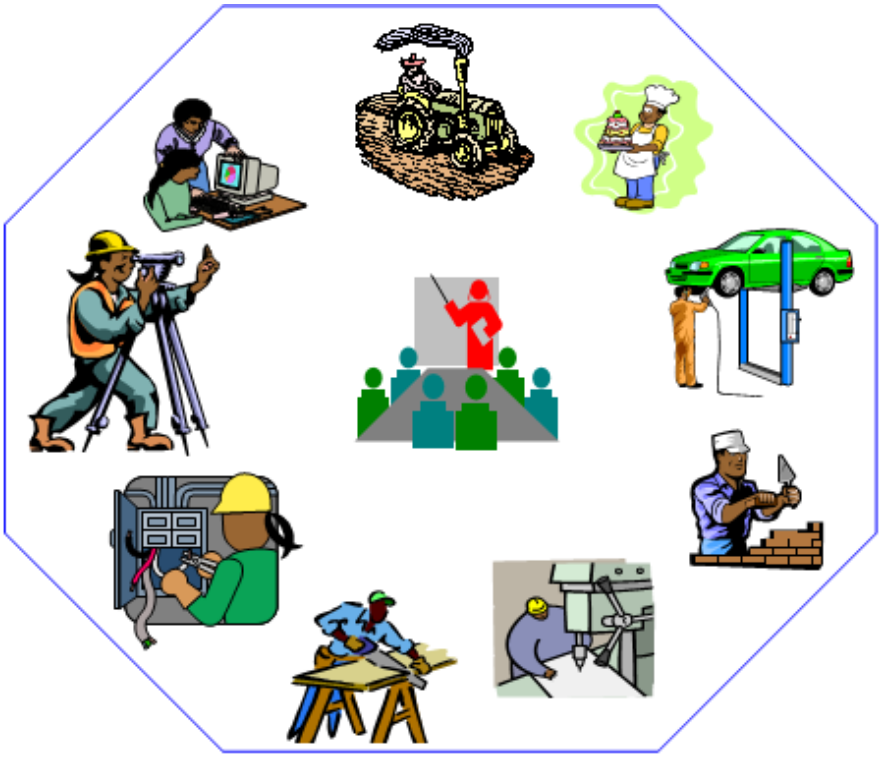
**Surface Mining**

**Level II**

Based on December 2018, Version 1 Occupational standards (OS)



# Module Title: - Perform Auxiliary operations

# LG Code: MIN SMN2 M07 LO (1-3) LG(21-23)

# TTLM Code: : MIN SMN2 TTLM 0421v1

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**Adama, Ethiopia**

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| LG #21 | LO #1 Plan and prepare for mobile lighting and dewatering activities |
|---|---|

**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Accessing, interpreting and applying compliance documentation
- Obtaining, interpreting and clarifying work instructions.
- Selecting resources and equipment
- Developing mobile lighting and dewatering plan
- Identifying and obtaining signage requirements
- Preparing and barricading sumps and lighting positions
- Coordinating and transporting pump, lines, fittings
- Identifying, addressing and reporting environmental issues.
- Selecting and wearing personal protective equipment
- Conducting pre-start checks for equipment
- Adhering emergency procedures

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Access, interprete and apply compliance documentation
- Obtain, interprete and clarify work instructions.
- Select resource and equipment
- Develop mobile lighting and dewatering plan
- Identify and obtain signage requirements
- Prepare and barricade sumps and lighting positions
- Coordinate and transporte pump, lines, fittings
- Identify , address and report environmental issues.
- Selecte and wear personal protective equipment
- Conduct pre-start checks for equipment

- Adhere emergency procedures

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If your performance is satisfactory proceed to the next learning guide,

| Information Sheet-1 | Accessing,interpreting and applying compliance documentation |
|---|---|

### 1.1,.Basic concept on Compliance documentation

Compliance documentation is the documents that must be completed in a job. These documents are required to show that the workplace is following the established laws, set practices and standards that must be in place.

It is not about you might complete; it is not about you'll finish them later; it is not about you'll work on if you have time! Compliance documents are documents that must be read and followed and in some cases completed by you.

In workplaces where there are inherent dangers around you, if you do not follow the rules you can expect to be looking for another line of work! Some of documents or information's of Compliance documentation:

- company guidelines and specifications
- Ethiopian standards (mineral exploration standards)
- Control of Substances Hazardous to Health Regulations
- Equal Employment Opportunity and Disability Discrimination legislation
- Records, reports, observations and verbal responses required to verify compliance with standards by a facility or program.

- **Accessing compliance documentation**

  Accessing compliance documentation is a means of approaching, entering, exiting, communicating with, or making use of different kinds of documents or information related to the work to be performed.

- **interpreting compliance documentation**

  Interpreting compliance documentation is explain the meaning of (information or actions) collected and accessed

- **applying compliance documentation**

  Applying compliance documentation is to make use of the above mentioned Accessing and interpreting specific documents or information for a practical purpose.

## Legislation

Legislation is the formal rules and laws set by governments.

The following regulations, procedures, standards and safety considerations may apply to planning and organize your work activities:

- Ethiopian Ministry of mines & petroleum Mining Act and Regulations( 678/2010) amended to 816/2013.
- Environmental Protection Act
- Equal Employment Opportunity and Disability Discrimination legislation
- Employment and workplace relations legislation
- Duty of care
- Code of Practice
- Occupational Health and Safety legislation
- Ethiopian Standards
- Manufacturer's specifications and recommendations
- Site specific regulations and procedures

## The difference between an Act and a Regulation

An Act is passed by Parliament and provides the ***framework*** which deals with administration, management, inspection, areas of responsibility, duties and penalties, i.e. for Ministers, Inspectors, and Mine Managers. Acts are LAW.

Regulations are an Act passed by Parliament and details the specific elements, such as regulations concerning the use and operation of mobile lighting plant, the levels of a specific chemical that can be found in the air within a mine, etc. They are the ***minimum standard*** to be complied with. Regulations are also law.

## Common law

Common law is the set of laws that are formed, not from government (i.e. statute law), but from past judgments in courts and judicial decisions. The major common law that affects us all is that about individual obligation.

Every person owes an obligation. To discharge their obligation, each person must act in a manner, which shows consideration to other people and property, i.e. to act in a manner, which a reasonable person (with such training/and or experience) would consider fair, just

and safe. If you act negligently in an inadvertent manner, i.e. you do not think about how you act or the consequences, you will be liable. If you act negligently in a reckless or willful manner, i.e. you deliberately decide to act in a manner, which is likely or calculated to cause damage/loss, you will be liable, and may be charged with a crime in certain circumstances (insurance does not cover you for such acts).

**Duties of workers**

Through the awards, regulations and other forms of law broad expectations or duties of workers have been set. Any worker however regardless of the industry they work in or where they are working, has a common set of duties:

- Take reasonable care for his or her own health and safety.
- Take reasonable care that his or her acts or omissions do not adversely affect the health and safety of other persons.
- Comply so far as the worker is reasonably able, with any reasonable instruction that is given by the person conducting the business or undertaking to allow the person to comply with the relevant legislation.
- Co-operate with any reasonable policy or procedure of the person conducting the business or undertaking relating to health or safety at the workplace that has been notified to workers.
- Identify and report risks and hazards.
- Use or wear appropriate personal protective equipment.
- Not intentionally misuse or cause damage to equipment.

**Being accountable**

Accountability is defined as *"being responsible to somebody or for something".*

In a work sense, accountability is about being true to your word and meeting all of your responsibilities. It is also about being true to yourself and your personal expectations of doing a good job. Accountability is an individual value. Real accountability cannot be forced; it must be voluntary.

**Honesty**

Be honest with yourself about your reasons and motivations for your actions. Be clear about the consequences and accept them graciously.

**Responsibility**

Once you have gotten a handle on being accountable to yourself, begin accepting responsibility when and where it is deserved. At the same time, do not be afraid to assign responsibility if it truly belongs to someone else. It can be hard to take the high road and be accountable for your actions, particularly if others around you don't choose the same path. It is not your place to preach or judge others, but you should act assertively and ask that they take responsibility for their actions.

**Assertiveness**

Assertiveness is behavior that allows a person to express honest feelings in a straightforward way and to exercise personal rights without changing the rights of others. Assertive people feel positive about themselves and others. They are willing to give others a chance to be reasonable before using less positive tactics. They want to openly discuss problems based on facts and needs. Assertion is based on respect for you and respect for the other person.

| Self-Check -1 | Written Test |
|---|---|

Activity

I. documents or information of Compliance documentation:

_____

_____

_____

_____

_____

_____

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-2 | Obtaining, interpreting and clarifying work instructions |
|---|---|

## 2.1.Work instructions

Work Instructions are documents that clearly and precisely describe the correct way to perform certain tasks. When planning any work you must take into account your duty of care obligations and the policy and procedures of your workplace. You must make sure your conduct is safe and does not place others at risk.

## 2.2.**Work instruction for Auxiliary operations**

Work instructions should provide employees with the following basic information:

**The purpose of the job:** the planning and preparing for mobile lighting setup and dewatering

**The work activity to be done and sequence of tasks:** activities such as installing, operating and recovering mobile lighting and dewatering equipment; and carrying out operator maintenance

**Hazard assessment:** For each step in the work task, list the potential hazards / risks that are reasonably foreseeable.

**Emergency requirements:** The person discovering an emergency is required to: Maintain the safety of themselves and others in the vicinity as a first priority, Evaluate the extent of the emergency, Take action to prevent further injury, Initiate emergency response at site level by making contacting with your immediate supervisor or the senior manager.

**PPE requirements:** List and use the types of Personal Protective Equipment that is required to be used whilst undertaking the task.

**Time frames:** Any work that is allocated to you or your team must be completed to the required standard and within the required time frame.

**Forms of instructions**

Work instructions can be received by you or your work team in several different ways. The most common ways of receiving work instructions in a mining or construction workplace are:

**Written documentation**

A written document means a document with text that provides information on an official work related matter. It may include reports, memos, letters, manuals, service standards and directives.

**Verbal instructions**

Verbal instructions are the instructions, directions and orders that are given to you through voice, i.e. the boss tells you what to do!

**Team meetings**

A team meeting is when the members of your work team are gathered together to receive instructions about the work tasks, report back on the team's progress on various jobs and to learn about what is happening in the immediate future on the work site.

**Plans / specifications**

All the drawings and documents detailing a job including the construction, mechanical and electrical drawings as well as a list of all the materials required. It would also include written instructions to the builder for materials, workers or team leader.

Work instructions should provide employees with the following basic information:

- The purpose of the job
- The work activity to be done and sequence of tasks
- Hazard assessment
- Emergency requirements, PPE requirements
- Time frames
- Priorities

**Confirmation and application of work instructions**

Confirmation of work instructions is an act of verifying or making certain that the documents clearly and precisely describe the correct way to perform certain tasks in the established manner. Application of work instructions is the action of putting the above mentioned instructions into operation.

**Carry Out Allocated Work**

In order to complete your tasks to the required standard and within the timeframe it is important that you know:

- The standards that must be reached.
- Which procedures are to be used
- How to use the required equipment or plant.
- How to complete the task.
- Without knowledge of each of these factors, it is difficult to complete the tasks.

**Work Procedures and Standards Documentation**

Common and relevant procedures and standards that need to be met will be widely available within the organization and could be included in induction documentation, employee/worker manuals, task or equipment directions and instructions. Pre-start checks / forms are a vital safety reporting measure because they can highlight issues before they have the potential to cause injury, damage or environmental impact or require costly maintenance. All vehicles, plant, machinery, tools, safety, PPE and emergency equipment must be check prior to use. Documentation related to work procedures and standards may include:

**prepare a Safe Operating Procedure**

Safe operating procedures should be written using plain English and must be set out in a concise, logical, step-by-step, easy-to-read format. The use of photos or diagrams may assist with this process.

Reference to the manufacturers or supplier's user manuals or information may be required to assist in providing accurate information.

**Procedures of auxiliary operation**

1. **Sequence of job steps**

Break down the task or operation into the basic steps to complete the work task and / or operate the item of plant / equipment. For example, what is done first, what is done next and so on.

2. **Potential hazards / risks**

For each step in the work task, list the potential hazards / risks that are reasonably foreseeable.

This may include, but is not limited to:

- Being struck by or contacted by anything, Striking against or contacting anything, Being caught in, on, under or between anything, Falling from height or being exposed to falling objects;
- Hazardous manual tasks, Being exposed to welding rays, fumes, light, electricity or other forms of energy, Being exposed to stored energy;
- Being exposed to hazardous chemicals

**3. Recommended control measures**

For each step in the work task, list the most appropriate risk control measure that will eliminate or minimize the risk to the person(s) completing the work task. For each potential hazard / risk, identify and list the steps of how the work task is to be completed, including what the operator(s) should or should not do to manage the level of risk. Specifically describe the safe operating procedure and precautions that must be taken for each step.

**4. Personal Protective Equipment (PPE)**

List the types of Personal Protective Equipment that is required to be used whilst undertaking the task.

**5. Perform the task**

Test the written procedure by carrying out the task in accordance with the documented safe operating procedure, completing the following checks:

- Inspect the task again
- Check the upstream and downstream tasks that may have an impact;
- Seek improvement to the work method, Consider all hazards at each step;
- Ensure understanding in the work group or an individual worker of the hazards associated with each step of the procedure and Reassess and modify the safe operating procedure, as required.

| Self-Check -2 | Written Test |
|---|---|

**Activity**

1. List and define the most common ways of receiving work instructions(6pts)

_____

_____

_____

2. What is work instructions three points.(3 points)

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-3 | Selecting resources and equipment |
|---|---|

### 3.1.Selecting tools and equipment

Regardless of the type of work to be done, you must have, choose, and use the correct tools in order to do your work quickly, accurately, and safely. Without the proper tools and the knowledge of how to use them, you waste time, reduce your efficiency, and may even injure yourself.Once you have confirmed your job requirements you need to choose the right equipment and attachments to get the job done.

When choosing equipment and attachments you need to think about:

- The task requirements, specifications and goals.
- The appropriateness of the equipment for the completion of the task.
- The characteristics, correct use, operating capacity and limitations of each item.
- The potential risks to yourself and others in the intended use of the equipment.

**Figure: Thining about to choose the right equipment**

## A.Hand tools

### 1. Wrenches

A wrench is a basic tool that is used to fasten or loosen bolt heads, nuts, studs, and pipes.

- **Open-end wrenches:** Solid, nonadjustable wrenches with openings in one or both ends usually they come in sets of from 6 to 10 wrenches, with sizes ranging from 5/16 to 1 inch.
- **Box wrenches:** Box wrenches are safer than open-end wrenches since there is less likelihood they will slip off the work.


**Figure: 4.2-wrench**

**2.Socket wrench:** The socket wrench is one of the most versatile wrenches in the toolbox. Basically, it consists of a handle and a socket-type wrench that can be attached to the handle.

**Figure: Socket wrench**

### 3.Union Nut Wrench

The adjustable union nut wrench is used to assemble and disassemble pipe union nuts.

**Figure: pipe wrench and pliers**

## 4.Hammers

Hammers, mallets, and sledges are used to apply a striking force.


\

**Figure: 4.5-Hammer**

### 5.Pipe cutters

Pipe cutters are used to cut pipe made of steel, brass, copper, wrought iron, or lead. Tube cutters are used to cut tubing made of iron, steel, brass, copper, or aluminum. The essential difference between pipe and tubing is that tubing has considerably thinner walls.

**Figure:pipe cutter**

### 6.screwdriver

A screwdriver is one of the most basic of hand tools. It is also the most frequently abused of all hand tools. It is designed for one function only—to drive and to remove screws.

Figure: Screw driver

**7.Pliers**

Pliers are used for various purposes, including:

- Tightening wire.
- Fixing wire.
- Gripping bolts to tighten with a spanner

Figure: pliers

**B.Power tools**

**1.Rotary hammers/drills** can perform heavy-duty tasks such as drilling and chiseling hard materials

Figure: Rotery hammer

## 2.Air Compressor

Equipment that converts power (using an electric motor, diesel or gasoline engine, etc.) into potential energy stored in pressurized air (i.e., compressed air). Used to fill tire, clean machineries etc.


Figure: Air compressor

**3.Hydraulic press**

It uses the hydraulic equivalent of a mechanical lever to generate a compressive force. Use to extract mechanical fittings such as gear, bearings etc.

