents and drawings can be attached at any stage of modification cycle.

The (Technical Authority) shall coordinate to get the right documentation attached to the FCP.

Date of attachment of each document is demonstrated.

39. Hazard Identification and Control

1.0 Hazard Identification

1.1 Hazard identification is defined as a method to identify associated hazards to operations or designed units or equipment. In case of existing operations, hazard identification study should be made periodically, if it needed to determine any needs for changes and according to standard systems or safe operations.

1.2 To identify these hazards which need to assessed studied and analyzed it should take the following probabilities which may results from these hazards:

- Fatalities or injuries.
- Hazardous materials release.
- Environmental damage.
- Property damage.

1.3 On behalf of these probabilities which may result some hazards identified it can set a scope of work and assign the team needed for preparing this study and determine the priority.

2.0 Process and Technical Risk

- Is the risk due to failure of the performance of process equipment? There are two types of failure that should be considered:
  - Failure of the equipment to meet business performance standards (e.g. quality / quantity of output, reliability, etc.) Typical adverse consequences include failure to meet emissions requirement or the impact of off-specification product.
  - Loss of containment e.g. risk due accidental release of hazardous materials. Typical consequences include vapor clouds (toxic / or flammable), fires, explosions and pollution.
- Such risks are typically assessed by technical specialists or teams and involve:
  - Formal identification, assessment and management of risks involved in a particular project, operation or activity.
  - Hazard identification processes such as – HAZOP.
  - Quantified risk assessment processes – QRA.
- QRA – is a systematic study of both the likelihood of occurrence (frequency) of an event, and its consequences. This measure of risk may be against numerical criteria to evaluate its significance, thereby deciding whether this is acceptable or whether further control measures are required.
- In the evaluation of the probable consequences of an incident, computer models are used to predict the mechanism of, e.g. gas-cloud formation, dispersion, thermal radiation, or explosion over-pressure. Once these physical consequences have been calculated, the resultant impact on individuals, and material damage to plant and property can be estimated.

3.0 Hazard Control

3.0 The resultant estimate of the risk may then be compared with agreed criteria. If the risk meets the criteria, it can be classed as Broadly Acceptable.

3.1 If the consequences are not acceptable, consideration needs to be given to the incorporation of control measures which will prevent in incident occurring.

3.2 Risks will be controlled through eliminating hazards, either by substituting the hazard with an alternative, by implementing operational controls or by installing control equipment.

In some cases, codes of practice and standards may provide sufficient evidence that, if they are properly applied, the resultant risk is acceptable.

4.0 Implementation and Requirements

4.0 Management put into place and promote the use of processes to identify hazards associated with GANOPE activities, assess risks, control the hazards and manage the risks to acceptable levels.

4.1 Potential hazards and risks to personnel, facilities, the public and the environment are assessed for existing operations, products, business developments, modifications, new projects, divestments and decommissioning.

4.2 Assessed risks are addressed by levels of management appropriate to the nature and magnitude of the risk. Decisions are clearly documented and resulting actions implemented through local procedures.

4.3 Risk assessments and risk management / control measures are referenced in project approval documentation.

4.4 Risk assessments are updated at specified intervals and as changes are planned.

40. Hazard Communication

1.0 General

- Under the Hazard Communication Standard, employees must be informed by the hazards that might be involved with chemicals that they use.
- HazCom says that employees have the right to know what chemicals they are handling, or could be exposed to.
- HazCom's intent is to make the workplace safer. Under the HazCom Standard, the company required to fully evaluate all chemicals on the worksite for possible physical and health hazards.
- All information relating to these hazards must be available to the employee 24 hours a day.
- HazCom also requires the company to ensure proper labelling of each chemical, including chemicals that might be produced by a process (process hazards).
- Labels must be clearly understood by all workers. Employers are required to provide both training and written materials to make workers aware of what they are working with and what hazards they might be exposed to.
- Employers are also required to make Material Safety Data Sheets (MSDS) available to all employees. An MSDS is a fact sheet for any chemical posing a physical or health hazard at work. MSDS's must contain the following information:
    - Identity of The Chemical (Label Name)
    - Physical Hazards
    - Health Hazards
    - Whether It Is a Carcinogen
    - Emergency and First Aid Procedures
    - Date of Preparation of Latest Revision.
    - Name, Address, and Telephone Number of Manufacturer, Importer, or Other Responsible Party.
- Blank spaces are not permitted on an MSDS. If relevant information in anyone of the categories is unavailable at the time of preparation, the MSDS must indicate no information was available.
- Your facility must have an MSDS for each hazardous chemical it uses. Copies must be made available to other companies working on your worksite, and they must do the same for you.

- The facility Hazard Communication Program must be in writing and, along with MSDSs must be made available to all workers 24 hours a day.

2.0 A Written Hazard Communication Program (General Program)

2.1 Introduction

The goals of the standard are to reduce the number of chemical related occupational illness and injuries.

To comply with the Hazard Communication Standard this written program has been established for the company. All departments and work centers of the company included within this program. Copies of this written program will be available (for review by any employee) in the following locations: (list all locations).

Department standard operating procedures work in conjunction with this basic document in providing the safest possible environment to all employees.

2.2 Responsibilities

2.2.1 Department Managers will be responsible for implemented and ensuring the compliance of their departmental personnel with Company's Hazard Communication Program. Additionally, they will assign appropriate supervisors with the responsibility of ensuring compliance.

2.2.2 Company's HSE Manager has the following responsibilities under company's Hazard Communication Program:

2.2.2.1 Develop and modify as necessary Company's Hazard Communication Program.

2.2.2.2 Annually check and review the effectiveness of the overall program and all work center programs.

2.2.2.3 Inspect quarterly each work center's Hazardous Chemical Inventory List and corresponding MSDS to ensure they are current and complete.

2.2.2.4 Receive and review all incoming or updated editions of MSDS and distribute them to pertinent work centers.

2.2.2.5 Maintain a current master MSDS file.

2.2.2.6 Train supervisors in requirements for the Hazard Communication program and assist in training personnel as required.

2.2.3 Assigned Supervisors have the following responsibilities under Company's Hazard Communication Program:

2.2.3.1 Reporting receipt of all new chemicals to HSE Department.

2.2.3.2 Ensuring that no chemical is used at the work center until it is listed on the Hazardous Chemical Inventory List, the corresponding MSDS is inserted into the Binder, and each employee has received the appropriate HazCom training.

2.2.3.3 Maintaining current work file, which includes ensuring the MSDS and Chemical Inventory List are current and accurately reflect chemicals used on site.

2.2.3.4 Ensuring proper labelling practices for all hazardous chemicals in accordance with this program.

2.2.3.5 Forwarding to the HSE Department all MSDS received from sources other than the HSE Department.

2.2.3.6 Ensuring that every employee is trained on this program and the hazards involved with chemicals used in the work center.

2.2.3.7 Ensuring that all on-site contractors receive copies of the Hazard Communication Program and all work center MSDS's. In turn, the work supervisor is responsible for obtaining MSDS from the contractor about chemicals that he may bring to the site that Company employees may be exposed to.

2.2.4 Company personnel will be responsible for familiarizing themselves with the Hazard Communication Program, and complying with instructions contained with the Hazard Communication Program.

2.3 Definitions of Terms

The Hazard Communication Program defines various terms as follows: (These terms either appear in Company's Hazard Communication Program or are definitions appropriate to MSDS)

Chemical*:* any element, compound, or mixture of elements and /or compounds.

Chemical Name*:* the specific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) Rules of Nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation.

***Combustible Liquid**:* any liquid having a flashpoint at or above 100º F (37.8º C) but below 200º F (93.3 º C).

***Common Name**:* any designation or identification, such as code name, code number, trade name, brand name, or generic name used to identify a chemical other than its chemical name.

***Compressed Gas**:* a compressed gas is:

- A gas or mixture of gases in a container having an absolute pressure exceeding 40 psi at 70 º F (21.1º C)
- A gas or mixture of gases in a container having an absolute pressure exceeding 104 psi at 130 º F (54.4º C) regardless of the pressure at 70º F (21.1º C).
- A liquid having a vapor pressure exceeding 10 psi at 100º F (37.8º C) as determined by ASTM D323-72.

***Container**:* any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical.

***Explosive**:* a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

***Exposure**:* the actual or potential subjection of an employee to a hazardous chemical through any route of entry, in the course of employment.

***Flammable Gas**:* a gas that at ambient temperature and pressure forms a flammable mixture with air at a concentration of 13 percent by volume or less, or a gas that at ambient temperature and pressure forms a range of flammable mixtures with air wider than 12 percent by volume regardless of the lower limit.

***Flammable liquid**:* a liquid having flashpoint less than 100 º F (37.8 º C).

***Flashpoint**:* the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite.

***Hazard Warning**:* Any word, pictures, symbols, or combinations thereof appearing on a label or other appropriate form of warning that convey the hazards of the chemical(s) in the container.

***Health Hazard**:* a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees.

***Immediate Use**:* the use under control of the person who transfers the hazardous chemical from a labelled container, and only within the work shift in which it is transferred.

***Label**:* any written, printed, or graphic material displayed on or affixed to containers or hazardous chemicals.

***NFPA Hazardous Chemical Label**:* a color-code labelling system developed by the National Fire Protection Association (NFPA) which rates the severity of the health hazard, fire hazard, reactivity hazard, and special hazard of the chemical.

***Oxidizer**:* a chemical that initiates or promotes combustion in other materials thereby causing fire either of itself or through the release of oxygen of other gases.

***Physical hazard**:* a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compresses gas explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water reactive.

***Portable Container**:* a storage vessel that is mobile such as a drum, side-mounted tank, tank truck, or vehicle fuel tank.

***Right to Know Station Binder**:* A Station Binder located in the "Right to Know" workstation that contains Company's Hazard Communication Program, the Hazardous Chemicals Inventory List and corresponding MSDS, and the Hazard Communication Program Review and Signature Form.

***Stationary Container**:* a permanently mounted chemical storage tank.

Unstable (Reactive Chemical): a chemical that in its pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under shock, pressure, or temperature.

Water reactive (Chemical): a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

***Work Centre**:* any convenient or logical grouping of designated unit processes or related maintenance actions.

2.4 Right to Know Workstations

Each work center will establish an employee “Right to Know" workstation and make it accessible to employees during their work hours.

The workstation will contain a “Right to Know “Station Binder”. This binder will contain Company's Hazard Communication Program, Hazardous Chemical Inventory List and corresponding MSDS, and the Hazard Communication Program Review and Signature Form.

2.5 Hazardous Chemical Inventory List

2.5.1 A list of all hazardous chemicals or fuels used or produced at each work center will be maintained in each Hazardous Chemical Inventory List. This Hazardous Chemical Inventory List is to be filed and maintained in each location.

2.5.2 The Hazardous Chemical Inventory List will also show the date of the most recent MSDS insertion for each chemical. The company’s master Hazardous Chemical Inventory List for all chemicals used within the company will be maintained by the HSE Office.

2.5.3 Each work site supervisor is to ensure that its Hazardous Chemical Inventory List is accurate updated, and available for employee use.

2.5.4 Work sites receiving new chemicals, or chemicals not on their current Hazardous Chemical Inventory List shall follow these procedures:

- Add the hazardous chemical to the Hazardous Chemical Inventory List.
- Procure and insert the chemical MSDS into the site file.
- Train employees on the hazards associated with the chemical.

2.5.5 The Hazardous Chemical Inventory List for each work site will be reviewed at least quarterly. A verifying signature for this quarterly review will be made on the Hazardous Chemical List the Hazardous Chemical Inventory List for each work site will be reviewed quarterly by the safety division to ensure it is current, and that corresponding MSDS are available.

2.6 Material Safety Data Sheets

2.6.1 The Material Safety Data Sheets (MSDS) are a set of individual data sheets providing related safety information for each hazardous chemical utilized or produced at the work site.

2.6.2 Material Safety Data Sheets are filed in each work site.

2.6.3 Each chemical listed on the Hazardous Chemical Inventory List must have a corresponding MSDS.

2.6.4 MSDS's are provided to work centers by the HSE Department any time manufacturer's forward new copies or new editions.

2.6.5 Work site supervisors are responsible for insuring that MSDSs are current and available for all chemicals listed on their work center's Hazardous Chemical Inventory List, and that chemicals are not used unless this information is available.

2.6.6 The Material Safety Data Sheets should contain information as follows:

- Identity of hazardous chemical.
- Identity of hazardous ingredients in a hazardous chemical mixture.
- Chemical and physical characteristics of the hazardous chemical
- Chemical and physical hazards of the hazardous chemical
- Acute and chronic health hazards, including signs and symptoms of exposure and medical conditions, which are generally aggravated by exposure to the hazardous chemical.
- Primary route of entry.
- Personal exposure limits in terms of maximum duration and concentration.
- Protective measures and special precautions.
- Emergency procedures and first aid procedures.
- Date of preparation of the Material Safety Data Sheet.
- Identification of person or agency responsible for the information contained on the Material Safety Data Sheet.

2.6.7 The Material Safety Data Sheet shall not contain any blank spaces. Not applicable or unknown information should be indicated as such.

2.6.8 The Purchasing Department shall specify that MSDS's will be required with all orders.

2.6.9 Any MSDS received by the work site should be forwarded to the HSE Department with notations on which work site forwarded the sheet, and an indication as to whether the chemical is in use or not.

2.6.10 If the work site is using a chemical and does not have an existing MSDS, the HSE Department should be notified Know immediately.

2.6.11 The HSE Department will procure the needed MSDS or will generate a generic form.

2.6.12 The HSE Department will review all incoming or self-generated MSDS for completeness before forwarding copies to pertinent work sites.

2.7 Hazard Warnings and Labelling

2.7.1 Hazard warnings are individual warnings on hazardous chemical containers, which provide related safety information for each respective hazardous chemical utilized or produced within Company.

2.7.2 Hazard warnings should be displayed on / or affixed to all hazardous chemical containers providing the information as follows:

2.7.2.1 Each portable container should be labelled, tagged, or otherwise marked as follows:

- Chemical or common name of the hazardous chemical.
- Hazard warnings.
- Name and address of the chemical manufacturer.

Note: Company supervisors should verify that all containers received for use are appropriately labelled.

2.7.2.2 Each stationary container shall be labelled as follows:

- Chemical or common name of the hazardous chemical stenciled with six (6) inch block letters.
- NFPA Hazardous Chemical Label.

2.7.2.3 Where applicable, all chemical piping should be labelled in accordance with the Piping Identification Code or with standard industry color codes.

