



WORK PERMIT SYSTEMS

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1 Introduction

Two shared root causes of several serious accidents reported over the past years are:

- the potential hazards, and their associated risks, inherent to a job were not pre-identified,
- the work was poorly planned and risk prevention measures were not identified/taken.

2 Scope and purpose

The scope of this document is to provide recommendations on how to plan and execute potentially hazardous jobs in a safe manner

There are two categories of potentially hazardous jobs:

- well known and identified jobs performed in a given place by qualified personnel (contractors excluded) following fully documented job steps (such as Job Safety Analysis),
- all the rest of potentially hazardous jobs.

The purpose of this AIGA Document is related to that last category of potentially hazardous jobs.

To achieve the maximum degree of safety when carrying out non-routine work it is therefore necessary to use a procedure to ensure those potential hazards are identified and that vital precautions are not overlooked. Such a procedure requires formal and disciplined action in both the planning and execution of the work. This procedure should require a written statement to be signed by a responsible person prior to being issued to the individual responsible for performing the work. This would mean that the equipment is safe for work to commence and that risks are under control. Such a process is the core feature of a work-permit-system like those used by major industrial gas companies and other organisations throughout Asia.

3 Definition of a Work Permit System

A work permit system consists primarily of a standard procedure designed to ensure that ALL potentially hazardous routine and non-routine work should be assessed re: a hazard checklist and then decide if a permit is required, this is to ensure works can be carried out safely. The procedure should define the need for the following essential steps:

- Details of the necessary preparatory work including assessment of hazards, precautions necessary to make equipment safe and preparation of a work procedure which clearly defines the scope of the work and describes in logical sequence the manner in which the job will be carried out;
- A clear definition of responsibilities;
- Appropriate training of the workforce and provision of adequate information relating to potential hazards,
- Provision of adequate safety equipment,
- A formal work permit, with or without attached specific checklists, to be signed by a responsible individual and the person carrying out the work.

4 General considerations

- It is the responsibility of line management to ensure that:
 - a formal work permit system is established as a standard operating procedure
 - the need for rigorous adherence to the procedure is regularly reinforced
 - the operation of the procedure is adequately monitored.
- It is recommended that reference to the use of the Work Permit procedure be incorporated as part of the company's safety policy statement.

- The “small” potentially hazardous jobs require as punctilious implementation of the Work Permit procedure as the “large” ones. Serious accidents can occur just as easily in the course of minor jobs on relatively simple installations as during extensive work on large and complex equipment.
- The establishment of a work permit system will not in itself prevent accidents. It must be stressed that the effectiveness of any work permit system will depend entirely on the people who implement it (both planning and execution). Ultimately, safe-working practices will only be achieved through the attitude and actions of well-trained and knowledgeable people.

5 How to identify potentially hazardous jobs

5.1 Introduction

There is a large diversity of jobs performed in Industrial Gases activities but the involved hazards to which personnel are exposed can be split in a few categories.

5.2 Potentially hazardous jobs categories

Also refer to the form exhibited in appendix A.

Here is a list of examples of potentially hazardous jobs where a Work Permit is required:

- jobs performed by contractors,
- potential oxygen deficiency or enrichment,
- potential flammable/explosive atmosphere,
- potential high temperature/pressure
- potential exposure to hazardous chemicals (toxic, reactive, acid, caustic,...),
- confined space entry,
- bypassing or removing/altering safety devices and equipment,
- elevated work
- Introduction of ignition sources where not permanently allowed (fire permit)
- Electrical troubleshooting or repair on live circuits,
- Maintenance or repairs in areas, or to equipment or lines, containing or supposed to contain hazardous materials or conditions,
- manual or powered excavations,
- use of mobile cranes,
- Insulation or catalyst handling,
- use of adapters,
- product conversion of stationary or mobile or portable vessels and containers,
- temporary or permanent changes, alterations, modifications of equipment or processes,
- Exposure to traffic (road, rail,...)
- Exposure to moving/rotating machinery

6 Planning and execution of work

6.1 Planning

Having decided that the nature of work to be undertaken falls within a category where a work permit is required it is essential that the job is thoroughly reviewed from both the technical and safety aspect by line management and all organisations involved.

The key technical and safety items to be considered during the planning stage are detailed below in logical sequence and summarised in the appendix B.