**4.Hydraulic jack:** Is a device that uses force to left heavy loads

Figure: Hydraulic jack

**Protective equipment**

Approved eye protection (safety glasses with side shields, goggles, etc.) must be worn at all times when assigned any certain job classifications. It is important to check with your supervisor to assure compliance.

| Self-Check -3 | Written Test |
|---|---|

**Directions:** Answer all the questions listed below.

**Instruction one**: Match the following with their similarities from Column “B” to column “A”(10poinst)

| Answer | **A** | **B** | |
|---|---|---|---|
| ____ | Hydraulic jack | A | Plastic hammer |
| ____ | Rotary drills | B | Tightening wire |
| ____ | Pliers | C | left heavy loads |
| ____ | Wrenches | D | basic tool that is used to fasten or loosen bolt heads |
| ____ | Mallet | E | can perform heavy-duty tasks such as drilling and chiseling hard materials |

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-4 | Developing mobile lighting and dewatering plan |
|---|---|

Planning begins by asking the following questions about the work to be done: (what? where? who? how?) The answers are then used to decide when to employ the available resources of men, materials, machines, methods and money.

The following five steps are typically carried out during the process of developing a useful work plan:

1. Identify specific action steps that need to be done
2. Define “who” will be responsible for each action step
3. Determine when each action step will take place
4. Estimate resources required for each action step
5. Revisit and revise the work plan on a regular basis

### 4.1.Dewatering in Mines

Dewatering of mines is of great importance. If it wouldn’t be done the mine would be filled with groundwater, making mining it impossible without developing submerged mining methods. Dewatering is also important in safety and economical aspects. The water pressure can make the walls of the mine unstable and thus increasing the risk of collapse, especially in open pit mines.

### 5.2. Dewatering plan

This Dewatering Plan describes:

- identification of required pump type and capacity
- discharge points and routes configuration
- layout and resources required for lines and fittings
- obtaining and transportation of equipment/plant and materials to the appropriate sites,
- identification and satisfaction of environmental requirements

**identification of required pump type and capacity**

Basically, there are two general classifications of pumps dynamic and positive displacement. These classifications are based on the method the pump uses to impart motion and pressure to the fluid.

Dynamic pumps, which include centrifugal and vertical turbine pumps, are used for most water distribution system applications. Positive-displacement pumps, which include rotary and reciprocating pumps, are most commonly used in water treatment plants for chemical metering and pumping sludge.

**Common Types of Dewatering:**

- Positive Dewatering (Deep Wells, Well points)
- Passive Dewatering (Sump Pumping)
- Trench excavation, Shaft construction, Pond dewatering, Creek / Stream Bypas

**Some of the factors should be consider in selecting dewatering pumps:**

- Reliability
- Operating power requirement
- Availability of repair parts
- Economical installation and operation
- Capacity, Flow - Must be given to establish line size.
- Total Lift (Static Discharge Lift plus Static Suction Lift) - gravity resistance determines pump strength. (High Head)
- Distance - Determines if line size should be increased to reduce friction loss.
- Environmental Considerations Impacts on Site (ie. Space, noise, etc.)

### 4.3. Plan for Mobile lighting

Mobile lighting Plan describes:

- identification of required Mobile lighting type and capacity
- obtaining and transportation of equipment/plant and materials to the appropriate sites,
- identification and satisfaction of environmental requirements

## 4.4. importance of lighting at work

Lighting at work is very important to the health and safety of everyone using the workplace. The quicker and easier it is to see a hazard, the more easily it is avoided. The types of hazard present at work therefore determine the lighting requirements for safe operation. **Lighting in the workplace**: Good practice To ensure lighting is suitable and sufficient, several aspects of lighting and the workplace need to be considered. These include:

- lighting design
- type of work
- The work environment, health aspects; emergency lighting.

| Self-Check -4 | Written Test |
|---|---|


I. List Contents of dewatering plan:

_____

_____

_____

_____

_____

_____

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

Name: _____ Date: _____

| Information Sheet-5 | Preparing,barricading sumps,lighting positions Identifying and obtaining signage requirements |
|---|---|

## 5.1. Preparing and barricading sumps and lighting positions

### a) Lighting

The Quarries Regulations 1999 Regulation 23 and guidance requires that there should be adequate lighting of site locations and vehicles at all times to enable all persons to work safely and in safety. Adequate lighting should be provided to all areas and especially to those areas used in hours of darkness or in poor visibility or diminished lighting conditions. As a minimum, lighting should be provided for junctions, around plant and buildings, pedestrian routes and areas where loading/unloading is to be carried out.

**Figure: Lighting on site**

**b) Demarcation requirements**

Wherever possible, physical demarcation should be used to separate a hazard or hazardous situation and/or work area from other activities. If physical demarcation is not practicable, signage and warnings must be in place to warn all personnel who might enter the area. Approved demarcation tape may be wrapped around a physical barrier to identify the level of control.

Where demarcation is used to prevent a person falling from one level to another, hard barricading such as scaffold tube, concrete blocks, or temporary fencing should be used. Trestles may be used for excavations where risk assessment deems the level of risk as acceptable (typically shallow excavations).

Demarcation shall not replace the requirement for more permanent fixtures to separate personnel from hazards, for example guards on moving equipment.

Demarcation shall be maintained for the duration it is in place by either the work crew accountable for the work area, or the person accountable to resolve a reported hazard. When erecting signage, the following shall be considered:

**Visibility** – Signs should be located so the message is legible, they attract attention and are clearly visible.

**Placement of signs** – Signs should be mounted as close as practicable to the observer's line of sight in the vertical plane.

**Regulatory and hazard signs** – These should be so sited in relation to a particular hazard as to allow a person ample time after first viewing the sign to avoid the hazard. The distance will vary, e.g. signs warning against the touching of switches or other electrical equipment should be placed close to the equipment, whereas signs used in plant yards or on construction work should be placed sufficiently in advance of the hazard to permit the warning to be perceived before the hazard is reached.

**Signs on moveable objects** – Signs should not be placed on moveable objects such as doors, windows or racks where a change in position would void the purpose of the sign or cause it to be out of sight. This does not apply to signs intended to be portable or moveable.

**Illumination of signs** – External or internal illumination of signs should be considered where the general lighting, either natural or artificial, does not provide for adequate visibility of signs. Glare from lighting should be avoided.

**Number of signs** – Care should be taken when considering the placement of several signs close together. The result may be that there is so much information in one place that little or none is absorbed, or the visual effect may be so confusing as to make it difficult to distinguish individual messages.

### c) Signage and Traffic Cones

Where deemed appropriate by risk assessment, a sign or traffic cones may be placed to warn a person of a hazard, or task being done. Examples of signs include 'Hot Works in Progress', and 'Gardening in Progress'.

**Approved demarcation tapes and retractable demarcation barriers**

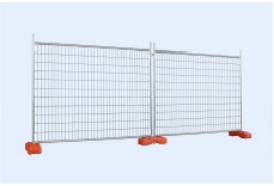
| Tape | Purpose | Condition of entry and other requirements | Examples |
|---|---|---|---|
| **Yellow – Cautionary Access**   | **Caution tape** shall be used to demarcate areas that require personnel to be warned of identified hazards prior to entry.<br>Demarcation tape must be marked with "CAUTION". | Persons requiring access must make sure they familiarise themselves with the hazards, risk assess the situation and providing it safe to do so may proceed into the area.<br>Where "CAUTION" retractable demarcation barriers are installed to control stockyard access, an Information Tag is not required. | Liquid spills, work areas, temporary lay down area. |
| **Blue and White – Restricted Access**   | **Restricted Access tape** shall be used to demarcate areas where access is restricted to persons directly involved in the work area or those persons who have been directly authorised by the person in charge of the work area as detailed on the Information Tag.<br>Demarcation tape must be marked with "RESTRICTED ACCESS". | Only authorised persons may access an area or equipment that has been demarcated with Restricted Access tape. Where a JHA exists a person must sign on.<br>Barriers and signage shall be arranged so that the work area is clearly defined and made inaccessible to unauthorised personnel. | Live works or commissioning , belt-change out areas. |

| Tape | Purpose | Condition of entry and other requirements | Examples |
|---|---|---|---|
| **Red and White – No Access**<br>  | **Danger tape** shall be used to demarcate areas and/or equipment where there is an immediate threat to people, equipment and/or the environment.<br><br>Demarcation tape must be marked with "DANGER" or "DANGER NO ENTRY". | Personnel shall **not** enter or work within an area that is demarcated with Danger Tape. | Unsupervised unprotected edges, drop zones, contaminated sites. |
| **White - High Voltage Access Permit in Place**<br>  | **High Voltage Access tape** shall be used by Electrical personnel to demarcate a work area where a High Voltage Access Permit is in place.<br><br>Demarcation tape must be marked with "HIGH VOLTAGE ACCESS PERMIT IN PLACE". | Only authorised persons may access an area or equipment that has been demarcated with High Voltage Access tape.<br><br>Demarcation and signage shall be arranged so that the work area associated with a High Voltage Access Permit is clearly defined and made inaccessible to unauthorised persons. There shall be only one entry point to the work area. The High Voltage Access Permit shall be displayed with High Voltage Lockout Station at the entry point.<br><br>Demarcation shall consist of a combination of the following:<br>• Permanent structures such as walls, fences and gates | Inspection of high voltage enclosures or slip rings. |

## Approved barricades

| Barricades | Details / Requirements / Uses |
|---|---|
| **Star Pickets**  | • Set at a maximum interval of 2 meters.<br>• Must have protective capping.<br>• Secured firmly in the ground (if penetrating more than 150mm an Excavation Permit is required).<br>• Must be used in conjunction with demarcation tape and information tag. |
| **Mesh Barriers**  | • Mesh barriers can be erected between existing structures or framework.<br>• Can be used with star pickets and/or barricade stands.<br>• Mesh shall be installed with the top edge at a height between 900mm -1200mm.<br>• Must be used in conjunction with demarcation tape and information tag. |
| **Safety Cone and Double Sided Floor Stand**  | • Plastic double sided stands or safety cones are used to identify ground related hazards where caution is required, for example, *where spills have occurred or cleaning is in progress.*<br>• Cones and stands shall be placed in a prominent position. |
| **Traffic Cones**  | • The maximum distance between warning cones should be 1.5 meters.<br>• Used to demarcate areas where work is taking place on roads and ground, for example, *cleaning up spills, survey marking, around mobile plant.*<br>• Persons requiring access must familiarise themselves with the hazards, risk assess the situation, and only proceed into the area if it is safe to do so. |

| Barricades | Details / Requirements / Uses |
|---|---|
| **Scaffold Tube**  | • Scaffold tubing can be used to demarcate around an open sump, pit or fall zone.<br>• Scaffold must be erected by a licenced scaffolder.<br>• Scaffold must be used in conjunction with demarcation tape and information tag or signage. |
| **Trestle**  | • Trestles can be used to demarcate live areas within a stockyard in conjunction with signage.<br>• Trestles can be used as a form of protection for excavations where a risk assessment deems the level of risk as acceptable (typically shallow excavations). |
| **Concrete Block**  **Water/Sand Filled Block**  | • These styles of hard barricading are designed to prevent access and protect people from hazardous processes, equipment and traffic areas.<br>• Chains (plastic and metal) can be used to connect hard barricades together to make a longer barricade.<br>• Water/sand filled blocks can be connected together to demarcate long term work areas.<br>• Concrete blocks must have an approved lifting point or slots to fit forklift tynes.<br>• Used primarily to demarcate long term work areas, for example a *laydown yard.* |

| Barricades | Details / Requirements / Uses |
|---|---|
| **Barricade Stand / Orange Bollard**  | • Barricade stands are used to demarcate areas where there is no structure to fix demarcation tape or chains.<br>• Can be used where the barricade needs to be moved to allow mobile plant and equipment into the demarcated area.<br>• Used in conjunction with demarcation tape and information tag. |
| **Temporary Fence**  | • Temporary fencing is used to demarcate areas where there is no structure to fix demarcation tape or chains.<br>• Used in conjunction with demarcation tape and information tag. |

## 5.2.Identifying and obtaining signage requirements

a) **Safety Signage Requirements**

Safety signs are erected to warn workers or the public of specific hazards and to communicate necessary precautionary measures and emergency actions. Safety signage, is required for:

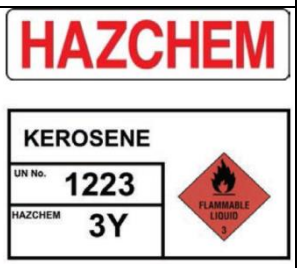
- construction sites,confined spaces,asbestos.
- hazardous areas; hazardous chemicals.
- site specific Personal Protective Equipment (PPE) requirements.
- fire protection equipment.
- Emergency and first aid information.
- emergency eyewash shower.
- traffic management and pedestrian control.

**b) Signage identification and Use**

Safety signage is classified and shall be used according to their function as follows:

| 1.**Regulatory Signs** – Signs containing instructions that if ignored could either be an offence at law, or a breach of site safety rules, safety procedures or other directions. | | |
|---|---|---|
| **Type** | **use** | **Example** |
| **site signage** | Any mining project must be identified with signage. At a minimum, the sign must:<br>• Identify the mining operator name and telephone contact numbers<br>• Identify the location of the site office<br>. | Company logo |
| **Mandatory Signs** | Signs that specify that an instruction MUST be carried out. Symbols (or pictograms) are white on a blue circular background and indicate the minimum standard of compliance required for the workplace where it is displayed. The sign's wording is in black lettering on the white background. Multiple symbols may be on the sign. |  |
| **Prohibition Signs** | Signs that specify behaviour or actions, which are not permitted. The round shape with a slash should be depicted in red over the action symbol in black. The sign's wording is in black lettering on the white background. |  |

| | | |
|---|---|---|
| **Restriction Signs** | Signs that place a numerical or other defined limit on an activity. The most common signs are speed restriction signs. The signs have a symbolic Red circle shape with black writing or symbol on it and may also be on the roadway surface. |  |
| **Hazard Signs** – Signs advising of hazards. | | |
| **Danger Signs** | Signs warning of a particular hazard or hazardous condition that is likely to be life-threatening.<br><br>(The word 'DANGER' shall be in white featured inside a red ellipse inside black rectangle. The sign's wording shall be in black lettering on the white background.) |  |
| **Warning Signs** | Signs warning of a hazard or hazardous condition that is **not** likely to be life-threatening.<br><br>(The hazard symbol shall be black on a yellow background and a triangle should be depicted around the hazard symbol. The sign's wording shall be in black lettering on the yellow background.) |  |
| 3.**Emergency Information Signs** | | |
| **Muster Point, First Aid Locations, etc** | Signs indicating the location of, or directions to, emergency related facilities such as exits, safety equipment or first aid facilities.<br><br>(They feature a white symbol and/or wording |  |

| | | |
|---|---|---|
| | on a green background.) | |
| **4.Fire Signs** | | |
| **Fire-fighting Equipment Locations, etc** | Signs advising the location of the alarms and fire-fighting facilities.<br><br>(Fire signs shall comprise a red rectangle with white symbol and/or wording.) |  |
| 1.**Hazardous Chemicals Placards** | | |
| **Placards** | Placards alert the emergency services and other persons to the presence of hazardous chemicals and provide information about them. |  |

## 5.3.Symbol and Hazard Pictorials Definitions

| | | | | |
|---|---|---|---|---|
|  Read the operator's manual |  Electrocution hazard |   Stop engine |  Earth ground |  Electrocution hazard |
|  Maintain required clearance |  Explosion / Burn hazard |  Disconnect battery Read the service manual |  Crush hazard |  Keep away from moving parts |
|  Keep away from moving parts |  Stay clear of belts and fan |  Burn hazard |  Explosion / Burn hazard |  Corrosive acid. |
|  Explosion hazard |  Do not use ether or other high energy starting aids on machines equipped with glow plugs. |  No smoking |  No flame |  No flame |


CAUTION
WET FLOOR
CAUTION
WATCH YOUR STEP
CAUTION
STAIRWAYS
CAUTION
WATCH YOUR STEP

| Self-Check -5 | Written Test |
|---|---|

**Directions:** Answer all the questions listed below.

**Part one Instruction one**: Match the following signage from Column “B” to column “A”(8points)

| Answer | **A** | **B** | |
|---|---|---|---|
| ____ | First aid | A |  |
| ____ | Fire ext | B |  |
| ____ | Prohibition Signs | c |  |
| ____ | Danger | D |  |

**Part two Instruction one**: Match the following signage from Column "B" to column "A"(8points)

| Answer | **A** | **B** | |
|---|---|---|---|
| ____ | Traffic cone | A | Lay down yard |
| ____ | Scaffold tube | B | Where work is taking place on road |
| ____ | Concrete block | c | Ground related hazards |
| ____ | Floor stand safety | D | Demarcate open sump |

***Note:*** **Satisfactory rating – 10 points** **Unsatisfactory - below 8 points**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-6 | Coordinating and transporting pump, lines, fittings |
|---|---|

### 6.1. Types of pipe lines

The three types of lines used in systems are pipe (rigid), tubing and hose (flexible). A number of factors are considered when the type of line is selected for a particular fluid system. These factors include the type of fluid, the required system pressure, and the location of the system.