2.7.3 Hazardous Chemical Labels should be affixed to hazardous chemical containers wherever appropriate and / or informative.

2.7.4 Number Rating System for each chemical can be obtained from the HSE Department.

Note: Company personnel should not remove or deface existing hazard warnings or labels on hazardous chemical containers received or used chemical at the work site, unless the container is immediately marked with the required information.

2.8 Training

2.8.1 The Hazard Communication Program requires periodic training of company personnel to ensure that the program requirement's HSE precautions are properly conducted. Supervisors should consider personnel training as a primary responsibility.

2.8.2 The Hazard Communication Program training duties and responsibilities for company personnel are established as follows:

2.8.2.1 The HSE Department shall be responsible for training supervisors in the program requirements, and will be available by appointment to present to work site personnel the required Hazard Communication Program brief.

2.8.2.2 Company supervisors shall be responsible for training company personnel in the program requirements.

2.8.2.3 Company personnel shall be responsible for familiarizing themselves with the program requirements.

2.8.3 The Hazard Communication Program training should be planned so that:

2.8.3.1 Training is given both in the program requirements and in related safety information, including protective measures, special precautions, and emergency procedures.

2.8.3.2 Training is given in the classroom and on the job training.

2.8.3.3 Training is given, utilizing group participation during discussion, and question and answer periods.

2.8.3.4 Training is ongoing, to preserve the continuity and integrity of program and work center safety.

2.8.4 The Hazard Communication Program should be provided as follows:

2.8.4.1 Training is conducted prior to assignment of a new employee to his work duties.

2.8.4.2 Training is conducted whenever a new hazardous chemical is utilized or produced at the work site.

2.8.4.3 Training is conducted prior to starting work on non-routine tasks involving hazardous chemicals.

2.8.5 The Hazard Communication Program training is to be conducted by the supervisor, according to the recommended outline below:

2.8.5.1 Locate and identify the Hazard Communication Program, Hazard Chemical Inventory List, and Material Safety Data Sheets, contained in the work site.

2.8.5.2 Discuss the objective and content of the Hazard Communication Program.

2.8.5.3 Explain that the Hazardous Chemicals at the work site concerned.

2.8.5.4 Discuss the physical and health effects of each hazardous chemical at the individual work site as contained in the MSDS.

2.8.5.5 Discuss the methods and techniques used to determine the presence or release of hazardous chemicals at the individual work center.

2.8.5.6 Discuss the protective measures and special precautions used to lessen or prevent exposure to hazardous chemicals at the individual work site.

2.8.5.7 Discuss emergency procedures for each hazardous chemical at the individual work site as contained in the MSDS.

2.8.5.8 Discuss the hazardous warning and labelling system.

Note: Hazard Communication Program training shall be recorded in each employee training record; these records will be examined during HSE Department's quarterly inspections.

2.9 On-Site Contractors / Visitors

2.9.1 Company department supervisors should notify all contractors, vendors, etc., performing work within company work sites of the Hazard Communication Program as follows:

2.9.1.1 The HSE Department, when notified by department supervisor, will provide a copy of the Hazard Communication Program, consulting engineers, contractors, etc., as appropriate upon their initial visit on site to perform each specific project.

Note: A copy of the Hazard Communication Program should be provided upon the initial visit for each specific project. It is not necessary to provide additional copies for ongoing visits to accomplish the same specific project.

2.9.1.2 All written requests for proposals or quotations, all written specifications, and all written contractors and work orders should include a written notification of the Hazard Communication Program.

2.9.2 It is the responsibility of department supervisors to provide a copy of the Hazard Communication Program to other supervisors or personnel outside of the department.

41. Visitors Safety Program

1.0 General

1.1 The safety of visitors to field, plant, or platform facilities is the responsibility of the operating supervisor over that area. The individual(s) bringing visitors to these locations must coordinate their activities with the operating supervisor(s) prior to the trip.

1.2 Visitors are defined are those that who do not normally report to that specific work location. They may include school tours, vendors, or company's employees from other locations.

1.3 All visitors must report to the information office before entering work locations, whether accompanied by a company employee or not.

1.4 All visitors must receive a brief safety orientation from the operating supervisor, covering as a minimum:

1.4.1 Smoking Policy

1.4.2 Facility alarms and emergency/evacuation procedures

1.4.3 Hazardous locations and substances that may be encountered

1.4.4 Personal protective equipment requirements

1.4.5 Reporting of injuries/accidents.

1.5 Visitors must not tour work locations unescorted unless prior approval has been obtained.

1.6 Visitors who may be pregnant and are advised by their physician to limit industrial workplace exposure are not allowed to tour work locations.

2.0 Personal Protective Equipment

2.1 Visitors must wear hard hats and safety glasses.

2.2 Hearing protection must be worn in all posted areas.

2.3 Proper footwear must be worn at all times.

2.4 The company will provide hard hats, visitor's safety glasses, and hearing protection to visitors.

42. HSE Inspections and Surveys

1.0 Introduction

Inspecting the concern's operational facility can be a valuable aid in detecting potential causes of injury. The inspection, however, should by no means constitute the major activity for isolating and defining hazards, for regardless of its value there is the major weakness of not being able to see all things at all times. Inspections are most useful as an integrated part of the program for seeking injury casual factors. Depending upon the company safety organization and the interest of the safety specialist, various methods of carrying on inspections have been attempted and are in forces.

2.0 Purpose

The purpose of inspections is to identify hazardous situations and organize remedial action before things can develop to a point where injury, fire or other losses can occur. In addition to the planned-maintenance and equipment-inspection program, which is an essential operating practice on every site, regular inspection of the plant and workplace should take place, under the following three headings:

2.1 General

Visual inspections to detect any deviation from the required standards, and in the interests of order and good housekeeping; conducted by staff of supervisory level who should develop and use a checklist as a systematic aid for this purpose.

Any hazardous condition should be reported immediately, in writing, classified according to seriousness.

Procedures for monitoring the remedial action should also be established as a written standard. Proper training for inspectors should be given.

2.2 Critical Parts / Items

These are the parts or items that could create particularly hazardous conditions if they were to fail. Such parts / items require regular inspection by experience staff.

All plant, equipment, materials, machinery and structures should be systematically reviewed, to identify the parts or items whose inspection requirements are of especial significance.

Such a review is complementary to, but significantly more detailed than, a typical planned maintenance program review.

A special program of inspection for the identified critical parts / items should be set up.

Before use

Mobile handling equipment such as forklift trucks and cranes should be inspected at the start of each day, with the aid of short check-list, to insure that essential safety items (such as brakes and tires) are in good working order.

Employees should also be encouraged to report sub-standard or hazardous conditions discovered at any time, not only during inspection. These reports should in writing and should always be followed up.

All inspections, regardless of type, should take place at regular planned intervals, as dictated by need. The specified performance standards should be carried out in each area. Middle and senior management should involve themselves in these inspections by taking part in nominated inspections or conducting their own.

The minimum standards for inspection frequency are given below, but sites with particular hazards may need to initiate inspections more often:

(a) Non-operating or administrative areas should be covered in their entirely every three months.

(b) Low-medium hazard operating areas should be covered in their entirely every two months.

(c) High hazard areas should be covered in their entirely every month.

The benefits from these inspections will be enhanced if they are monitored and if an effective written follow-up procedure is instituted. Whenever equipment cannot be withdrawn from service for expert inspection, continuous monitoring should be considered.

An impartial person should regularly check inspection records and reports, to determine if standards are being met. The number of inspections made should be compared with the number required for each major unit on the site, and the results reported in writing to departmental heads and above.

3.0 Definitions of 'Order'

A place is in order when there are no unnecessary things about, and when all necessary things are in their proper place. In this statement the word '**no**' means **NONE, NOT ANY, NOT EVEN ONE**!!!

An effective method of classifying hazards is to group them in terms of their loss potential:

3.1 Class A Hazard.

A condition or practice likely to cause permanent disability, or loss of life or a part of the body; and / or likely to cause extensive loss of structure, equipment or materials.

3.2 Class B Hazard.

A condition or practice likely to cause serious injury or illness resulting in temporary disability; or likely to cause property damage that is disruptive but not extensive.

3.3 Class C Hazard.

A condition or practice likely to cause minor, non-disabling injury or illness, or non-disruptive property damage.

4.0 Effective HSE Inspections

A safety inspection is a management tool that can be used to measure the effectiveness of an organization's HSE programs in meeting its goals and objectives. What is an effective HSE inspection? It's one that accomplishes the following:

4.1 Determines if the organization's health and safety program is meeting its objectives and goals.

4.2 Establishes a basis for facility organization, employee participation, and personnel accountability in safety matters.

4.3 Evaluates the effectiveness of the organization's health and safety program regardless of the strengths and weaknesses of other areas within the organization.

4.4 Detects and corrects any operations, procedures, and/or equipment in violation of federal, state, or local laws, regulations, and standards.

4.5 Identifies the strength and weaknesses of the current safety and health program.

4.6 Facilitates the formulation of an improvement plan that can easily be communicated to all levels of management within the organization.

5.0 Qualification of the Inspector

To ensure the effectiveness of HSE inspection, the inspector must have the following qualifications:

5.1 Be properly educated and trained in the area of the inspection (e.g., process operations, electrical, steam generation, chemical, etc.).

5.2 Have previous work experience in the area.

5.3 Be technically competent.

5.4 Have adequate investigative and analytical skills.

5.5 Be objective and independent.

5.6 Have adequate communication skills.

6.0 Standards for Evaluation

- The HSE inspector who attempts to conduct HSE inspection without using standards of evaluation is ill equipped to perform the intended function.
- We are talking about a checklist to itemize the standards of evaluation for what elements must be examined and verified during the inspection.
- Checklists can range from quite simple to very complex. The point is the HSE engineer cannot remember every item, process, work practice, or document that should be checked during an inspection.
- A well-organized checklist is a living document. You should be able to add to it or delete portions from it that no longer apply.
- To aid in developing a site-specific HSE inspection checklist, OSHA has developed a number of self-inspection checklists used by many businesses.
- These checklists are not all-inclusive, but they do provide a model, a template that can help you fashion your own HSE inspection checklist.

43. Housekeeping

1.0 Introduction

Good housekeeping means maintaining the necessary standards of domestic cleanliness and tidiness to make sites and workplaces safe, healthy, pleasant places at which to work. It may be summarized by the phrase 'A place for everything and everything in its place.' Bad housekeeping is the cause of a large number of accidents on site.

2.0 Purpose

2.1 The purpose is to promote order and cleanliness through a site.

2.2 There are three main objectives:

2.2.1 The elimination of accident and fire hazards.

2.2.2 The conservation of space, time, material, and effort.

2.2.3 To obtain and maintain good working conditions.

2.3 The general layout of a site is extremely important in good housekeeping.

2.4 Roads and passageways should be kept clear of obstructions at all times.

2.5 All roads should be signposted to enable Lorries coming on site to proceed to their correct destination and to facilitate the task of emergency services to get to their destinations with ease and the minimum of delay.

3.0 Stairways

3.1 Stairways should at all times be kept clear of all materials and must be properly lighted.

3.2 Handrails must be provided.

3.3 Treads should be of a non-slip substance as slips can result in serious falls. If possible, outside stairways should be covered to keep off rain, snow and ice.

3.4 Design should not include long flights; landings are recommended every ten or twelfth tread.

3.5 Circular stairways should be avoided, but if absolutely necessary, should be designed with a minimum variation in tread width. Treads should be covered with durable anti-slip materials.

3.6 It is good practice to enclose all inside stairs with partitions of fire resisting material and to install approved fire doors to prevent the spread of smoke and flame from one floor to another.

4.0 Lighting

4.1 Inadequately lit work areas are often the cause of accumulations of rubbish, scrap, etc. All workplaces, passageways, and stairways should be adequately lit and free from shadows.

4.2 Sudden transitions from brightly lit to dimly illuminated areas and vice versa are dangerous, because of momentary blindness caused to persons passing through.

4.3 All light fittings, windows, and roof lights should be regularly cleaned and defective light bulbs replaced (first ensuring the current is switched off).

4.4 Adequate lighting at site boundaries and approaches is also important.

4.5 Protected lighting is an aid to the prevention of accidents and thefts; for instance, at waterfront boundaries, which is a favorites approach for intruders.

4.6 Lights should be installed so that no shadow is cast over water by a seawall or bank, especially where barges or ships are loaded at night.

5.0 Access Ways and Passageways

5.1 All access ways and passageways must be kept clear at all times. They should be so arranged that they are the easiest means of going through a site, thereby reducing the temptation to employees to take short cuts and walk through operating areas and near other equipment.

5.2 Stacked materials should not project into access ways or passageways.

6.0 Overhead Walkways and Ramps

6.1 Nothing must be thrown down from one level to another.

6.2 Tools, etc. should not be placed on overhead locations, such as scaffolding, window ledges, or shelves, where they can fall and strike men working below. In such locations suitable protection must be installed to prevent tools, materials, etc. falling.

6.3 Regular inspections of overhead walkways, etc. should be carried out to ensure that no loose materials, etc. are left around.

7.0 Floors

7.0 Floors, passageways, walkways, etc. must be kept clear of small articles, tools, scrap metal or any other working material when any of these are no longer in use. Oils, grease, chips, or other material which can be the cause of slipping or falling must be removed.

7.1 Ordinary foot traffic and shifting of materials, as well as the tracking in of rain, snow, and ice through the site can cause floors to become slippery. By sprinkling sand occasionally this hazard can be minimized.

7.2 Floors should be cleaned frequently and kept in good condition, firm and level. Worn spots and other defects should be reported for repair immediately.

7.3 Inclined ramps should have raised slats fixed on their surface, with an opening to enable wheelbarrows, etc. to be moved along them.

8.0 Material Storage

8.1 Improper stacking and storage of materials is a major safety hazard and must not be tolerated.

8.2 Inside stacking must be done in specially designated places and located in such a manner as to minimize the hazard of a stack falling. The stacked materials must not present a tripping hazard.

8.3 Proper clearance should be allowed between the ceilings and the tops of stacks.

8.4 In the stacking of bulky objects, specially designed guards should be provided to prevent the rolling and shifting of the material into aisles or places where men are working.

8.5 Stacked materials on working platforms should be protected against falling by wire mesh guards or other suitable means.

9.0 Tools

9.1 Small tools and implements should not be permitted to lie around where they may present a slipping or tripping hazard.