6.1.1 Nature of scope of work

- Definition of work and location of equipment
- Partial or total shutdown

6.1.2 Review of flowsheet, drawings and specifications

To ensure that equipment can be brought to a safe condition for work to commence it is of prime importance that a review of all appropriate process flowsheets, layout and engineering drawings together with equipment and material specifications is carried out. The purpose of the review is to ensure that all the key persons involved in job planning have a thorough understanding of the job. It is recommended that drawings or sketches are used to define the limits of working areas and, where appropriate, are attached to the work permit form.

The review should include not only the equipment itself but the total process of which it is part. The following items should be considered and evaluated as part of the review:

- Process fluids and materials involved
- Degree of isolation of process equipment and where/how
- Effect on other processes,
- Power supply isolation,
- Specialist advice,
- Location of underground services and pipes,
- Location of elevated power cables,
- Location of elevated pipelines and walkways,
- Purging and lock-out requirements,
- Pressure, temperature,
- Valve identification,
- Equipment specifications,
- Operating and maintenance instructions,
- Materials of construction,

6.1.3 Inspection of work site

Attention must be paid to the following items:

- Assess activities adjacent to work site
- Neighbouring activities
- Site rules
- Overhead cables
- Underground services
- Access problems
- Escape routes
- Alarm systems
- Fire-fighting equipment
- Traffic
- Environmental considerations
- Natural hazards
- Flooding
- Ground movement
- Rain/snow/ice
- Wind/fog
- Customer requirements/attitudes

6.1.4 Identification of the involved hazards

Evaluate the work and the place where the work will take place against the following list of possible hazards. Then, define the appropriate risk prevention (or mitigation) equipment and actions.

- Flammable materials or fluids
- Oxygen
- Toxic substances
- Asphyxiating atmospheres
- Confined spaces
- Electricity
- Pressurised systems
- Temperature – high/low
- Corrosive substances
- Moving objects
- Traffic
- Falls/trips/slips

6.1.5 Development of work procedures

The preparation of a detailed work procedure is essential, particularly for complex, non-routine work, to ensure that work will proceed safely in a planned and logical manner. This preparation includes the safety part of the job such as atmospheric analysis checklist, lock-out checklists, etc... which will be attached to the Work Permit form. At all stages of the work it will be necessary to consider and to define the following requirements:

- The reference drawings and other documents to be provided
- The timing of various stages of the work
- Details of any special equipment to be provided
- The need to inform local authorities
- The necessary safety precautions to be taken
- Details of safety equipment to be provided
- Emergency procedures

The work procedure itself can then be developed in a logical sequence of work-steps. This should include details of how the following typical operations are to be accomplished:

- Depressurising
- Draining
- Venting
- Purging
- Flushing
- Isolating
- atmosphere testing
- Disassembly of equipment
- Method of repair
- Reassembly and installation
- Quality control (e.g. welding inspection)
- Pressure and leak testing
- Reinstatement of equipment
- Hand-back procedure

6.1.6 Assignment of personnel and responsibilities

A clear definition of the roles of personnel involved in the planning and execution of work is essential and should include:

- The person accountable for ensuring that the work is carried out correctly and safely
- Details of all regulatory requirements and special qualifications required
- Details of the organisation and persons responsible for the various activities
- Co-ordination of interrelated activities for which more than one work permit is required

When considering the various areas of responsibility within the organisation particular attention should be paid to the appointment of qualified personnel responsible for the following activities:

- The approval and issue of work permits
- Liaison with customers (as appropriate)
- Direct supervision of work and contract labour
- Pre-job discussion and briefing
- Safety information and training

6.1.7 Communication/co-ordination

It is of vital importance that effective means of communication and co-ordination between all involved parties are established at the planning stage.

The areas with which communication links must be established could include:

- All parties directly involved with the work
- Other departments which may be affected
- Supervisors responsible for interdependent work in other areas for which separate work permits will be issued
- Company emergency services
- Also, pay attention to possible external communication needs such as customers, local authorities, etc...

6.1.8 Compliance with regulations

During the planning of any routine or non-routine work it is necessary to ensure compliance with national and local regulations.