**Selection of pipes and tubing**

The material, Id, and wall thickness are the three primary considerations in the selection of lines for a particular fluid power system.

**Sump Dewatering**

Water directed by drains and ditches to a point where it collects in a sump, is usually pumped up the pit wall using high pressure centrifugal pumps. The use of hydraulically efficient, high quality layflat hose with low friction loss will reduce the number of pumps required to achieve the desired flow and head. This results in increased efficiency and cost savings for the mine.

Flexible Pipelines has extensive breadth and depth of experience in manufacturing flexible rising main systems to the world of mine dewatering operations.

**Figure: Dewatering hose installation**

Dewatering applications are:

- Pumped wells or deep sumps inside the pit
- Pumped wells outside the pit
- Free flowing drill holes inside the pit, the inflow being collected and pumped from one or more sumps.

**Well master – Flexible Rising Main System**

Well master is the Industry Standard Flexible Rising Main designed for use with electric submersible pumps in all types of ground water borehole extraction and well monitoring operations. Key features & benefits:

- Lightweight for ease of use, Rapid installation & retrieval, Single long length installation
- Easy to store and transport
- Elimination of overhead hazards and working under suspending loads during installation.

**Well master Fittings**

Well master is available with a range of unique, custom designed, high security couplings. They are reusable, field-fit table and manufactured from 316 stainless steel. A full range of installation accessories is also available.

**Figure: Hose holder**

**Installation Methods**

One of the key benefits of using Well master is the ability to rapidly install and retrieve the hose from boreholes. This can be achieved using a number of methods depending upon operating conditions and technical requirements.

**Crane Installation**

Installation by crane is the usual method of delivering Well master to the borehole where access is limited.

**Specialist Trailer Installation**

The use of a specialist installation trailer removes the danger of overhead hazards and working under suspending loads during installation and retrieval of Well master.

**Vehicle Installation**

Vehicle installation allows deployment to take place at ground level using the Angus wellhead roller. Well master can be completely installed at ground level without the need for operators to work under suspended loads.


**Figure: Dewatering installation methods**

| Self-Check -6 | Written Test |
|---|---|


I. List Dewatering applications:

_____

_____

_____

_____

_____

_____

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-7 | Identifying, addressing and reporting environmental issues |
|---|---|

## 7.1. Environmental Protection issue

Environmental protection can be defined as the prevention of unwanted changes to ecosystems and their constituent parts. This includes the protection of ecosystems and their constituent parts from changes associated with human activities; and the prevention of unwanted natural changes to ecosystems and their constituent parts.

## 7.2.Environmental Protection Requirements

Environmental protection requirements are part of every worksite. Make sure you check with your supervisor about what environmental issues need to be managed during your work. All environmental details should be listed in an 'Environmental Management Plan' for the site. It can include details for:

**a)Waste management:**

- Non-hazardous solid waste should be collected for recycling or disposal at an approved sanitary landfill.
- Hazardous waste should be handled by specialized providers (in accordance with regulatory permits) of hazardous waste management facilities specifically designed and operated for this purpose.

**b)Water quality protection:** Recommended practices to manage impacts to water quality include:

- Efficient oil and grease traps or sumps should be installed and maintained at refueling facilities, workshops, fuel storage depots, and containment areas, and spill kits should be available with emergency response plans;

c) **Noise control:** Where necessary, noise emissions should be minimized and controlled through the application of techniques which may include:

- Implementation of enclosure and cladding of processing plants

**d)Vibration control:** The most significant vibrations are usually associated with blasting activities

**e)Dust management:** control Dust suppression techniques (e.g. wetting down, use of all weather surfaces, use of agglomeration additives) for roads and work areas, optimization of traffic patterns, and reduction of travel speeds;Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures

**f)Consider the environment when cleaning equipment.**

- Contaminants into waterways
- Wastage of water
- Dispose of hazardous waste properly. Examples of potentially hazardous waste are used motor oil, fuel and fuel filters.

**g)Controlling of Water pollution**

Mining activities will almost always have an impact on water environment through direct or indirect contact of either the surface or groundwater. Therefore, industries must invest in ensuring that water is not contaminated or where contamination does occur, they invest in treatment or containment within appropriate reservoirs, pipelines, canals or other storage facilities. Mining industries must encourage adopting practices and technologies which are environment friendly. The practice that must be followed by the industries is as follows as highlighted by;

Resource conservation and management by scientific way with minimum waste;

Finding substitutes of the mineral widely used at present;

- Proper recycling of used metals.
- Adoption of environmental friendly technologies.
- Efficient and efficient use of energy.
- Forestation and preservation of biological diversity.
- Government should not permit mining operation in ecologically sensitive areas.
- Follow Acts, Rules and Regulation made by Ministry of Environment, Forest and climate change
- Waste food material, paper, decaying vegetables and plastics should not be thrown into the open or underground drains.

- Effluents with high organic content and slurries from distilleries and industries should be sent to biogas plants for generation of energy.
- Oil slicks should be skimmed off from the surface with oil separators or suction devices. Sawdust may be spread over oil slicks to absorb the oil components and then the material is incinerated.

**i)Control of Air Pollution**

The following should be done to manage and control air pollution

- Use of better designed equipment and smokeless fuels, hearths in industries and at home.
- Automobiles should be properly maintained and adhere to recent emission-control standards.
- More trees should be planted along road side and houses.
- Renewable energy sources, such as wind, solar energy, ocean currents, should fulfil energy needs.
- Tall chimneys should be installed for vertical dispersion of pollutants.

**j)Control of land Pollution**

- Encourage organic farming
- Proper garbage disposal
- Recycle garbage
- Reduce use of herbicides and pesticides
- Over packed items
- Efficient utilization of resources and reducing wage

| Self-Check -7 | Written Test |
|---|---|

Activity

**Directions:** Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the advantage of environmental protection requirements?3points
2. Mention the environmental protection requirements? 3points
3. List the mechanisms Control of land Pollution (at least 4) ? 4points

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-8 | Selecting and wearing personal protective equipment |
|---|---|

### 8.1.Selecting and wearing personal protective equipment

Some aspects of your work may require you to wear personal protective equipment (PPE). PPE is clothing and equipment designed to protect workers from injury or even death. PPE is provided by your workplace and you should use PPE correctly to protect your own health and safety.

### a)Select Personal Protective Equipment (PPE)

All personal protective equipment is to be selected based upon the hazards identified during the risk assessment process of the activity to be undertaken. Personal Protective Equipment shall be fitted properly, be comfortable and provide the proper protection to the wearer. PPE that is not properly fitted to the individual worker is a hazard and will not provide the desired level of protection

Fig personal protective equipment

| **Follow safe work procedures and wear Personal Protection Equipment (PPE) to help avoid injury.** | |
|---|---|
| **Eye Protection**<br><br>Wear safety glasses at all times while breaking or hammering rock, core splitting, blasting or when visiting mining operations.<br><br>Wear safety glasses or goggles when handling chemicals | **safety glass**<br><br>  |
| **Hearing Protection**<br><br>Noise level assessments must be conducted to | **Ear protector** |

| | |
|---|---|
| determine the level of hearing protection required (s. 68 (2) of the OHS Regulations). Noise exposure to more than 85 dB over an eight hour period is not permissible and prolonged exposure may permanently damage a worker's hearing |  |
| **Protective Headgear**<br><br>When on drill sites and mine sites, approved CSA Type II hard hats shall be worn. A comfortable fit is necessary. Painting, piercing, or altering a hard hat can weaken it and is not permitted. | **Helmet**<br><br>  <br>Helmet |
| **Gloves**<br><br>Gloves protect the hands from temperature extremes, corrosive materials, chemicals and cuts and scrapes. Gloves must properly fit the wearer so as not to create additional hazards. | **Glove**<br><br>  |
| **Footwear**<br><br>Safety footwear is designed to protect a worker's feet against injuries such as impact, compression, and puncture (s.80 (1) of the OHS Regulations). | **Safety shoe**<br><br>  |
| **Respiratory Protection** | **Mouth and nose Mask** |

| | |
|---|---|
| Various fumes and dusts may be produced and may have detrimental effects when inhaled. The proper respiratory protection equipment is chosen based on the hazard. |   |
| **Skin protection**<br><br>Protective suits (chemical resistant full body aprons, full length gloves, and full face shield) while handling acids and corrosive materials. | **Apron**<br><br>  |

| Self-Check -8 | Written Test |
|---|---|

**Identify the PPE that would be most suitable for protecting the health and safety of the employee.**

| Hazard | PPE |
|---|---|
| | |
| | |
| | |
| | |

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-9 | Conducting pre-start checks for equipment |
|---|---|

## 9.1. Pre-start check for equipment

Refer to the Operator's Manual for complete pre-start check instructions. Always read, understand, and follow the procedures in the Operator's Manual when checking or operating an equipment or machine. The following content sections of manufacturer's machine operational manual may help you to check equipments:

- Description and specifications
- Operating instructions
- Maintenance Instructions
- As-built drawings
- Support equipment (accessory)
- Bill of Material

**Material Specification Template**

| No | Equipment or machine name | | | | | |
|---|---|---|---|---|---|---|
| | Part number | material | specification | unit | Quantity | remark |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |

**9.2.Pre-start check for mobile lighting:** equipments should be checked based on specification for example:

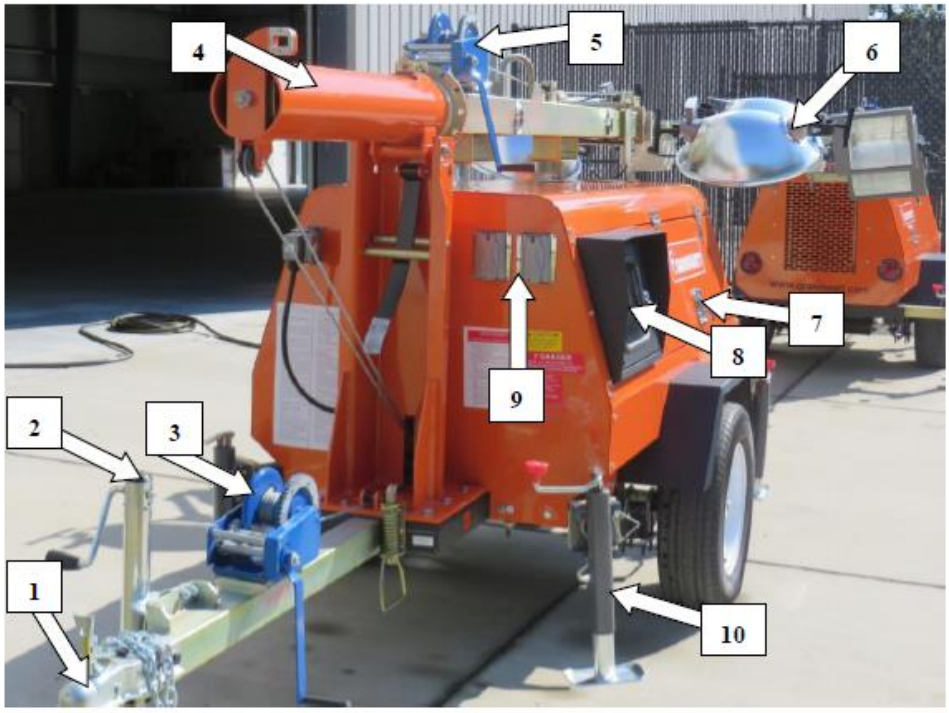
1. Mast components
2. Electrical components
3. Power source and others

**a)mobile lighting powered by diesel**


**Figure: Mobile lighting tower**

**b) Material specification**

**External construction**




| Items | Description | Items | Description |
|---|---|---|---|
| 1 | Coupler | 2 | Tongue wheel |
| 3 | Upright -Winch handle | 4 | Telescopic mast |
| 5 | Extend-winch handle | 6 | Floodlight （optional） |
| 7 | Door engine inspection x 2 | 8 | Command panel |
| 9 | External electrical sockets | 10 | Stabilizer legs x 4 |

Figure: mobile lighting parts

c)**Command panel analog**

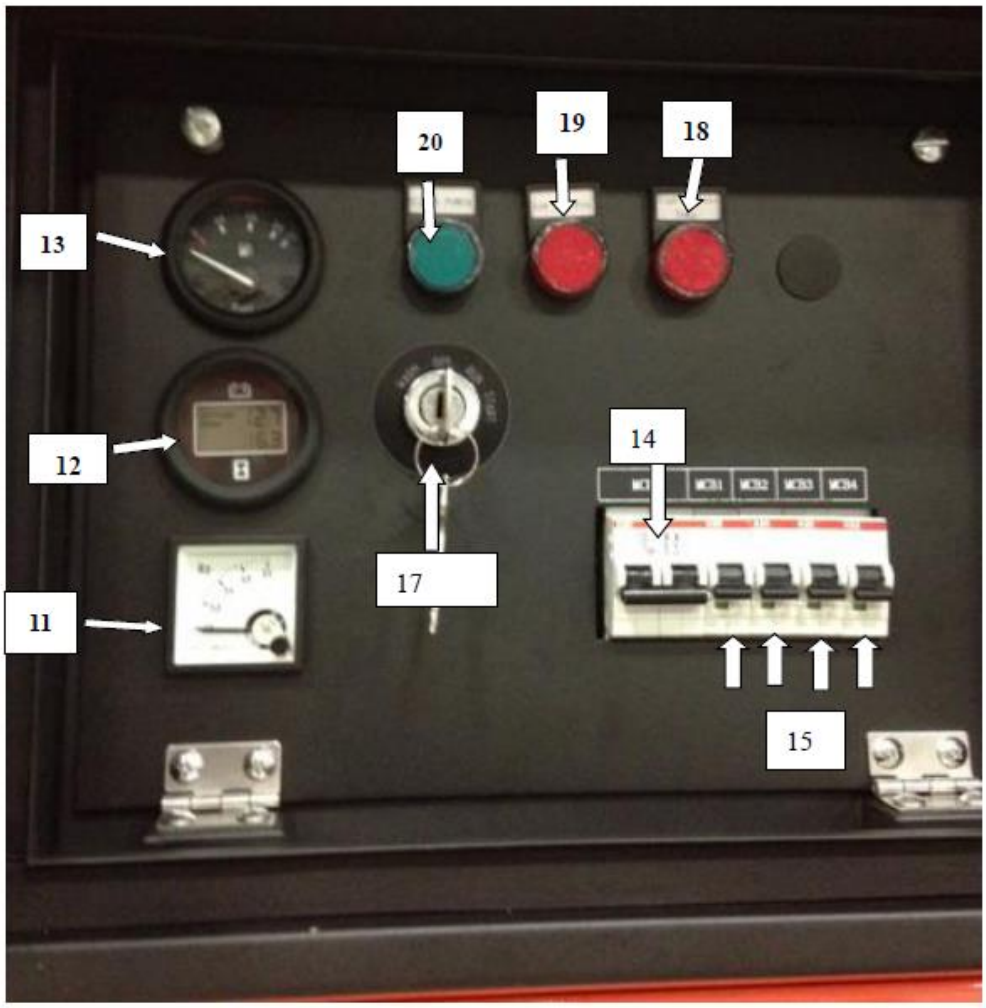



**Figure 1**

| Items | Description | Items | Description |
|---|---|---|---|
| 11 | Frequency Meter (Hz) | 12 | Hour Meter/Battery gauge |
| 13 | Fuel Gauge | 14 | Main circuit |
| 15 | Floodlight Circuit Breakers | | |
| 17 | Ignition switch | 18 | Low Oil Pressure |
| 19 | High Coolant Temp | 20 | Voltage Indicator |