9.2 Special racks for tools should be provided.

9.3 Tool bins should be provided for picks, shovels and similar tools.

9.4 Storage places should be located conveniently where workers will use them, and the temptation to leave equipment at workplaces where it would cause accidents or be lost is then reduced.

9.5 Tool cribs and racks will do much to encourage good housekeeping and promote efficiency.

9.6 Tool box and site box lids should be propped open to prevent finger and hand injuries.

10.0 Offices

10.1 Good housekeeping procedures are as necessary in the office as on a site.

10.2 All passageways should be kept open and free from obstruction.

10.3 Books and papers should be kept in their proper place and not permitted to lie on the floor or scattered about on tables.

10.4 Drawers on filing cabinets should not be allowed to remain open, and only one drawer at a time should be opened; if all drawers are left open there is a danger of the cabinet falling over.

10.5 On no account should the drawers of filing cabinets be used as stepper.

11.0 Vending Machines

Where vending machines for mils of bottled or canned drinks are located on a site, workers should be instructed to place empty containers into cases provided for the purpose adjacent to the machine, and in no circumstances should empty containers be permitted to be left around the site.

12.0 Dumps for Scrap

It is good practice to demarcate three areas for scrap-one for the useful, another for the sailable, and another for dirt or refuse. Label them with suitable notices. As the heaps grow it will show dramatically how much valuable material has been recovered and how much refuse and filth has been disposed of.

REMEMBER NO JOB IS EVER FINISHED UNTIL IT HAS BEEN CLEARED UP.

13.0 Loose Timber

When shuttering is stripped, all loose timber must be carefully stacked and removed. Loose timber with protruding nails is a major source of accidents; therefore, all nails will be removed or bent over to prevent penetration wounds, etc.

44. Manual Handling of Materials

1.0 General

1.1 The improper handling of materials is one of the greatest single causes of injury in industry. Most of the injuries are caused by simple, sometimes repetitive actions. Such injuries could be avoided by the employee giving full attention to the job at hand.

1.2 Bruises, lacerations and puncture wounds of the extremities and strains and sprains and sprains of the back and other joints are the types of injuries encountered most frequently from material handling.

1.3 Before handling materials, be alert to the possibility of sharp edges, nails, silvers, sharp wire ends, strap ends or other projections that might cause cuts or punctures.

1.4 Wear serviceable gloves and safety shoes when handling rough or heavy objects.

1.5 Be sure and keep hands and fingers away from the point of "pinch" or "bite" between the material being handled and another item, or the bench, floor, ground, structure or other fixed object.

1.6 Never carry sheet glass, tin or similar material under the arm. Wear gloves, use both hands and carry it to the front and side, where it does not block your vision.

1.7 If an object is heavy or large, check its weight by tipping or moving it before attempting to lift or carry it.

1.8 If an object is too heavy or bulky for you to lift, get someone to help you – or use mechanical means.

1.9 When it is necessary for you to lift an object, use the following method:

1.9.1 Face the object; place feet fairly close together and close to the object to be lifted.

1.9.2 Bend the knees and squat by the object in a comfortable position. (Don't stoop over it).

1.9.3 Get a firm, balanced grip on the object.

1.9.4 Keep the back straight and the arms as straight as possible. (Do not twist the body)

1.9.5 Lift the object by straightening the legs, while keeping the back straight. (Don't jerk)

1.9.6 Keep the object as close to the body as possible.

1.10 When it is necessary to move an object from one location to another, use the following procedure:

1.10.1 Be sure you can lift and carry it.

1.10.2 Be sure you have a clear route to where you are going.

1.10.3 Be sure the footing is OK.

1.10.4 Be sure you have a clear place to put the object down.

1.10.5 Pick the object up as described in No.1.9, above.

1.10.6 Walk carefully, twisting as little as possible.

1.10.7 Set the object down carefully, by reversing the lifting procedure.

1.11 Never carry a heavy object onto or off of a truck, unless the truck bed is flush with, and against the dock or loading platform, or a suitable deck plate or ramp is securely in place.

1.12 Don't attempt to step up or down a high step with a heavy or bulky object. Use a ramp or skids instead.

1.13 Use care and caution in the handling of all objects. Many items, harmless in themselves, can cause injury if improperly or thought-Lesly handled.

2.0 Handling Lumber

2.1 The handling of lumber, both new and used, is much more hazardous than it appears on the surface.

2.2 Gloves should always be worn when handling any type of lumber.

2.3 When handling used lumber, particularly from a scrap pile, be especially alert for protruding nails, wires, poisonous plants and snakes.

2.4 Protruding nails should always be removed from scrap lumber whether it's to be used again or discarded. Bending nails over helps but does not completely eliminate the hazard.

2.5 Never loosen your grip and allow lumber to slide through your hands.

2.6 Lifting large pieces of lumber that are water logged or extremely muddy can be a lifting hazard. Pry them loose and test their weight before attempting to lift them. If they are too heavy – get help.

2.7 One person should not carry extremely long pieces of lumber in congested areas even if the weight is not too great. Someone should carry near each end to protect against injury to others.

2.8 Full sheets of plywood or insulation, (4’ × 8’ or larger), are too large and awkward for one man to handle. Get help and be sure your vision is not blocked.

2.9 If mechanical means are not available, long, heavy timbers should be carried by at least two men. The men should lift, carry and lower on signal so that no one will be hurt.

3.0 Handling Pipe

3.1 Full joints of pipe, even in small sizes, should not be carried by one man in congested areas. Someone should carry close to each end to prevent injury to others.

3.2 One end of a joint of pipe shall never be dropped while someone is holding the other end. Always lay it down together.

3.3 The practice of two men carrying joints of small pipe on their hips or shoulders is to be discouraged. The hands should be used instead.

3.4 The fingers should never be placed in the open ends of a joint of pipe to move or carry it.

3.5 Gloves must be worn and extreme caution must be exercised when handling subs, pup joints and large fittings. Burrs, sharp threads and sharp edges are frequently present on these items.

3.6 Carrying bars with U-shaped recesses, or grip carrying tongs should be used to carry long pipe, too large to be firmly gripped with one hand.

3.7 When long, heavy pipe is to be moved, a sufficient number of workmen and tools shall be provided to safely handle the load. The following procedures should be followed:

3.7.1 Perfect coordination of the crew is essential. A signalman, possibly one of the crew, should be selected and his signals should be understood and observed by all.

3.7.2 Before lifting, all crew members should squat to a lifting position, grasp the lifting tool firmly and be prepared to lift on signal.

3.7.3 On signal, all crew members should lift together, straightening their knees, keeping backs straight and keeping the carrying tools close to their bodies.

3.7.4 On signal to start, all crew members should move smoothly together, avoiding sudden starts, stops or jerks.

3.7.5 At the appointed place, all crewmen should stop on signal and wait for the signal to lower.

3.7.6 On signal to lower, all crewmen should lower the load slowly, together, using their knees and keeping their backs straight.

4.0 Handling Drums

4.1 To loosen or tighten a bung, always use a proper type bung wrench with a long handle.

4.2 A wadded rag, piece of waste or similar item should be held tightly over the bung when it is loosened to catch any possible spray from pressure in the drum.

4.3 If a drum contains acid, caustic or any other injurious chemical, goggles shall be worn when removing the bung.

4.4 The use of drum carts, drum tilters and drum racks will greatly increase the safety factor when handling full or partly full drums. Be sure the chime catch is securely engaged before raising or tilting the drum.

4.5 Suitable gloves should always be worn when handling or moving drums.

4.6 A drum may be moved a short distance by tilting and rolling it on the bottom chime. Extreme care must be taken, however, in watching both the balance of the drum and other objects which might mash the fingers.

4.7 When necessary to move a drum from one location to another, always use a winch, hoist or other power equipment if available and practical.

4.8 To lay a full or partly full drum on its side, use the following procedure:

4.8.1 Stand facing the drum, with one foot against the bottom, legs apart and the other foot back about one-half a step.

4.8.2 Reach to far side of drum and pull it toward you.

4.8.3 When drum is balanced, steady it with both hands and face it with feet spread apart.

4.8.4 Lower drum with both hands on the inner side of top chime.

4.8.5 Keep your back straight while lowering drum.

4.8.6 Watch out for your toes.

4.9 Roll drums by pushing, with hands on top. Change direction by gripping one chime and pulling back, and then proceed to push with both hands on top. Do not kick or roll the drum with the feet.

4.10 When necessary to go down a skid or slope, skid the drum end-wise or use a snub rope with the drum in a rolling position.

4.11 To go up a skid or steep slope, if power is not available, use a snub rope, with one man pulling and at least two men pushing.

4.12 To set a full or partly full drum upright, use the following procedure:

4.12.1 Stand close to end of drum with one foot directly in front and the other a little to the side.

4.12.2 Squat, and keeping back straight, place hands about 8” apart under bottom chime.

4.12.3 Using legs and arms raise drum to balance position.

4.12.4 Guide the drum to a standing position with both hands on the inner side of the chime, on the near side.

4.13 Never put fingers on outside edge of chime when setting up or moving a drum in close quarters.

5.0 Handling Sacked Materials

5.1 Use the proper position and action for lifting.

5.2 When standing fairly erect, rest the sack against one hip and your abdomen.

5.3 Walk carefully, balancing sack with the other hand.

5.4 To carry a sack on your shoulder, while in a standing position, boost the sack to one shoulder, place hand on your hip so that sack rests partially on your shoulder and partially on your arm. Balance sack with the other hand.

5.5 When the sack is to be put down, reverse the lifting procedure. If it must be lowered to the ground, bend your knees, not your back.

5.6 If building a pile, swing the sack forward to its proper place from either the shoulder or hip, depending on the height of the pile. Do not attempt to heave or toss the sack.

5.7 Sacked material should always be properly "Crosstie" if piled more than two sacks high.

5.8 When handling cement, chemically treated mud's or other materials that create excessive flying particles or dust, proper eye protection and dust masks shall be worn.

5.9 When handling sacked material for prolonged periods, employees shall keep as much of the body covered as possible. Exposed parts of the body should be washed frequently to prevent chemical irritations and burns.

6.0 Handling Chemicals

6.1 Because of the many kinds and types of chemicals used in our operations, it is not feasible to detail the specific hazards involved and the safety precautions necessary to protect against them, in this handbook. The "Employee Protection Manual – Chemicals" contains this information and should be consulted as necessary. More detailed information can be obtained from Health Information Bulletins on those chemicals for which such bulletins have been issued by the Environmental Health Service Division.

6.2 For information on the safe handling of specific chemicals most commonly used in our field operations, refer to the Company handbook, "Employee Protection Manual – chemicals" and Environmental Health Service information bulletins.

6.3 For information on the safe handling of chemicals in laboratory operations, refer to the "Laboratory Safety" section of this handbook.

6.4 All containers of hazardous chemicals shall be plainly labelled to properly identify their contents and warn against their dangers.

6.5 Always determine exactly what chemicals you are using and know all the precautions that are necessary to prevent injury.

6.6 Chemical goggles, chemical gloves, proper respirators and suitable body and clothing protection, as applicable, shall be worn when handling hazardous chemicals.

6.7 All chemical containers shall be kept tightly closed when not in use and shall be kept in a clean, dry place, away from excessive heat.

6.8 All chemical containers shall have a safe means of removing the chemical without excessive splash, spray or other uncontrolled contamination of the surroundings.

6.9 When necessary to dilute a chemical with water, as a general rule, the chemical should always be put in the water. Water should not be added to the chemical. When diluting an acid, the acid should always be added to the water.

6.10 Any mixing of chemicals shall be done exactly as directed by the manufacturer.

6.11 When any hazardous chemical is pilled, proper clean-up and disposal of the spill and any clean-up materials that might be contaminated shall be made in accordance with directions contained in the Company handbook, "Employee Protection Manual - Chemicals."

6.12 Hazardous chemicals to be disposed of shall not be dumped into public sewer systems or into lines emptying into creeks or rivers. They shall be disposed of in a safe manner, under the direction of a fully qualified person.

7.0 Handling Materials by Power

7.1 All materials which are too large or too heavy to be safely handled by hand shall be handled by power operated equipment.

7.2 When power operated equipment is available, it should be used on large or extended jobs of handling small materials. This can usually be done with a saving of time and increased safety.

7.3 All pipes, larger or heavier than 4" line pipe should be handled by power equipment, except in specific spotting or stabbing operations.

7.4 All basic power operated equipment including winches, drums, cables, blocks, safety hooks, slings, etc., shall be inspected in accordance with applicable regulations and be kept in good operating condition at all times.

7.5 Ties, slings, bridles, etc., shall be of proper size and strength for the load to be lifted and shall be securely fastened to the load.

7.6 If the operator cannot clearly see every part of the operation to be performed, he shall have a signalman to assist him.

7.7 When a signalman is used, he shall be in a position to see every phase of the operation and be clearly seen by the operator.

7.8 Any signal which might possibly be required shall be thoroughly understood by both the operator and the signalman.

7.9 Workmen shall never get under a suspended load.

7.10 If it is necessary to guide a load, guidelines of sufficient length for complete safety of the workmen shall be provided.

7.11 When loading material with a winch line, workmen shall stay far enough away to avoid injury if the line should fail.

7.12 When handling material by use of a "come-along", good judgment shall be used to avoid sudden movement or shock which would put undue strain on the equipment.

Manual Lifting and Handling

1. Stance

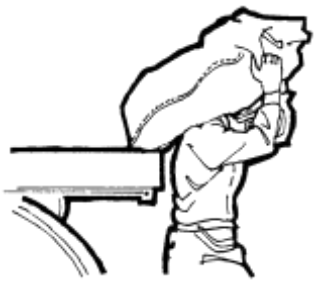
Face the direction of travel if lifting alone. Stand over the weight. Feet about 300 mm (12 inches) apart and one slightly in front of the other. This position enables you to keep your balance.

2. Straight Back

Keeping a straight back does not mean a vertical back. Be aware of the difference. Maintain a 'straight' back. Let leg muscles do the work.

3. Chin In

Before lifting, raise the head slightly and tuck the chin in. this also helps you to keep the back straight.



4. Proper Grip

Take a proper hold. Grip with the palms of the hands and the roots of the fingers. Never lift with finger tips.

5. Arms Close to the Body

Keep arms close to the body. The body then takes the weight instead of the hands and arms.

6. Position of Feet

Your leading foot should always point in the direction of travel.

7. Body Weight

Use your body as a counterweight to save muscular effort.

8. Progressive Movement

8.1 HARMFUL

TOP HEAVY and CONSCIOUSLY keeping back straight when lowering hands lead to PROGRESSIVE STIFFENING AS hands are lowered.

