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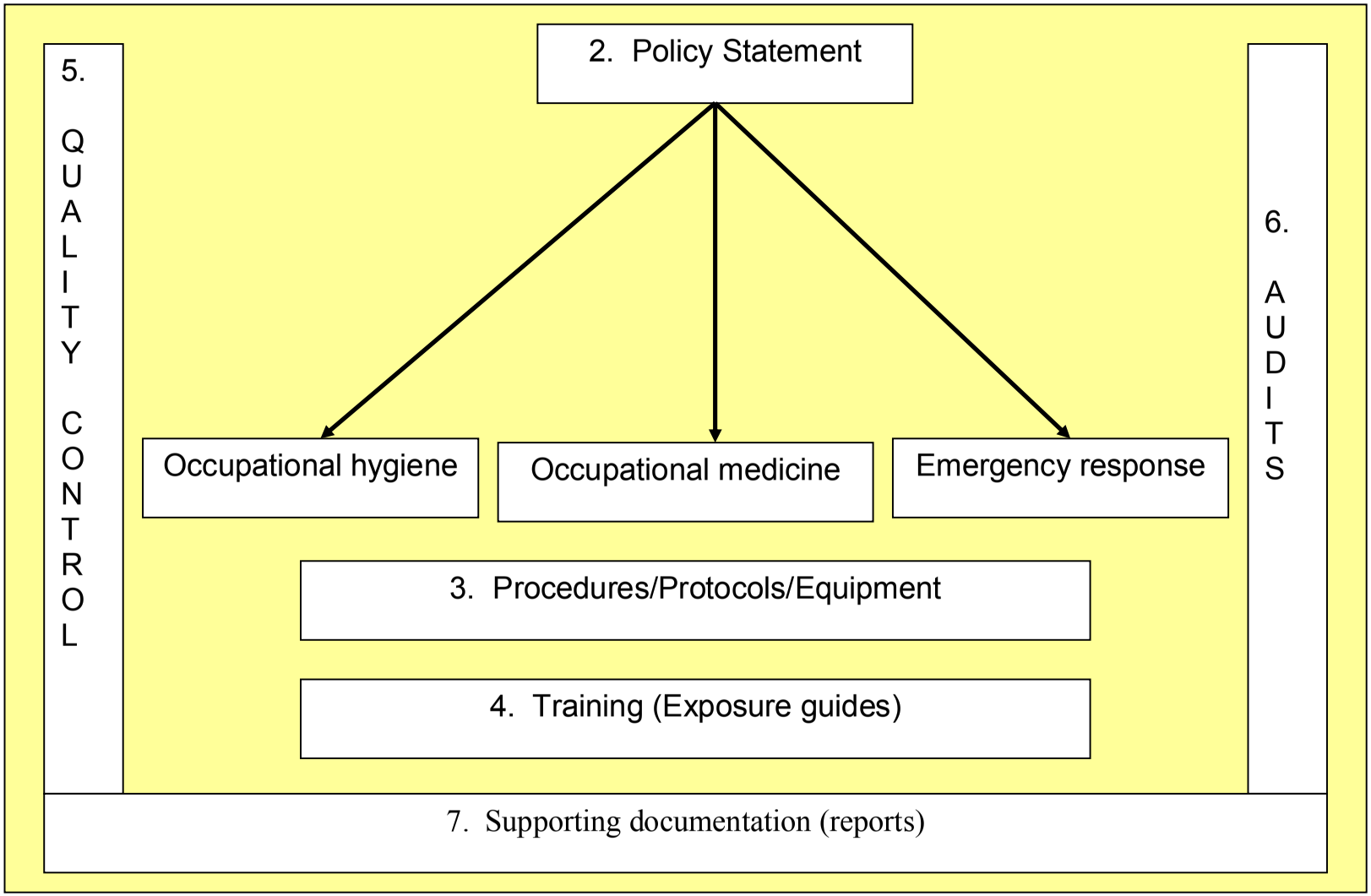
1. Overview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2. Policy statement

In support of the Safety, Health and Environmental Policy's to prevent or minimise work-related injuries and health impairment of employees and contractors XYZ Smelter Management has committed itself in order to manage sulphur dioxide (SO_2) exposure by:

- Continuously conducting risk assessments
- Evaluating exposure against international standards
- Controlling the exposure as far as reasonable practicable
- Ensuring that the workforce is competent with regard to manage excessive exposure
- Continuously improve the management of exposure

In order to achieve the above-mentioned Management has committed itself to the following objectives and has compiled a policy to comply with OHSAS 18000 requirements.

1 Objectives

The objectives of the SO_2 policy are to:

- Maintain good health
- Ensure a productive workforce
- Save on financial loss due
  - Ill-health and death
  - Inappropriate control procedures
- Spend resources more effective
- Reduce harmful effect of substances
- Select and place employee appropriately
- Provide appropriate OH education
- Match health outcome to exposure

- Reduce possibility of a law suite
- Comply with legislative requirement

2 OHSAS 18000

This policy must in compliance to OHSAS 18000:

a) Be appropriate to the nature and scale of the organisation's occupational health and safety risks.

b) Include a commitment to continual improvement.

c) Include a commitment to at least comply with current applicable occupational health and safety legislation and with other requirements to which the organization subscribes.

d) Be documented, implemented and maintained.

e) Be communicated to all employees with the intent that employees are made aware of their individual OH&S obligations.

f) Be available to interested parties.

g) Be reviewed periodically to ensure that it remains relevant and appropriate to the organization.

3 Procedures/Protocol/Equipment

3.1 Medical surveillance

1 Introduction

Certain employees have a predisposition with regard to exposure to SO_2. These employees need thus to be excluded from work in an SO_2 atmosphere.

The following employees need to be excluded:

- Eye Disease
- Skin Disease
- Pulmonary Disease

The medical surveillance consists of an entry-, periodic- and exit medical examination.

2 Entry medical surveillance screening

The entry medical surveillance screening includes the following:

- General medical examination
    - Occupational history
    - Medical history
    - Skin evaluations
- Baseline lung function
- Baseline chest x-ray
    - Mantoux/tine test if indicated.
- Visual acquity/eye conditions
- Biological effects monitoring
    - FBC
    - UK and E
    - LFT

- HIV Eliza

3 Periodical medical surveillance

The periodic medical surveillance includes the following:

- General medical examination
  - Medical history – any new conditions not previously identified added to the employee database.
  - Skin evaluations
- Lung function
- Chest x-ray
  - Mantoux/tine test if indicated.
- Visual acquity/eye conditions
- Biological effects monitoring
  - FBC
  - UK and E
  - LFT
  - HIV Eliza

Note:

Screening for other conditions that may contribute to the worker being in a high-risk category (areas to consider HIV/AIDS, epilepsy, diabetes, hepatitis). Compile database of employee's medical history.

4 Exit medical surveillance

The exit medical surveillance includes the following:

- General medical examination
  - Medical history – any new conditions not previously identified added to the employee database.

- Skin evaluations
- Lung function
- Chest x-ray
- Visual acquity/eye conditions
- Biological effects monitoring
  - FBC
  - UK and E
  - LFT

3.2 Occupational hygiene procedure

1 Occupational hygiene monitoring

This procedure should be read in concurrence with XYZ Smelter's Business Management System the Control of measuring and monitoring devices.

Monitoring is a continuing program of observation, measurement and judgement to control environmental stressors associated with work operations.

1.1 Purpose of monitoring

The purpose of monitoring is to:

- Determine the degree of personal exposure to airborne substances;
- Determine the effectiveness of control measures; and
- Demonstrate compliance to statutory requirements.

1.2 Personal and static monitoring

Personal Monitoring: It is the qualitative and quantitative measurement of a particular employee's exposure to environmental factors. The sampling device must be placed in the breathing zone of the employee.

Static Monitoring: It is the qualitative and quantitative measurement of environmental factors in the work area. The sampling device must be placed as close as possible to the worker's normal workstation or at the source.

1.3 Number of Samples

Workers must be divided in HEG's to obtain representative samples. The scale of the sampling group as per international requirements can be determined as follows:

Table 1: 95% confidence level for top 10%

Size of group (N)	<12	13-14	15-16	17-18	19-21	11-24	25-27	28-31	32-35	36-41	42-50
Number of samples (n)	11	12	13	14	15	16	17	18	19	20	21

1.4 Frequency of monitoring

1.4.1 Pollutants Toxic Gases and Vapours

The monitoring of SO_2 should be based on the level of exposure in a particular area or personal exposure. Three categories are proposed, based on the worse case scenario. These categories are:

- Category A = Area exceeding occupational exposure limit (OEL)
- Category B = Area >50% OEL ≤100%
- Category C = Area ≤50% OEL

The frequency of sampling should be as follows:

Table 2: Frequency of sampling

CATEGORY	MINIMUM FREQUENCY
A	Sample on a weekly basis
B	Sample on an monthly basis
C	Sample on a quarterly basis

1.4.2 Ventilation Systems

- Once every six months.

1.5 Methodology

All monitoring will be performed according to the prescribed methods like NIOSH, OSHA, SABS methods. All samples will be sent as, prescribed in paragraph 3, to the identified accredited laboratories for analysis. The Occupational Hygiene section personnel will only do the preparation and calibration of sampling equipment.

Note: Intentional tempering with monitoring equipment will expose individuals to management action.

1.6 Transport of sampling material

All sampling material will be transported according to the prescribed sampling method. All sample tubes will be transported from the laboratory to the workplace and from the workplace to the analytical laboratory in temperature less then $25^{O}C$.

1.7 Occupational Hygiene Monitoring process

The Occupational Hygiene Monitoring process will be conducted in conjunction with XYZ Smelter's Business Management System.

2 Calibration

Calibration consists of external, internal calibration and verification.

2.1 External Calibration

All equipment destined for calibration will be sent to an approved facility for calibration as required by legislation. The calibration cycle, calibration certificates and all other relevant information regarding calibration will be kept on a file "Calibration and Maintenance Register".

2.2 Internal Calibration

Internal calibration will be conducted if and when required by the method. The equipment is calibrated before and after use if required.

2.3 Verification

Verification (re-calibration) is conducted following sampling when required by the methodology.

3 Occupational hygiene laboratory approved for analysis of occupational hygiene samples

The following accredited laboratories will be responsible for the analysis of Occupational Hygiene Samples:

3.1 Chemtech Laboratory Services
P O Box 25825
Monument Park
0105
Tel no: 082 416 6921
Fax no: (012) 347 4979

3.2 MNL Inspectorate
Johannesburg
Tel. (011) 496 2228

3.3 Emergency response protocol

1 Disaster planning and management

Defining a Disaster

"A disaster is a great sudden misfortune resulting in loss of life, serious injury and property loss. Strictly speaking, if such misfortune befalls even one person, it is a disaster. However, in current usage the term is used to refer to a sudden occurrence which kills and injures a relatively large number of persons". A more functional definition is simply that a disaster is declared when the immediate patient load in the emergency medical services system is greater than that which the normal number of personnel can handle. Both of the above definitions of disaster are acceptable.

Generally, the sudden presentation of a large number of casual-ties is considered a disaster, no matter how well the emergency care system is prepared. However, a disaster may occur when a relative small number of patients present to an emergency system that does not have the resources to deal with the situation effectively.