6.2 Execution of work

Once the planning phase is complete, it is then essential to consider the manner in which the work is to be carried out in practice. The key areas to be considered are described below and summarised in the appendix C:

6.2.1 Preparatory work

- Check all requirements as detailed during the planning stage are complete
- Check all safety equipment is available
- Check all tools and equipment are available
- Ensure all necessary training and instruction has been given
- Ensure all safety precautions are observed

6.2.2 Communication and implementation

- communicate instructions to employees and request their feedback
- fill-in the work permit form
- Work permit form to be signed by those persons authorising and accepting the permit

6.2.3 Supervision and monitoring

- Supervise workforce
- Monitor work in progress
- Ensure safety precautions are observed
- Check when job is complete

6.2.4 Closing

- Bring plant and equipment to state of operational readiness
- Sign off work permit that job has been completed
- Inspect and check that safe operating conditions have been restored.

7 Work Permit implementation

7.1 The work permit is a formal declaration by:

- The person authorising the work grants that all potential hazards and necessary precautions have been identified and implemented
- The person carrying out the work acknowledges that the nature of work and precautions to be observed are understood and accepted;

7.2 The prime responsibilities of the person authorising the issue of the work permit are:

- Inspecting the work area
- Anticipating and identifying hazards
- Defining safety precautions
- Making the area and equipment safe for work
- Following the principles of safe working practices
- Discussing requirements with the person accepting the permit
- Issuing the work permit
- Implementing the handback procedure.

Reference is made to the chart shown as Appendix D.

7.3 The prime responsibilities of the person accepting the work permit are:

- Ensuring that the nature of the work, the work procedure and the potential hazards are understood
- Complying with the safety precautions and constraints as specified on the work permit
- Ensuring that the equipment is brought to a state of operational readiness and that the handback procedures are observed.

Reference is made to the chart as Appendix E.

7.4 Guidelines for using the “work permit”

7.4.1 The information given in the permit and its attachments must be specific, detailed and accurate. It must be stated which equipment or plant has been made safe, the exact nature of the work to be carried out and the safety precautions required.

7.4.2 The permit must specify the date and the period of time for which it is effective. This period should be short, preferable 8 hours, or one shift, but normally not more than 24 hours. When the permit has expired, proper arrangements should be made for either reissuing the existing permit or issuing a new one.

Where a permit is valid for a period longer than one shift, there must be a procedure to communicate instructions from one shift to another.

7.4.3 It must be made clear that no work will be carried out other than that specified in the permit. If it is found that the programme of work must be changed then the existing permit shall be cancelled and a new one issued.

7.4.4 It must be made clear that no work will be carried out at a place other than that specified in the permit and that no change is allowed. This prohibition must apply to all personnel including senior staff. As stated above, a change of scope shall result in the cancellation of the existing permit and the issue of a new one.

7.4.5 The permit must be approved/signed by an authorised person, this person should normally be a supervisor or a manager. Such a person must:

- Be directly accountable for the plant or equipment on which work is to be carried out,
- Fully understand the work programme and how it is to be performed,
- Have full knowledge of the plant and the potential hazards associated with the process and equipment,
- Be competent to ensure that all safety precautions have been properly implemented before signing and issuing the permit,
- Ensure that direct and unbroken communication links are established with the person (s) carrying out the work both prior to and during the work activity to prevent the occurrence of misunderstandings.

7.4.6 The permit shall be accepted and signed by the person who is in immediate charge of the work and who, from that moment, becomes responsible for ensuring that all specified safety precautions are observed, that only authorised work is carried out and that the work is confined to the area defined in the permit. Other personnel involved may also be required to sign the permit as appropriate.

7.4.7 It is good practice that a copy of the permit is given to the person responsible for carrying out the work and that a second copy is retained centrally by the production staff and/or plant manager for reference. Both copies should be posted and visible both where the job takes place and in another place so that in case of an emergency, persons involved may get a quick overview of the ongoing work and of the related hazards.

8 Training requirements

8.1 Company employees

It is important that employees are required to undergo formal training to ensure that they fully understand the nature of the equipment with which they are working, the potential hazards and the appropriate accident prevention techniques. The training programmes should be followed by a qualification test of the new employee, or employee new to the job, to demonstrate the effectiveness of the training and the suitability of the individual to participate in activities requiring a work permit.

The level and frequency of training will depend on the seniority and experience of the employees together

with the nature of their responsibilities.

Besides the initial qualification, a periodic re-qualification test, for example annual or bi-annual, should be taken to ensure that the employee's knowledge is refreshed and, further, to stress the need for adherence to established safety procedures. To facilitate the re-qualification process it is preferable that written procedures are available for use as reference material by the employee.