Figure: - mobile lighting command panel

## d)Command panel (Digital)

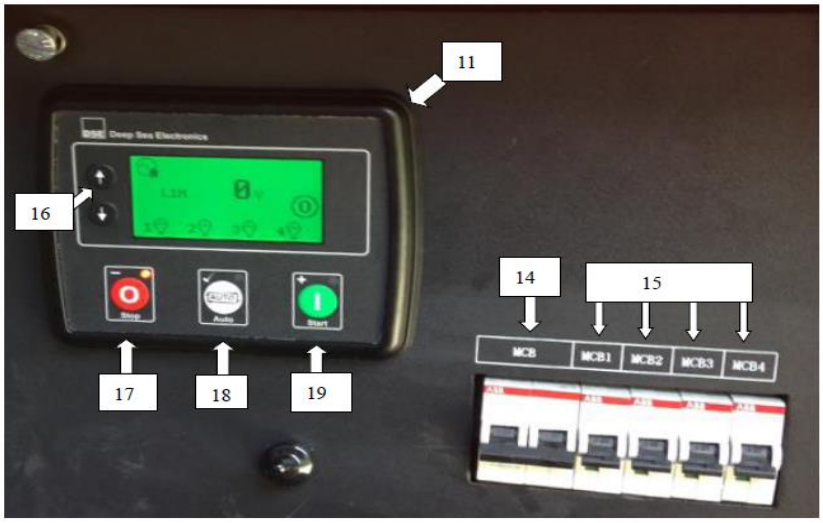
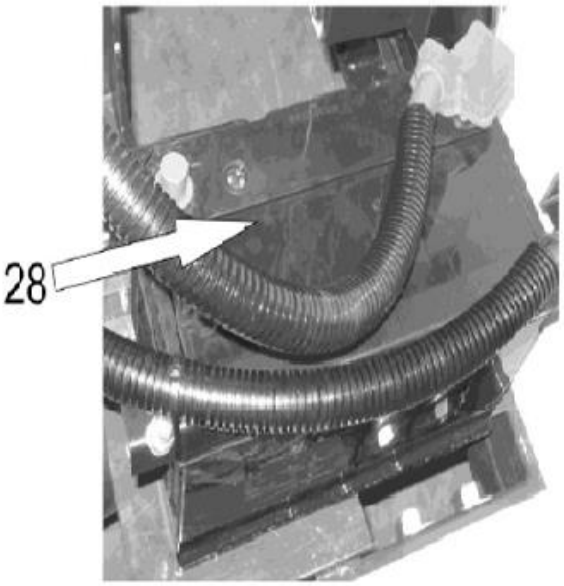



**Figure 2**

| Items | Description | Items | Description |
|---|---|---|---|
| 11 | Deep Sea Controller | 12 | |
| 13 | | 14 | Main circuit |
| 15 | Floodlight Circuit Breakers | 16 | Scroll Up/Down |
| 17 | Stop/- | 18 | Auto Start/Enter |
| 19 | Manual Start/+ | 20 | |

Figure: mobile lighting command panel (digital)

## e)Battery and Fuel tank




| Items | Description |
|---|---|
| 28 | 36AH 12V battery |


| Items | Description |
|---|---|
| 30 | Lockable Fuel Cap |

Figure: mobile lighting Battery and fuel tank

| Self-Check -9 | Written Test |
|---|---|

List mobile lighting components and their function (10 point)

| no | components | function |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-10 | Adhering emergency procedures |
|---|---|

## 10.1. Emergency Situations

**a)Emergency:** It can be any event that requires immediate attention such as an evacuation or a rescue. Emergencies can be the result of a work incident or can be a natural or manmade disaster (severe weather or sabotage). Some examples include:

- Fire
- spills
- Emergency evacuation.
- Incident or injury, Electrical shock, falls.
- Fumes.
- Explosions
- Emergencies resulting from working in remote locations
- natural disasters; e.g., ice storms, tornados or severe storms, floods

OSH guidelines and policies are put in place to try and prevent emergencies. However, sudden or unexpected incidents do occur which can result in serious injury or even death. You need to be aware that emergencies can and do happen, and you need to know how to handle them. Important information, eg phone numbers for emergency services should be put up near telephones, and evacuation procedures should be posted in a prominent place where all staff members can see them.

**b)Fire**

In the event of fire, a three-step procedure should be adopted.

1. Call 000 for the fire service.
2. Determine what type of fire it is, eg electrical, liquid, wood/paper.
3. Use a fire extinguisher.

**c)First aid**

First aid facilities should be available which are appropriate for the types of accidents which may occur.It is recommended that all employees have a current Senior First Aid Certificate. A member of staff should be appointed as first aid officer and this person should take charge in the event of an emergency and be trained in the use of the first aid kit.

**d)Ensuring a safe working environment**

There should be an ongoing program of staff training in matters relating to health and safety. This is just as important as training in the use of equipment and techniques. Every member of staff should have a perfect understanding of what is required of them when it comes to safe work practices. Employers should make sure that employees are supplied with the necessary safety equipment and barrier clothing, and that these are used properly.

| Self-Check -10 | Written Test |
|---|---|

**Activity**

I. List example of fire emergency (Dewatering site)

_____

_____

_____

_____

***Note:*** **Satisfactory rating – 3 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

| LG #22 | LO #2- Install, operate and recover mobile lighting and dewatering equipment |
|---|---|

**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Resolving coordination requirements
- Accessing and applying safety requirements and procedures
- Installing and dismantling mobile lighting and dewatering system
- Carrying out pre-start, start-up and shutdown procedures
- Monitoring and adjusting dewatering system performance
- Recognizing, documenting and reporting hazardous and emergency situations
- Confirming whether the discharged water is dispersed as required
- Completing work
- Recovering the dewatering system
- Clearing work area and disposing/recycling materials
- Testing lights start-up and shutdown
- Activating lights
- Enhancing visibility lighting position

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, **upon completion of this learning guide, you will be able to**:

- Resolve coordination requirements
- Access and apply safety requirements and procedures
- Install and dismantle mobile lighting and dewatering system
- Carry out pre-start, start-up and shutdown procedures
- Monitor and adjust dewatering system performance
- Recognize, documente and report hazardous and emergency situations
- Confirm whether the discharged water is dispersed as required
- Complete work

- Recover the dewatering system
- Cleare work area and dispose/recycle materials
- Test lights start-up and shutdown
- Activate lights
- Enhance visibility lighting position

**Learning Instructions:**

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If your performance is satisfactory proceed to the next learning guide,

| Information Sheet-1 | Resolving coordination requirements |
|---|---|

## 1.1.Resolving coordination requirements

a)**Work instructions**

When planning any work you must take into account your duty of care obligations and the policy and procedures of your workplace. You must make sure your conduct is safe and does not place others at risk.

The task requirements will be outlined in your work instructions for that job. Generally these instructions will be provided by your immediate supervisor, the team leader, site manager or other person in direct authority. These instructions may include:

- planning and preparing mobile lighting setup and dewatering activities
- installing, operating and recovering mobile lighting and dewatering equipment and
- carrying out operator maintenance

**b)Forms of instruction**

Work instructions can be received by you or your work team in several different ways. The most common ways of receiving work instructions in a mining or construction workplace are:

**1.Written documentation**

A written document means a document with text that provides information on an official work related matter. It may include reports, memos, letters, manuals, service standards and directives.

2.**Verbal instructions**

Verbal instructions are the instructions, directions and orders that are given to you through voice, i.e.t he boss tell you what to do!

**3.Team meetings**

A team meeting is when the members of your work team are gathered together to receive instructions about the work tasks, report back on the team's progress on various jobs and to learn about what is happening in the immediate future on the work site.

All the drawings and documents detailing a job including the construction, mechanical and electrical drawings as well as a list of all the materials required. It would also include written instructions to the builder for materials, workers or team leader.

Work instructions should provide employees with the following basic information:

- The purpose of the job, The work activity to be done and sequence of tasks, Hazard assessment
- Emergency requirements, PPE requirements, Time frames, Prioritie

When you understand the task, you can create a plan. A job plan must cover all parts of the work and should:

- Break down the job into individual tasks
- Identify the equipment needed to perform each task
- Define the safety requirements for each task
- Set a timeframe for job completion

By planning your job ahead you will make sure that all resources you need to complete the job safely and on time are available.

**c)Inspection of work area**

There are various methods of preparing a work plan that will ensure compliance with site procedures and safe work outcomes.

**1.STOP**

Begin the Job plan with risk assessment. Ask yourself five important questions:

How can I be injured? How can others be injured? How can equipment be damaged?

What is the safest, most productive, highest-quality way to accomplish the task?

What information do I need?

Consider the following: surroundings/ environment, equipment/tools/parts, skills required, assistance needed, changes from previous experience, and procedures/job safety analyses (JSAs)/regulations.

**2.LOOK**

After stopping, the employee must ***look*** for energies or specific hazards created through the interaction of the human, the machine and the environment. This review includes ergonomic and health hazards in the workplace that have the potential to cause accidents and injuries.

**3.ASSESS**

The employee must then ***assess*** the risks and rate them according to the risk matrix.

Based on the hazards identified in the **LOOK** phase, the employee assesses the consequences and the likelihood of their occurrence and determines the level of risk to which he or she will be exposed in performing the task.

**4.MANAGE**

• Reducing energy - electrical; mechanical (motion, spring, etc.); chemical; thermal; gravity; noise; etc. Isolation and guarding - mechanical, PPE. Controls include the elimination of the hazard; substitution or redesign; training, planning and management; and guarding or PPE.

**Sequence of work tasks**

The order in which you perform your tasks will determine how efficiently your job will be carried out. If you use a logical and practical process in planning and preparing for work it will help reduce the time taken to complete the task. The following may be useful when planning a job:

1. Create a checklist for your job
2. Jot down a list of tasks for your job
3. Complete a job plan table for your work
4. Carry out the job plan

When planning your work, all tools and materials required should be prepared and delivered to the work area and be ready to use at each stage of the job.

Any permits, licenses or approval that are required should be obtained before any work starts. If this is not done it might lead to downtime later.

As part of the planning process you may need to liaise with others in the workgroup if they are required to perform services in order to complete the task. Early planning also helps them to plan their time and gives you a better chance of a smooth operation.

**Documents and reports**

Some jobs require paperwork to be done as part of the organization's requirements. The types of documents used to collect this information might include:

Shift reports, Log books, Timesheets, Pre-start checklists or Maintenance checklists

**Resolving Problems**

There will be days when things don't go according to plan. You must be flexible enough to manage problems that occur and get the job done as efficiently and safely as possible. Things that you may need to consider have me worried...

- What happens if the weather changes?
- Is there a risk the power will go out?
- Is the equipment reliable or will it breaks down?
- What safety hazards will there be?
- Which team members might be absent?

**Resolving problems**

Fixing problems is much easier and more effective when you already have a plan in place for that purpose. For example, if you plan for a change in weather conditions and this occurs, then you will easily be able to change your work and get the job done efficiently.

Potential problems that you identify during the planning process are not the only ones to consider. You must also deal with any problems resulting from work procedures. The purpose of having work procedures is to guarantee that employees work efficiently and safely. If you find problems with work instructions or procedures you must identify and report them so that poor and inefficient processes can be changed and improved.

Modifications to work practices are not uncommon and should be encouraged in a safe and efficient work environment.

| Self-Check -1 | Written Test |
|---|---|

**Activity**

**I. Define the following(2pts)**

1. Work instruction_____
2. List factors considered for planning_____’

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Questio**

| Information Sheet-2 | Accessing and applying safety requirements and procedures |
|---|---|

**2.1Access and apply site safety requirement**

**Duties of a worker**

While at work a worker must:

- take reasonable care for their own health and safety
- Take reasonable care for the health and safety of others
- comply with any reasonable instructions, policies and procedure given by their employer, business or controller of the workplace

**2.2.Access, Interpret and apply work health and safety procedures and ensure the work activity is compliant**

Your work site will have some form of Site Health and Safety Management System. This system will include risk management elements and practices that ensure safety and health of workers on site. It is the primary means by which an operator ensures the health, safety and welfare of employees and others at a work site.

Work Health and Safety Procedures on a work site may include:

- Personal Protective Equipment (PPE), Hazard identification and risk assessment
- Personal health and hygiene, Working with hazardous substances
- Working with plant and mobile equipment, Environmental protection , Fire prevention and fire fighting, Site communications, Training, Emergency response, Tagging and isolation
- Defect reporting system, Standard Operating Procedures, Work instructions

**2.3.Carry out isolation of energy sources and immobilization of potential energy sources**

**1.Isolation:** process of ensuring that harm or loss cannot be caused by an energy source when conducting work.

**2.Hazard:** can be defined as a source of potential harm or a situation with potential to cause harm. If you look at hazards as an energy source, then you will need to know how to identify and manage it.

examples of the common types of energy sources/hazards that you may encounter at a traffic control worksite:

**Mechanical: (**Vehicle/mobile equipment, shaft, fan belts..)

**Hydraulic and Pneumatic: (**Pressurized hydraulic systems, Pressurized air or gas systems)

**Electrical:** Power supply to electrical equipment

**Thermal:** Hot mechanical components, hot liquids, fire,

**Chemical:** Liquids such as fuels, cleaning products, acid and caustics

**Radiation:** Ultra Violet (sun), welding arc flash, microwaves, lasers

**Acoustic/Vibration**

**Plant and machinery noise**

**1.Isolation:** refers to the process of ensuring that there is no possibility of any energy source being present which could cause injury to personnel as they are carrying out tasks on or near plant and equipment. Isolation measures include locks, clasps, tags, closing and blanking devices, removal of mechanical linkages, blocks, slings, and removal from service.

The following general procedures regarding isolation provide a basis to which you can add site specific information.

The basic steps of safe isolation are:

1. **Identify** the equipment to be worked on and the isolation requirements.

a. Including all locations where the equipment can be started

b. Including any associated equipment

2. **Isolate** - Ensure that the intended isolation will not cause injury or damage and that all points are isolated. Be aware that the equipment may require the isolation of several energy sources.

3. **Lock & Tag** - Apply your personal isolation lock and personal danger tag to the isolation point/s.

4. **Dissipate** - Check and remove all stored energy

5. **Verify** – Test to ensure that the equipment is correctly isolated and cannot be re-energized

2.4.**Locate destinations by interpreting and applying site plans, transport rules and signage**

When moving around your work site you need to be aware of the specific rules regarding plant and equipment, pedestrians, signage and devices and no go zones.

- **Signs**

Common signage that you will come across in the workplace is based around safety and risk.

**2.5.Identify, act on, and report breaches in site safety**

All workers have obligation to identify and report hazardous and dangerous issues and situation that may occur in the workplace.

How do you identify potential issues?

- Conduct regular safety checks, this is a proactive approach
- Know your immediate work environment, this way you will notice any out of the ordinary issues or concerns
- Be familiar with workers and equipment, again this will assist in noting any issues

Some examples of breaches in safety may include;

- Working at heights without safety controls
- Inappropriate use of equipment, Unsafe movement around plant and equipment
- Allowing unlicensed and non-qualified workers to use equipment or perform duties
- Lack of proper guards and restrictors on equipment
- Using mobile phones whilst carrying out duties

**2.6.Apply personal safety Measures**

There are no guarantees of personal safety in any environment. It is incumbent upon each individual to safeguard themselves against incidents, near misses and risks. One of the best ways to maximize your safety and minimize risk is to follow some very simple safety rules;

- Follow directions and instructions

- Use equipment correctly, Do not participate in ‘horse play’
- Know your emergency procedures and equipment, Stay alert, Understand your responsibilities
- Conduct regular safety checks, Keep yourself fit and healthy, Look out for others
- Treat all high risk environments with respect, Be familiar with the site and equipment
- Wear personal protective equipment and clothing

**2.7.Establish and maintain a clean and tidy safe working area**

Tidy and safe work environments minimize risk and damage to equipment, worker and supports a professional approach to the overall business. It is everyone’s responsibility to maintain a clean and tidy workplace; poor housekeeping can lead to the unnecessary creating of hazards.

A common practice relating clean and tidy workplaces is adopting the **3S methodology**, by which workplaces are organized in an efficient and sustainable order.