The number of victims most frequently used to quantify a disaster is 25 killed or seriously injured individuals.

Magnitude of Disaster

The magnitude of a disaster can be described as a multiple patient incident, multiple casualty incident, or mass casualty incident.

A multiple patient incident is one in which there are fewer than 10 casualties. This is frequently encountered in most facilities as multiple vehicle accidents. Usually, these incidents are well handled without implementing disaster plans. However, even a few

seriously injured patients can stress the resources of a small facility, so that special plans must be put into effect. These plans may include calling in additional staff, transferring stabilized patients to other facilities, diverting further ambulance traffic, and the like. In any case, care must frequently be prioritised.

A multiple casualty incident is one in which there are 10-100 patients. Although only very minor injuries may be involved, the principles of disaster management must be used. These include triage and prioritisation of patients, primary transportation of the most critical patients, first aid at the scene, effective use of communications, and control by a central authority.

A mass casualty incident involves more than 100 patients. These are the most likely to create panic and confusion, and must be handled in a systematic fashion. Disasters of this magnitude frequently disrupt communications, power, water supply, and other vital services. Therefore, it is necessary for disaster plans to consider backup systems.

Three levels of mass casualty incidents have been described. In a Level 1 disaster, the local community emergency medical system has adequate resources to provide on-scene triage, emergency first aid and stabilization, and transportation to local facilities capable of handling the patient load. Level 2 disasters are those in which a multi-local authority (or multi-community) approach is necessary to deal adequately with the number of victims. A Level 3 disaster requires state and/or national assistance

2 Disaster plan principles

In preparing a disaster plan, eight principles must be considered:

1. Whenever possible, prevent the occurrence of disaster.
2. If the disaster cannot be prevented, minimize the number of casualties.
3. Prevent further casualties after the initial impact of the disaster.

4. Rescue the victims.
5. Provide first aid to the victims.
6. Evacuate the injured to medical installations.
7. Administer definitive medical care.
8. Promptly reconstruct the lives of the victims.

"Disaster plans strive to set in motion a chain of events in response to an event that is unpredictable. Even with detailed rehearsals under the most realistically contrived circumstances, one can never be fully assured that a disaster plan will stand up".

As noted earlier, the response to a multi-casualty incident is unlikely to go smoothly unless it has been planned and rehearsed well in advance. Planning for such incidents must involve all applicable agencies (rescue services, public safety organisations, hospitals, and so forth), for the success of the venture depends critically upon how well individuals from different organisations can work together and coordinate their efforts. Lines of authority and lines of communications must be clearly established and agreed upon before the disaster occurs.

There is no time at the scene of a mass casualty incident to argue over who is in charge.

In addition, certain types of disasters require special considerations, and these must be identified in advance. In a hazardous material incident, for example, decontamination will assume first priority (if indicated) and the medical teams may have to wear protective clothing prior to accessing the scene.

All these actions require planning and drill. A multi-casualty incident may occur only once in a few years, but when it does occur, the EMS system must be ready.

It should be stressed that the plan for managing victims of a disaster must be built around the existing EMS system in a given community. Insofar as possible, individuals should function in their usual roles in order to minimize confusion. Hospital personnel, for example, should remain at the hospital, with the possible exception of a mobile triage team dispatched from the hospital to the scene. Communications should go through the usual channels and the dispatcher should "clear the air" of all unnecessary transmissions. Radio discipline must also be rehearsed during disaster drills.

A major principle that has emerged from examining previous disasters is that it is essential to prevent transferring a disaster from the field to the hospital. Simply transporting all the victims of a large disaster to the nearest hospital without field stabilization only accomplished a change in the location of a disaster. The sudden arrival of a large number of unstable patients at a single hospital emergency room is a classic situation in which the resources available for patient care are overwhelmed. With field stabilization and sophisticated communication systems, patients can be distributed to facilities in a rational manner, allowing the most effective patient care.

Emergency first aid at a disaster site may be delivered by a stratified physician team or well-trained paramedics. Much of the British literature suggests sending a team of hospital-based physicians. One suggested combination consists of an anaesthesiologist, chief surgical resident, and chief medical resident. With the evolution of paramedic programs and their expanding hospital-directed pre-hospital care, it is also possible to rely on paramedics to do much of the stabilization and field triage. Simple procedures such as clearing an airway, providing haemostasis with direct pressure, volume resuscitation through fluid replacement, and application of the military antishock trousers (MAST) suit will save lives regardless of which qualified individuals performs these tasks.

As with other aspects of disaster planning, each community must examine its resources to determine the most effective means of providing emergency first aid.

At the scene of an accident or disaster, careful consideration must be given to the advisability of attempting a rescue operation. "Conditions may be so hazardous, and the chance of success so low, that rescue should be delayed until additional equipment and personnel have been obtained. Unduly jeopardizing men to retrieve or transport a dead body is never justified. Self-sacrifice is spiritually commendable, but under rare conditions it can have the effect of sacrificing everyone".

In potentially dangerous environments, rescuers must always consider their own safety before attempting any rescue of victims.

Easy fatigue and exhaustion of rescuers should be anticipated when they must endure extremes of temperature, elevation, dampness, or otherwise hazardous environments. Frequent rests and changes in personnel are necessary to control stress and fatigue-induced errors.

3 Disaster drills

Another major principle in disaster planning is the need for periodic, realistic disaster drills. The effectiveness of an emergency plan should not be determined for the first time during an actual disaster. To make sure that the plan will be effective under actual conditions, it should be thoroughly tested under simulated emergency conditions and involve large numbers of moulage casualties.

These tests often show deficiencies in the plan, highlighting problem areas that require revision. Those responsible for the administration of the program will undergo valuable review of their own functions.

The types of problems discovered may be major. The changes made after each disaster drill are necessary to keep a disaster plan a realistic and workable document, as opposed to a static plan unresponsive to the demands of a real disaster.

When disaster drills are held with moulage victims, it is a good idea to have a tracking card attached to each victim. These cards should list the type of injury, time of triage, triage category, initial treatment, time and initial triage category upon arrival in the emergency room, and definitive management.

Patient Tracking Card

Name: Employee Number:

Gender:

Clothing:

1. Injuries and vital signs: _____

   _____

2. Initial triage category: _____

   _____

3. Time of initial triage: _____

4. Initial first aid measures:_____

   _____

5. Time and location of arrival at hospital: _____

   _____

6. Triage category upon arrival at hospital: _____

   _____

7. Definitive diagnostic and treatment measures at hospital:_____

   _____

8. Miscellaneous comments: _____

   _____

Another aid in the evaluation of disaster drills is the use of videotape, which can be carefully reviewed and critiqued at a later date.

Because of the difficulties in performing realistic disaster drills where many key personnel may not be involved, an innovative approach is described to ensure greater participation in testing of disaster plans. In this approach, a scenario describing in general terms a credible disaster is presented individually to members of medical, administrative, and nursing staff by members of the disaster committee. After the disaster scenario is read and digested, questionnaires are distributed. Slightly different questions are given to each person depending on his job description. All questionnaires test the individual's ability to make decisions and set priorities.

The completed questionnaires are then critiqued in terms of communication, assessment, triage, flexibility of function, use of personnel, general resources, and planning. Scenarios, questionnaires, and critiques are used as a basis for a workshop for all personnel involved.

An example of such a plan is an explosion and fire in the smelter area spreading to the adjoining building and possibly other areas of the complex. Sample questions are:

1. Who would you notify of the disaster, and what would you tell them?
2. Where would triage be located?
3. What would you tell the general staff of the disaster?
4. The Fire Chief wants to know how many persons are in the disaster, how would you obtain this information?
5. What medical personnel would you need immediately, and how would you get in touch with them?
6. What medical implications would the disaster have immediately and for the succeeding two or three days?
7. What could be done to relieve general panic and facilitate staff evacuation?

The most important feature of the new approach to disaster planning is that it stimulates individual thought and concern. Each person is involved and cannot hide behind other members of the team. This novel approach has many advantages, including low cost, surprise drills, minimal disruption of routine hospital activities, ability to be done at frequent intervals, and the possibility of involving all key members of the hospital staff, leading to disaster awareness. Such a plan is not meant to replace realistic drills involving multiple casualties, but may be used as an excellent adjunct to periodic mock drills.

4 Central authority

The larger the disaster, the more important the official organisation of authority. The only way that the huge number of decisions and problems can be handled successfully in a major disaster is with a prearranged organisational chart. The purpose of the organisational chart is the delegation of authority, which is essential.

A central authority in charge of disaster management is a need frequently expressed in the available studies of civilian disasters. Such a central authority must be arranged in advance and should reside in several key persons or their designated replacements. Among those assigned to this central group are the regional head of civil defence (disaster control agency), the head of police function in the area, and the ranking official in public health or his representative. Cooperation among the heads of the involved agencies is of maximum importance to the success of the effort.

If the authority of a central agency is not made clear, its directives may be ignored in the time of stress; if the organisational ability is poor, confusion will exist and no plan can be executed in orderly fashion. The authority of this group should clearly be superior to that of other local agencies. Further, the right of the central authority to issue orders utilizing hospital facilities and personnel must be unquestioned. It should be arranged in advance, by mutual agreement, and it requires considerable education, both of the public and of

medical personnel. Practice drills are essential to demonstrate the role of the central authority and to accustom others to this role.

An agreement reached in order to avoid disputes between two agencies assigns to the former the responsibility for rescue, evacuation, and first aid and to the latter the responsibility for relief and welfare activities when disasters occur. This agreement should be clearly understood by local representatives of the two agencies. If a change in assignment of the major responsibility for direction and control in disaster management becomes necessary before the work is completed, some well-defined method of determining the point of shift of responsibility should be established. The exact interaction of these agencies varies in different communities and should be incorporated into local plans.

The necessary elements of an effective communication system have been summarized as follows:

1. The principal coordination centre must have direct communication links with medical facilities receiving victims, with law enforcement officials, with all rescue units (including ties to mutual aid agencies), and with fire units and other support agencies.
2. Rescue units must have the capability of communicating with one another, with law enforcement agencies, and with the receiving medical facilities. Any roving disaster coordinating vehicle must be similarly equipped.
3. Communication between disaster vehicles and the coordination centre with the Defence force and police is desirable.
4. Field triage operations require hand-held walkie-talkie radios capable of communicating with the communications centre; all rescue units, and other hand-held field radios.
5. The coordination centre must provide a means for recording all essential transmissions. A master tape of all transmissions is desirable.

One desirable feature that aids all aspects of emergency care is the availability of an emergency telephone number. With such a system, the possibility exists for a central communications centre to receive calls efficiently and quickly dispatch the necessary services. An emergency number also allows the public quickly to report a potential disaster that can possibly be averted or one that has already occurred.

5 Major incident

Duties

1. Notified Confirm existence of incident
2. Inform Superiors
3. Proceed to incident scene - obtain location of Foreword Command Post (FCP) if available.
4. Alerts staff - according to standing orders
5. Alert back - up agencies
    a. Emergency services - ambulance, fire, traffic, SAP
    b. Red Cross
    c. Civil defence
    d. Medical Command (SAMS)
    e. Hospital Co-Coordinator for area
6. Establish Foreword Command Post (F.C.P)
7. Liase with FCP commander to determine site safety
8. Assume medical operational control of incident site
9. Clearways and hazards
10. Report status to control and get vehicle and staff status
11. Mobilize forces available
12. Establish Central Holding Area (CHA) and Casualty Clearing Station (CCS) and First Aid Post (FAP) in consultation with Incident Medical Commander.