8.2 Permit Approvers

Employees authorised to approve Work Permits must be experienced senior employees qualified and certified/appointed by the site management per the following complementary training:

- Work permit system and qualification system to work on potentially hazardous equipment,
- Knowledge of products handled such as oxidizing, inert, flammable, corrosive and toxic substances including their physical properties, health risks, fire and explosion hazards, spill and leak procedures and relevant precautionary measures,
- Locking and tagging procedures,
- Personal protective equipment (hard hat, safety glasses, breathing equipment, acid suit, etc),
- Fire fighting and fire prevention procedures,
- Confined space entry procedures, including techniques for atmospheric analysis,
- Working with elevated pressures, low/high temperatures or electricity,
- Working at elevated locations,
- Procedures for dealing with other potential risks specific to the particular activity of the company concerned,
- Working below ground level e.g. trenches, pits etc...

8.3 Contractors

Employees of contractors do not normally receive or participate in company training programmes. However, it is important that before commencing work on a company's premises they receive basic instructions regarding potential hazards and precautions, site rules, safety procedures, emergency procedures and, where appropriate, more detailed instruction for special or more complex tasks. It is recommended that such instructions be presented as part of a training package to provide the necessary impact and consistency of information. Audio-visual systems are effective methods for presenting training programmes with the additional advantage that they can be used easily and as often as required. Records of the names of those contractor employees who have attended training/induction programmes should be maintained.

9 Documenting and Monitoring Work Permit systems

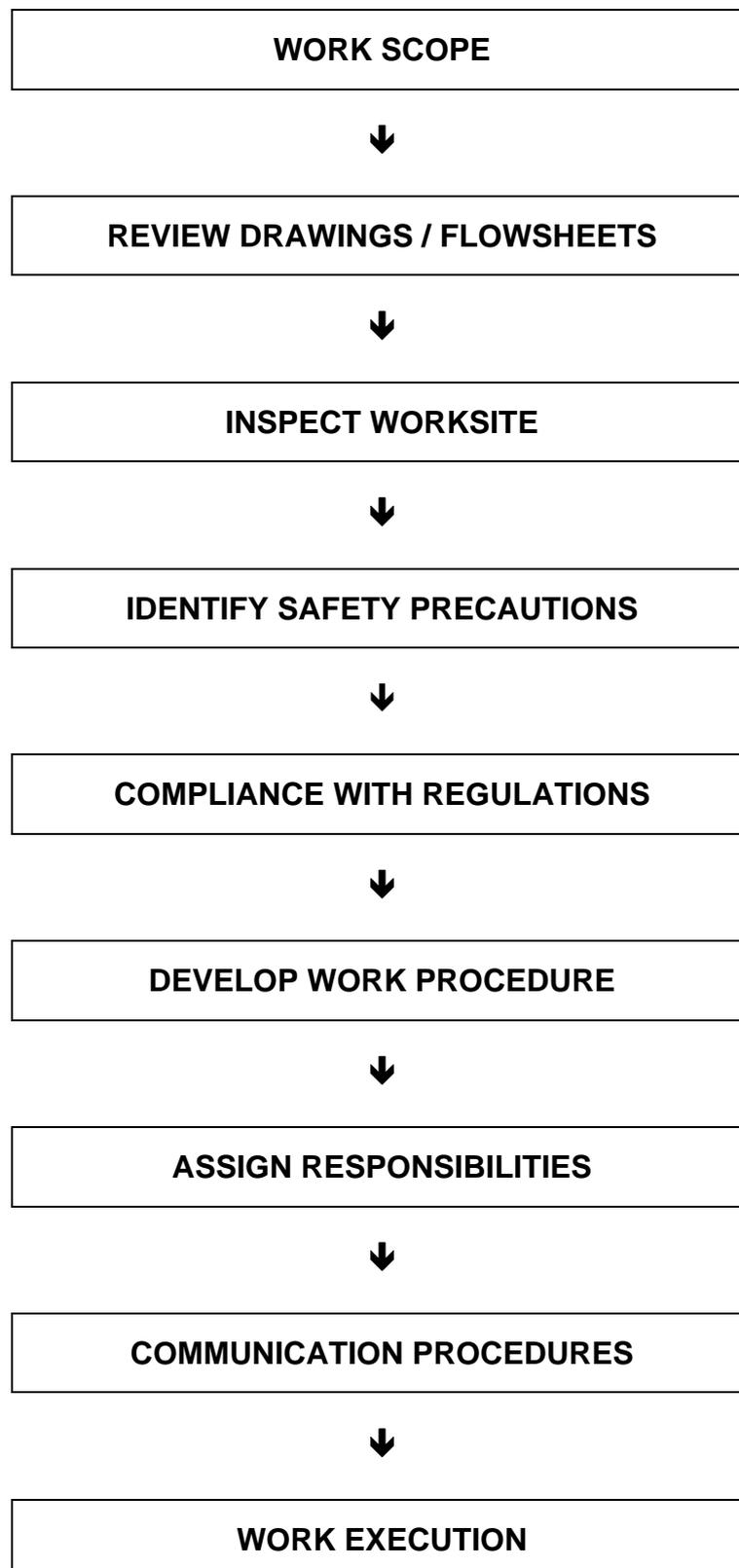
A dedicated procedure must describe the Work Permit System/process. Work Permits are filed for at least one year after issue date. Auditors may then check that the forms were filled in compliance with the requirements.