8.2 HEALTHFUL

PROGRESSIVE RELAXATION results from UNLOCKING of BOTH KNEES as hands are lowered.

LOOKING UP as hands take the load AUTOMATICALLY straightens back at the CORRECT MOMENT.

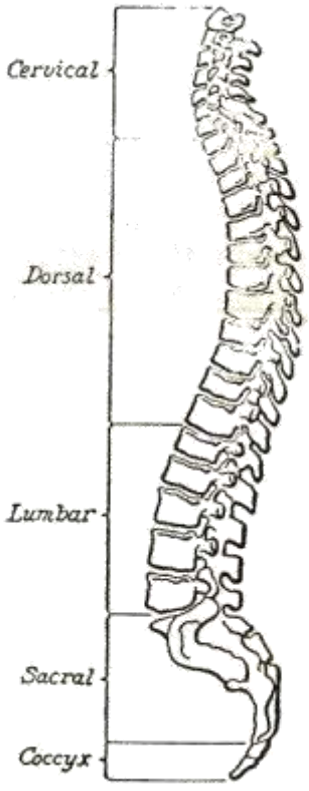
45. Back Injury Prevention Program

1.0 Introduction

- Backache, back strain, or back trouble is an age-old problem that stems from a lack of understanding of physical anatomy and how to properly use your well-designed body to do work.
- We need a simple understanding of our physical body, especially the back and legs. We should have a basic understanding of the mechanics of work such as lifting and other related activities, and how these affect our body.
- We must understand and practice good lifting procedures and other similar work activities. We must think before we act. Knowing is not enough, we must also do what we know is right.

2.0 The Backbone Construction

- The backbone is made up of twenty-six small bones called vertebrae. They are piled one upon the other, and each vertebra is separated by a disc or plate. This disc acts something like rubber heel or a shock absorber.
- These small bones are tied together with ligaments, muscles and nerves. They give strength and sensation to our back and allow for movement. The backbone encases the spinal chord and supported at the pelvis or hip.
- The leg is made up of three large bones which are tied together with large muscles and ligaments.
- Our back is constructed for heavy work, but like any well designed piece of equipment, it has its limitations.
- The legs are also designed for heavy work, in fact, these big bones and muscles will perform heavier work than will the smaller bones and muscles of the back.



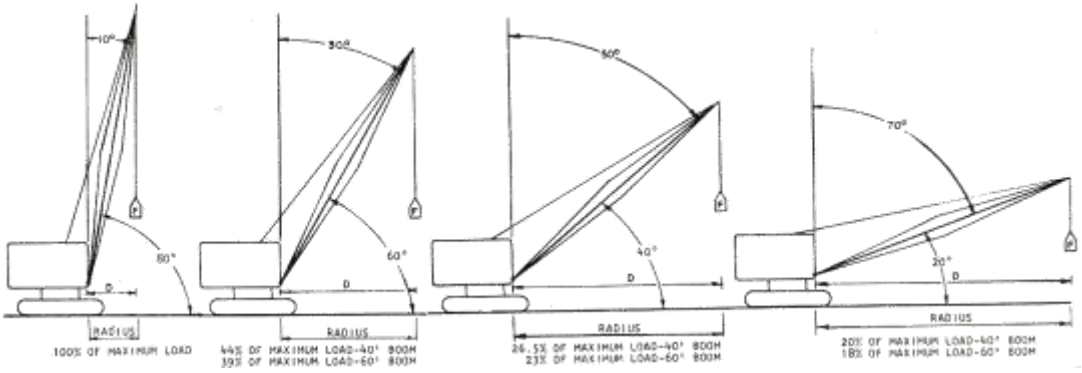
The Bones of the Spine

3.0 Back Injuries

- Muscle strain involves torn or stretched ligaments, tendons and muscles. When injured they swell and tend to pull the spine out of the vertical. Sometimes they take a long time to heal, and on occasions they remain in a weakened condition.
- It is possible that they may be easily injured in future accidents. Improper lifting, pulling, pushing, sudden jerks, or twisting are some of the common causes of this type of injury.
- Fractured and dislocated vertebrae or discs are the most frequent causes of permanent back injuries. These are the kinds that often require surgery.
- Accidents involving sudden blows or impacts to the body such as a fall or being involved in a bad accident, account for many of these injuries. Improper lifting techniques may also cause this kind of injury.
- Another area that causes backache and other back troubles is our individual physical condition. Age and the lack of proper exercise will affect our ability to do heavy work. The bed we sleep in, the posture we have when we sit or stand, and nervous tension will all affect our back and are often the cause of backache.

4.0 Improper Lifting

- Improper lifting techniques are habits we have formed since childhood. We should form the habit of lifting with our legs and not our back. Use your legs for all lifting, even when picking up a light object.
- Our back is much like a beam supported at only one end. For a better understanding, we might compare the backbone to the boom of a crane. Like the crane our backs are designed for heavy lifting but within reasonable limits.
- The more vertical we keep our back, the more we can safely lift. If we maintain the desired 10 to 30-degree angle between the back and the vertical, we will be generally forced to squat in order to reach the load.
- The diagrams below show that the load might get reduced as the boom angle increases from the vertical or if the length of the boom should become greater. This is necessary in order to remain within safe operating limits of the crane.

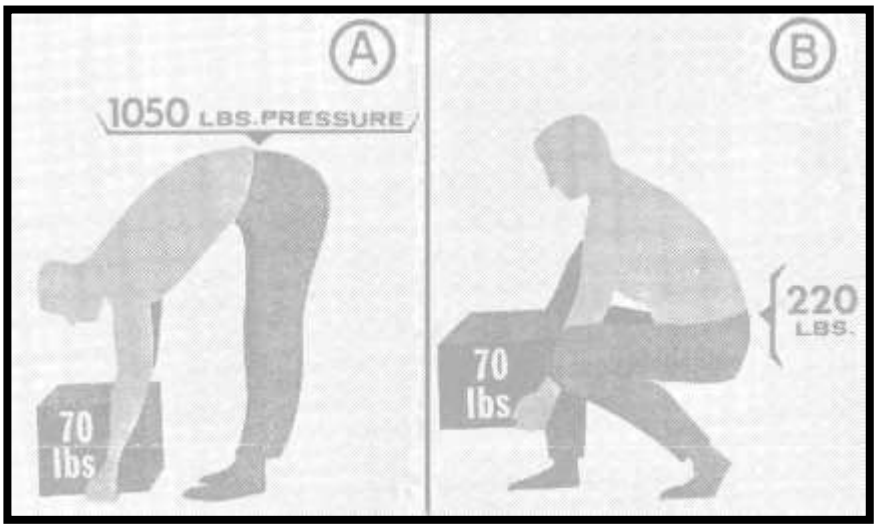


Boom Angles with Representative Load Limits

- As the distance increases, the moment will increase unless you reduce the weight - unless the crane operator watches this, he may buckle the boom or possibly tip his crane over. The same thing happens when we overload our back through improper and unwise lifting techniques.
- From the formula:

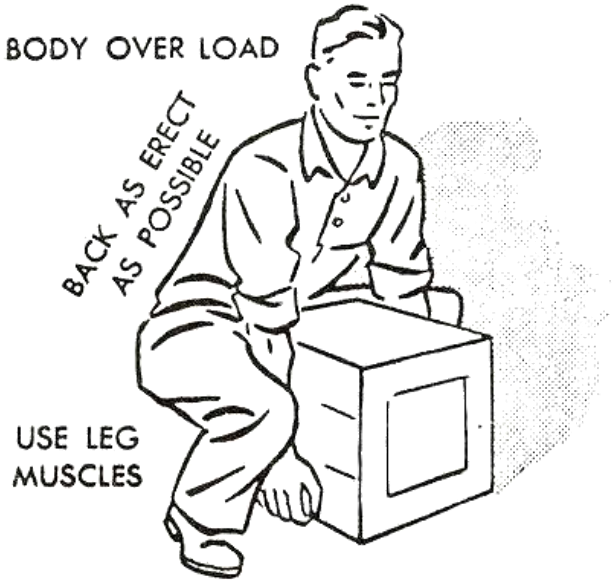
$$\text{Moment} = \text{Force} \times \text{Distance}$$

The "moment" or torque is the resulting force applied at the lower back. The "force" may be the resistance or weight of an object, and the "distance" is measured from a fixed point on the lower back or beam to the weight. When we stand erect, there is some pressure on the lower back. If we should bend over, the weight of our upper body increases this pressure considerably. When we squat and hold the back as straight as to our body, this pressure is reduced.



5.0 Good Lifting Methods

- Good lifting methods or techniques are simple, and anyone who is in reasonably good physical condition can lift heavy loads if he follows the following method:



(1) Face the load and place your feet so you will have good balance.

(2) Squat and keep your back straight and as near vertical as possible.

(3) Keep the load as close to your body as possible and watch your hands and fingers from sharp edges or caught-in-between.

(4) If it is a heavy load, test before your lift. If you can't rise up with your legs, the load is too heavy and you need help.

(5) Lift with your legs.

(6) Don't twist your body. Shift your feet instead. A twisting torque or moment tends to aggravate the force already applied to your backbone.

(7) Don't over-lift by reaching out to pick up or set down a load.

(8) Don't lift with a jerk. Use smooth motions, because fast and jerking motions will tend to increase the force already applied to your backbone.

(9) Get help if you need it. This may be in the form of mechanical device, mechanical leverage or other men to help you.

(10) Remember, when setting a load down, it is just the reverse of lifting.

- The human body is a wonderful piece of machinery. It was designed to do such things, as heavy lifting and heavy work, but like any other piece of equipment, it has its limitations, it must be properly maintained and used correctly.

46. Abrasive Wheel Machinery

1.0 General

Our HSE Philosophy in GANOPE is to provide safe and healthy working conditions for all personnel "employees and contractors" - and to ensure that HSE practices and procedures are applied and there is a commitment by all at every location and work site to follow HSE rules and regulations in line with our HSE Policy.

1.1 All abrasive wheels shall be checked upon installation to assure that the machine or spindle speed in RPM is not greater than the safe RPM recommended for that particular wheels being installed.

1.2 The wheels shall fit freely on the spindle.

1.3 The spindle bushing, if used, must be narrower than the wheel.

1.4 Immediately before mounting, all wheels shall be closely inspected and sounded by the user (ring test) to assure the wheel's integrity. A ring test simply consists of the wheel being gently tapped with a light non-metallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels. If they sound cracked (dead), they shall not be used.

1.5 Fixed machines shall be securely anchored to prevent movement or tipping.

1.6 All entries must specify the class or description of the abrasive wheels which the appointed person may mount, and the person appointed must be provided with a copy of the entry or certificate. The occupier may revoke an appointment at any time by a signed and dated entry in the Register.

2.0 Training and Appointment of Persons to Mount Wheels

No person shall mount an abrasive wheel unless he has been trained and competent to carry out mounting, and has been duly appointed in writing.

3.0 Selection of Wheels

3.1 In selecting a wheel, due account shall be taken of the factors which affect Safety.

3.2 Selecting the correct wheel for the job is equally important for efficient production and for Safety.

3.3 As a general rule, soft wheels are more suitable for hard material, and hard wheels for soft material.

3.4 With wheels of unsuitable structure for the job, loading may result, i.e. the abrasive wheel face becomes clogged with particles of the material being ground. A wheel may also be too hard or too fine, resulting in 'glazing'.

3.5 The Operator is then tempted to press the work-piece too hard on the wheel, causing it to break.

3.6 The best policy in selecting grinding machine is to consult Manufacturers of machines and abrasive wheels, and not to experiment without competent advice.

4.0 Abrasive Wheel Characteristics

4.1 In the process of manufacture of abrasive wheels, the abrasive and bonding materials are controlled to produce wheels of the varying qualities required for an almost unlimited range of grinding conditions and requirements.

4.2 The following are the variable elements in abrasive wheel manufacture, and the standard symbols that are used to designate them:

4.2.1 Abrasive means the abrasive used in the wheel construction. Aluminum Oxide is expressed as A, Silicon Carbide as C.

4.2.2 Grain Size means the size of abrasive grains used as cutting particles. The grains are classified according to the sieve through which they have passed. The range is expressed by numbers (Coarse 8 to very fine 600).

4.2.3 Wheel Grade is generally considered as the tenacity with which the bonding materials hold the abrasive grains in a wheel. Wheels are graded as 'soft' or 'hard' according to this degree of tenacity. The Grade scale is expressed in letters, from A (soft) to Z (hard).

4.2.4 Structure means the relationship of abrasive grain to bonding material, and the relationship of both to the spaces or voids that separate them. The void or spaces in the structure assist in rapidly removing 'chips' from the wheel face, thus eliminating or choking of the abrasive surface.

4.2.5 Bond Type means the bonding material used in the wheel construction, and is described by letters V (vitrified) B (resinoid), etc.

5.0 Abrasive Wheel Marking System

5.1 British Standard Specification No. 4481/1961 is now generally adopted as a basis for the marking of abrasive wheels. This specification secures uniformity, and completely identifies and describes a wheel.

5.2 It also provides a general indication of the hardness and grain size of any one wheel as compared with another. In view of the wide variation in grinding conditions, however, wheels of similar marking, made by different manufacturers, may not necessarily give the same grinding action.

5.3 The four principal wheel characteristics are marked in the following order, and denoted by the appropriate symbols.

1-Abrasive.

2-Grain (size of abrasive particles).