13. Supervise triage, extrication, evacuation, medical rescue and logistic components at CHA.
14. Liase with triage teams to determine evacuation priorities and with superiors re correct numbers of staff and equipment.
15. Transmit regular sitreps re patient, staff and vehicle status.
16. Ask for regular sitreps re bed status, staff and vehicle status.
17. Keep log of vehicle, staff and patient movements
18. Requests for additional replenishment
    a. Medical
    b. Rescue
    c. Food
    d. Shelter
    e. Petrol
    f. Specialized equipment
19. Allocation of relief squads as required
20. Stand down of teams
21. Organise Debrief

6 Principles of medical disaster management

Receiving the Call

On receipt of a call or on originating a disaster call the following information should be born in mind.

1. The exact **LOCATION** of the accident or disaster:
    a. Specific directions: landmarks
    b. Telephone number of caller (which may help pinpoint location).
2. If it is a vehicular accident, the number and types of **VEHICLES** involved:
    a. If there are trucks, what are they carrying? Are there hazardous cargoes?

b. Are there any buses involved?

c. In what condition are the vehicles? Is any vehicle on fire?

3. **NUMBER OF VICTIMS** and estimated extent of injuries.

4. **HAZARDS** at the scene:

   a. **FIRE**

   b. Downed **ELECTRIC WIRES**

   c. **HAZARDOUS MATERIALS** carried by involved vehicles.

   d. **TRAFFIC** hazards.

   e. Vehicles in unstable or precarious positions.

   f. Debris.

A printed dispatch information form encompassing the above questions can be of considerable help to the dispatcher in rapidly eliciting all essential information and coordinating the emergency response.

On the basis of this initial information, the dispatcher must determine how many ambulances should be sent and what ancillary services, such as police, fire department, and utility company technicians, should also be requested to respond.

Arrival on Scene

On arrival the first responder's first task is to make a quick assessment of the overall situation and in this regard certain principles apply. These are:

1. The positioning of your vehicle to avail you protection whilst carrying out your initial assessment.

   a. Head light must not shine into oncoming drivers eyes.

   b. Beyond the reach of downed wires: ± 20 meters.

   c. At least 40 metres from any burning vehicle.

   d. If there is a spill of any sort, petrol or toxic substance the vehicle should not be placed downstream from the flow.

e. The vehicle should be parked upwind from incidents involving the spillage of hazardous substances.

f. The vehicle should not be parked closer than 1, 000 meters from an incident involving an explosive cargo.

REMEMBER: That the first responder who rushes blindly into a hazardous environment is likely to be of little help and may indeed contribute to the problem that the rest of the team must manage.

ALWAYS LOOK FIRST TO YOUR OWN SAFETY FIRST. DEAD HEROES CANNOT SAVE LIVES.

2. The initial rapid assessment of the scene includes:
   a. Are there enough personnel present to cope with the situation?
   b. The number and severity of casualties.
   c. Is there enough equipment available or will any specialized items be required?
   d. The extent of the overall situation.
   e. Does the incident involve a hazardous substance?

Those at the scene most skilled in hazard control, usually the fire department, should be assigned to this responsibility, and the paramedics should work in coordination with hazard control personnel. The paramedic can greatly assist these personnel by first looking out for his or her own safety. The rescuer who rushes blindly into a hazardous environment is likely to be of little help and indeed may contribute to the problems that the rest of the rescue team must manage.

The initial rapid assessment of the scene should also permit an evaluation of whether the number of rescue personnel present is sufficient or whether more help is needed. One

ambulance and at least two rescuers will be required for every seriously injured victim. For the less seriously injured, two victims may be accommodated in a single ambulance.

Establish Forward Command Post (FCP)

This is a safe area from where the senior members of the responding services can gather to control the incident scene.

Cordon the area

If an exceptionally large area is involved then divide the incident scene into smaller areas, which will report progress to a centralized control point.

Triage

Triage is a military term for a process by which patients are classified according to the severity of their injuries at the time they are first seen. The cornerstone is categorisation, so that immediate resuscitation is given to those in urgent need while the less severely injured are segregated for later treatment. Those who will require evacuation are identified, and those who are dead or hopelessly injured are isolated.

Perhaps the most difficult psychological task of medical personnel is to resist the usual instinct to do as much as possible for a gravely ill patient. As has been noted in combat surgery and in massive casualty work, "the doctor must realize that there may be tens of hundreds of patients awaiting his services, and fruitless work on a hopeless case or too definitive a procedure on a patient who could wait without harm, may allow another patient to die for want of a haemostat applied to a bleeding vessel".

Detailed guidelines on what constitutes a "hopeless case" cannot be given because this is a decision that must be made relative to the number of casualties and the resources available to care for them.

Establish a Casualty Clearing Station (CCS)

1. The triage and treatment area should be large, well-lighted area at a safe distance from any known hazard, arranged in such a way that the triage officer, preferably a surgeon, can see the entire area at a glance.
2. The triage area should be located between the scene of the casualties and the evacuation vehicles, so that an orderly system of triage, treatment, and evacuation can be maintained.
3. **SUPPLIES** and **EQUIPMENT** should be immediately visible and accessible.
   a) **STRETCHERS** should be arranged to allow enough space between patients for comfortable movement of medical personnel.
   b) At every stretcher position, there should be:
   i. IV equipment: catheters, infusion sets, intravenous fluids, and devices for suspension of IV bottles.
      ii. Stethoscope
      iii. Sphygmomanometer
      iv. Bag-valve-mask device or pocket mask.
      v. Oral airway
      vi. Portable oxygen and suction
   vii. Dressings, self-adhering roller bandage, triangular bandages, scissors.

   c) Sterile, pre-packaged sets for emergency procedures should be clearly labelled and conveniently located:
      i. Endotracheal intubation kit
      ii. Cutdown set
      iii. Tracheostomy set

iv. Chest tube set with Heimlich valves and collection bags.
v. Additional sterile dressings
vi. Urethral catheterization set
vii. Sterile syringes and needles
viii. Medication kits with pre-filled syringes

d) Military Anti-Shock Trousers (MAST) should be conveniently located.
e) Backboards, cervical collars, and splints should be readily available.
f) At least one monitor/defibrillator unit should be available in the triage area.
g) This process is facilitated if the community has at least one vehicle especially equipped for disasters which contains the following:
   i. Rolls of conron tape
   ii. Bulk Medical supplies as listed above
   iii. High power lights generator
   iv. Portable communication equipment
   v. Emergency ration packs
   vi. Bulk water supply (drinking purposes)

REMEMBER: Deployment of this equipment should be drilled in periodic field exercises:

The triage and treatment area should be **BETWEEN** the site of the casualties and the evacuation vehicles, to ensure orderly triage and treatment before evacuation.

7 Sorting of casualties

The purpose of sorting, or triage, among mass casualties is to accomplish THE GREATEST GOOD FOR THE GREATEST NUMBER. No task in the management of mass casualties requires more educated judgement than the sorting of the injured; thus, responsibility for triage should be assigned to the most experienced and trained person at the scene, preferably a senior surgeon or emergency physician.

Proper management of multiple casualties requires several rounds of triage. The first triage is carried out at the casualty site, as the triage team moves rapidly from one victim to another, determining which require immediate treatment. Recall the principles of triage:

1. Salvage of Life takes precedence over salvage of limbs.
2. The principal immediate threats to life are asphyxia and haemorrhage.

Thus, in the first round of triage, the priorities for treatment are according to the familiar priorities of Airway, Breathing, and Circulation. Patients with obstructed airways must receive immediate efforts to relieve the obstruction. Artificial ventilation is begun on patients who are apnoeic. Patients with exsanguinations haemorrhage are managed to control bleeding, and external cardiac compressions are begun on those without palpable pulse. Only those patients who are hopelessly wounded (e.g., decapitation, devastating head trauma) and those with injuries not immediately threatening the airway, breathing, and circulation are bypassed. In this first round of triage, which is basically the PRIMARY SURVEY OF THE SCENE, the triage officer in charge keeps moving from patient to patient, tagging patients and assigning assistants to begin immediate treatment as warranted. The primary triage officer should not stop to treat any single patient but should survey all of the patients first in order to obtain an overall evaluation of the scene.

In the second round of triage, which is best accomplished in the triage area, more definitive measures are taken to manage life-threatening problems. Jeopardized airways are secured with endotracheal tube, intravenous infusions are begun for shock, chest tubes are inserted for tension pneumothorax, and so forth.

Only when the immediately life-threatening problems are under control do efforts shift toward secondary injuries. In this round of sorting, the critically injured victims undergo methodical and complete physical examination to detect lesser problems, while the less seriously injured receive initial evaluation.

To summarize the triage process, let us look, for example, at a mass casualty situation in which a school bus and tractor-trailer have collided, and there are upward of two dozen injured, ranging from minor to critical in severity. Let us also suppose that in the initial response 10 rescuers arrived at the scene. Their initial deployment might be as follows:

1. Two rescuers begin unloading equipment to establish a triage area.
2. One or two rescuers attend to hazard control.
3. The remaining rescuers move immediately to triage and initial treatment.
    a. The leader of the triage team performs triage only, moving rapidly from one victim to another, to obtain an overview of the total situation.
    b. The remainder of the group splits up to attend the first priority patients as they are encountered, according to assignments made by the leader of the triage team.

8 Information gathering and record keeping

One person at the scene should be assigned the task of collecting information from the victims. Especially important is the determination of who is not there; that is, are there any victims unaccounted for? People suffering injury may become dazed and wander from the scene, and it is necessary to know whether a search must be launched.

From conscious patients, it will be important to obtain the usual medical history information, including name, age, sex, significant medical history, allergies, and current medications. Such information, together with details of the physical examination and treatment, is best recorded on a TRIAGE TAG affixed to the patient.

A triage tag should be of a durable material, able to withstand wet weather and dirt, and of a size that is easily handled and readily seen. It should have a sturdy tie or wire for attaching to the patient's wrist or clothing.

The triage tag should contain space for at least the following information:

1. Identifying Information

Name:

Age:

Address:

Next of kin:

Address:

Relationship:

Phone:

2. Information about the Scene

Position in which patient was found:

Location in which patient was found:

Information relevant to the mechanism of injury:

3. Medical History

Known medical problems:

Current medications:

Allergies:

Time patient last ate:

Blood type, if known:

4. Physical Examination (Name of examiner)

Continuous record of vital signs, neurological signs:

Pertinent physical findings:

5. Treatment

Time, drug, dose, route:

6. Priority

The last category of information and priority of treatment can be indicated by using colour-coded tags or affixing a colour-code sticker to the triage tag during the first round of triage. Various systems have been suggested for categorizing priorities, and in general the simplest system is usually the best. The purpose of such

stickers is to indicate to the rescuers which patients require most urgent or ongoing attention, according to the judgement of the triage team leader.