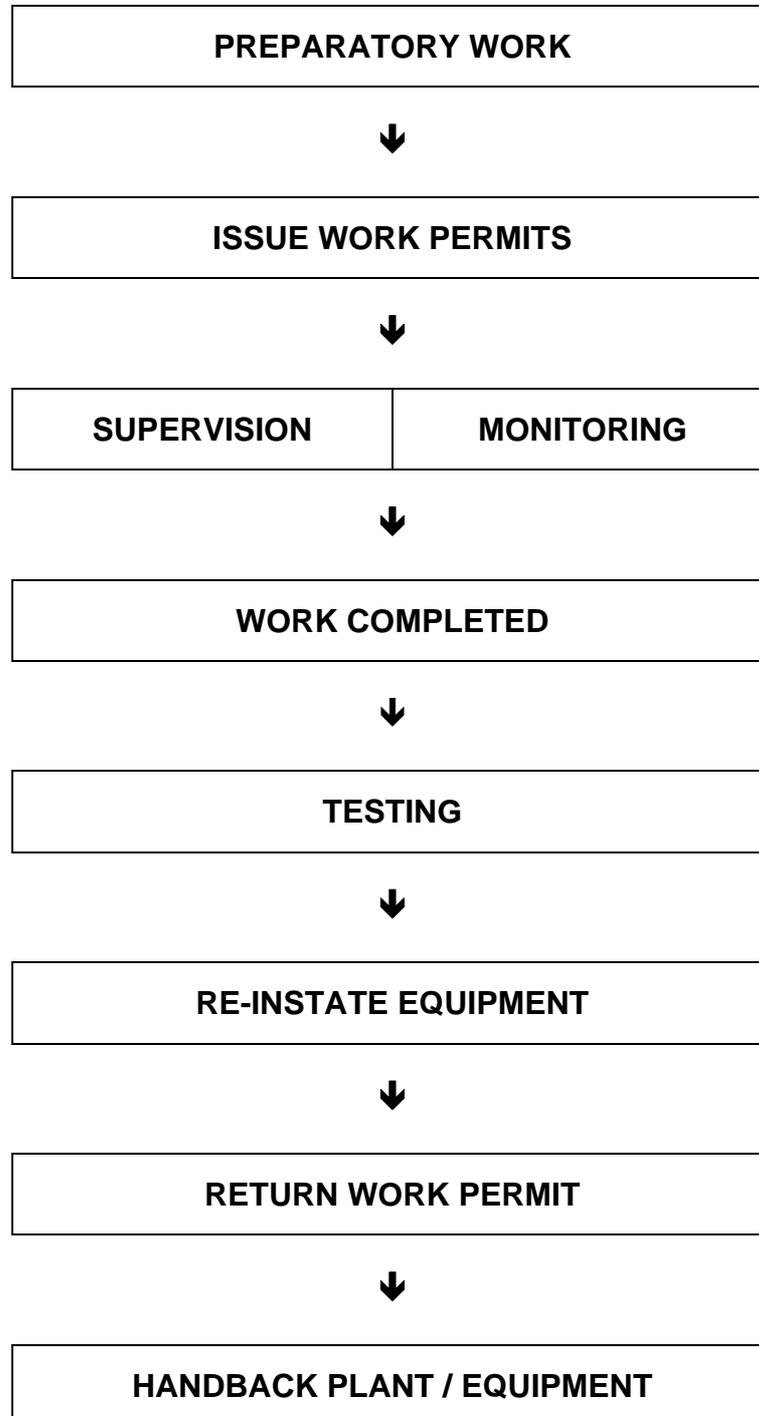
Also, training records must be kept available to evidence the fact that only qualified persons have been involved in the Work Permit implementation process.