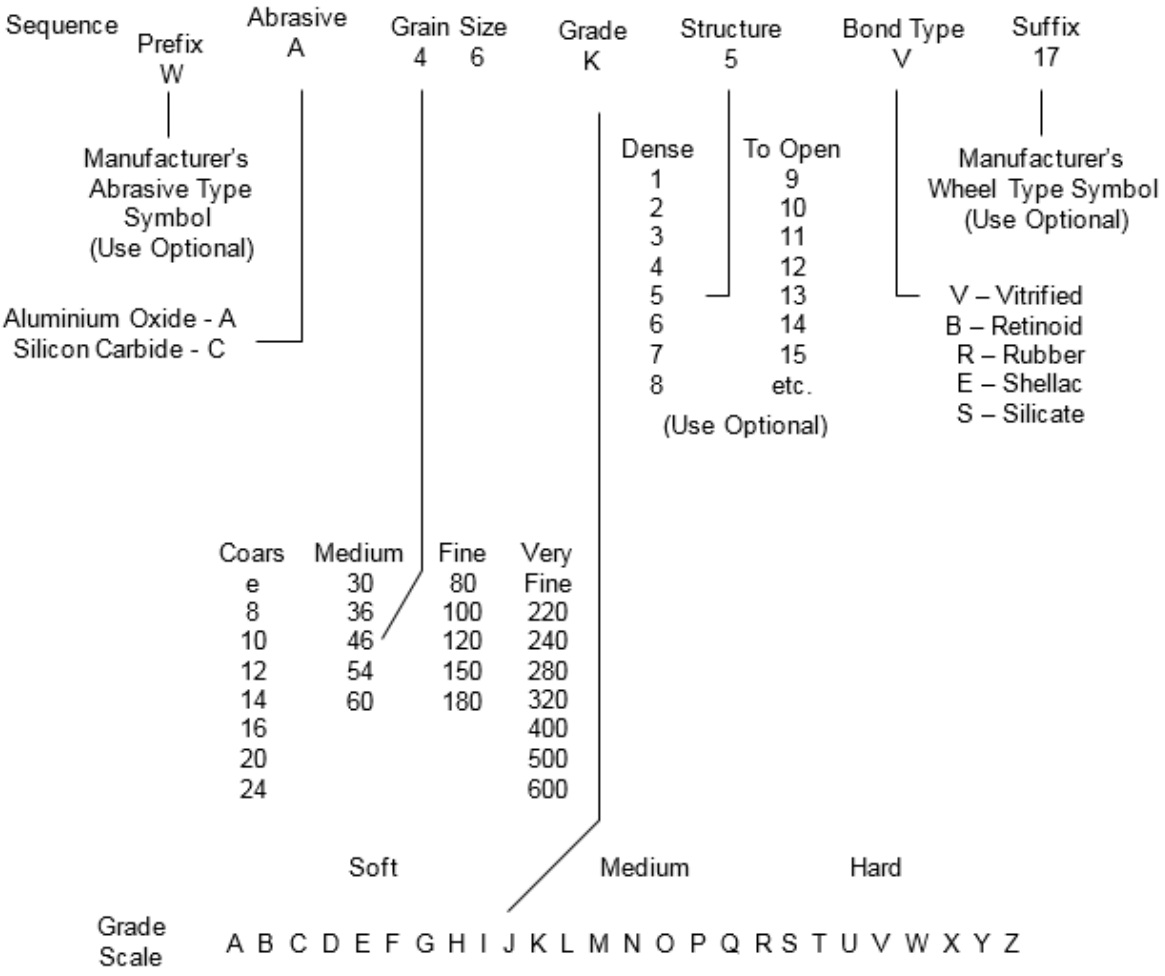
3-Grade of hardness.

4-Bond type.

5.4 The marking symbols are generally shown on the abrasive wheels, on a tag attached to the wheel or on an accompanying label. Tags and labels should be carefully preserved as they are essential information of exact duplication of a wheel.

5.5 It is essential that those persons who are trained for wheel mounting should be able to recognize the specification marked on wheels.

British Standard Marking System for Grinding Wheels



6.0 Securing the Wheel

6.1 In the case of a single central spindle nut, tighten the nut only sufficiently to ensure that the flanges drive the wheel and prevent slip. If the tightening torque recommended by the maker is known a torque wrench should be used. Otherwise tighten by hand pressure on a spanner. Excessive clamping pressure applied, for example, by using an extension to a spanner or by hammering, may damage the wheel.

6.2 When the flanges are clamped by a series of screws take care to tighten them uniformly. First screw with the fingers and then tighten in a diametrical sequence.

7.0 Starting New Wheels

7.1 Before running the wheel makes sure the guard is in proper adjustment.

7.2 If the machine is fitted with a work rest, adjust this as close as possible to the surface of the wheel; rotate the wheel by hand to make sure it is clear all the way round.

7.3 New wheels should be run free at full operating speed for a short period before they are used, during the trial run everyone should stand clear.

8.0 Guards

8.1 Guard must be in place for each abrasive wheel and brush.

8.2 The safety guard for fixed grinders shall cover the spindle end, nut, and flange projections and shall be mounted to maintain proper alignment and limit the wheel exposure to 90 degrees.

8.3 Wheel exposure shall not begin more than 65 degrees above the horizontal plane of the spindle.

8.4 Work rests shall be used on all fixed grinding machines and will be set within 1/8 inch of the wheel.

8.5 All bench pedestal grinders must have an adjustable tongue guard with the guard being set to clear the abrasive wheel by not more than ¼ inch.

9.0 Personal Protection

Ask your supervisor which of the following personal protective equipment is required for the equipment, operation or process you work with.

9.1 Eye Protection

9.1.1 Wear industry-rated eye protection.

9.1.2 Get medical help as soon as possible if your eye is injured.

9.1.3 Contact lenses alone won't protect your eyes. Add safety goggles or safety glasses.

9.1.4 Don't wear contact lenses if you're exposed to chemicals, vapours, splashes, radiant or intensive heat, or suspended particles.

9.2 Head Protection

9.2.1 Wear a safety hard hat and add other head protection as needed, such as a face shield, goggles or hood.

9.2.2 Make sure your hard hat fits securely.

9.2.3 Check the hat for cracks. Look for straps or sweatbands that are frayed or broken.

9.2.4 Clean the shell of your hard hat to remove oil, grease and chemicals.

9.3 Foot Protection

9.3.1 Make sure your foot protection fits right, feels comfortable and is right for your work.

9.3.2 Sandals, gym shoes, are not appropriate.

9.4 Hearing Protection

9.4.1 Wear hearing protection that fits comfortably.

9.4.2 Make sure it works with the other equipment you wear, such as head, eye and breathing protection.

9.4.3 Ask your supervisor or safety professional for the proper ear plugs or ear muffs for your work environment.

9.5 Work Clothes

9.5.1 Don’t wear scarves or neckties that can get caught in machinery.

9.5.2 Wear short-sleeved shirts and cuff-less pants. Stay away from full sleeves. Tuck in your shirttail.

9.5.3 Avoid shorts, dresses and tank tops.

9.5.4 Wash your clothes often, and replace or repair clothing that’s worn or torn.

47. Hearing Conservation Program

1.0 Introduction

Prevention of noise-induced hearing loss is the primary and ultimate goal of all occupational hearing conservation efforts. Although this goal is simple to state, it is not easy to achieve. In spite of stringent and vigorous efforts to control potentially hazardous noise exposure among workers, may employees continue to acquire noise-induced hearing-losses that should have been prevented.

2.0 Elements of Hearing Conservation Program

All program of hearing conservation, the large and the small, contain essentially the following elements:

- Written Program.
- Monitoring (Sound Surveys).
- Audiometric Testing.
- Hearing Protection.
- Written Safe Work Practice.
- Training.
- Administration and Engineering Controls.
- Record Keeping.

3.0 Occupational Noise Exposure

- Noise is commonly defined as any unwanted sound. Noise literally surrounds us every day, and is with us just about everywhere we go. However, the noise we are concerned with here is that produced by industrial processes.
- Excessive amounts of noise in the work environment cause many problems for workers, including increased stress levels, interference with communication, disrupted concentration, and most importantly, varying degrees of hearing loss.
- Exposure to high noise levels also adversely affects job performance and increases accident rates.
- One of the major problems with attempting to protect worker’s hearing acuity is the tendency of many workers to ignore the dangers of noise.
- Now that noise exposure must be controlled in all industrial environments, that well-written and well managed hearing conservation programs must be put in place, and that employee awareness raised to the dangers of exposure to excessive levels of noise.
- Noise is measured in units of sound pressure levels called decibels, named after Alexander Graham Bell, using A-weighted sound levels (dBA). The A-weighted sound levels closely match the perception of loudness by the human ear. Decibels are measured on a logarithmic scale which means that a small change in the number of decibels results in a huge change in the amount of noise and the potential damage to a person's hearing.
- OSHA sets legal limits on noise exposure in the workplace. These limits are based on a worker's time weighted average over an 8-hour day. With noise, OSHA's permissible exposure limit (PEL) is 90 dBA for all workers for an 8 hour day. The OSHA standard uses a 5 dBA exchange rate. This means that when the noise level is increased by 5 dBA, the amount of time a person can be exposed to a certain noise level to receive the same dose is cut in half.

- The National Institute for Occupational Safety and Health (NIOSH) has recommended that all worker exposures to noise should be controlled below a level equivalent to 85 dBA for eight hours to minimize occupational noise induced hearing loss. NIOSH has found that significant noise-induced hearing loss occurs at the exposure levels equivalent to the OSHA PEL based on updated information obtained from literature reviews. NIOSH also recommends a 3 dBA exchange rate so that every increase by 3 dBA doubles the amount of the noise and halves the recommended amount of exposure time.

4.0 Hearing Conservation: The Written Program

In addition to stating the purpose, the written program should contain a statement about the terms pertinent to the written program. For example, a statement declaring that the Hearing Conservation Program is designed to comply with Environmental Law requirements, and that a continuing, effective Hearing Conservation Program will be administered whenever employee noise exposures equal or exceed an 8-hour Time-Weighted Average (TWA) sound level of 85 decibels measured on the A-scale, clearly defines the perimeters of the program.

5.0 Noise Hazard Area

Any area where noise levels are equal to or exceed 85 db. Environmental Law requires employers to designate work areas, post warning signs, and warn employees when work practices exceed 90 dB as a 'Noise Hazard Area'. Hearing protection must be worn whenever 90 dB is reached or exceeded.

6.0 Hearing Conservation Program

6.1 Designation of Responsibilities

The Hearing Conservation Program requires good direction, management, supervision and conduct at all levels within the Company. Assigned duties and responsibilities of Company key personnel *should not be* delegated to subordinates.

6.1.1 Each company management will be responsible for implementing and ensuring compliance with the company's Hearing Conservation Program.

6.1.2 Company management shall establish the responsibilities for managing this program and for designating the employee classification that will perform the following:

6.1.2.1 Supervise program within departmental work centers.

6.1.2.2 Report potential noise hazards to the HSE department for further evaluation.

6.1.2.3 Provide hearing protection devices as required.

6.1.2.4 Maintain work Centre employee training records.

6.1.3 The company HSE department is the Hearing Conservation Program manager. The HSE Manager will be responsible for the following:

6.1.3.1 Writing and modifying, as necessary, the company's Hearing Conservation Program.

6.1.3.2 Conducting noise level measurements and maintaining a current and accurate noise level measurement summary of all company workplaces.

6.1.3.3 Providing training on the Hearing Conservation Program as required, including training in how to wear hearing protection devices.

6.1.3.4 Ensuring that audiometric examinations of all company personnel who come under the Hearing Conservation Program are conducted by medical clinic / Centre.

6.1.3.5 Ensuring Hearing Conservation Records are forwarded to company department concerned.

6.1.3.6 Providing work Centre supervisors an ongoing, current approved listing of hearing protection equipment.

6.1.4 The company medical Centre manager will be responsible for maintaining employee hearing conservation records, and will facilitate referral of employees requiring further medical examination by a physician.

6.1.5 Assigned supervisors have the following responsibilities under the Company's Hearing Conservation Program:

6.1.5.1 Reporting to the HSE department any installation or removal of equipment that might alter the noise level within designated work centers.

6.1.5.2 Ensuring that hearing protection devices, as prescribed by the HSE department, are available to employees.

6.1.5.3 Ensuring hearing protection devices are utilized as required.

6.1.5.4 Maintaining current training records on Hearing Conservation Program.

6.1.5.5 Ensuring that all new employees receive a baseline audiogram within six months of hire date.

6.1.5.6 Ensuring proper hazard labelling for all noise hazard areas.

6.1.5.7 Ensuring that suitable hearing protection is provided to work Centre visitors.

6.1.6 Company personnel will be responsible for:

6.1.6.1 Familiarizing themselves with the Hearing Conservation Program.

6.1.6.2 Wearing hearing protection devices as required.

6.2 Monitoring: Sound Level Survey

6.2.1 The Hearing Conservation Program begins with noise monitoring and sound level surveys.

6.2.2 When information indicates that any employee's exposure equals or exceeds an 8-hour time-weighted average of 85 decibels, the company must develop and implement a *monitoring program.*

6.2.3 The responsibility for noise monitoring is typically assigned to the company HSE department.

6.2.4 Additional monitoring procedural requirements include:

6.2.4.1 Identify employees for inclusion in the hearing conservation program and

6.2.4.2 Identify the proper hearing protectors.

6.2.4.3 All continuous intermittent and impulsive sound levels from 80 decibels to 130 decibels must be integrated into the noise measurements.

6.2.4.4 Instruments used to measure employee noise exposure must be calibrated to ensure measurement accuracy.

6.2.4.5 Monitoring must be repeated whenever a change in production, process, equipment, or controls increases noise exposures to the extent that:

6.2.4.5.1 Additional employees may be exposed at or above the action level; or

6.2.4.5.2 The attenuation provided by hearing protectors being used by employees may be rendered inadequate.

6.3 Audiometric Testing

6.3.1 Audiometric testing is an important element of the Hearing Conservation Program for two reasons: It helps to determine the effectiveness of hearing protection and administrative and / or engineering controls. Audiometric surveillance also helps to detect hearing loss before it noticeably affects the employee.

6.3.2 Audiometric examinations are usually done by an outside agency, but can be done in-house with the proper equipment. Wherever they are done, they require properly calibrated equipment used by a trained and certified audiometric technician or physician.

6.3.3 The company HSE department is to ensure that designation of audiometric evaluation procedures is included in the written Hearing Conservation Program.

7.0 Hearing Protection

7.1 The hearing protection element of the Hearing Conservation Program provides hearing protection devices for employees and training in how to wear and use them effectively, as long as hazardous noise levels exist in the workplace.

7.2 Hearing protection comes in various sizes, shapes and materials, and the cost of these equipment can vary dramatically.

7.3 Two general types of hearing protection are used widely in industry: the cup muff and the plug insert type. Because feasible engineering noise controls have not been developed for many types of industrial equipment, hearing protection devices are the best option for preventing noise-induced hearing loss in these situations.

7.4 As with the other elements of the Hearing Conservation Program, the hearing protective device element must be in writing and included in the Hearing Conservation Program.

8.0 Safe Work Practices

Safe work practices are an important element in the Hearing Conservation Program. Written safe work practices for hearing conservation should focus on relaying noise hazard information to the employee. For instance, if an employee performs a maintenance function in a high noise hazard area, the written procedure for performing this function should include a statement warning about the noise hazard and lists the personal protective devices associated with this function.