Medical Records

The maintenance of accurate medical records during a disaster serves many functions. Records are necessary for following patient treatment, collecting vital statistics, notifying relatives, preparing press releases, filling out insurance papers, fulfilling legal responsibilities, and performing a detailed study of the management of the disaster.

Prearranged, streamlined, brief medical record forms should be a part of each hospital's disaster plan. Pre-numbered emergency disaster tags are a vital part of record keeping. During triage, a disaster tag, which contains the results of the initial 60-second assessment, is attached to the arm of each patient. The coloured tag should correspond to the patient's general triage category. The card may read as follows:

1. Blue - Dead/death imminent
2. Red - Critically ill but salvageable
3. Yellow - Salvageable (not immediately critical), but requires definitive medical care
4. Green - Walking wounded

The following information is essential for each tag:

1. Name of identifying features
2. Vital signs (timed)
3. List of injuries
4. Medicines or therapeutic measures received
5. Allergies

Establish a First Aid Post (FAP)

1. Priority three casualties are sent to the FAP for stabilisation usually the largest number of patients.
2. The First Aid Post is not within the confines of the casualty clearing station but is situated within the incident's cordon.

Establish a Staging Area - Central Holding Area

1. No person enters the incident site except via the CHA.
2. All resources of all services responding to the incident are collectively managed by the respective officers at the Forward Control Post and are consolidated at the CHA.
3. This practice obviates lack of control of the incident scene and chronic traffic congestion. A good tip is to tell back up units where you want them to go to direct them to the incident site.

As each evacuation vehicle leaves the scene, the communications officer or the driver of the vehicle should radio the receiving hospital to notify it of the:

1. Number of victims en route
2. Major problems of each victim
3. Condition of each victim
4. Estimated time of arrival

On completion of an incident hold a debrief involving all agencies/parties concerned:

- Identify positive and negative aspects.
- Implement systems to ensure that identified problem areas do not re-occur.
- Ensure all personnel are aware of the protocol.

4 Training (Exposure guides)

4.1 Employees

SEE POWERPOINT PRESENTATION

4.2 Managers, Supervisors and Emergency Teams

Content

BASIC CHARACTERISTICS

WHAT IS SULPHUR DIOXIDE (SO_2)?

SO_2 is a colourless gas at room temperature and a colourless liquid when pressurized or cooled. It is a non-flammable, very soluble gas with an irritating Pungent Acid Odour and taste.

SO_2 has many industrial and agricultural uses and is derived from the combustion of sulphur – containing fossil fuels, which are not commonly used indoors, the SO_2 gas is produced as a by-product during the smelting and converting processes.

Domestic indoor air levels of SO_2 rarely exceed 30% of outdoor/industrial levels unless an unvented kerosene burner is used with extremely low-grade fuel. Most indoor exposure in the workplace, results from the misuse of equipment, including inadequate venting of oil – burning combustion appliances.

When released into the environment, sulphur dioxide moves into the air. In the air, it can be converted to sulphuric acid, sulphur trioxide, and sulphates.

SO_2 dissolves in water and reacts with moisture to form Sulphuric Acid. Some foods and wines are preserved with small amounts of SO_2 that are safe for human consumption.

Sulphur dioxide can be absorbed into the soil, but we don't know if or how it moves in soil. SO2 is one of the most common air pollutants.

Sulphur Dioxide is shipped in cylinders as a liquid compressed gas at a temperature of below 14^0F / -10^0C.

PHYSICAL PROPERTIES

CHEMICAL FORMULA: SO_2

MOLECULAR WEIGHT: 64.06 daltons

BOILING POINT (760 MM HG): 14.0ºF (-10.0ºC)

FREEZING POINT: -99.4ºF (-72.7ºC)

VAPOUR PRESSURE: 2,538 mm Hg at 70.0EF (21.1ºC)

VAPOUR DENSITY: 1.43 g/Ml (water = 1.00)

WATER SOLUBILITY: soluble in water (11.3 g/100 Ml at 68ºF [20ºC])

FLAMMABILITY: non-flammable

WARNING PROPERTIES: pungent door is usually adequate to warn of acute exposure. Most people can detect sulphur dioxide at levels of 1 to 3 ppm (1 ppm is equivalent to 2.62 mg/m³).

NOTE: Full information data sheet is included in this document as Annexure 1

HAZARDOUS CLASIFICATION

The CAS number of SO_2 is 7446-09-5.

There are no studies to date that clearly show any carcinogenic effects in humans or animals due to sulphur dioxide exposure.

Studies have investigated workers in the copper smelting and pulp and paper industries, but the results were inconclusive since the workers were also exposed to arsenic and other chemicals.

There is only one animal study available that suggests sulphur dioxide may be a carcinogen in mice.

The International Agency for Research on Cancer (IARC) has classified sulphur dioxide as Group 3 substance, not classifiable as a human carcinogen.

The Environmental Protection Agency (EPA), an international body, has set an air quality standard for long-term exposure, as well as a 1-year average concentration of sulphur dioxide at 0.03 ppm. Short-term, 24-hour air concentrations should not exceed 0.14 ppm more than once a year.

The Occupational Safety and Health Administration (OSHA) – another international body, has set a limit of 2 ppm over an 8-hour workday, 40-hour workweek.

SYNONYMS FOR SO_2

The synonyms for SO_2 are:

- Sulphurous Acid Anhydride
- Sulphurous Oxide
- Sulphur Oxide

SULPHUR DIOXIDE IN INDUSTRY

Exposure to Sulphur Dioxide can occur in Industry when exposed to the following Industries and/or substances.

ANTIOXIDANTS	INDUSTRIES
• Antioxidant	• Coke Ovens
• Bleaching Agents	• Foundries
• Chemical Synthesis	• Ore Refining
• Disinfectants	
• Food Additives	
• Fumigant	
• Solvents	

SITUATIONS PLACING PEOPLE AT RISK

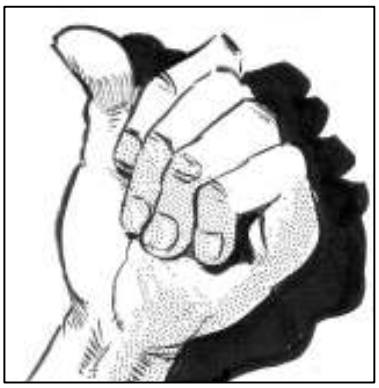
- Breathing air containing it or touching it.
- Working in industries where it occurs as a by-product, such as copper smelting or power plants.
- Working in the manufacture of sulphuric acid, paper, food preservatives, or fertilizers.
- Living near heavily industrialized activities where sulphur dioxide occurs.
- In nature, sulphur dioxide can be released to the air from volcanic eruptions.

ROUTES OF ABSORPTION AND ELIMINATION

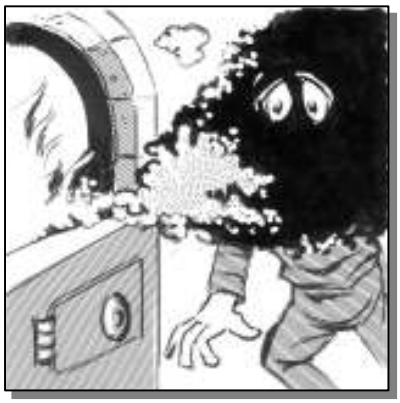
The absorption of SO_2 occurs through the following routes of entry.

Inhalation: The process of taking in materials through breathing through the nose or mouth

Skin contact: The process of taking in materials through the skin.



Eyes: The process of taking in materials through the eyes.



EXPOSURE MONITORING

MONITORING

Identify risk areas

Identify workers exposed.

Check machinery / processes producing SO_2.

Check the working shifts of the workers.

Note

Unless an apparent source for SO_2 is present, it is rarely helpful to monitor for these pollutants in most indoor air quality investigations

SAMPLING & SENSORS

Commonly available for SO_2 (Grab – sample detector tube – Drager)

Use specific apparatus for SO_2 to detect it.

Adding filters that remove potential interferences can enhance sensor specificity for SO_2.

Gas Detector tube with reagents to identify SO_2 – when SO_2 comes into contact with it – it changes colour (e.g. white to orange) - Used with a Drager or similar pump.

To sample for gases and vapours especially for longer periods such as 8 h Time Weighted Average (TWA) the use of sorbent tubes is a widely accepted method.

Sorbent is like a sponge, which soaks up the molecules of the material being, sampled.

Can be either active or passive sampling.

Detector tubes and their properties

TUBE	STANDARD MEASUREMENT RANGE	NO OF STROKES	TIME	DEVIATION	COLOUR CHANGE	HUMIDITY	TEMP
0.1/a	0.1 – 3ppm	100	20 min	10 – 15%	Yellow	3 – 15mg H_20/L	10 – 30^{0}C
0.5/a	1 – 25ppm	10	3 min	10 – 15%	Grey blue - white	3 – 20mg H_20/L	15 – 30^{0}C
	0.5 – 5ppm	20	6 min	10 – 15%			
1/a	1 – 25ppm	10	3 min	10 – 15%	Grey blue - white	3 – 20mg H_20/L	15 – 25^{0}C
20/a	20 – 200ppm	10	3 min	10 – 15%	Brown yellow - white	< 40mg H_20/L	0 – 40^{0}C
50b	400 – 8000ppm	1	15s	10 – 15%	Blue - yellow	1 – 15mg H_20/L	0 – 50^{0}C
	50 – 500ppm	10	3 min	10 – 15%	Blue - yellow	1 – 15mg H_20/L	0 – 50^{0}C

NOTE CROSS SENSITIVITY

0.1a – It is impossible to measure sulphur dioxide in the presence of other acidic gases.

0.5a – Hydrogen Sulphide is also indicated, however, with different sensitivity. Nitrogen Dioxide will decrease the reading

1a – Hydrogen Sulphide in the Threshold Limit Value – TLV range is retained in the pre-layer and does not interfere. Nitrogen Dioxide will decrease the reading.

20a – Hydrogen Sulphide is indicated but with a different sensitivity. It is impossible to measure sulphur dioxide in the presence of hydrogen sulphide.

If Sulphur Dioxide and Nitrogen Dioxide are present at the same time the indication will not correspond to the expected sulphur dioxide concentration. These gasses react with one another in the gas phase before entering the detector tube.

Extension of measuring range

Using n = 1 + 3 desorption strokes, multiply the reading by 10: the range of measurement is 200 – 2,000 ppm

The desorption stroked are to be taken in clean air (i.e. free of Sulphur Dioxide) immediately following the single pump stroke

50b – Hydrochloric Acid is indicated in high concentrations – 10,000ppm. Hydrochloric Acid corresponds to an indication of 150ppm Sulphur Dioxide

No interference by: 500ppm Nitric Oxide, 100ppm Nitrogen Dioxide

CLINICAL PRESENTATION

Exposure to very high levels of sulphur dioxide can be life threatening.

Exposure to 100 parts of sulphur dioxide per million parts of air (100 ppm) is considered immediately dangerous to life and health.

Concentrations of 6 to 12ppm cause immediate irritation to the nose and throat, while 0,3 to 1ppm can be detected by the average individual possibly by taste rather than smell.