- Sort
- Systematic arrangement
- Shine (keep the workplace tidy)

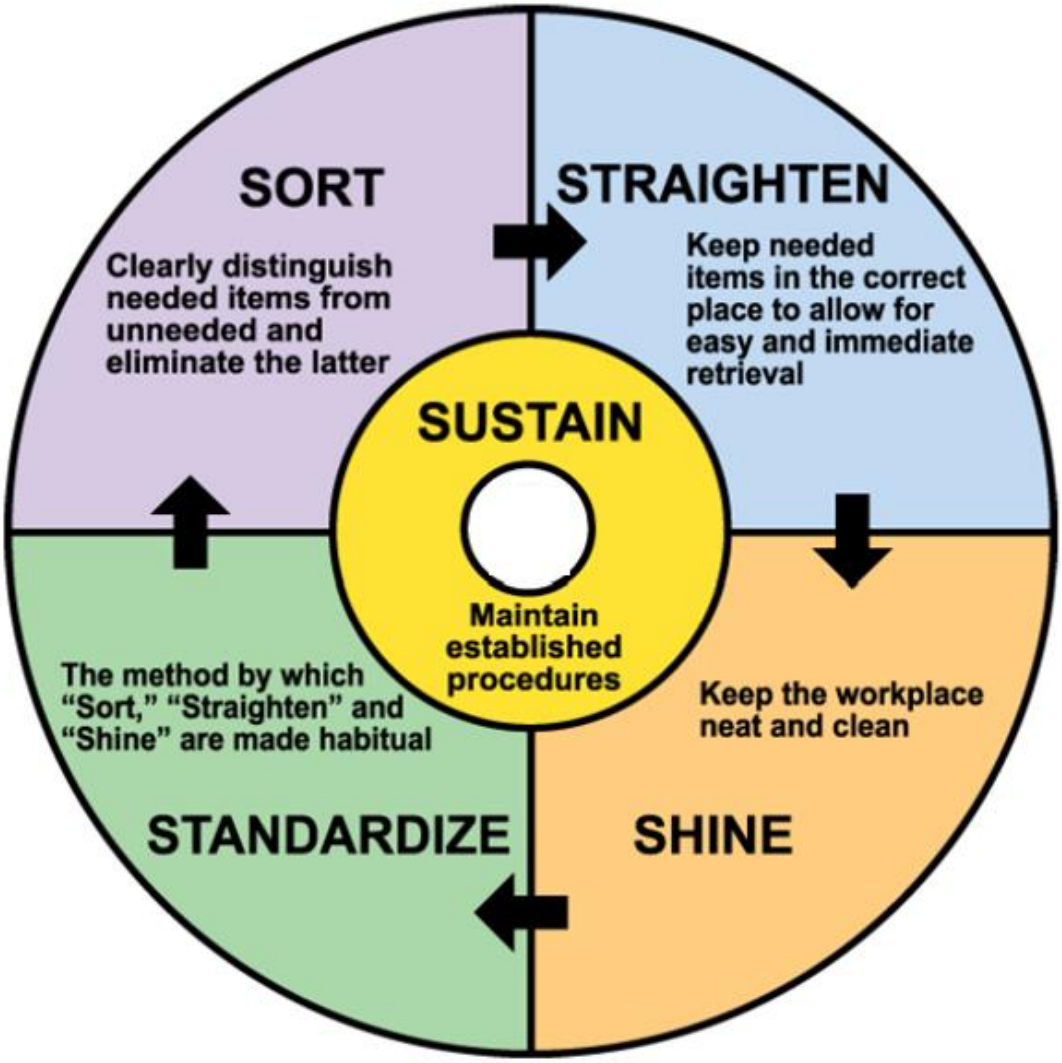



Figure: Kaizen 5S

**2.8.Obtain permits and clearances before specialized work is carried out**

Permit systems are used extensively on work sites for specialized work, especially in machine installation and maintenance at worksites. The responsible officer must complete a risk assessment and put all appropriate controls in place prior to issuing a permit.

Work that may require permits may include:

- Access to restricted areas, Welding and cutting, Material handling
- Power supply and pressure, Acid

## 2.9. Apply safe manual handling procedures

Manual handling covers a wide range of activities including lifting, pushing, pulling, holding, throwing and carrying. It includes repetitive tasks such as packing, typing, assembling, cleaning and sorting, using hand-tools, and operating machinery and equipment. Because most jobs involve some form of manual handling, most workers are at risk of manual handling injury. The types of injuries that can be caused by manual handling may include

- muscle sprains and strains
- injuries to muscles, ligaments and other structures in the back
- injuries to soft tissues such as nerves, ligaments and tendons in the wrists, arms, shoulders, neck or legs, abdominal hernias and chronic pain

## 2.10.Personal hygiene

Policy and procedure should indicate the importance of hygiene and its necessary aspects, including:

- hand washing
- personal health, use of barrier clothing
- Immunization of all employees.

**Hand washing**

Washing your hands protects against the spread of infection and disease; however, it is impossible to completely sterilize the skin. Microorganisms, especially transient ones acquired from patients, can be removed through thorough hand washing.

**Technique for hand washing**

Do the following when you wash your hands.

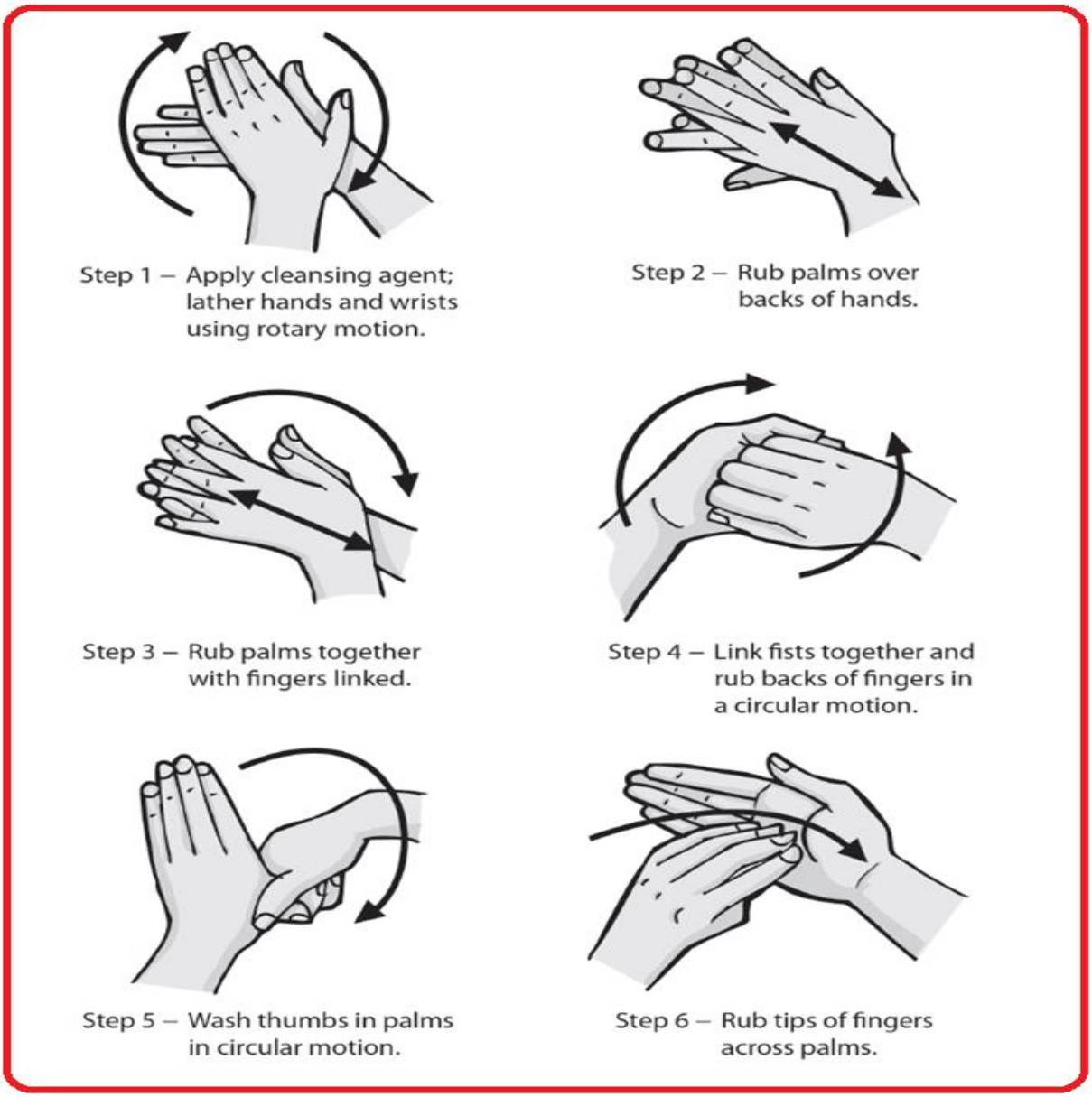



Figure: Technique for hand washing

**Managing Risks**

You must manage risks to health and safety relating to a hazardous manual task. You must:

- identify hazards
- eliminate the risk, wherever possible
- minimize the risk by implementing control measures in accordance with the hierarchy of control

- maintain the control measure so that it remains effective
- review risk control measures

You must also consult with workers who are affected, or likely to be affected, by the manual task.

**Apply Operational Safety Measures**

Operational or essential safety measures form the baseline of life safety within the workplace, relating to firefighting, emergencies, evacuation, alarm and first aid.

**Recognize and respond to alarms**

for alerting site personnel that an emergency situation is unfolding. Radio communication will be the most common type of onsite method for communicating and will be significant in any alarm.

In the event of an emergency on a work site generally some form of visual or audible alarm will activate. The types of alarms may include:

- Alarm bell
- Electronic tone (warbling, whoop-whoop etc. often used for fire)
- Sirens
- Tones transmitted over site radio/communication systems
- Flashing lights

**Identify and clarify responsibility in responding to emergency situations**

All workers will have differing responsibilities relating to reposing to an emergency, these details would have been covered during a workplace induction, and/or through toolbox talks and regular training. You have a responsibility for ensuring your own safety in the event of an emergency.

**Apply Basic Firefighting techniques**

The potential for a fire to occur in high risk environment is very likely, as there may be present a range of plant equipment, combustible waste and hazardous chemical and materials. Before fighting a fire it is crucial to understand more about fires, how they start, how they can be controlled and what to do after the fact.

There are three basic components that are required for a fire to ignite burn and continue to burn. These are **oxygen**, **heat** and **fuel** and are described in the fire triangle.


Figure: -Fire components

The fuel can be any material that can be burnt, oxygen (O2) is an essential part of the chemical reaction needed to create fire, and heat is needed for ignition.

The fire triangle or combustion triangle is a simple model for understanding the necessary ingredients for most fires. The triangle illustrates the three elements a fire needs to ignite: heat, fuel, and an oxidizing agent (usually oxygen).

**FUEL** - any combustible material - solid, liquid or gas.

**OXYGEN** - Sufficient oxygen must be present in the atmosphere surrounding the fuel for fire to burn.

**HEAT**- Sufficient heat energy must be applied to raise the fuel to its ignition temperature

**Classes of Fire**

The following table 5.1 sets out the classes of fire. Note that they are classified according to the fuel the fire needs to exist.

**Class A** – Paper, textiles, wood, most plastics and rubber **Class B** – Flammable liquids **Class C** – Combustible gases **Class E** – Electrically energized equipment **Class F** – Cooking oils or fats

**Fire Extinguishers**

There are a number of different types of portable fire extinguishers, each can be identified by the color coding and labeling. Check that the extinguisher you intend to use is suitable for the type of fire encountered e.g. a water extinguisher must never be used on any fire involving electrical equipment. With proper use, a portable fire extinguisher will be able to reduce or eliminate the degree of injury, damage and cost to business in the event of a small fire.

**Using Fire Extinguishers**

There are four (4) basic steps for using modern portable fire extinguishers. The acronym **PASS** is used to describe these four basic steps.

**1.Pull (Pin**) Pull pin at the top of the extinguisher, breaking the seal.

**2.Aim** Approach the fire standing at a safe distance. Aim the nozzle or outlet towards the base of the fire.

**3.Squeeze:** Squeeze the handles together to discharge the extinguishing agent inside. To stop discharge, release the handles.

**4.Sweep:** Sweep the nozzle from side to side as you approach the fire, directing the extinguishing agent at the base of the flames. After an A Class fire is extinguished, probe for smouldering hot spots that could reignite the fuel

**Approach the fire no closer than 1.8 m from the fire.**

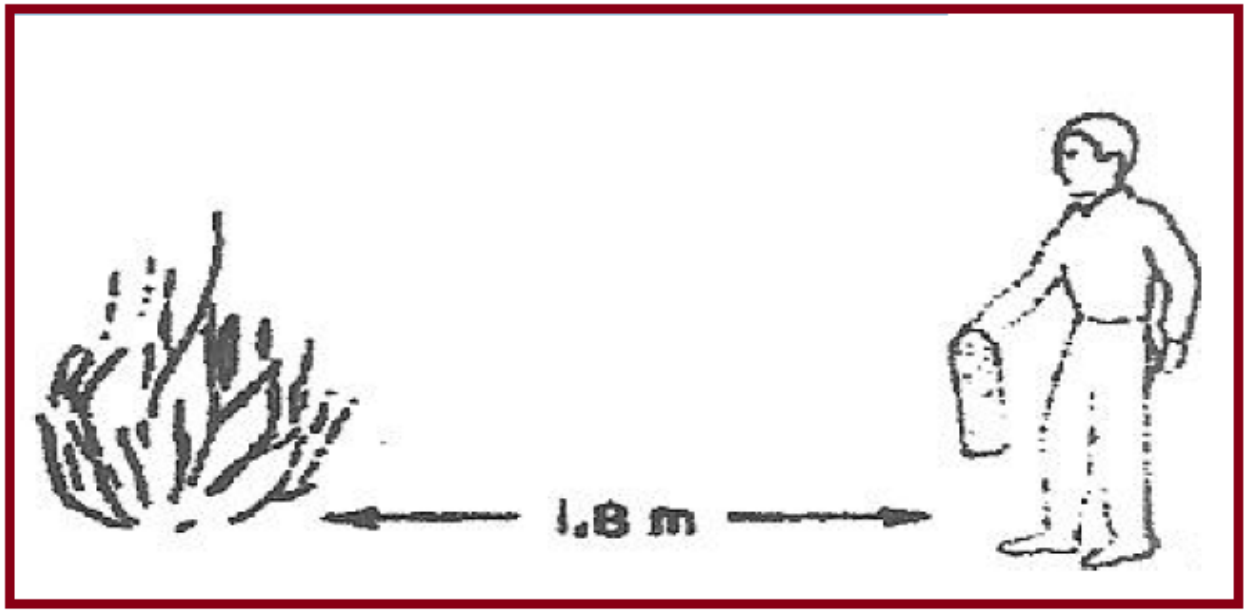



Figure: Fire Extinguishing

**identify emergency escape route(s) and procedures**

An emergency plan is a written set of instructions that outlines what workers and others at the workplace should do in an emergency. An emergency plan must provide for the following:

- emergency procedures, including: an effective response to an emergency
- evacuation procedures
- notifying emergency service organizations at the earliest opportunity
- medical treatment and assistance
- effective communication between the person authorized to coordinate the emergency response and all people at the workplace
- testing of the emergency procedures—including the frequency of testing, and
- information, training and instruction to relevant workers in relation to implementing the emergency procedures

**Maintain Personal Wellbeing**

Maintaining your wellbeing is not just about minimizing risk or the absence of disease or illness it is also about a person's physical, mental, emotional and social health factors It is easy to identify these risks; the difficulty is managing these risks and put preventative measure in place. Preventative measure may include:

- Rotating of shifts, this will allow workers the opportunity to vary the times they are at work, allowing them to experience different break times and travel times
- Job share, if the opportunity arises, this could reduce issues and spread the load
- Information kits, well-being information kits provide details on nutrition, exercise, stress management as well as balancing home and social life
- Safe work systems, these are inherent to ensure that staff feel safe and secure and reduces anxiety
- Ergonomics, attempt to have good workplace design
- Job design, have a look at the overall job and the tasks required, is there a better and more efficient way.
- Prevention of sickness and disease, ensure that you encourage sick staff to stay at home rather than spread illness through the workplace
- Improved communication, informed staff are less like to stress or become anxious

**Access and explain verbally or in writing the requirements for fitness for duty**

Dewatering and mobile lighting worksite worker needs to fully in control of their actions and their judgment or ability to concentrate should not be impaired in any way.

**I'M SAFE Checklist**

- I illness - do I have any symptoms?
- M medication – have I been taking prescription or over the counter drugs
- S tress - Am I under psychological pressure from the job? Worried about financial matters, health problems, of family issues?
- A alcohol – Have I been drinking within 8 hours?
- F fatigue – Am I tired and not adequately rested
- E motion – Am I emotional update
- F fitness for duty may also refer to returning to work

**Comply with all work health and safety polices including smoking, alcohol and drug use**

There will be a number of general health and safety polices in procedures that you will be required to follow and fulfill noted earlier that include:

- Personal Protective Equipment (PPE), Hazard identification and risk assessment
- Personal health and hygiene, Working with hazardous substances, Working with plant and mobile equipment, Environmental protection, Fire prevention and fire fighting
- Site communications, Training, Emergency response, Tagging and isolation

| Self-Check -2 | Written Test |
|---|---|

**Activity**

I. What inform the four (4) basic steps for fire extinguishers? **(8 pts)**

1. Pull (Pin) _____
2. Aim _____
3. Squeeze: _____
4. Sweep:_____

_____

***Note:*** **Satisfactory rating - 8 points** **Unsatisfactory - below 4 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-3 | Installing and dismantling mobile lighting and dewatering system |
|---|---|

### 3.1. Dewatering system

**centrifugal pumps**

Because it delivers a constant flow of water at a constant pressure for any given set of conditions, the centrifugal pump is ideal for delivering water to customers. Most well pumps are centrifugal pumps. They are ideal for use in the distribution system since they do not produce pulsating surges of flow and pressure.