Line management must observe how Work Permits are implemented, whether relevant instructions are communicated, known and actually practised...

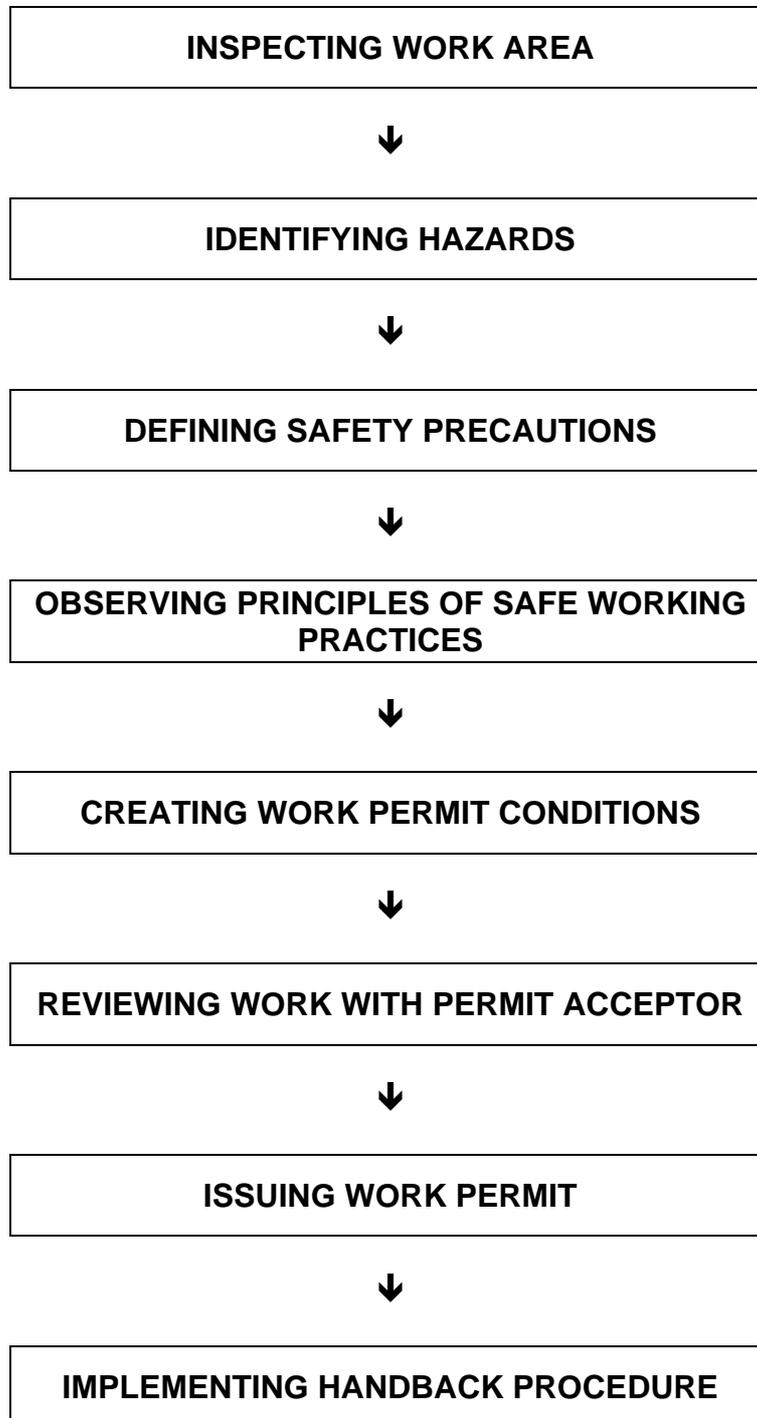
The Work Permit system and its implementation must be audited as a fundamental part of the safety management systems.

Appendix B: Work planning



Appendix C: Work execution

Appendix D: Permit issuers responsibilities



Appendix E: Permit acceptors responsibilities

UNDERSTANDING OF WORK PROCEDURES

**UNDERSTANDING POTENTIAL HAZARDS AN
SAFETY PRECAUTIONS**

ACCEPTING WORK PERMIT

OBSERVING PERMIT CONDITIONS

COMPLYING WITH HANDBACK PROCEDURE