Burning of the nose and throat, breathing difficulties, and severe airway obstructions occurred in miners who breathed sulphur dioxide released as a result of an explosion in a copper mine.

Long-term exposure to persistent levels of sulphur dioxide can affect your health.

Lung function changes were seen in some workers exposed to low levels of sulphur dioxide for 20 years or more.

However, these workers were also exposed to other chemicals, so their health effects may not have been from sulphur dioxide alone.

Asthmatics have also been shown to be sensitive to the respiratory effects of low concentrations of sulphur dioxide.

Animal studies also show respiratory effects from breathing sulphur dioxide. Animals exposed to high concentrations of sulphur dioxide showed decreased respiration, inflammation of the airways, and destruction of areas of the lung.

EFFECTS OF SHORT-TERM (ACUTE) EXPOSURE

Respiratory System

SO_2 is a moderate to strong irritant.

Most inhaled SO_2 only penetrates as far as the nose and throat with minimal amounts reaching the lungs unless the person is breathing heavily, breathing only through the mouth or the concentration of SO_2 is high.

Sensitivity varies among people, however, short exposure (1-6 hours) to concentrations as low as 1 ppm may produce a reversible decrease in lung function.

A 10 to 30 minute exposure to concentrations as low as 5 ppm has produced constriction of the bronchiole tubes. About 20 ppm is objectionably irritating, although people have been reported to work in concentrations exceeding 20 ppm.

50 ppm is so objectionable that a person cannot inhale a single deep breath. In severe cases where very high concentrations of SO_2 have been produced in closed spaces,

SO_2 has caused severe airways obstruction, hypoxemia (insufficient oxygenation of the blood), pulmonary oedema (a life threatening accumulation of fluid in the lungs), and death in minutes.

The effects of pulmonary oedema include coughing and shortness of breath, which can be delayed until hours or days after the exposure. These symptoms are aggravated by physical exertion.

As a result of severe exposures, permanent lung injury may occur.

SUMMARY OF SHORT-TERM (ACUTE) EXPOSURE

In summary, inhalation can cause the following complications:

Bronchospasm can be triggered in individuals who have underlying lung disease, especially those who have asthma and emphysema. Rarely, new onset airway hyper reactivity, known as reactive airways dysfunction syndrome (RADS), develops in patients without prior bronchospasm.

UPPER RESPIRATORY TRACT	LUNG & BRONCHI	SKIN	EYES	INGESTION
Irritates Nose	Hypoxaemia	Frostbite from Liquid Compressed gas	Exposure to 5.4 ppm SO_2 resulted in mild irritation	Not applicable. Ingestion of gaseous SO_2 is highly unlikely.
Throat irritation	Reflex Broncho-constriction	Burns	9ppm - moderate to severe irritation and inflammation of conjunctivae	
Cough	Pulmonary Oedema	Chemical induced dermatitis	At 8-12 ppm, smarting of the eyes and lacrimation	
Choking	Chemical Pneumonitis		There is strong irritation at 50 ppm	
Glottis Oedema	Respiratory paralysis		In severe cases, (very high conc.in confined spaces), SO_2 has caused temporary corneal burns.	
	Pulmonary fibrosis		Frostbite from Liquid Compressed gas	
	Chronic bronchitis			
	Bronchopneumonia with bronchiolitis obliterans			

EFFECTS OF LONG-TERM (CHRONIC) EXPOSURE

RESPIRATORY EFFECTS

- Chronic exposure can result in an altered sense of smell (including increased tolerance to low levels of sulphur dioxide).
- Increased susceptibility to respiratory infections.
- Several human studies have shown that repeated exposure to low levels of SO_2 (below 5 ppm) has caused permanent pulmonary impairment. This effect is probably due to repeated episodes of bronchoconstriction.
- Chronic bronchitis.
- Accelerated decline in pulmonary function.
- Repeated or prolonged inhalation exposure may cause asthma.
- emphysema
- Chronic exposure may be more serious for children because of their potential longer life span.

MEDICAL SURVEILLANCE

An entry-, periodic-, and exit medical surveillance need to be conducted according to the guidelines provided in Section 3 of the SO_2 Policy Manual.

EXCLUSIONS

Employees with the following conditions should be excluded from working in an area where they will be exposed to SO_2.

- Eye Disease
- Skin Disease
- Pulmonary Disease

BIOLOGICAL MONITORING

Sulphur dioxide in the body is changed into other sulphur-containing chemicals in the body.

These breakdown products can be measured in blood and urine, but this requires special equipment that is not routinely available in a doctor's office.

Furthermore, exposure to chemicals other than sulphur dioxide can also produce sulphate, so the presence of sulphate breakdown products in your body does not necessarily mean you have been exposed to sulphur dioxide.

IMPLEMENTATION OF STRINGENT CONTROL MEASURES

Identifying Risk Areas.

This depends primarily on removing the source of exposure, which in the non-industrial environment involves limiting smoking and the use of kerosene space heaters.

In the industrial environment it involves the utilisation of approved equipment, air sampling – situated in appropriate risk areas, limiting incompatibility and reactivity exposure to identified substances and operator training, as well as providing appropriate Personal Protective Equipment (PPE).

PREVENT INCOMPATIBILITY AND REACTIVITY REACTIONS OCCURRING

Incompatibility situations

- Powdered alkali metals (such as sodium & potassium),
- Sulphur dioxide dissolves in water or steam to form sulphurous acid.
- Liquid sulphur dioxide corrodes iron, brass, copper, and some forms of plastic and rubber.
- Many metals, including zinc, aluminium, caesium, and iron, incandesce and/or ignite in unheated sulphur dioxide.
- Sulphur dioxide reacts explosively when it comes in contact with sodium hydride.
- Sulphur dioxide ignites when it is mixed with lithium acetylene carbide diamino or lithium acetylide ammonia.

Note: SO_2 Reacts with water, moist air or fog but only oxidizes very slowly to form Sulphuric Acid (H_2SO_3).

INSTITUTE OR MODIFY AN ACTIVE AWARENESS AND PREVENTION PROGRAM

- Conduct a walk through survey in the work environment.

- Use your senses – you can smell/taste SO_2.
- Seven questions to ask in order to identify a potential risk area:
  - What process occurs here?
  - What machinery/chemicals are used?
  - What raw materials are used here?
  - What by products are produced here?
  - What end products are produced here?
  - What waste materials are produced here?
  - What waste products are produced here?
  - What control measures are in place and are they effective?
- Flow diagram of the manufacturing processes in factory – highlight high-risk areas.
- Other contributing environmental factors are looked for.

PREVENTATIVE MEASURES

- Adequate early warning alarm system
- Adequate ventilation
- Tried and tested emergency procedures
- Approved eye protection
  - Chemical goggles / head protection
- Approved respiratory protection
  - Appropriate respirator / SCBA
- Approved skin protection
  - Appropriate HAZMAT rated overalls
  - Physical examination of exposed personnel on a regular basis
  - Chest x-rays
  - Pulmonary function assessment
- Preclude from exposure those with:
  - Eye Disease
  - Skin Disease

- Pulmonary Disease
- Prevent skin contact / frostbite (cylinders)
  - 8hr: Saranex, Barricade, Responder
  - 4hr: Teflon
  - Prevent possible skin freezing from direct liquid contact

GENERAL

One of the requirements for allowing the use of chemical cartridge respirators is that the contaminant has good warning properties, as with SO_2. This is required so that as a cartridge nears the end of its service life, or where concentrations of SO_2 in the ambient air exceeds the concentrations capable of being filtered out by the cartridges, the SO_2 will break through and be perceived by the respirator wearer as either a taste or smell.

If odours or tastes are perceived while wearing a cartridge respirator, the employee must leave the area immediately. In cases where respirator failure might have been the cause of the exposure, the Supervisor will inspect the respirator and cartridges and replace it if is found to be defective. In cases where it is suspected that airborne concentrations of the contaminant might have been high, an incident will be booked and investigated by the Supervisor of the area.

In the case of a respirator equipped with either pre-filters or filter cartridges, the user will notice an **increase in breathing resistance** as the filters near the end of their service life. When this is detected, the employee must leave the area immediately and ask his / her Supervisor to replace the filter.

PERSONAL PROTECTIVE EQUIPMENT

RECOMMENDATIONS FOR SULPHUR DIOXIDE CONCENTRATIONS IN AIR

- Only DME approved equipment should be used

- If eye irritation occurs, full-face piece respiratory protective equipment should be used.

UP TO 20 PPM

Chemical cartridge respirator with cartridge(s) to protect against sulphur dioxide

UP TO 50 PPM

Powered air-purifying respirator with cartridge(s) to protect against sulphur dioxide

UP TO 100 PPM

Full-face piece chemical cartridge respirator with cartridge(s) to protect against sulphur dioxide; or gas mask with canister to protect against sulphur dioxide; or powered air-purifying respirator with a tight-fitting face piece and cartridge(s) to protect against sulphur dioxide.

RESPIRATOR FAILURE

When using a respirator, the warning properties of SO_2 gas (i.e. odour, taste, eye irritation, or respiratory irritation) are considered to be an indication of potential respirator failure. Should these be experienced, employees must promptly leave the area and check for the following:

- Proper face seal
- Damaged or missing respirator parts
- Saturated or inappropriate cartridge

EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATION OR IDLH (Immediately Dangerous to Life and Health)

CONDITIONS

Positive pressure, full-face piece Self Contained Breathing Apparatus (SCBA); or positive pressure, full-face piece SAR with an auxiliary positive pressure SCBA.

ESCAPE

Gas mask with canister to protect against sulphur dioxide; or escape-type SCBA.

NOTE:

The IDLH concentration for sulphur dioxide is **100 ppm**. The purpose of establishing an IDLH value is to ensure that the employees can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protective equipment every effort should be made to exit immediately.

EYE PROTECTION

Sulphur dioxide has been reported to cause eye irritation or damage; employees may require eye protection.

TRAINING

Respirator users and their supervisors must receive training on the contents of the Respiratory Protection Programme and their responsibilities under it.

Training must cover the following aspects regarding PPE:

- The proper selection and use.
- The limitations of the respirator.
- Ensuring a proper fit before use.

- How to determine when a respirator is no longer providing the protection intended.
- Cleaning respirator facemasks.
- Signs and symptoms of respiratory or other adverse health effects due to SO_2 exposure. Employees should report any symptoms experienced to the Supervisor, who should then refer employees to the medical facility for an assessment.

NOTE:

Additional information on the product is included as annexure 2

EARLY WARNING SYSTEMS

Regulation 9.1(2) of the Occupational Hygiene Regulations of the Mine Health and Safety Act calls for the provision of early warning systems where the risk assessment indicates a significant risk of a toxic release that could result in an atmosphere that is immediately dangerous to life or health.

This is applicable to work areas where excessively high exposure to SO_2 is a risk.

Early warning systems used for the warning of employees against excessively high levels of exposure to SO_2 must:

- Have clear visual AND audible alarms
- Have as a minimum two alarm setting levels (preferably one at 2ppm and 100ppm and another at 5ppm and 500 ppm).
- Be robust
- Easy to use
- Clear display of pollutant concentration
- Be calibrated at all times
- Situated in identified areas of high concentrations of SO_2

ALARM SETTINGS

- Recognise the right of any employee to leave a dangerous working place.
- Standard Evacuation Operational Procedures must be adhered to at all times.
- Employees should evacuate to an area where the SO_2 concentrations is less that 0.5 ppm.