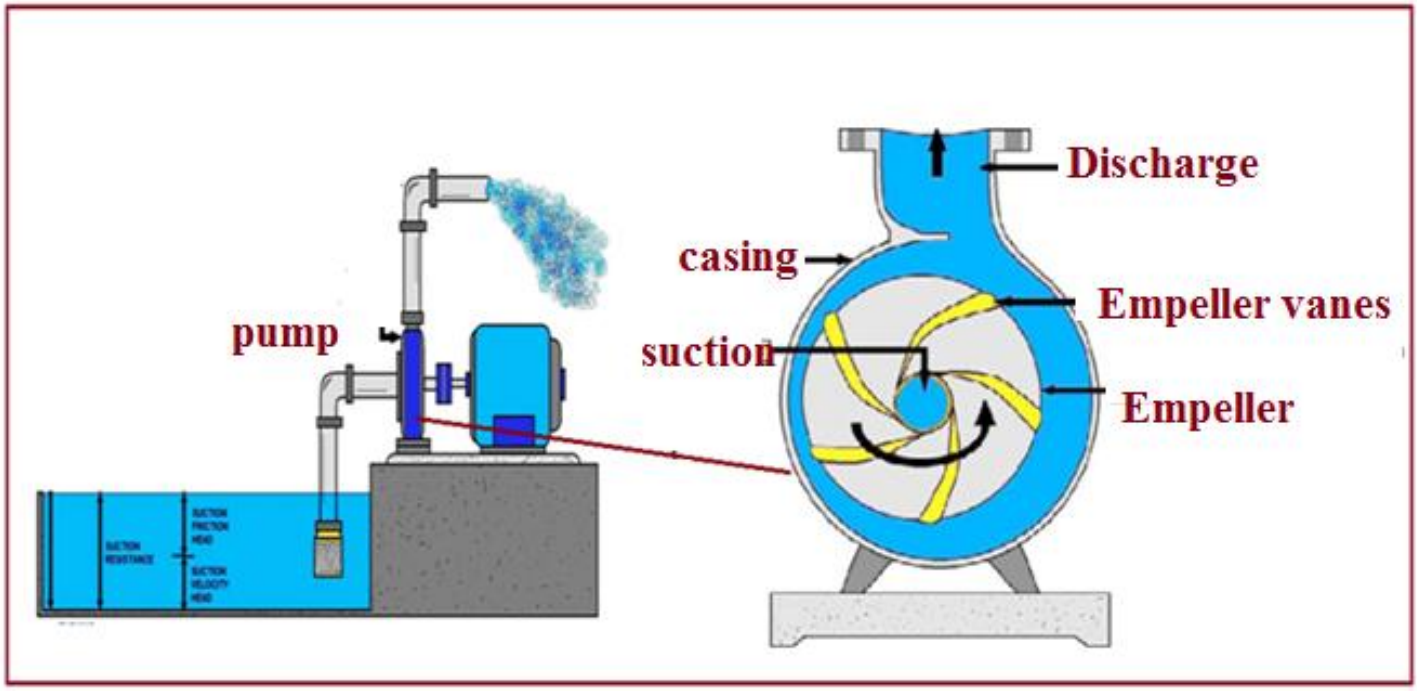



Figure: Centrifugal pump and components

There are many types of centrifugal pumps, but they all have major parts in common.

A centrifugal pump has two main components:

1. A rotating component comprised of an impeller and a shaft
2. A stationary component comprised of a casing, casing cover, and bearings.

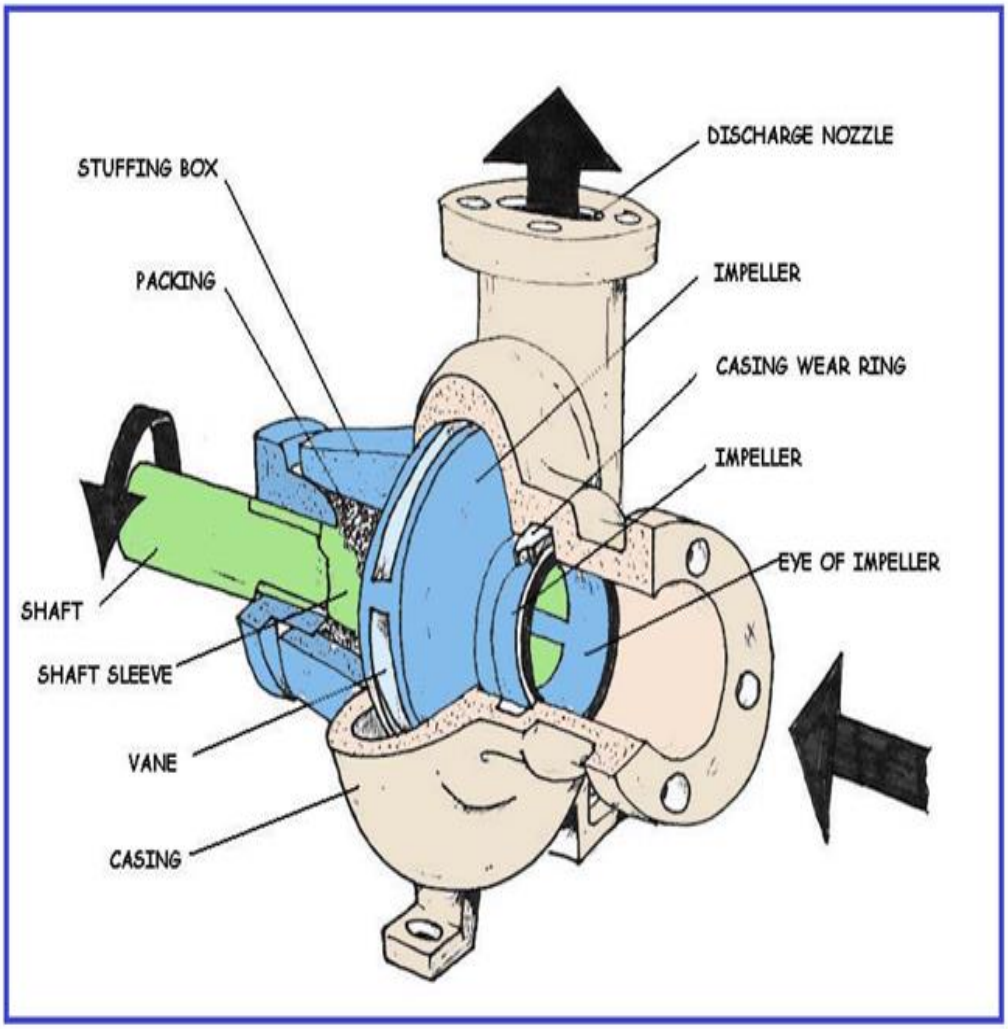



Figure: -Centrifugal pump components

### Pump drives

The pump needs a means of rotating the impellers. The most common source of power is the electric motor, which is often the squirrel-cage type with a constant speed and torque.

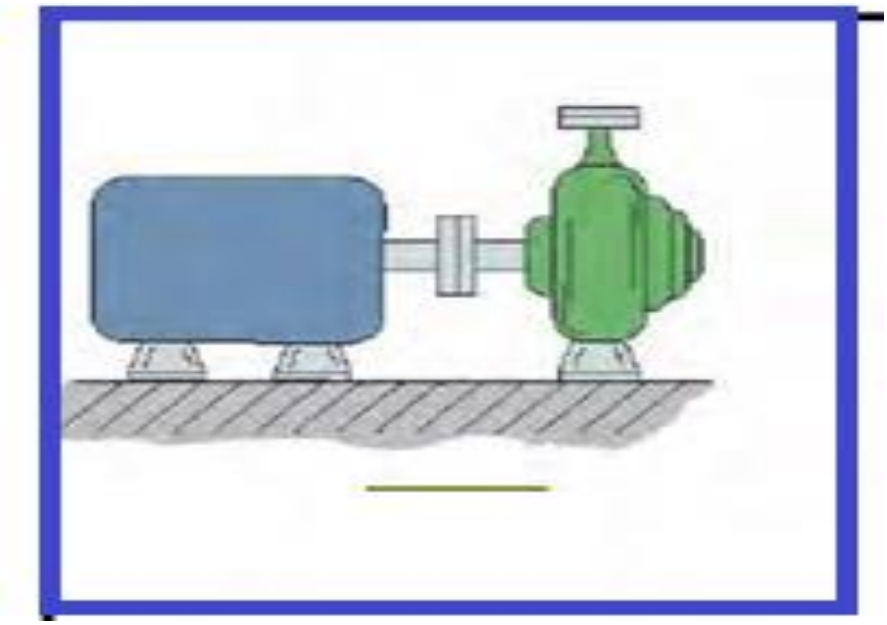


Figure: motor and pump

### Types of Centrifugal pumps

### 1.Vertical turbine pumps

A line shaft turbine pump is one of the most common pumps to be used in the water industry. The pump consists of bowls that contain the impellers, which are connected with each other through the pump shaft bearings. The vertical turbine pump contains the following parts: power source, discharge head, pump column, pump shaft, shaft bearings, and the pump itself.

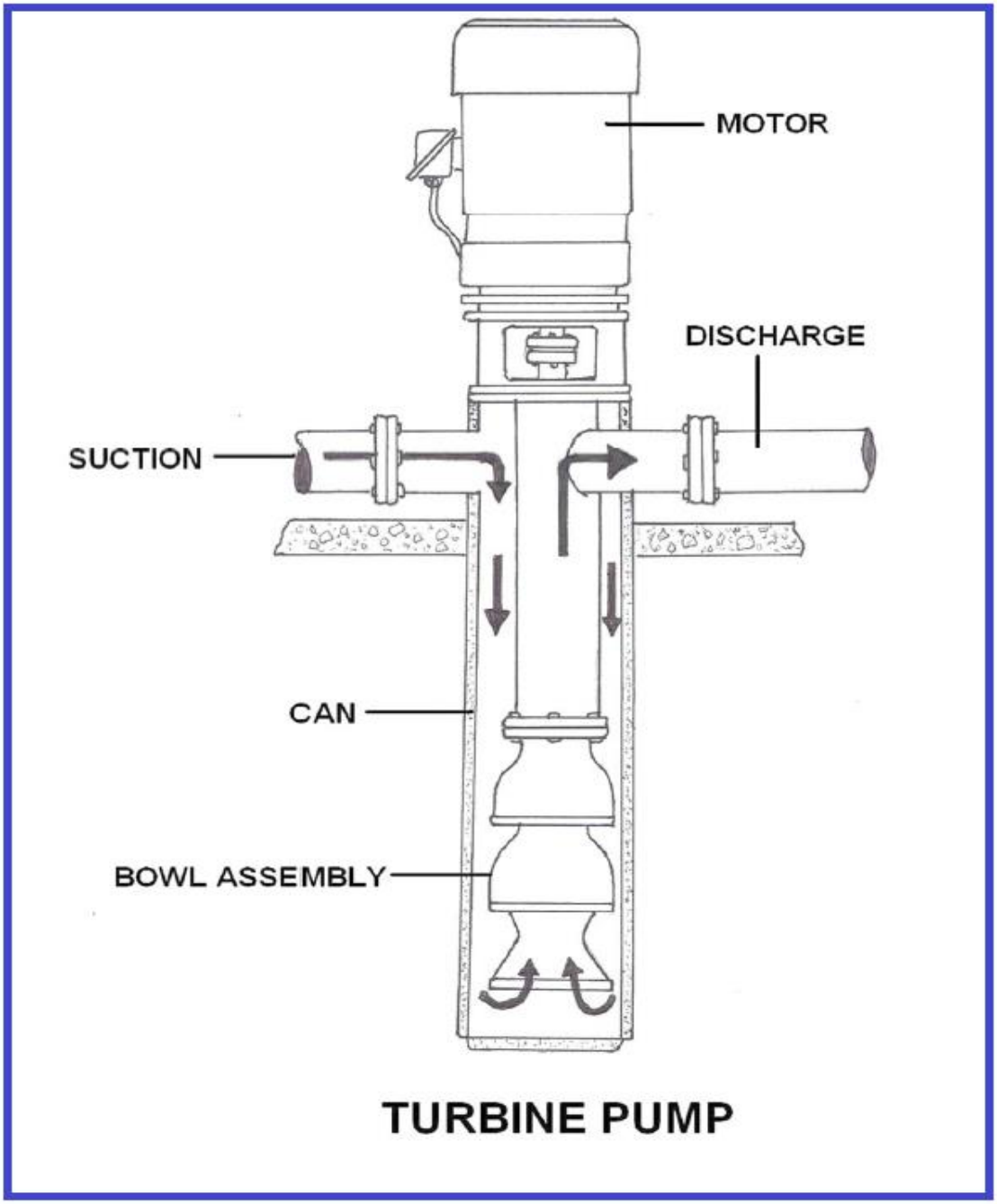



Figure: Vertical turbine pumps

## 2.Submersible pumps

The submersible pump is especially suited to deep well and booster service for industrial, commercial, and municipal water systems. The pump utilizes a submersible motor coupled directly to the bowl assembly and is designed to operate completely submerged in the fluid being pumped. Power is supplied to the motor by waterproof electrical cable.

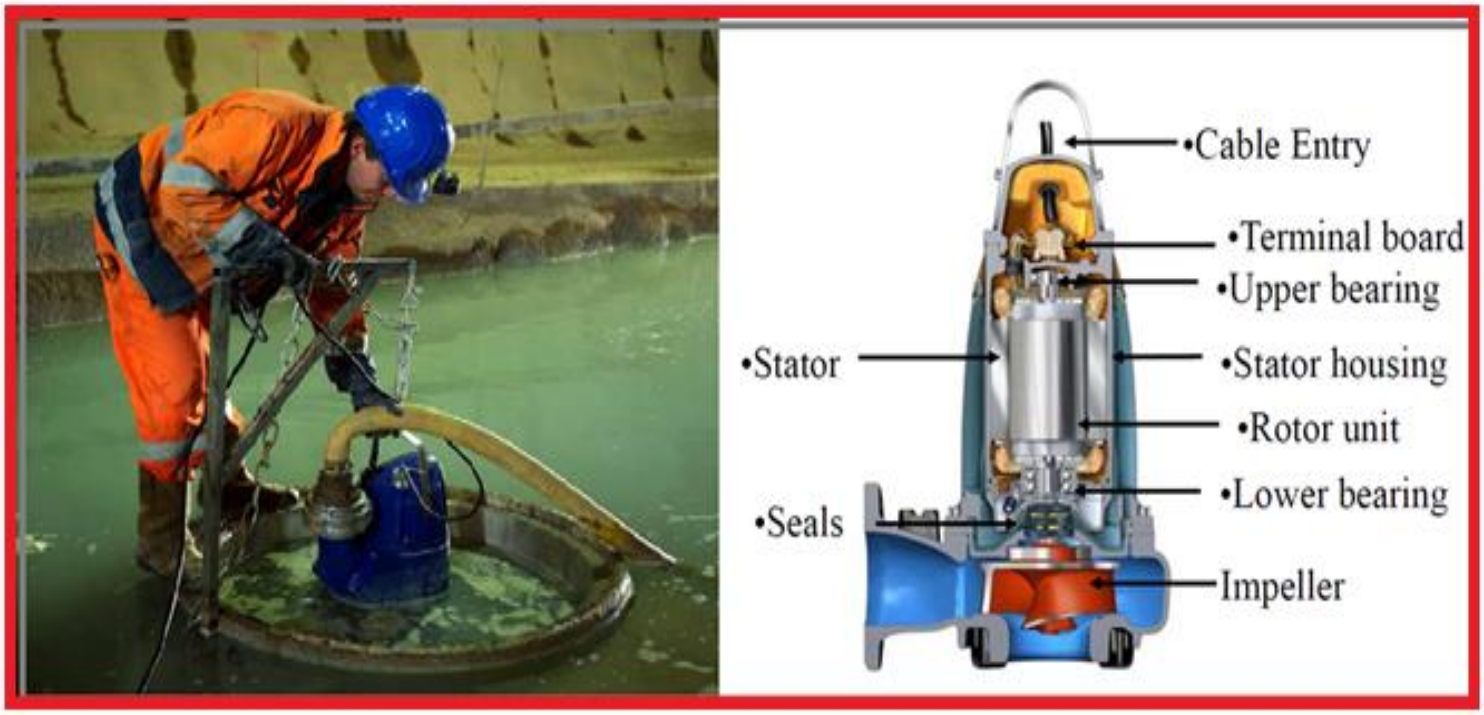



Figure: - submersible pumps

Installing new submersible pump, securing wire and connecting pump wiring.