9.0 Recordkeeping

The company is required to keep and maintain certain records. Along with an accurate record of all employee exposure measurements, the company is required to retain all employee audiometric test records. Audiometric test records must include:

- Name and job classification of the employee;
- Date of the audiogram;
- The examiner's name;
- Date of the last acoustic or exhaustive calibration of the audiometer;
- Employee's most recent noise exposure assessment;

The company is required to retain records of noise exposure measurement for two years. Audiometric test records must be retained for the duration of the affected employee's employment.

10.0 Administrative and Engineering Controls

- Another important element that must be included in any Hearing Conservation Program is administrative and engineering controls.
- Administrative controls, simply stated, involve controlling the employee's exposure to noise.
- If a certain work area has a noise source that exceeds safe exposure levels, the employee is allowed within such a space only up to the time in which he or she has reached their maximum allowed time-weighted exposure limit.
- For example, if the noise hazard area consistently produces noise at the 100-dBA level, the employee would only be allowed in such an area up to 2 hours per 8-hour shift.
- Engineering controls used in controlling hazardous noise levels can be accomplished at the source of the noise through preventive maintenance, speed reduction, vibration isolation, mufflers, enclosures, and substitution of machines.

48. Barricade Tape Program

1.0 Purpose

To establish guidelines for the use of barricade tape to limit or restrict personnel entrance into an area.

2.0 Program

2.1 Barricade tape will only be used to limit personnel entrance into an area where a potential for injury / exposure exists due to non-routine work being performed.

2.2 Maintenance and operations will be informed of the purpose of the barricade tape, type of access being restricted (either with caution or no access at all), and the expected duration of the tape being in place.

2.3 Two distinct colors of barricade tape will be authorized for securing an area of the company:

a) Red

Totally restricted entrance into the area enclosed inside the Red tape. No personnel will enter this area until the flagging has been removed.

b) Yellow / Black

Entrance to this area should be done with caution, only if necessary and after determining why the area is barricade off.

49. Combustible Gas Indicators

1.0 Introduction

Combustible gas indicators are an important segment of a total fire protection program. They are primarily considered an indicator or early warning system to potentially hazardous conditions which will allow immediate corrective actions to be taken and possible process shutdown, if found necessary.

2.0 Objectives

The objectives of a combustible gas indicator program are:

2.1 To ensure a safe working environment through combustible monitoring.

2.2 To emphasize the need for a proper maintenance program.

3.0 Guidelines / Strategies

Combustible gas indicators are divided into two main categories, portable and fixed. Both types will be described in the following sections.

3.1 Portable Combustible Gas Indicators

3.1.1 Portable combustible gas indicators are as the name implies, "portable" which means they can be carried anywhere. It tests primarily for flammable gases. It uses a set of batteries to measure the oxidation rate of the gas, which is then read from a meter calibrated to show the combustibility of the gas concentration.

3.1.2 Portable combustible gas indicators, sometimes called explosimeters, shall be used in accordance with the manufacturers' recommendation for determining the lower explosive limit (LEL) of combustible gas in the air. The LEL is also commonly referred to as the lower flammable limit (LFL). The operating supervisor shall be responsible for ensuring the requirements of this program are implemented and enforced.

3.2 Calibration

3.2.1 Portable combustible gas indicators shall be inspected and field calibrated, in accordance with the manufacturers instruction, prior to use. All field calibration tests will be done upwind, in a clean fresh air environment, away from the area to be tested. The reasons for testing in this area are:

- The instrument is not contaminated and therefore may give false readings.
- So that the personnel are in a safe working environment.

3.2.2 If the instrument is to be used numerous times during a shift, it may only be necessary to calibrate prior to the initial use unless the instrument has been dropped or moved which may affect the calibration of the unit.

3.2.3 Field calibration and maintenance records must be documented by operating personnel and maintained on file at the local field office / or safety office.

3.3 Uses

Portable combustible gas indicators shall be used when:

3.3.1 Lighting fired heaters.

3.3.2 Issuing hot work permits.

3.3.3 Doing all confined space entry work.

3.4 Training

Personnel required operating portable combustible gas indicators shall receive initial and refresher training on the use, limitations, and care of the instruments per the manufacturer's operating instructions.

All training will be conducted by qualified personnel only and will be documented and kept on file.

3.5 Testing

Testing procedures must conform to certain criteria.

3.5.1 The test must be valid and accurate which means that the correct instrument of known accuracy was used in such a manner as to give the true picture.

3.5.2 The person using the instrument must make sure that the instrument is giving reliable information and that it is interpreted correctly.

3.5.3 The goal of the test is not to show vapours within certain limits but to show the actual picture of the entire contents of the space. If the presence of vapour is indicated, the space or area must be re-evaluated to determine why, and that corrective measures taken before work proceeds.

3.6 Exposure Protection for Personnel Conducting the Test

It must be understood that testing an area because there is a possibility of a hazardous condition, the person conducting the test must be protected from the potential hazard and be properly equipped with the necessary safety equipment.

3.7 Where to Conduct Tests

Location is important because the hazard may be restricted to a small portion of the entire volume, therefore, TEST THE WHOLE VOLUME! If the vapour or gas has a specific gravity which is different from that of air to any degree, there may be lighter gases collecting at the top while the heavier ones will hug the floor and collect in pits and sumps.

3.8 Interpretation of Readings

3.8.1 The operator must always watch the meter while testing. The needle can quickly rise and fall in a high concentration and come to rest on that part of the scale that would indicate a safe reading, yet in actual fact, an extremely dangerous concentration could exist. This is particularly evident when strong concentrations of explosive vapour are in an oxygen deficient atmosphere.

3.8.2 Personnel operating combustible gas indicators must be required to study the instruction manual on the device regularly so they can be aware of the limitations and characteristics of the instrument.

3.8.3 Unless instruments are maintained and checked at regular intervals by competent and qualified personnel, the usefulness of both instrument and operator is significantly reduced and those person's dependent upon accurate readings may be unnecessarily placed in jeopardy.

3.9 Check Points for Tester

3.9.1 <u>Do's</u>

3.9.1.1 Do select the correct sampling hose for the specific application.

3.9.1.2 Do follow the proper instructions for the care and maintenance of the instrument.

3.9.1.3 Always use the shortest length of sampling hose, this will minimize the possibility of vapors condensing in the hose.

3.9.1.4 Whenever a reading is obtained, purge the instrument in fresh air, and take a second test to be certain of an accurate reading.

3.9.1.5 Purge the indicator by drawing in fresh air, even if another sample is not to be taken right away, as this removes any possibility of contamination by corrosive gases in the combustion chamber.

3.9.1.6 Do check the calibration of the instrument to be sure it is reading accurately.

3.9.1.7 Do check the battery voltage and/or zero adjustment periodically.

3.9.1.8 Do check the instruments for tightness.

3.9.2 Don’ts

3.9.2.1 Don’t sample high temperatures with a cold instrument. Condensation may occur and give a false reading. Whenever possible, the instrument must be at the same temperature as the vapor being sampled.

3.9.2.2 Don’t remove the flashback arresters from the instrument. They prevent the explosion which occurs in the combustion chamber from passing back to the mixture being sampled.

3.9.2.3 Don’t use the indicator for sampling gasoline vapors containing TEL (tetraethylead, liquefied lead additive) unless the indicator has been approved for this specific application.

3.9.2.4 Don’t let the sampling hose or probe reach into a liquid.

3.9.2.5 Don’t adjust the voltage when a sample is in combustion chamber.

3.10 Fixed Combustible Gas Detectors

Fixed combustible gas detectors are detectors which are permanently placed at strategic locations to monitor conditions on a continuous basis.

Fixed or automatic combustible gas detectors / systems shall be used to initiate alarms and shutdowns in company facilities where hazardous levels of combustible gas could accumulate and where deemed appropriate by local management, e.g.

3.10.1 Any malfunction or abnormal condition which prevents safe operations of the plant shall initiate appropriate action to automatically shut down the facility.

3.10.2 When the facility operates on purchased electrical power, shutdown features must incorporate adjustable time delays to prevent plant shutdown from short duration power outages. Automatic restart systems shall be overridden by the shutdown system.

3.10.3 Partially attended plants, those which are not manned 24 hours a day, must have suitable provisions incorporated so the unit(s) can be automatically shut down for 24 hours without causing damage to the facility.

3.10.4 In partially attended facilities, each condition that actuates a shutdown must also actuate a visual annunciator. A remote signaling device must be actuated during unattended periods.

3.10.5 In fully attended facilities, each condition that actuates a shutdown must actuate a visual and audible alarm prior to the shutdown. These alarms must actuate sufficiently ahead of each shutdown point to give time for corrective measures to prevent a shutdown.

3.10.6 Concentrations of combustible gases that will trigger alarms and shutdowns shall be as follows. These are maximum set values. Set points may be lower.

- 10 % LEL – Low alarm, actuate alarms / annunciator
- 50 % ELL – High alarm, may or may not actuate shutdowns, depending upon the capability of the facility.

3.10.7 Combustible gas detection systems shall be calibrated in accordance with the manufacturer's recommended procedures or at least every three (3) months, whichever is more frequent.

3.11 Records

Records must be maintained on the calibration of these instruments at the office of the person in-charge.

50. Hot Tapping

1.0 Scope

- These procedures for making hot taps on pipelines vessels or tanks containing flammable liquid or other materials represent a composite of petroleum industry safe practices for this type of work.
- They may be used as a guide and as a source of information; however, they cannot be expected to cover all contingencies which may be encountered.
- If a special need or a special problem exists responsible supervisor should revise these procedures keeping in mind that safety of the operation is the first consideration.

2.0 Approvals

To maintain control of the conditions under which hot tapping can be done responsible supervisor in charge will:

2.1 Determine that the contents of the system will permit welding or hot tapping. Hot work on lines or vessels containing corrosive or toxic materials should be given special consideration. Certain materials may cause metallurgical or chemical changes in the heat zone.

Carbon steel, for example, is changed metallurgic ally at elevated temperature in the presence of caustic or elemental Sulphur.

Where air may occur in the presence of vapors in equipment, the oxygen content should be and should remain at the level which precludes formation of a flammable atmosphere.

Heating compressed air lines or vessels may cause detonation if lubricating oil has been vaporized and distributed through the system by the compressor. These lines or vessels usually can be removed from service and cleaned prior to hot work.

2.2 Determine if the equipment is metallurgic ally suitable for welding or hot tapping.

2.3 State conditions under which welding or hot tapping may be done and establish a safe procedure.

The job should be inspected by the individual responsible for authorizing welding or hot tapping operations.

He should designate precautions to be followed before granting authorization to proceed.

A gas test of the hot work area may be required. An inspection of the parent metal is necessary.

2.4 Observe the operation to make sure the foregoing conditions are followed during performance of the job.

2.5 Determine the suitability of the hot tapping machine.

2.6 Hot tapping machine depending upon their design are limited to use up to their maximum pressure temperature ratings.

3.0 Procedure

3.1 Make sure the correct equipment or line has been selected to be welded or hot tapped.

3.2 Obtain the necessary approvals.

3.3 Provide either a suitable fire extinguisher (preferably dry chemical) and / or a pressurized fire hose.

3.4 Determine by inspection and by use of hammer testing, ultrasonic thickness devices, radiography or other approved thickness measuring devices that the equipment to be welded or hot tapped is of sufficient strength and thickness to receive the connection.

Previous inspection records and data on corrosion rates will be helpful in making this determination.

3.5 When hot tapping be sure the fitting is of proper length to accommodate the hot tap machine.

3.6 Hot tap machines many be powered by hand, air or hydraulic equipment or by electric motors.

3.7 Before a hot tap is made, the machine its cutter, and its pilot drill should be carefully inspected to be sure the machine is in satisfactory condition.

3.8 The fitting should be electrically welded to the equipment to be tapped.

3.9 Care should be exercised that the fitting is properly positioned to prevent misalignment of the tapping machine when the cut is made the machine is usually set at right angles.

3.10 Test the finished welding before cuttings is started. Testing may be done hydrostatically below 200°f. If the temperature of the line or vessel is above 200°f, an air test soaping the welds for leaks maybe used radiograph, dye penetrate or magnetic particles also may be used for testing.

3.11 Attach a full opening gate valve to the branch nozzle. It may be necessary to grind off the seat ring lugs to permit the cutter to pass through the openings.

3.12 Install cutting machine on gate valve. The small vent connection on the machine should be opened. Extend boring bar through opening several times to be sure the cutter doesn't jam or drag.

3.13 The travel of the cutter should be accurately calculated, particularly in small size pipe to assure that the opposite side of the pipe is not cut.

3.14 Adjust boring bar stops and drill entry point.

3.15 When pilot drill penetrates equipment close vent valve on cutting machine.

In addition to the machine stop setting completion of the cut can be determined by resistance to hand cranking or speeding up of air or hydraulic motor.

3.16 Retract boring machine close valve and open bleeder.

3.17 Remove the cutting machine, the connection is ready for use.

51. Repairs to Crude Oil, Liquefied Petroleum Gas and Products Pipelines

1.0 Introduction

1.1 This data sheet is designed to serve as a guide to safe practices in the repair to crude oil, liquefied petroleum gas (LP-gas) and products pipelines.

1.2 The data presented herein represent a consensus on a desirable approach to such repair jobs; however, this data sheet should not be regarded as an industry standard.

1.3 Users of this data sheet are specifically directed to applicable occupational safety and health administration standards (OSHA) and department of transportation regulations (DOT).

2.0 Purpose and Scope

2.1 This data sheet is intended as a guide to safe working practices in the repairs to crude oil, LPG, and products pipelines.

2.2 Although it is recognized that an "on-the-job" approach is tailored by the conditions of a particular job, the observance of the suggestion herein should improve the ability to complete a repair without accident or injury.

3.0 Preliminary knowledge

3.1 Qualified supervision is essential. If it is necessary for the designated supervisor to be away from the job, he should assign a responsible and experienced employee to act as temporary supervisor.

3.2 It is essential that all personnel working on pipeline repairs understand the need for careful planning of the job. Employees should be briefed on the procedures to be followed in accomplishing the repair.

4.0 Precautionary Measures and Procedures

4.1 In ensuring that the pipeline is ready and safe for repair the supervisor should make certain that proper arrangements have been made to control oil or product flow and cathodic protection rectifier currents.

4.2 Before moving to the job site, the supervisor should check tools and equipment, to make certain they are adequate and in good condition.

4.3 If spilled product at the leak site is known to be toxic, or if the possibility of an oxygen-deficient atmosphere exists, approved respiratory protective equipment should be available.