As a **guide**, it is recommended that employees evacuate any workplace whenever the concentration of SO_2 in the ambient air of the workplace exceeds 50 ppm. **Evacuation guidelines are provided in the Summary report (Section7.3).**

This value is based on:

- A set IDLH value for SO_2 of 100 ppm (The purpose of establishing an IDLH value is to ensure that the employees can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protective equipment every effort should be made to exit immediately).
- To allow for employees to be able to escape without risk to their health, it is recommended that a factor of 50% be build in the stated IDHL value.
- Respiratory protection has been proven, when used correctly, to provide protection against SO_2 concentrations as high as 100 ppm.
- To allow for the partial protection of employees using their respiratory protection incorrectly and possible failure of respiratory protection as a result of poor maintenance, damage, aging, etc. it is once again recommended that a factor of 50% be build into the stated IDHL value.

Recommended level setting for the first alarm that should indicate for employees to start preparations to evacuate a workplace where SO_2 concentrations are deemed to be a significant risk: **40 ppm**

It is further recommended that the second alarm be set on a level of **50 ppm** that should be an indication to employees to immediately evacuate a workplace.

At all times it should be taken into consideration that individuals will react differently to different airborne concentrations of SO_2.

The recommended alarm settings are made in good faith, based on recent research and experience.

Whenever circumstances arise that appear to an employee to pose a serious danger to the health and safety, he or she has the right to leave the work place.

The recommended values should also be reviewed constantly.

What to do if there is an incident

Regular air sampling to determine existing Sulphur Dioxide levels and any other potential hazardous threats must be conducted.

Carry out a cautious initial assessment of an incident comprising the following aspects:

- Risk to rescuers. (Prevailing hazards)
- Probability of victim survival.
- Difficulty of rescue.
- Capabilities and resources of on scene response teams.
- Possibility of explosions or sudden material release.
- Available escape routes and safe havens.
- Constraints of time and distance.
- Activate emergency plan

Evacuation

- Management recognise the right of any employee to leave a dangerous working place.
- The relevant Standard Evacuation Operational Procedure must be adhered to at all times.
- The employees should evacuate to an area where the SO_2 concentrations is less that 0.5 ppm.

MANAGING THE PATIENT

Pre-hospital management

- Persons exposed only to sulphur dioxide gas pose no risk of secondary contamination to rescuers. Persons whose skin or clothing is contaminated with liquid sulphur dioxide can secondarily contaminate response personnel by direct contact or through off gassing of vapour.

- Sulphur dioxide is severely irritating to the eyes, mucous membranes, skin, and respiratory tract. Exposure to high levels can cause pulmonary oedema, bronchial inflammation and laryngeal spasm and oedema with possible airway obstruction.
- There is no antidote for sulphur dioxide. Treatment consists of support of respiratory and cardiovascular functions.

NOTE: CPR OSCE SKILL SHEET AND IMMEDIATE ACTION PROCEDURES ARE ATTACHED AS ANNEXURE 3 OF THE EMERGENCY RESPONSE SECTION.

SUMMARY OF THE MANAGEMENT AND TREATMENT OF EMPLOYEES FOR EXCESSIVE SO_2 INHALATION / EXPOSURE

HAZARDS

Ascertain the safety of the area

Wear appropriate PPE

Move the exposed person to fresh air at once, i.e. air with an SO_2 concentration <0.5 ppm.

Take into consideration the ambient wind direction

Symptoms of irritation can be limited / removed / reversed:

- Once source of exposure is removed (Leaking cylinder / improved ventilation).
- Remove patient from source or source from patient.

HELLO

Ascertain the patient's level of consciousness

HELP

Get medical attention as soon as possible.

AIRWAY

Open, maintain and protect

BREATHING

Ascertain if the patient is breathing

Administer oxygen

If breathing has stopped, perform mouth-to- mouth resuscitation

USE A ONE-WAY VALVE OR BAG VALVE MASK – NO DIRECT CONTACT WITH THE PATIENT'S MOUTH IS ADVISED).

Definitive Respiratory support

- Assisted ventilation
    - Oxygen administered with Intermittent Positive Pressure Ventilation (PPV) via bag, valve mask - reservoir or ventilator
- Bronchodilators
- Decongestants

CIRCULATION

Ascertain if the patient has a pulse

(If no pulse detected perform CPR as per protocol sheet)

LEVEL OF CONSCIOUSNESS

If the patient is breathing but is unconscious place in the recovery position

GENERAL MANAGEMENT

Assess the patient and treat any other obvious injuries

EYES

- Irrigate eyes with water
    - Be alert for contact lenses and remove

NOSE

Decongestants

UPPER AND LOWER AIRWAYS / LUNGS

Oxygen

Assist ventilation (as above)

SKIN

- Treat burns in normal manner
- Wash contaminated areas of body thoroughly with soap and water
- Do not remove clothing if frozen but clothing may be removed in other contamination situations
- Cover with Burnshield or wet dressings for first 24 hours
- Flamazine dressings
- Referral to burns unit (if required)

GENERAL CARE

- Keep the affected person warm and at rest.
- Symptomatic
- Supportive
- Refers as a matter of urgency to a medical facility

DISABILITY

- Corneal damage (may result in permanent impairment)
  - Contact lenses may be damaged
- Skin burn damage (may result in permanent impairment)
- Peribronchial fibrosis with chronic obstructive airway disease can occur

NOTE:

PATIENT REPORT FORM		
Employee Name:		Employee Number:
Time of Incident:	Time despatched:	Time on scene:
PRIMARY SURVEY		
Hazard:		Airway:
Hello:		Help:
Breathing:		Circulation:
VITAL SIGNS		
Respiration:	Pulse:	BP:
EXAMINATIONS & TREATMENT		
Departure time to Hospital/Clinic/ First aid post:		Arrival at Hospital:
DECONTAMINATION		

NOTE:

EMERGENCY DEPARTMENT MANAGEMENT TABLE – SEE ANNEXURE 4

SULPHUR DIOXIDE PATIENT INFORMATION SHEET

This handout provides information and follow-up instructions for persons who have been exposed to sulphur dioxide.

What is sulphur dioxide?

Sulphur dioxide is a colourless gas that has a strong, stinging door. It has many industrial and agricultural uses. Most sulphur dioxide comes from burning fossil fuels containing sulphur and is a major part of air pollution. It is shipped and handled as a compressed gas in a special container. Some foods and wines are preserved with small amounts of sulphur dioxide that are safe for most people.

What immediate health effects can result from sulphur dioxide exposure?

Inhaling sulphur dioxide causes irritation to the nose, eyes, throat, and lungs. Typical symptoms include sore throat, runny nose, burning eyes, and cough. Inhaling high levels can cause swollen lungs and difficulty breathing. Skin contact with sulphur dioxide vapour can cause irritation or burns. Liquid sulphur dioxide is very cold and can severely injure the eyes or cause frostbite if it touches the skin. Some people with asthma who are sensitive to sulphites might have an asthma attack if they eat foods preserved with sulphur dioxide or other sulphur-containing chemicals.

Can sulphur dioxide poisoning be treated?

There is no antidote for sulphur dioxide, but its effects can be treated and most exposed persons recover completely. Persons who have inhaled large amounts of sulphur dioxide might need to be hospitalised.

Are any future health effects likely to occur?

A single, small exposure from which a person recovers quickly is not likely to cause delayed or long-term effects. After a serious exposure, damage to the lungs can occur, causing asthma, pneumonia, and bronchitis. Permanent damage to the lungs is possible.

What tests can be done if a person has been exposed to sulphur dioxide?

Specific tests for the presence of sulphur dioxide in blood or urine are not generally useful. If a severe exposure has occurred, blood analyses, x-rays, and breathing tests might show whether the lungs have been injured. Testing is not needed in every case.

Where can more information about sulphur dioxide be found?

If the exposure happened at work, you might be required to contact your employer. Employees may request a Health Hazard Evaluation from the National Institute for Occupational Health (NIOH) or an equivalent local organisation.

More information about sulphur dioxide can be obtained from your local health department, your doctor; or a clinic in your area that specializes in occupational health. Ask the person who gave you this form for help locating these telephone numbers.

Follow-up Instructions

Keep this page and take it with you to your next appointment. Follow only the instructions checked below.

[ ] Call your doctor or the Emergency Department if you develop any unusual signs or symptoms within the next 24 hours, especially:

- eye, nose, throat irritation
- coughing or wheezing
- difficulty breathing or shortness of breath
- chest pain or tightness
- nausea, vomiting, diarrhoea, or stomach pain

[ ] No follow-up appointment is necessary unless you develop any of the symptoms listed above.

[ ] Call for an appointment with Dr._____ at_____.

When you call for your appointment, please say that you were treated in the Emergency Department at _____ Hospital by_____and were advised to be seen again in ____days.

[ ] Return to the Emergency Department/Clinic on ____ (date) at _____ AM/PM for a follow-up examination.

[ ] Do not perform vigorous physical activities for 1 to 2 days.

[ ] You may resume everyday activities including driving and operating machinery.

[ ] Do not return to work for _____days.

[ ] You may return to work on a limited basis. See instructions below.

[ ] Avoid exposure to cigarette smoke for 72 hours; smoke may worsen the condition of your lungs.

[ ] Avoid drinking alcoholic beverages for at least 24 hours; alcohol may worsen injury to your stomach or have other effects.

[ ] Avoid taking the following medications: _____

[ ] You may continue taking the following medication(s) that your doctor(s) prescribed for you: _____

- Provide the Emergency Department with the name and the number of your primary care physician so that the Emergency Department can send him or her a record of your emergency department visit.
- You or your physician can get more information on the chemical by contacting: _____ or _____, or by checking out the following Internet Web sites: _____;_____.

Signature of patient _____ Date _____

Signature of physician _____ Date _____

5 Quality control

1 Purpose

The aim of quality control is to set quality control standards for the management of sulphur dioxide (SO_2).

2 Application

This standard should be read in conjunction and dealt with according to XYZ Smelter's management system, specifically with reference to:

- Measurement and analysis
- Control of non-conformity
- Corrective action

This standard is specifically applicable to the Occupational Hygiene department of XYZ Smelter.

3 Scope

To provide quality control guidelines with regard to the following within XYZ Smelter operation:

- Occupational hygiene equipment
- Medical rescue equipment
- Pre-placement selection of employees

4 Responsibilities

a. The Occupational Hygiene Department is responsible for the Occupational Hygiene equipment (including respirators).

b. The Occupational Medicine Department is responsible for the Medical rescue equipment.

c. A project team consisting of all role players is responsible to conduct research with regard to the:
   - Work environment
   - The risk to health of any work or any condition prevalent on/or in any premises with regard to SO_2

d. The Occupational Hygiene Department is responsible to provide induction material with regard to SO_2.

e. The Training Department is responsible to educate and train employees on SO_2.

g. The Emergency Care Department is responsible to train employees with regard to evacuating an SO_2 area.