### 1.2. Mobile lighting

Mobile Lighting is a work site lighting tower use for night construction, emergency handling, rescuing, special events, etc.The trailer allows it to be drawn by different kinds of vehicles.

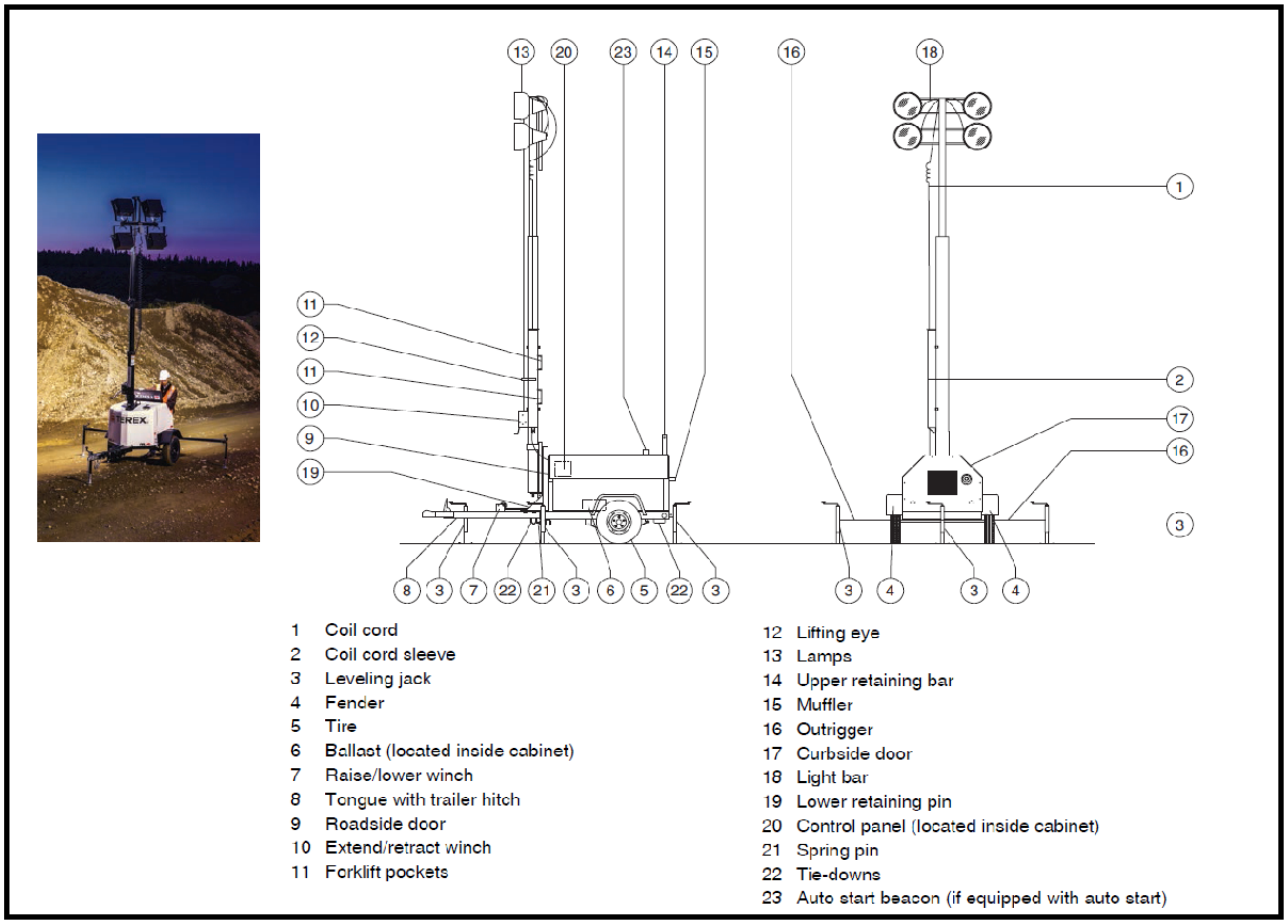



Figure: 6.14- mobile lighting

**Disassembly**

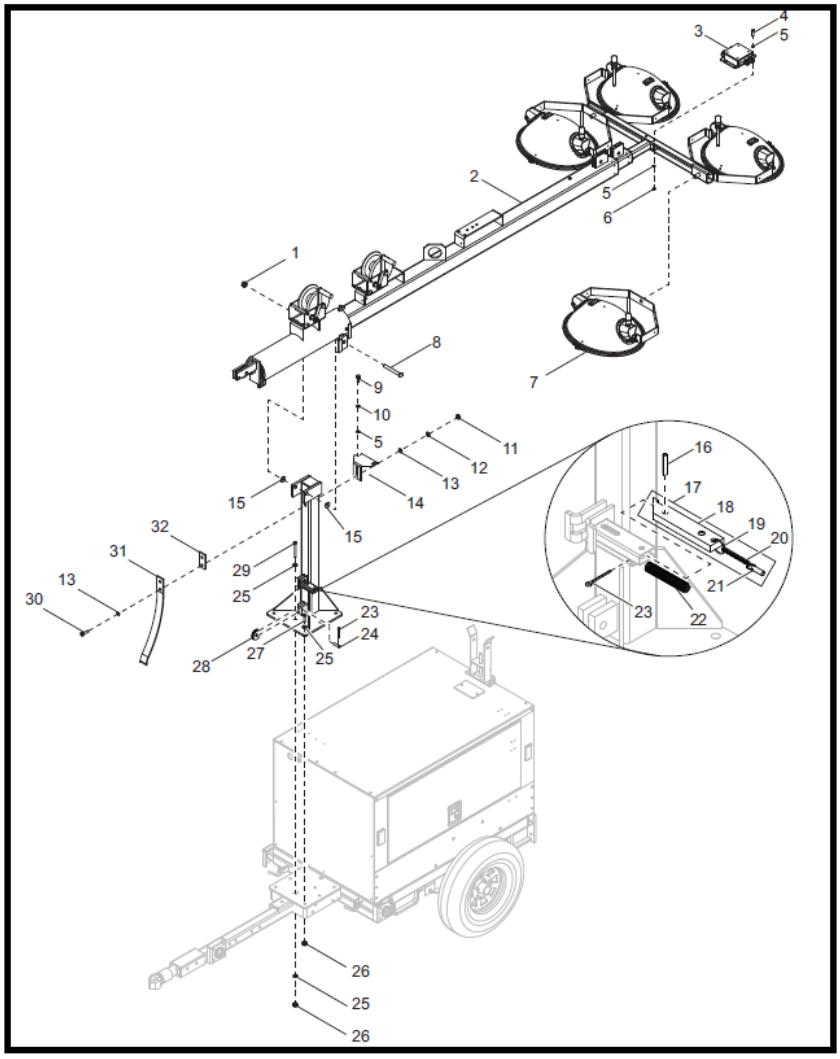
1. The bowl assembly shown in (page below), is composed of a discharge bowl, intermediate bowl, enclosed impellers with taper collets, bearings, and pump shaft.

a) Begin disassembly by removing the cap screws that secure the discharge bowl and the first intermediate bowl, and slide off pump shaft.

b) Remove sand collar by heating. (Not the shaft.)

**dismantling mobile light mast**

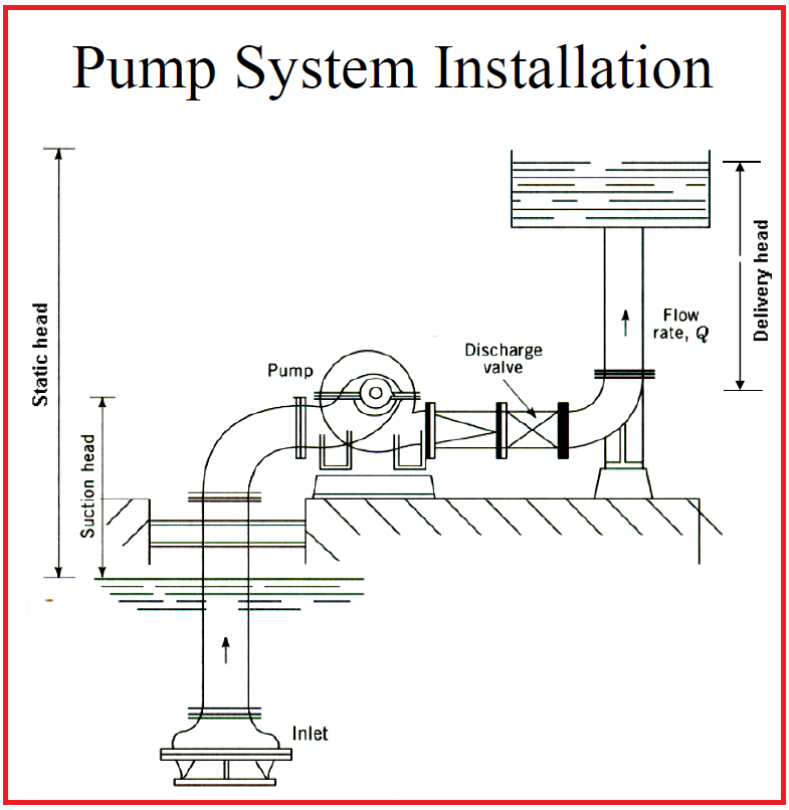
**Follow the following procedure while dismantling lighting mast.**

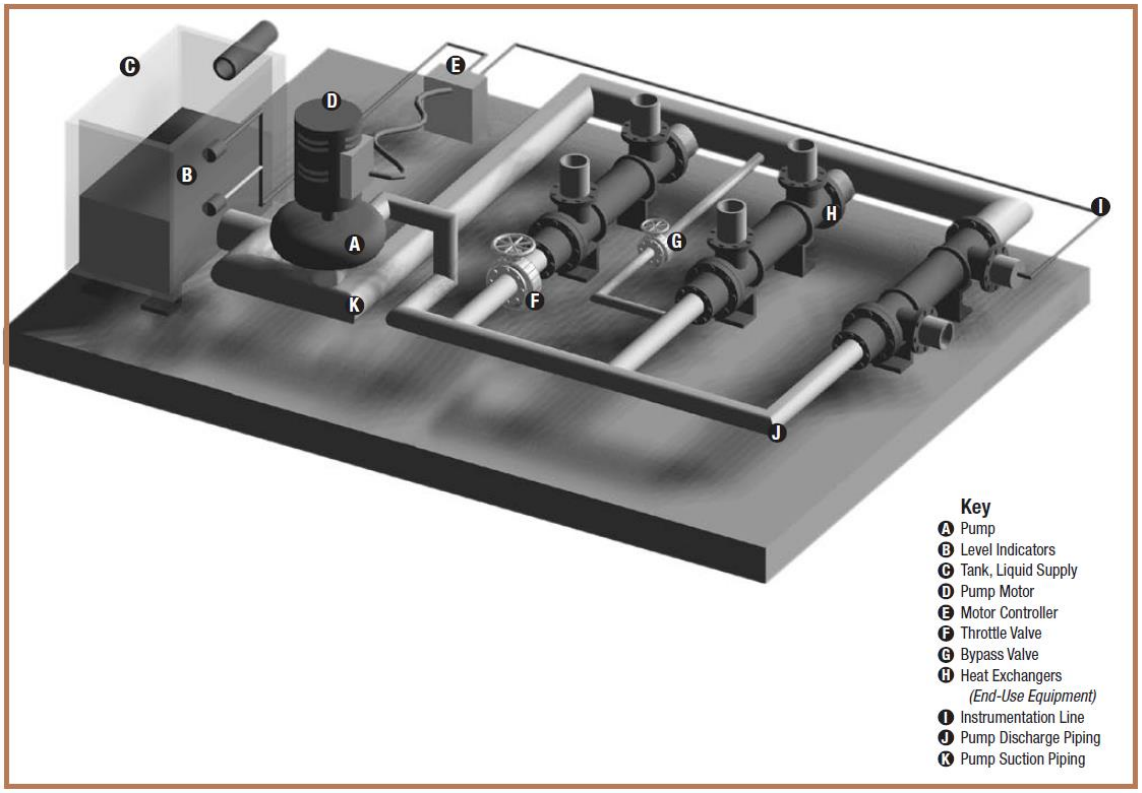


- Part list

| Item | Part No. | Qty | Description |
|---|---|---|---|
| 1 | 60584 | 1 | Nut, .750-10 nylock, G5 |
| 2 | 13536 | 1 | Assembly, mast |
| 3 | 13020 | 1 | Assembly, mast junction box |
| 4 | 60753 | 2 | Screw, .375-16 x 3.50 std hex, G5 |
| 5 | 60698 | 6 | Washer, .375 flat .875/.040, SS |
| 6 | 60358 | 2 | Nut, .375-16 nylock, G5 |
| 7 | *Page 8* | 4 | Assembly, light |
| 8 | 15292 | 1 | Screw, .750-10 x 6.50 std hex, SS |
| 9 | 60690 | 2 | Screw, .375-16 x 1.0 std hex, SS |
| 10 | 60703 | 2 | Washer, .375 split lock, SS |
| 11 | 14229 | 2 | Nut, .500-13 hex, G2 |
| 12 | 60702 | 2 | Washer, .500 split lock, SS |
| 13 | 60699 | 4 | Washer, .500 flat 1.070/.080, SS |
| 14 | 14459B | 1 | Bracket, door adjustment |
| 15 | 60744 | 2 | Washer, .750 flat 1.250/.060 |
| 16 | 15165 | 1 | Pin, roll - .250 x 1.25 |
| 17 | 11215 | 1 | Assembly, latch bar |
| 18 | 14663Z | 1 | Bar, latch |
| 19 | 60706 | 1 | Ring, split - 1.0, SS |
| 20 | 60707 | .58 ft | Chain, sash, SS |
| 21 | 14403 | 1 | Pin, cotterless - .312 x 1.0 |
| 22 | 14275 | 1 | Spring, compression - .60 OD x 2.75 x .054 |
| 23 | 15380 | 2 | Pin, cotter - .125 x 1.250 |
| 24 | 35655 | 1 | Pin, clevis - .500 dia x 1.75 |
| 25 | 60309 | 10 | Washer, .500 flat 1.060/.090 |
| 26 | 62221 | 8 | Nut, .500-13 nylock, G5 |
| 27 | 60683 | 6 | Screw, .500-13 x 1.50 std hex, SS |
| 28 | 14261 | 1 | Sheave - 2 in |
| 29 | 60659 | 2 | Screw, .500 - 13 x 5.0 std hex, G5 |
| 30 | 60732 | 2 | Screw, .500 - 13 x 5.5 std hex, SS |
| 31 | 14845B | 1 | Spring, kickback - 50 lb |
| 32 | 11554Z | 1 | Spacer plate - kick-back spring |

## Installing pump


Pump System Installation
Static head
Suction head
Pump
Discharge valve
Flow rate, Q
Delivery head
Inlet

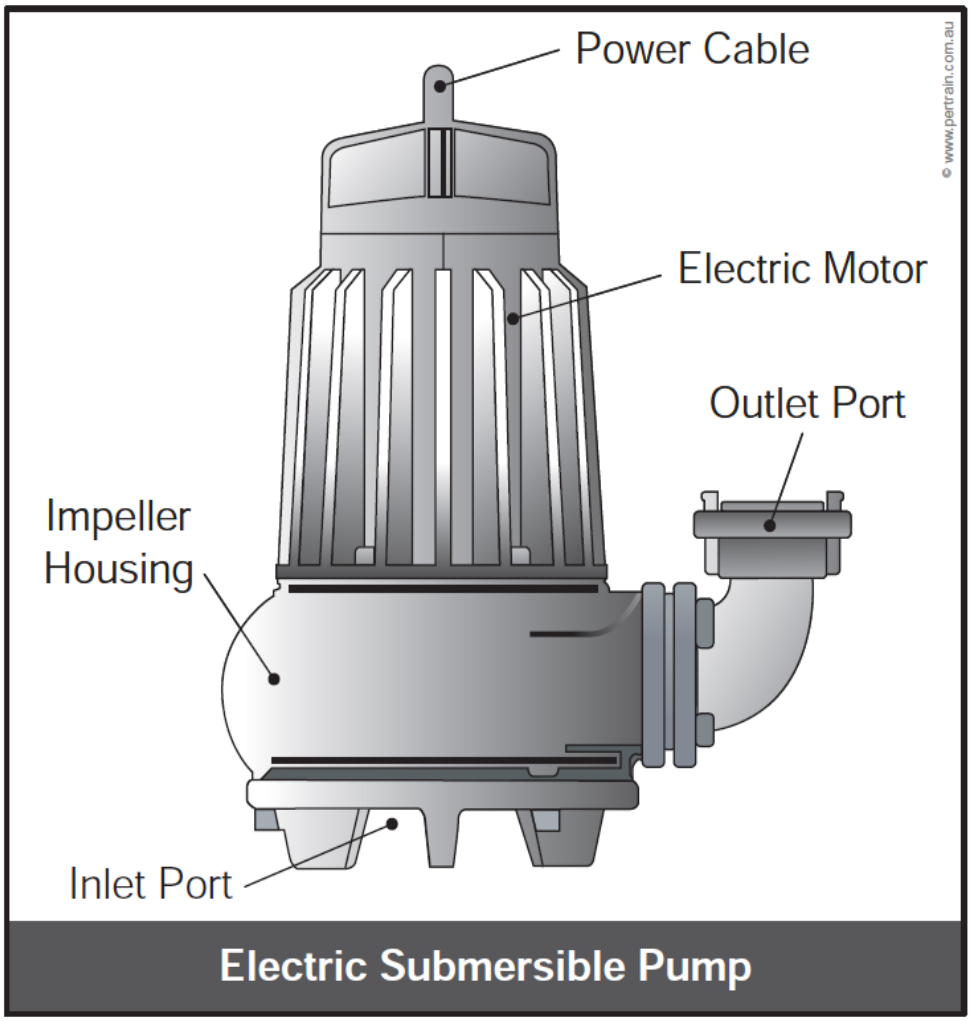

C
E
D
B
A
K
F
G
H
I
J
Key
A Pump
B Level Indicators
C Tank, Liquid Supply
D Pump Motor
E Motor Controller
F Throttle Valve
G Bypass Valve
H Heat Exchangers
(End-Use Equipment)
I Instrumentation Line
J Pump Discharge Piping
K Pump Suction Piping

**installing Submersible pump**

Install an electric submersible pump using the following steps.