4.4 Personnel and equipment should not be permitted in the area of a leak or a break until the contaminated area has been clearly defined.

4.5 Suitable warnings should be placed where the nature of the product and the likelihood of public access to the area warrants; "DANGER" and "CAUTIONS" placards are suggested for such purpose. "DANGER" placards should be placed in the immediate vicinity of the leak; "CAUTION" placards should be placed in such outlying areas as appear necessary.

4.6 In instances where repairs are temporary or work is interrupted, the leak site should be barricaded and marked with warning lights or should be fenced to protect against the possibilities of accidents and injuries.

4.7 Spectators should not be permitted within the defined area at any time.

4.8 Surface terrain, direction and velocity of prevailing winds, and proximity to possible sources of ignition such as may be found on highways, on railroads, or in residences should be carefully considered. Roadblocks, if considered necessary, should be erected immediately. A "wind sock" will assist the repair crew in detecting changes in the wind or air currents.

4.9 Since the hazards of fire and explosion exist throughout excavation and repair work, fire extinguishers should be available and ready for instant use while the work is in progress.

4.10 When excavation or digging is required in congested municipal or residential areas, it may be advisable for the supervisor to contact the city engineer, the fire chief, the police, or another public official who can help provide separator barriers, control traffic, and eliminate potential ignition sources where oil or product liberation is involved.

4.11 A combustible-vapor indicator should be used to determine the concentration of petroleum-vapors in the area and to define the hazardous area.

4.12 Matches, lighters (including friction lighters) and smoking materials should be deposited in a place designated as safe. Smoking, if permitted, should only be allowed at a safe location.

4.13 Certain rocks can produce incendiary sparks when violently struck with either ferrous or nonferrous metal. In geographic areas where such minerals are present and where volatile flammable liquid is encountered during excavation, the risk of injury to personnel from flash fires can be decreased by keeping the area well drained of liquid.

4.14 When excavations are located in densely wooded areas in ravines, near creeks, or in low places where movement of air is restricted, special effort is required to vapor-free the area in and around the excavations. Oil-soaked dirt may have to be removed from this type of site to an area a further distance from the excavation than otherwise would be required.

4.15 Before beginning excavation, it may be necessary to remove spilled oil or product or other combustible material from the work site.

4.16 Unless powered pumping equipment required for such removal is approved for operation in a hazardous atmosphere, the equipment should be located in an area free of flammable vapors.

4.17 Vehicles and power equipment should not be moved into the area of the leak until the foregoing precautions have been taken. The moving of power equipment into the leak area to expedite repairs should be well planned. The equipment should be removed from the area as soon as its function has been served. Personnel not required to operate such equipment should not be allowed in the immediate area.

4.18 Walls of the excavation should be sloped or shored to prevent cave-ins.

4.19 For ingress and egress, steps should be cut into one wall or a ramp should be provided at one side or at one end of the excavation; large excavations may require additional means of ingress and egress.

4.20 Since tools and equipment should be located upwind of the excavation, spoil should be placed elsewhere. Access to the excavation should also be on the upwind side.

4.21 Spoil should be located well away from the edge of the excavation in order to provide adequate space for employees to safely work and walk around within the repair area.

4.22 The excavation should be large enough in length, in width, and in depth to provide adequate room for personnel required to perform repair or inspection work; additional space may be needed if welding is necessary.

4.23 The excavation should also provide space for a sufficient amount of bar pipe on each side of the cut or flange separation to attach a bonding cable (see par.27). The bottom of the excavation should be fairly smooth in order to provide a base for solid footing.

4.24 When excavation is done by mechanical methods, the digging equipment should be operated upwind, if possible. Also, all emergency personnel rescue or fire-extinguishing efforts should be made from the upwind side.

4.25 Whenever possible, temporary repairs should be made without welding or torch cutting. Permanent repairs requiring welding or cutting should be delayed until oil or product clean up and vapor dissipation have been completed.

4.26 Line cuts, when required, should be made with pipe saws with mechanical cutters.

4.27 Because of the possibility of electrical currents on the pipeline, an electrical bond should be made across all proposed points of separations before the line is cut or a flange joint is separated. If replacement pipe is required, the pipe joint or joints should also be bonded. The bond should not be removed until repairs have been completed.

4.28 If welding is to be performed, all oils products, and saturated earth should be removed both from within and around the excavation; also the excavation and its surrounding area should be checked for vapor. It may be necessary to spread dry dirt around and on the bottom of the excavation.

4.29 When welding or other hot work is required, the following additional precautions should be observed:

4.29.1 The excavation should be tested with an indicator to determine that the atmosphere is safe for such work.

4.29.2 Where vapor seals or plugs are utilized to prevent the escape of vapor from a pipeline, some positive method of venting or monitoring should be used to ensure against a pressure build-up in the line while hot work is it progress.

4.29.3 If oil or product seeps into the excavation after hot work is started, the work should be halted immediately and the oil or product should be removed. The atmosphere should again be tested before hot work is resumed.

4.30 Upon completion of repair, necessary tests and operating checks should be made before placing the line in service.

4.31 Following completion of permanent repair, the site should be restored to its original condition.

5.0 Liquefied Petroleum Gas Pipelines

5.1 General Conditions

Although the preceding methods and procedures are generally applicable to the repair of pipelines handling LP-gas, personnel assigned to pipeline repair crews should be well informed of the characteristics of the special materials they may handle and the special problems that may be encountered if leaks occur. The most significant characteristics and their related problems are discussed below:

5.1.1 The boiling points of LP-gas materials are well below usual ambient temperatures; therefore, any liquid released as a result of a leak usually convert rapidly to vapour.

5.1.2 Further, a relatively small release of such a liquid can create a flammable atmosphere over a large area.

5.1.3 For example, 1 gal. of butane vaporized and mixed with air in proportions corresponding to the lower flammable atmosphere to an approximate depth of 3ft over an area 25 ft. in diameter.

5.1.4 Since the vapors of LP-gas materials (like those of gasoline) are heavier than air and thus tend to remain close to the ground, the precautions outlined in par. 4.8 are especially applicable to the potential hazards associated with LP-gas leaks.

5.1.5 Since vaporization of leaking LP-gas may freeze the surrounding ground, the danger exists that frostbite may occur in the event the escaping gas should contact exposed parts of the body.

5.1.6 The above mentioned refrigerating effect on the ground can also cause difficulties in excavation.

5.1.7 Since LP-gas have substantially greater volatility than crude oil or gasoline (as indicated by the following table of physical properties for propane and butane, typical of the majority of LP-gases), additional precautions may be required when leaks occur.

Approximate properties of LP-gases

	Commercial Propane	Commercial Butane
• Vapor pressure, pound per square inch Absolute at 100F	192	59
• Boiling point, in degrees Fahrenheit at 14.696 psi	-51	15
• Cubic feet of vapor per gallon of liq.	36	31
• Specific gravity of gas (air=1)	1.554	2.0854
Lower, percent by volume in air	2.4	1.9
Upper, percent by volume in air	9.6	8.6

5.2 Precautionary Procedures

The following precautions (not necessarily in the order shown) should be taken as soon as possible following the detection of a leak:

5.2.1 Eliminate all nearby ignition sources (especially those downwind of the leak) and evacuate adjacent areas in possible danger.

5.2.2 Determine with an indicator the extent of a flammable atmosphere in the area.

5.2.3 If conditions warrant, contact appropriate public officials for assistance in isolating the area, controlling traffic, evacuating nearby residential areas, and controlling spectators.

5.2.4 Contact individuals controlling line flow. Advise them to stop pumping and to close block valves if it is necessary to isolate the section of the line that is leaking.

5.2.5 If flammable vapors are not accumulating to an extent that causes a serious hazard, consideration should be given to continuing pumping until the LP- gas has been replaced at the point of leakage by a less volatile product.

5.2.6 If this procedure can be accomplished, the hazards associated with the subsequent repairs to the line may be significantly reduced.

5.3 Repair Procedures

5.3.1 When leakage has been reduced to a point where it is safe for workmen to enter the leak area and excavate the line, temporary repairs can often be made by installing one of the various types of clamps available for that purpose.

5.3.2 When the clamping procedure is unfeasible or insufficient to permit returning the line to service.

5.3.2.1 Safe repair may be affected by hot-tapping the line to provide a means of inserting plugs (stopples) to isolate the defective line section.

5.3.2.2 A bypass may be installed around the leak to permit continued operations while the defective section is drained and repaired.

5.3.2.3 Though the plugs (stopples) are designed to withstand high deferential pressure, their effectiveness is influenced by line size, pipe wall condition, and temperature.

5.3.2.4 Consideration should therefore be given to these factors to ensure that the proper type plug is used and that its holding capacity can adequately resist the pressure to be encountered.

5.3.2.5 Tapping and plugging equipment should be installed and operated by skilled personnel trained for the operation, or qualified representatives of the manufacturer should be available to assist.

5.3.3 If it is feasible to remove the pipeline from service for an extensive duration:

5.3.3.1 Repairs may be accomplished by hot-tapping the line and installing a connection through which the pipeline's contents can be drained or vented to a place safe for disposal

5.3.3.2 After draining has been completed and pressure has been reduced to atmospheric, the line may be cut and the defective section replaced.

5.3.3.3 In some instances, Flaring may be a desirable means of disposing of the material drained from the line: however, to avoid ignition of any vapors that may have accumulated as a result of the leak. Care should be taken in selecting the location for the flaring.

- The special tools and equipment needed for safe repair of LP-gas pipelines should be;
  - Kept in constant readiness at locations known to crews likely to make the repairs.
  - Also a supply of pipe suitable for making replacements should be kept available for quick transport to any section of the line.

52. Naturally Occurring Radioactive Materials (NORM)

1.0 Introduction:

NORM stands for Naturally Occurring Radioactive Material; process associated with the oil and gas industry leads to enhancement of the naturally occurring radionuclides which are already present at varying concentrations in Earth's crust, this is often referred to as TENORM (Technologically-Enhanced Naturally Occurring Radioactive Materials). In this document, NORM and TENORM will be referred to as NORM.

- Examples of operational components where NORM maybe present include –but are not limited to-:

- Down-hole tubing, safety valves, etc
- Long piping runs
- Well heads
- Production manifolds
- Flow-lines (to gas/oil separators)
- Separators (high, intermediate, and low pressure)
- Dehydrators
- Desalinators
- Valves
- Gas/oil separator
- Oil storage tanks.

2.0 Purpose:

The purpose of this procedure is to ensure that all the activities which are carried out in accordance with the safe practice of work when dealing with NORM and to ensure that all activities are in compliance with the Egyptian law and legislations in place.

3.0 Roles and Responsibilities:

Area Manager is responsible of ensuring the implementation of this procedure at the job location and to ensure that the information mentioned in it has been passed formally to the designated and affected parties.

Area Manager has an ownership responsibility in ensuring that the procedure will be subject to revision and management of change procedures will be further applied when necessary.

HSE Manager is responsible to provide all the technical assistance needed and further coach workforce about all the hazards and mitigations mentioned or referred to in this procedure.

4.0 Reference Documents:

Document Title
OGP Guidelines for the management of Naturally Occurring Radioactive Material (NORM) in the Oil & Gas Industry

5.0 Norm Exposure and Hazards:

NORM emits three types of radiation, are:

- Alpha (α)
- Beta (β)
- Gamma (γ)

Alpha and beta do not have the sufficient energy to penetrate human skin, respectively they do not penetrate steel pipework, therefore the main hazards associated with alpha and beta will be during breaking of containment activities, otherwise and during normal operations or survey activities they will be enclosed within the pipework itself. On the contrarily, gamma has the potential to penetrate through pipework and hence can be detected outside the pipework during normal operation.

Oil and gas processing takes place within enclosed equipment; thus occupational exposure to NORM typically takes place by two means:

- Irradiation – as a result of gamma radiation from deposits inside equipment exposing workers outside the equipment - external exposure where the source remains outside the body. A typical example is gamma rays which directly penetrate through the skin.
- Contamination – as a result of disturbing NORM deposits during maintenance work on equipment when taken offline - internal exposure where radioactive material is taken into the body via inhalation, ingestion or absorption. A typical example is during breaking containment where alpha and beta particles maybe ingested, inhalated or absorbed through wounds.

Unlike the effects associated with exposure to high radiation levels from man-made sources – typically used for radiography- exposure to NORM will not result in acute and severe effects. Chronic exposure to NORM above exposure limits or following inadequate safety precautions are typically delayed effects such as the development of certain forms of cancer.

Handling, storage, transportation and the use of NORM contaminated equipment or waste media without controls can lead to the spread of NORM contamination, and result in contamination of areas of land and sea, resulting in potential exposure of the public indirectly.

6.0 Norm Management Process:

6.1. Norm Monitoring – Hazard Identification:

This is done prior to work in order to identify areas that are classified as NORM contaminated areas. Monitoring should be done using the proper certified and calibrated equipment to ensure accurate measurements.

Further monitoring and surveys to take place in order to further identify hot spots and restricted areas within the platform itself.

Monitoring must be taken at frequent intervals and after the conditions have changed (*e.g.* after shut down of platform or prior to/after breaking of containment, *etc*).

NORM Monitoring results and information must be passed to the workforce and the concerned parties and restricted areas shall be clearly identified and marked up and access controlled.

6.2. Principles Of Protection – Mitigation:

Because NORM involves such low levels of radiation it its likely to minimize dose, three techniques are used:

1. Minimize exposure time. Because radiation exposure is proportional to time, the longer a worker stays in a radiation field, the more dose he will receive. By reducing the time spent in a radiation field, we will reduce the amount of dose received.

2. Maximize distance from the radioactive source. Radiation fields decrease with increasing distance. Simply by increasing the distance from the source, a large drop in dose can be observed.

3. Employ shielding. Shielding can be employed to block the radiation from reaching you. In most cases with NORM, shielding is rarely used because the levels of radiation are quite low. Alpha and beta particles are usually well shielded by pipework itself. Gamma rays, however, may require a dense material like lead to reduce their intensity significantly.

6.3. Additional Precautions During Breaking Containment:

Control of Work (COW) procedures shall be strictly adhered to and permit to work (PTW) to be issued and additional attached checklists/documents to be completed prior to commencement of the work. All isolation requirements to be followed and in place whenever required. TBRA to be in place and its recommendations shall be followed.