5 Relation between Management, Technical Operations, Support Services and the Quality System

a. The management of XYZ Smelter will assist all the section towards their needs

b. Responsibilities of the different sections are to:
   i. Plan, design and implement their monitoring programs.
   ii. Maintain and keep records.
   iii. Make information available to the Management of XYZ Smelter.
   iv. Ensure that all the monitoring programs and the reports comply with statutory requirements.

c. The Manager of the different section will be held responsible and accountable for acts and omissions, which may result from its activities.

6 Procedures for the control and maintenance of documentation

This procedure should be read in conjunction with XYZ Smelter's Business Management System.

All relevant documentation is kept safely at the Main office building. The Section Managers will have access to the documents. If necessary, arrangement will be made for other interested parties to peruse these documents.

It is the responsibility of all members of the Occupational Hygiene and –Medicine Sections to have the necessary knowledge of all documentation that is required by the Department of Minerals and Energy.

7 Occupational health reports

A register will be kept of all Occupational Health reports. It will be the responsibility of the Manager of each section to complete the register for all the reports.

The different Managers will verify the accuracy of the report before sending out the reports to the different sections and to the Department of Minerals and Energy. All reports will be kept in hard copy form for a period of ten (10) years and on electronic format for a period of forty-years (40).

8 Verification of results

a. Verification of Occupational Hygiene methodology

Verification of the Occupational Hygiene Department will be done on a three-monthly basis as follows:

i. Three personal sampling pumps will be used for static sampling for both dust and HCS.
ii. The air inlets of the sampling train will be placed as close as possible to one another to ensure that the exposure is similar.
iii. All of the above samples will be taken over the same period of time after which it will be sent to the analytical laboratory.
iv. A comparison will be made between the different results obtained and will be kept on the file “Verification”.
v. The above results will be used to establish the level of confidence of Occupational Hygiene methodology.

b. Verification of analysis

Verification of the analysis of the Analytical Laboratory will be done on a six-monthly basis.

i. A minimum of three samples will be exposed to similar conditions.
ii. One of these samples will be analysed by the accredited laboratory and the remaining two will be sent to two other analytical laboratories.
iii. All the results will be compared to determine deviations.
iv. These findings will be placed on the file “Verification”.
v. The above results will be used to establish the level of confidence of the laboratory analysis.

c. Verification of collection media

Verification of collection media is done on each batch of filter media.

i. One collection media of a batch will be sent for analysis.
ii. The results of the latter analysis will be subtracted from the results of the samples taken.
iii. These results of the analysis will be placed on the file “Verification”.
iv. The above results will be used to establish the level of confidence in the collection media.

9 Calibration and maintenance register

A complete list of occupational hygiene and medical rescue equipment will appear in the "Calibration and Maintenance Register". The Calibration and Maintenance Register makes provision for the following:

- Identification of equipment
- Serial number
- Manufacturer
- Description of equipment
- Model number
- Calibration cycle
- Date of last calibration
- Place of Calibration
- Calibration Expire Date
- Maintenance

All relevant information on sampling equipment will be documented in the Calibration and Maintenance Register. The Calibration and Maintenance Register will be updated as calibration and maintenance work is been done on instrumentation.

10 Traceability of occupational hygiene measurements

All occupational hygiene monitoring must be traceable, repeatable and verifiable. Therefore members of the Occupational Hygiene section will follow the following measures:

a. The sampling sheet for determining SO_2 concentrations and total volume of air sampled will be used.

b. All the information, together with the sampling tube will be sent to the laboratory for analysis. The laboratory personnel will be made completely

conversant with the numbering technique of the samples in order to ensure that the correct results are obtained.

c. All information and results received from the analytical laboratory will be kept in the Test report file.

d. The chemical sampling sheet will be used to capture the analysis results.

11 Complaints

This procedure should be read in conjunction with XYZ Smelter's Business Management System. A record of complaints received will be kept in the laboratory.

12 Audits

The external and internal audits will be conducted for compliance against legislation requirements, requirements of the Department of Minerals and Energy, SAIOH and the internal quality system in accordance with the Section 6 of the SO_2 Policy Manual.

6 Audits

1 Purpose

To define the process for planning and implementing internal and external audits for XYZ Smelter with regard to the management of SO_2 specifically related to:

- Occupational hygiene (monitoring and control)
- Evacuation simulation
- Effective training

2 Principles

The internal and external audits is based on the following principles:

The internal audits are sufficient for conformance to the internal audit requirements of ISO9001:2000; and ISO14001:1994.

The Occupational Hygiene Department is responsible for managing the internal audit.

The assessments are planned as follows:

- Internal audit every six months
- External audit every year

The results from the previous year's audits will be used as guidance to determine the scope of the planned audits in terms of the elements or parts thereof, to be covered.

The frequency of scheduled internal audits will not necessarily be increased due to gaps identified in the previous assessment, but ad hoc audits may be arranged if a common non-conformance is identified that raises a concern. These issues will also be included to be audited during the following years scheduled audits. The Manager will identify the necessary skill required in the team for these audits, or other relevant discipline experts.

The audit schedule must be approved and distributed at least four (4) weeks prior to the first audit being conducted unless arranged otherwise with the management of the particular area.

The detailed internal audit program will be issued at least two (2) weeks prior to the assessment.

The same principle will be followed with external audits wherever possible, but will however be subjected to the commitment of the external auditor.

Only competent members of staff are used for the internal audits.

Should a team member be unable to attend a scheduled assessment the scheduled member will have the responsibility to arrange a suitably team member to replace him/her. Changes should be cleared with the scheduled Lead Auditor.

The Occupational Hygienist, SHE Representative, and Occupational Health Practitioner of the area being audited must accompany the External Occupational Hygiene auditor(s). In the instances where these specified people are not available their Management must represent the area or arrange for an appropriate substitute.

Inexperienced personnel are included in the team as observers, for training purposes. They form part of the audit team, and will be responsible for assessing parts of the assessment criteria as identified by the Manager and the Lead auditor.

Lead auditors appointed for each assessment team, are responsible for the following:

Obtaining any relevant information needed for the audit.

Coordinate and assist the audit team members with determining the questions to be assessed.

Contact the management of the area to be assessed well in advance to discuss the proposed schedule and to finalise arrangements regarding the assessment.

Ensure that the appropriate members of the management team attend the pre- and post audit meetings.

Ensure that the audit is conducted as per planned arrangements and in accordance with the rules set out in this procedure, and taking immediate action to correct any deviations.

Handle all inquiries regarding detail of the audit, audit report and corrective action requests.

Formulate the final report issued after the feedback period (4 weeks).

Verify the corrective action requests identified during the audit.

The Manager of the department being audited must always be present during an internal audit unless arranged otherwise by or with the specific Manager.

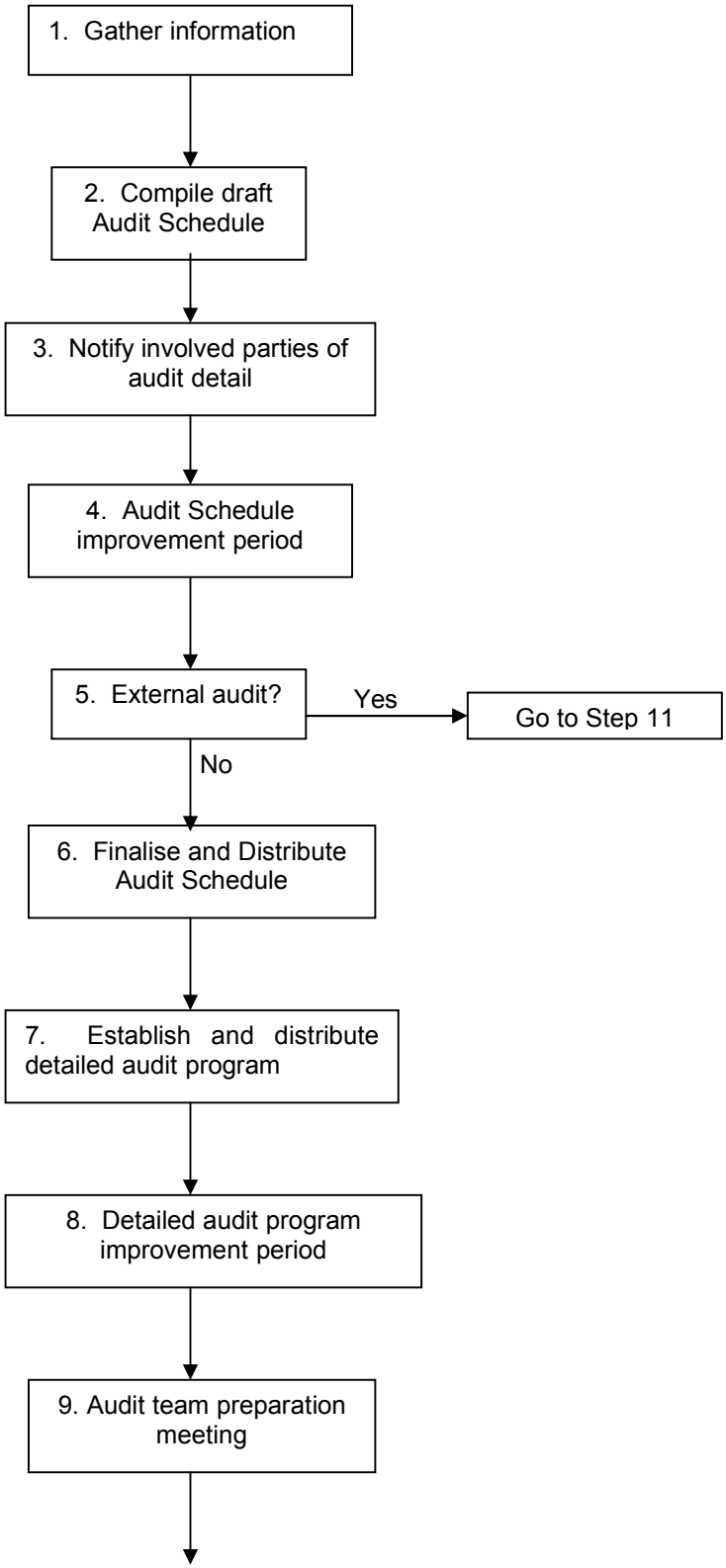
The audit team members support the Lead auditor in planning and conducting the audit.

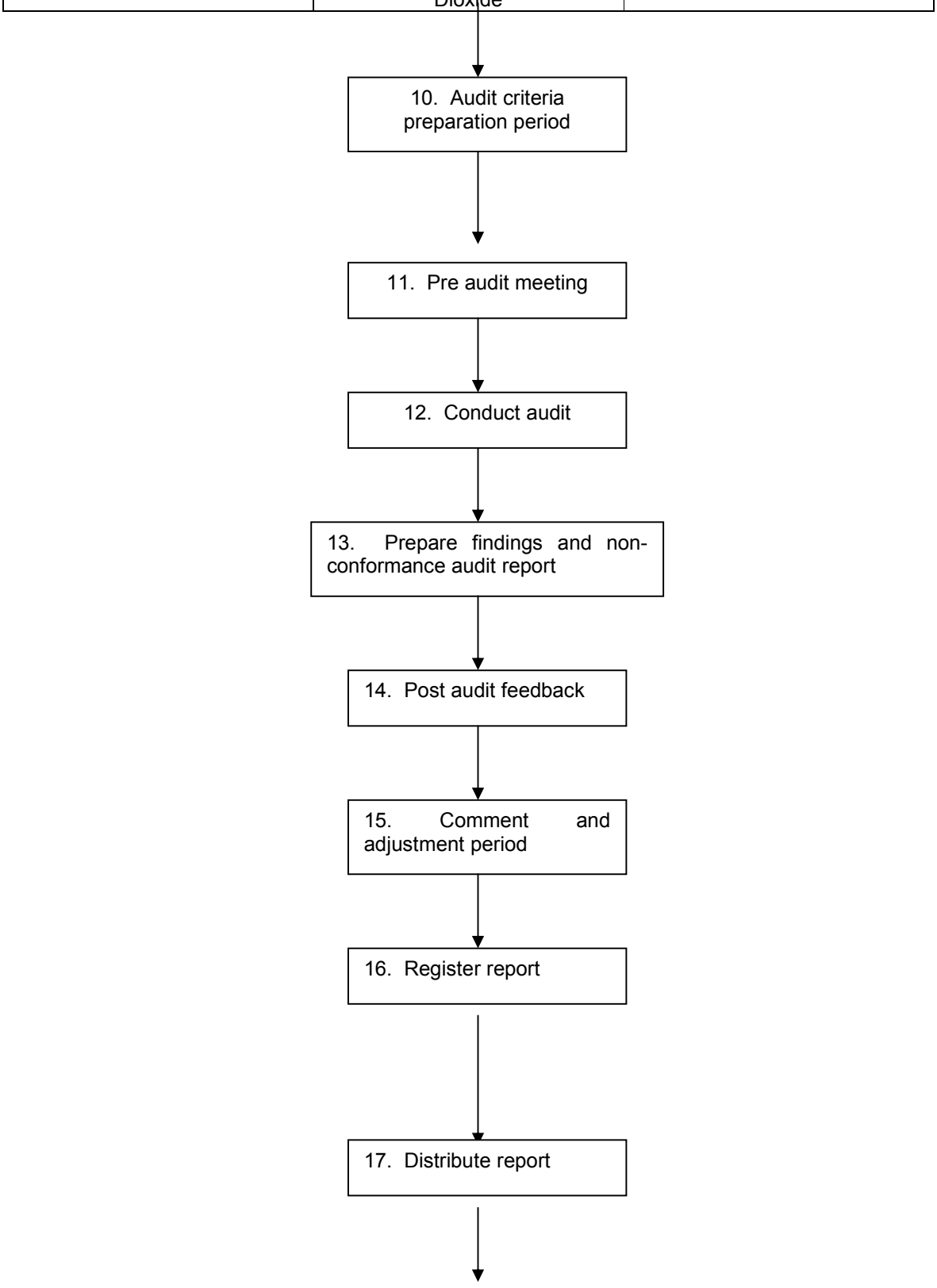
A Lead auditor or audit team member will never be used to audit his/her own area.

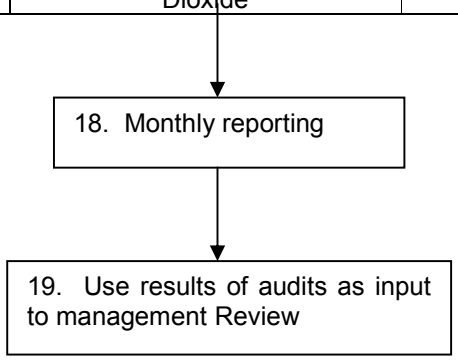
The Occupational Hygiene Department maintains the assessment criteria to be used during the audit.

2.18 The questions to be used during the audit are identified by the audit team leader and team members. The five standard options per question must be reviewed/adjusted by the audit team and discussed with the Manager during the preparation phase. The reviewed questions must be handed back to the Manager as soon as possible, but at least two (2) days prior to the audit.

3 Process Flow Chart – Internal And External Audits




10. Audit criteria preparation period
11. Pre audit meeting
12. Conduct audit
13. Prepare findings and non-conformance audit report
14. Post audit feedback
15. Comment and adjustment period
16. Register report
17. Distribute report



Note: If the need exists for audits to be done in addition to the official audit scheduled, the same process must be followed. The corrective action requests must be registered and managed via each Business Unit own Corrective Action System.

4 Summary of audit process steps

Step 1: Gather information for establishing audit schedule

Liase with Certification Bodies and Management to determine auditing needs and requirements. The information is typically related to compliance with certification and legislation requirements and business objectives.

Step 2: Establish draft audit Schedule

Internal audits are scheduled by the **Occupational Hygiene** Department and are recorded on XYZ Smelter's internal audit schedule.

4.2.2 During the scheduled management review at the end of each cycle as described above a risk analysis based on the following guidelines (end of section) will be conducted to determine whether the audit frequency needs to be adjusted or not.

4.2.3 The Divisions or Departments have the freedom to schedule and conduct additional self-audits within their areas, although this is not compulsory and not included on the internal audit schedule.

4.2.4 Information identified on the draft audit schedule are the dates, audit areas, Lead auditor, audit team members and final report due date.

4.2.5 The audit team is independent from the area being audited.

4.2.6 The time allocated to an audit are scheduled on the basis of importance of the activity to be audited and the size of the area to be audited.

ELEMENTS INFLUENCING EFFECTIVE PERFORMANCE	HOW MEASURED	WEIGHT
Implement previous audit recommendations	% Implementation	10
Staff Turnover	% Turnover	10
Number of Health incidents	% of total health incidents	10
Occupational hygiene monitoring	% of Monitoring schedule	10
Occupational hygiene control	% Mitigation achieved in relation to OEL	20
Performance of evacuation drill	Effectiveness of evacuation simulation	20
Effective induction training	Random evaluation of understanding	20

4.3 Step 3: Notify involved parties of audit detail

The Manager is responsible for the communication of the planned audit detail to all involved parties.

4.4 Step 4: Audit schedule improvement period

Recommendations on improvements of the schedule are obtained from the Business Units and Divisions followed by confirmation of management's acceptance and approval of improvement of the schedule.

4.5 Step 5: Internal or external audit

Internal audit go to step 5.1 and external audits go to step 10.

4.6 Step 6: Finalise and distribute audit schedule

Recommendations made are used to improve the audit schedule. The latest revision is registered as a controlled document and distributed to all relevant parties.

4.7 Step 7: Establish and distribute detailed audit programme

The Manager makes use of a Pivot table to schedule all the assessment team members and all the Departments in the Business Unit/ Division. The detailed program is distributed to assessment team members and management representative for comment.

4.8 Step 8: Detailed audit program improvement period

Management, Business Units, Divisions and assessment team members confirm acceptance and approval in the audit schedule.

4.9 Step 9: Audit team preparation meeting

The Manager brief the Lead auditor and audit team members on the purpose of the planned assessment, previous history of area to be audited and outstanding corrective action requests. This also provides a medium for the audit team to familiarise themselves with one another, to lay down guidelines for audit team conduct and to familiarise themselves with the audit area (visit to area if not familiar with area).

4.10 Step 10: Audit criteria preparation period

The assessment tool (access database) is used as basis for all internal assessments scheduled by the **Occupational Hygiene** Department. The identified Lead auditor and audit team draws up the detail questionnaire for each

audit before each audit commences, by choosing questions from the self-audit database. The Manager in conjunction with the audit team decides on the compulsory topics to cover during the annual cycle. When planning the audit, the final checklist must consist of:

4.10.1 All the compulsory topics and sub-topics in the self-audit database identified by the Manager

4.10.2 Additional questions chosen by the Lead auditor and the audit team from the self-audit database not marked as compulsory questions. The selection of these topics can be based on focus areas as perceived by the audit team.

During the audit preparation the lead auditor is responsible for:

4.10.3 Conducting pre-audit visits to get familiarised with the area to be audited;

4.10.4 Finalising the detail audit program for the department to be audited and distributing it to the relevant management of the area to be audited

4.10.5 Briefing the audit team members on the scope of the audit and their individual roles and responsibilities;

4.10.6 Fixing a time for the audit feedback meeting to be held as per schedule.

4.10.7 Ensuring that all selected questions have pre-empted answers (each auditor responsible for his own folder)

The Manager must ensure that the audit team leader and team members have access to the assessment tool kit and related forms.

4.11 Step 11: Pre-audit Meeting

Before the external audit commences, a meeting is held with the management of the area to be audited. Arrangements for the audit, clarification of purpose and general approach to be followed are explained to the auditors. The attendance register (Use attendance register form) must be filled in during this meeting.

4.12 Step 12: Conducting audit

During the assessments, objective evidence for compliance is evaluated. The questionnaire use will have pre-empted responses to the various questions and

once the level of compliance is determined, the auditor will mark the correct level of compliance on the questionnaire.

4.13 Step 13: Preparation of findings and non-conformance report

The Lead auditor and audit team members will be responsible to prepare the findings and non-conformance report. In the case of internal assessments the Manager is responsible for the preparation of a feedback report by using the inputs from the Lead auditor and the team members. The individual inputs from the assessment team must be available for incorporation into the feedback report on a daily basis.

4.14 Step 14: Post audit meeting

The feedback and non-conformance report are communicated to the management representative after the completion of each audit. The purpose is to clarify any uncertainties regarding findings made. The official attendance register used during the pre-audit meeting must also be completed.

4.15 Step 15: Audit report comment and adjustment period

The Management representative will be able to review the findings and non-conformance report. A period of three (3) weeks will be allowed for comments. The Lead Auditor and the Manager will evaluate all comments and if comments are valid the report will be changed accordingly. The Lead auditor handles all inquiries regarding the rating report and non-conformances raised. The **Occupational Hygiene** Department is contacted when actions to be implemented needs to be clarified with regard to system requirements or if any comments are made with regard to the audit tool. Improvements to the report can be initiated at this stage if necessary.

4.16 Step 16: Register audit report

After the comment period the Manager will register the report as well as corrective action requests. Corrective action must be initiated in accordance with XYZ Smelter's Corrective Action System.

4.17 Step 17: Distribute audit report

The Manager prints a summary report and the **Occupational Hygiene** Department distributes the summary report and corrective action requests are distributed to all parties involved

4.18 Step 18: Monthly reporting

The following audit performance reporting (status of audits conducted, performance and corrective actions) is done on a monthly basis to Management:

4.19 Step 19: Input to Management review meeting

The Management of XYZ Smelter uses the results of all audits and assessments conducted as input to the management review. The aim is to determine continual improvement. The Manager prepares the inputs for the management review meeting.

5 Related documents

6 Appendix

6.1 Attendance register form - appendix 1.

7 Supporting documentation

7.1 A Sulphur Dioxide Occupational Hygiene Survey at XYZ: XYZ Smelter

NOT AVAILABLE

Evaluating the Effectiveness of Respirators

NOT AVAILABLE

Critical Ambient Concentration for Sulphur Dioxide

NOT AVAILABLE

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WEBSITE. http://www.osha.gov.

Participating companies

The Policy Manual was compiled by the following participating companies.

Nershco
Services (Pty) Ltd
2000/003450/07

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cc 2005/043871/23