The following are the basic control procedure that should be applied during breaking containment of a NORM identified equipment:

- Boundaries to be established around the work area. The boundary should be as small as possible but large enough to allow for personnel and equipment access from the work area and to allow for all work to be accomplished in a safe manner. Containers or plastic bags should be provided for discarded protective clothing and contaminated trash at the exit of the work area.
- Only essential personnel should be allowed in the work areas where potential NORM levels exists. Prior to breaking containment, sufficient ground cover shall be placed below the item in the work area, the ground cover should be made of a plastic, waterproof type material capable of withstanding the work activities involved without tearing or ripping. Alternatively, a suitable drip-tray or catch pan may be used. The ground cover should be sized to provide for the containment of leakage and waste and to allow ample room for related peripheral work.

- Post the boundary/barricade with radiation warning signs "Caution: NORM Material": (with radiation trefoil)
- Hold a safety meeting for all personnel performing work. Radiological items which should be addressed during the meeting are, but are not limited to, protective clothing and respiratory protection requirements, radiation and contamination levels, job required to be done which may cause radioactive material to become airborne, requirements for waste generated, heat stress, action to be taken in the case of emergencies.
- Commence the job required; any dry material that is NORM-contaminated should be wetted down to prevent the generation of airborne radioactive materials. Dry material should be wetted periodically throughout the work.
- Openings of equipment or pipes that have internal NORM contamination should be sealed or wrapped by plastic or other suitable materials. If gamma is present, install blind flange on pipe opening when appropriate.
- Obsolete NORM-contaminated pipes or equipment should be clearly labeled as "NORM Contaminated Materials" and removed to a designated area. The area should be labeled as "Containing Radioactive Materials" and access restricted.
- Upon completion of the task, personnel should remove their protective clothing before leaving the work area and dispose of them in the allocated disposable area.
- All material, equipment and tools used should be surveyed for both loose contamination and exposure rate levels upon exit from the work area. A reading greater than background levels is positive indication of contamination, and should be handled as such. The contaminated tools should be cleaned up using certain type of chemicals or by high pressure water jetting techniques.
- Upon job completion, the accessible areas of the work area should be surveyed for loose contamination. Any loose surface contamination found should be promptly cleaned up and drummed.
- Once the work area has been verified free of loose surface contamination, the boundary and postings may be taken down.

The obsolete NORM contaminated pipework will be transported and further dealt with via GANOPE designated department and under their own management system.

6.4. Worker Protection:

Workers entering NORM-contaminated area or conducting intrusive work on NORM-contaminated equipment should adhere to the following guidelines:

- Personnel required to work with NORM should be trained in the associated hazards.
- All NORM operations shall be covered by a safe system of work which should identify the hazards and highlight the precautions to be taken.
- Any item or area with detectable levels of loose NORM contamination should be subject to radiological controls.
- Appropriate PPE should be worn (which may include but not be restricted to):

  – 'Tyvek' style coveralls

  – Neoprene, PVC, or NBR gloves

  – Half-face respirators with HEPA cartridges; these should be tested for fit

  – Quarter-face HEPA disposable respirators.
- Eating, drinking, smoking and chewing are not allowed in work areas where there is potential NORM contamination.

- Only essential personnel should be allowed in the work areas of potential NORM contamination.
- Personnel should wash up thoroughly with copious quantities of soap and water, after working with contaminated equipment, and before eating, drinking, or smoking, and at the end of the workday. Decontamination washing unit should be conducted separately fro personal messing/washing.
- Use systems of work that minimize the generation of waste PPE (i.e. use PPE that can be cleaned, inspected and re-used).

6.5. Training And Awareness:

Training and awareness are major components of a NORM management system. Workers need to be made aware of the hazards associated with NORM, the controls that are required for their protection and the methods for preventing environmental contamination.

A formally structured training program should provide workers with the following information:

- Origins of NORM
- Radiation and contamination
- Biological effects of radiation
- Risks associated with radiation exposure to NORM
- Comparisons of other radiation sources personnel are exposed to everyday
- Worker protection from NORM
- NORM legal limits
- Emergency response procedures

6.6. Compliance Monitoring:

Refers to the continue monitoring of the dose equivalent received by every worker at all stages of work – *i.e.*, during all times in which workers are on the platform and suspect to any levels of NORM irrespectively-

This is accomplished by using Badge films (currently using: Kodak Personal Monitoring film Type 2®), film badges are sent for analysis on a regular intervals and records are being kept and monitored for further assessment.

Personnel NORM levels are treated as confidential and are notified only to the person whose records they are.

CBCs (Complete Blood Count) are done prior to gaining access to offshore platforms; CBCs are assessed via a competent physician and are repeated for continuity every 6 months.

7.0 Norm Dose Limit:

Dose limit is 1 mSv/year, however, dose limit of 5 mSv per 5 years is GANOPE Policy with all the precautions and recommendations are implemented. Close monitoring of the dose limits for each individual is undertaken to ensure that dose limit remain sufficiently below the ceiling limit. This dose limit does not apply to certified radiation workers.

8.0 Audit:

Mitigations and procedural recommendations stated in this document and the supporting documents are subject to frequent management audits and site inspection to verify applicability and compliance.

External audits will be provided via third party (EAEA) to ensure compliance with the Egyptian laws and legislations.

9.0 Glossary:

- Alpha radiation

Radioactive decay by the emission of a high energy charged particle consisting of 2 protons and 2 neutrons (nucleus of helium atom)

- Beta radiation

Radioactive decay by emission of a negatively charged particle from the nucleus of an unstable atom (a beta particle has the same mass and charge as an electron)

- Gamma radiation

High energy, penetrating electromagnetic radiation (photons) emitted by unstable nuclei.

- NORM

Naturally Occurring Radioactive Material, relating to the material which is enhanced by technological intervention to concentrations above those usually found in nature. It is sometimes referred to as TENORM (Technologically Enhanced Naturally Occurring Radioactive Material).

- Sievert (Sv)

The SI unit of radiation dose equivalent. Occupational radiation dose limits are specified in units of milliSievert (*i.e.* the whole body radiation dose limit for a radiation worker is 20mSv). In NORM measurements, it is usual to measure in the microSievert or nanoSievert range. All measurements of radiation dose-rate are provided as a rate per hour, *e.g.* 10 microSieverts per hour (10μSv/hr)

- EAEA

Egyptian Atomic Energy Authority

- TBRA

Task Based Risk Assessment

53. Hydrogen Sulphide Safety Program

1.0 General

1.1 Hydrogen sulphide gas, (H2S), an acid gas which is sometimes present in natural gas, is the most dangerous poisonous gas encountered in our operations. In low concentrations, it has a characteristic odour of rotten eggs and a sweet taste. In higher concentrations, the sense of smell is quickly paralyzed. The sense of smell, therefore, can never be relied upon to indicate the amount of H2S present.

1.2 Hydrogen sulphide may be present in natural gas produced alone or in combination with crude oil. Concentrations may be from the faintest odour to a percentage that will result in sudden death. Accordingly, whenever H2S is present, respiratory protection is of extreme importance.

1.3 Hydrogen sulphide is heavier than air, having a specific gravity of 1.19, with respect to air, so heavier concentrations will be found at ground or lower levels, such as well cellars, open ditches and natural topographical low spots.

1.4 Hydrogen sulphide is highly flammable and has an explosive range of 4.3% to 45.5% by volume in air.

1.5 When H2S is known to be present in natural gas or crude oil, all products are handled in systems designed to confine and, when necessary, dispose of the gas in a safe manner.

1.6 When, through accidents, leakage or necessary opening of a closed system, H2S becomes present in the atmosphere, employees present shall wear prescribed respiratory protection and take such other precautions as become necessary.

1.7 If your eyes become irritated or you notice a halo around an electric light while working in a plant or area which has been determined to be “safe” from H2S, take the following precautions:

a. Leave the location at once.

b. Wash your eyes thoroughly with water.

c. Wear air supplied respiratory equipment with full face protection if necessary to return to the location.

1.8 Permissible limit of concentrations of H2S for continuous exposure during an 8-hour period is 0.001%, or 10 parts per million by volume in air. Exposure to higher concentrations of H2S will have the following effect:

a. 0.001 To 0.010% (10 to 100 ppm) for 30 to 60 minutes= eye and respiratory tract irritation.

b. 0.010 to 0.020% (100 to 200 ppm) for 2 to 15 minutes = loss of sense of smell; for 8 to 48 hours = death.

c. 0.020 to 0.050% (200 to 500 ppm) for 1 to 4 hours = death.

d. 0.050 to 0.060% (500 to 600 ppm) for 30 to 60 minutes = death.

e. 0.060 to 0.150% (600 to 1500 ppm) for 2 to 15 minutes = death.

1.9 Since the result of exposure to H2S is paralysis of the nerves controlling respiration, persons stop breathing and lose consciousness quickly. If the victim is promptly removed to a clear area and artificial respiration is started immediately, the chances of complete recovery are good.

Any delay in the start of artificial respiration appreciably reduces chances of recovery. Even-though chances of recovery may seem slim, artificial respiration should be continued until normal breathing is resumed or, if a physician is not available, it should be continued for a minimum of two hours.

Any person overcome by hydrogen sulphide should be treated for shock – that is, kept warm while artificial respiration is being applied and kept quiet until he can be checked and released by a physician.

1.10 Hydrogen sulphide reacts with iron and steel to form iron sulphide. Iron sulphide reacts with air to form iron oxide. The conversion of iron sulphide to iron oxide creates heat sufficient to ignite flammable vapours.

2.0 Hydrogen Sulphide Precautions

2.1 Any well, tank, plant or work area where H_2S may be present must be approached from upwind if possible.

2.2 Hydrogen sulphide is soluble in water as well as on moist mucous membranes. All hydrogen sulphide respiratory equipment shall, therefore, be equipped with full face masks.

2.3 In atmospheres which contain more than 10 ppm of H2S by volume in air, such as inside tanks, well cellars, bell holes, vessels, other confined areas or open spaces, only the following may be used:

a. Self-contained breathing apparatus. "Self-contained breathing apparatus is most suitable where more freedom of movement is required, but the time of use is limited to 15 to 30 minutes ".

b. Supplied – air breathing apparatus, with auxiliary self-contained air-supply for emergency purposes.

2.4 When H2S concentrations may be above 200 ppm by volume in the breathing zone of any person(s), an extra person to serve as standby shall be present, and is capable to provide assistance in case of emergency.

2.5 The standby person must have a source of air separate and independent of the person(s) being observed and remain outside of the H2S area if all possible. If this cannot be accomplished, the standby persons must wear their respiratory protection equipment until their co-worker is clear of the H2S area.

2.6 A life line of sufficient length and strength to permit emergency removal of any person from a hazardous to a safe atmosphere shall be securely attached to the harness of any person working in a hazardous atmosphere.

2.7 In areas where H2S is prevalent, an automatic resuscitator, or its equivalent, with extra breathing air shall be kept available at all times. Breathing air must be Grade D breathing air or medical oxygen, never welder's oxygen.

2.8 All personnel working in H2S hazardous environments are to be trained and certified in CPR techniques annually, as all H2S environments are potentially dangerous.

2.9 All personnel permanently assigned to work full-time in H2S environments are to receive training in respirator usage, Cardio Pulmonary Resuscitation (CPR) techniques and in the hazards associated with H2S on an annual basis.

2.10 Wind socks shall be placed at locations where the concentration of H2S in any person's breathing zone, may be expected to reach or exceed 300 ppm.

2.11 Buildings and enclosed spaces, and areas that may experience H2S leaks shall be considered for the installation of Fixed H2S Detection / Alarm Systems. The system shall activate distinctive audible and visual alarms.

2.12 No person shall enter an area where H2S concentrations are known or suspected to be 10 parts per million (ppm) by volume in air at the person's breathing zone without wearing proper respiratory protective equipment.

2.13 All contract personnel must be required to comply with the same H2S safety requirements as do company personnel.

2.14 Facial hair (beards) is prohibited for any company person, contractor or visitor who enters an area where respiratory protective equipment may be necessary. There must be no exceptions to this standard.

54. Environmental Aspects

1.0 Purpose

The purpose of this procedure is to define the methods concerning with: -
- The identification of the environmental aspects of GANOPE activities\ services.
- The identification of the significant environmental aspects of GANOPE activities \ services.
- The evaluation of the significant impacts on the environment.
- Determining controls of the significant impacts on the environment.

2.0 Scope

- The identification and evaluation of the Environmental aspects has to be carried out for all activities or services of all sites. This procedure describes the way to identify such aspects and helps to evaluate impacts on environment.

3.0 References

3.1: ISO 14001
3.4: Environmental laws.

4.0 Definitions

Environment: - surroundings in which GANOPE operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation.

Note: - Surroundings in this context extend from within GANOPE the global system.

Environmental Aspects: - Element of a GANOPE'S activities or products or services that can interact with the environment.

Note: - A significant environmental aspect has or can have a significant environmental impact.

Environmental Impact: - any change to the environment, whether adverse or beneficial, wholly or partially resulting from a GANOPE'S environmental aspects.

5.0 Procedure and responsibilities

5.1 Responsibilities

Typically, the area manager and HSE department are responsible for all issues concerning the identification of Environmental Aspects and Impacts related to operations. But operations manager and contractors can hold responsibilities in their identification and evaluation, and the rest of the personnel involved in the affiliate activities participate to make the Aspects/impacts identification and evaluation as efficient as possible.

5.2 Procedure

An environmental aspect assessment will be made or systematically reviewed/updated in case of:

- Process operating modification,
- New project or development,
- Emergency situation,
- New legislation release,

- Progress of knowledge on environmental matters,
- Site restitution,
- Environmental accidents,
- According to retention time.

5.3 Aspect Identification

At first, environmental aspects related to this area's activities, products and services should be identified within the defined scope of the Environmental Management System. Ongoing and Planned activities that could cause environmental impacts should be taken into account.

Every Environmental Aspect will be registered in the "environmental aspect description" field of the form of (Environmental Aspects Identification an |Evaluation Register) while the work causing this aspect will be entered in the corresponding field.

An Aspect must be described in a way showing its potential impacts on the environment.

Example of environmental aspects:

- Emission to air, noise, odor, vibration
- Effluent discharge, spillage from liquid chemical, releases to water, aqueous discharges hazardous and non-hazardous wastes
- Disposal of waste, releases to land
- Use of raw material and natural resources (e.g. land use, water use)
- Use of energy
- Planned outputs of product

5.4 Impact Identification

An environmental aspect can have one or more environmental impacts. An impact must be described in a way showing what changes of the environment may eventually occur. So, all the generated/potential impacts for which a relation of cause and effect will be found between them and the identified environmental aspects will be listed and assessed.