- Attach a rope to the pump to lower and raise it from the hole.
- Suspend the pump body just above the bottom of the excavation by supporting it with a piece of timber.
- Turn on the electrical mains power.

  The pump should start when the float switch is activated.
- Check that the float is freely operating and not obstructed by floating debris.



| Self-Check -3 | Written Test |
|---|---|

**Activity**

What inform the four (4) basic steps for fire extinguishers? **(10 pts)**

1. pumping _____
2. Pump case_____
3. dewatsaring _____
4. Lighting tower_____

_____

***Note:*** **Satisfactory rating - 16 points** **Unsatisfactory - below 8 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-4 | Carrying out pre-start, start-up and shutdown procedures |
|---|---|

## 4.1. Mobile lighting

### What is a Safe Operating Procedure?

A safe operating procedure (SOP) is a written document that provides step-by-step instructions on how to safely perform a task or activity which involves some risk to health and safety. A safe operating procedure is sometimes referred to as a safe work procedure or safe work method statement.

### Pre-Start Checklist

Read the manual carefully before operating the lighting tower.

- Ensure the lighting tower is in a horizontal position.
- Check the fuel, coolant, and engine oil levels are filled properly to their correct levels.


Figure: mobile lighting

Note: No fuel and lubrication in the engine of the lighting towers purchased.

- Walk around the machine and look for any obvious damage to the body itself, the lights, the tires and the tie down points.
- Check the wire ropes and ensure they are intact and not kinked.
- Check that all appropriate stickers are legible.
- Check the grounding.
- Check all of the switches on the Command Panel and ensure that they are all intact.
- Check that the circuit breakers placed on the front board are in the “OFF “position.

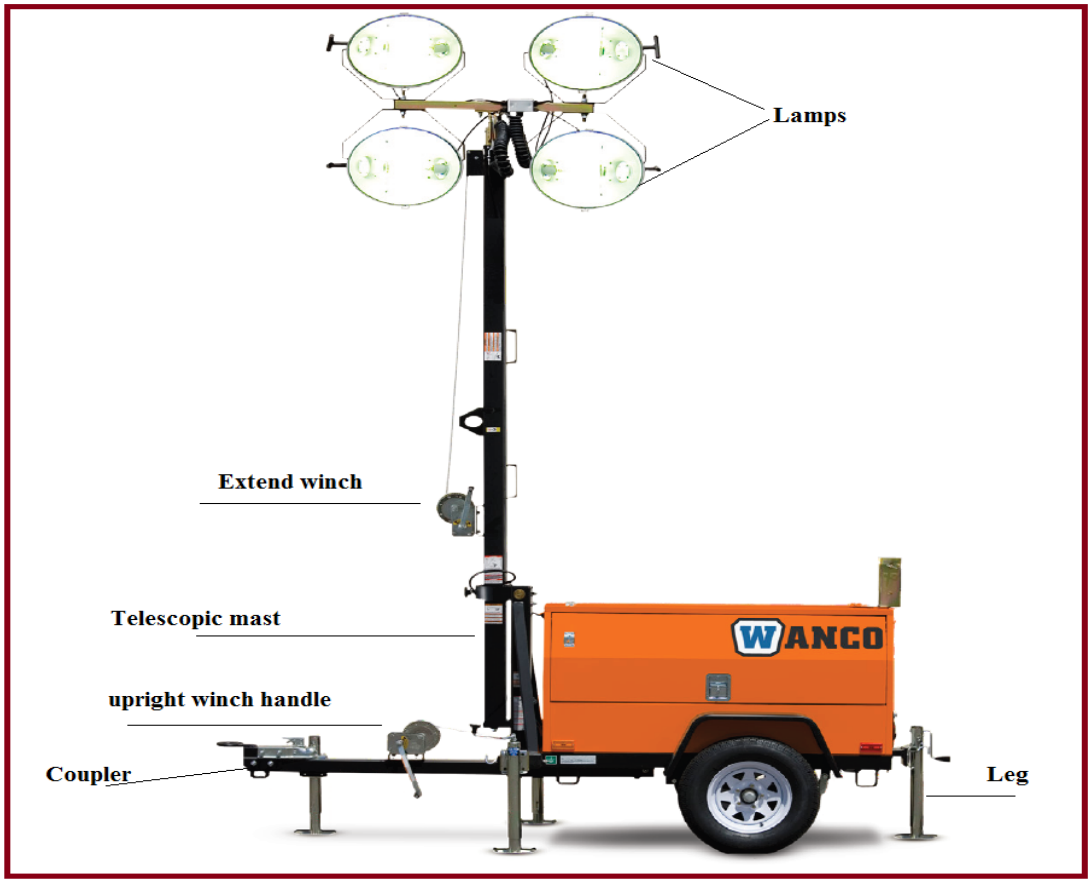



Figure: mobile lightin

## 4.2. Dewatering pump

**Operation of pumps:** Operate all mechanical equipment, including pumps, in accordance with the manufacturer's instructions.

Checks for the pump before starting

a) The shaft rotates freely.

b) The pump is primed.

c) If there is any valve in delivery branch, it is open.

d) The stuffing box (gland) is properly tightened (in case of gland packed pump)

**Checks during running conditions:**

a) The direction of rotation is correct.

b) The pump is running smoothly.

c) See that the prime mover is not overloaded.

d) Leakage through stuffing box is normal i.e. 50 to 60 drops per minute

In the gland packing pump.

e) There is no leakage from mechanical seal.

f) The ball bearing does not get excessive hot.

g) Avoid idle running on operation against closed discharge valve for a longer period of time.

**Function Tests**

**Setup**

1. Position the light tower at the desired work site.
2. Chock the wheels.
3. Disconnect the trailer lights and the safety chains.
4. Open the latch on the trailer hitch.
5. Pull the release pin on the tongue jack and rotate into vertical position.
6. Turn the leveling jack handle to lower the front outrigger foot pad and raise the tongue of the machine enough to clear the tow vehicle.
7. Release the spring pin on the side outriggers and slide them out into the deployed position. Make sure the outriggers are locked in place. Rotate the leveling jack into position.

8. Turn the leveling jack handles to level the machine. Level the machine using only the leveling jacks
9. Check the bubble level (if equipped) on the front of the machine to make sure the machine is level

- **Test Machine Functions**

By raising and extending, then retracting and lowering the mast back to the horizontal position, the following functions will be tested: **winches, latches, and mast extension and mast rotation.**

10. Remove the cotter pin and the upper retaining pin from the top of the mast.
11. Turn the raise/lower winch handle clockwise until the mast raises approximately 2 feet /60 cm. Result: A clicking sound should be heard as the mast rises.
12. Release the winch handle. Result: The winch brake should hold the mast.
13. Continue to turn the winch handle clockwise until the lower retaining bar locks into the mast. Result: The mast sections should rise smoothly, free of hesitation or binding.
14. Insert the lower retaining pin through mast supports. Insert the cotter pin through retaining pin.
15. Turn the extend/retract winch handle clockwise until the mast extends approximately 2 feet /60 cm. Result: A clicking sound should be heard as the winch handle is turned.
16. Release the winch handle. Result: The winch brake should hold the mast.
17. Continue to turn the winch handle clockwise until the mast reaches full vertical position. Result: The mast sections should extend smoothly, free of hesitation or binding.
18. Turn the T-handle to release the mast rotation lock.
19. Rotate the mast clockwise and then counterclockwise as far as it will go in either direction. Result: The mast should rotate smoothly and easily in both directions.
20. Rotate the mast to line up the arrows on the front of the mast.
21. Tighten the T-handle to secure the mast.
22. Attempt to rotate the mast in both directions. Result: The mast should not rotate.

23. Turn the extend/retract winch handle counterclockwise until the mast sections are fully retracted. Result: No clicking sound should be heard when the winch handle is turned.
24. Remove the cotter pin and lower retaining pin.
25. Begin lowering the mast to the horizontal position by turning the raise/lower winch handle counterclockwise. Result: No clicking sound should be heard when the winch handle is turned.
26. Turn the winch handle counterclockwise until the mast is lowered into the travel lock.
27. Insert the lower retaining pin into the mast support and install the cotter pin to secure.

- **Test the Lights**

28. Make sure the circuit breakers and the light switches are in the off position.

Note: Be sure the lamp fixture connections are properly tightened before turning the lights on.

29. Start the engine. See Starting the Engine in the Operating Instructions section.
30. Turn the main circuit breakers to the on position.
31. Turn the light switches to the on position.

| Self-Check -4 | Written Test |
|---|---|

**Activity**

What inform the four (4) basic steps for fire extinguishers? **(8 pts)**

1. List Checks during running conditions
2. List Function Tests

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

| Information Sheet-5 | Monitering and adjusting dewatering system performance |
|---|---|

## 5.1. Dewatering pump

**Operation of pumps:** Operate all mechanical equipment, including pumps, in accordance with the manufacturer's instructions.(General pump)

| Inspection | Action |
|---|---|
| Prestart Checks<br>Valves | Open the valve in the cooling liquid supply to the bearing, if the bearings are liquid cooled.<br>Open the valve in the flushing water supply to the stuffing boxes, if so equipped.<br>Open the valve in the sealing liquid supply to the stuffing boxes or mechanical seals, if so equipped.<br>Open or close the discharge valves according to the manufacturer's manual. |
| Rotors | Check the rotor to see that it is free. You should be able to turn the rotor shaft by hand. Do not start the pump until any difficulty is corrected.<br>Prime centrifugal pumps before startup. The equipment will not pump water unless air in the pump and suction piping is replaced with water. In addition, the rotating element may seize from a lack of lubrication.<br>Use one of the following methods to prime the pump, depending on operating conditions: positive suction head (1) or negative suction head (2). |
| Starting the Pump | Always start the pump according to the manufacturer's manual. |
| Equipment area | Ensure that all personnel are clear of dangerous areas. |
| Valves | For pumps started with discharge valves closed, open valves slowly after pump approaches operating speed. Do not operate the pump with a closed discharge valve. |

| Inspection | Action |
|---|---|
| Stuffing boxes and Packing | Observe leakage from the stuffing boxes and adjust the sealing liquid valve for proper flow to ensure packing lubrication. For new packing, allow pump to run for 10 to 15 minutes before tightening the stuffing box gland. Gradually tighten the stuffing box gland until leakage slows to a constant drip. |
| Pump and driver | Check the general mechanical operation of the pump and driver. Ensure that working parts are free to move without damage. |
| Stopping the Pump | Always review instructions for disconnecting and securing drive and rotating equipment. |
| Valves | As a rule, there is a check valve in the discharge line close to the pump. In such cases, shut down the pump by stopping the driver according to the manufacturer's manual. |
| | Then close all valves, except the check valve, in this order: discharge, suction, pump cooling water supply, and other connections leading to the pump or system. |
| | In some instances, however, the use of a check valve is not feasible because the sudden closing of the valve under high discharge pressure might create pressure surges or water hammer. In such cases, close the discharge valve slowly to avoid water hammer. |
| Monitoring Operations | |
| Unusual sounds | Learn to recognize the normal sounds and conditions of a properly run pump. Listen to the sounds of the pump on regular inspection tours and investigate any abnormal sounds at once. |

| Inspection | Action |
|---|---|
| Bearings | Check bearing temperature and lubrication. Where petroleum-based lubricants are used, follow the manufacturer's manual and do not over lubricate. |
| Suction and discharge readings | Check these readings and compare with "normal" valves. Make sure valves are set as required. Check shaft packing. Check discharge rate. Check driving equipment. |

- Operating instructions for rotary- and reciprocating-displacement pumps.

Prestart Rotary- and reciprocating-displacement pumps do not usually require priming. However, when priming is necessary, follow priming procedures for centrifugal pumps.

- Starting and operating. Always start and operate rotary- and reciprocating-displacement pumps with both suction and discharge valves open to prevent motor overload and pump damage.

| Symptom | Possible Cause |
|---|---|
| No water is delivered. | Broken or disconnected shaft.<br>Excessive discharge head.<br>Plugged or nonsubmerged suction. |
| Pump does not deliver rated capacity. | Speed too low.<br>Suction lift excessive.<br>Suction partially plugged.<br>Mechanical defect. |
| Pressure is too low. | Discharge head too high.<br>Speed too low.<br>Pressure relief valve set too low.<br>Mechanical defect. |
| Pump stops after starting to operate. | Bent column shaft.<br>Clogged suction. |

- **Operating precautions**

a) Rotary- and reciprocating-displacement pumps depend on clearances for efficiency. Keep grit or other abrasive material out of the liquid being pumped to prevent excessive wear and rapid loss of efficiency and self-priming ability.

b) A pressure-relief valve that discharges back to the suction side of the pump is usually provided on the outlet piping. Adjust this valve for a relief pressure that does not overload

the motor. Make sure the check valves seat properly at normal pressures. Otherwise, loss of efficiency and priming ability result.

c) Use the manufacturer's manuals to develop a checklist for the particular rotary- or reciprocating-displacement pump being used.

**PUMP SHUTDOWN.** When a pump is shut down for an extended period, or for overhaul inspection and maintenance, the following procedures apply:

a) Shut off all valves on suction discharge, water seal and priming lines. Drain the pump completely by removing the vent and drain plugs until the water has run off. This operation protects against corrosion, sedimentation and freezing.

b) Disconnect the switch to the motor and remove the fuses.

c) Drain the bearing housing. If the shutdown is to be followed by an inactive period, purge all the old grease. Otherwise, refill with fresh grease. If an overhaul is scheduled, do not refill the oil or grease receptacles until the pump is reassembled.

**1. prior to starting:**

- Ensure that submergence is more than the recommended minimum on outline drawing.
- Ensure direction of rotation by giving the driver a short run. Incorrect rotation will quickly damage the pump.

**2. Putting the pump in operation**

- Start the pump. Let the motor pickup full speed.
- Ensure that the current taken by motor does not exceed the full load/ current stated on the motor name plate.
- See that motor is not getting over loaded.

**3. Check during running**

- The pump is running smooth. Check noise and vibrations. Vibrations should be checked at the top of motor. Stop the pump if abnormal noise or vibrations are observed. Detect the reasons for vibrations and restart the pump after eliminating the reasons for the same.
- Head and capacity developed by the pump is as specified in the name plate of the pump.

- Motor bearings are not getting heated up excessively.
- Check that oil temperature is not more than 80□

| Self-Check -5 | Written Test |
|---|---|

**Activity**

What inform the four (4) basic steps for fire extinguishers? **(10 pts)**

1.Impeller _____

2.Pump case_____

3.Valve _____

_____

4.Lighting tower_____

***Note:*** **Satisfactory rating - 16 points** **Unsatisfactory - below 8 points**

**Answer Sheet**

Score = _____

Rating: _____

| Information Sheet-6 | Recognizing, documenting and reporting hazardous and emergency situations |
|---|---|

**Whs Hazard:** Anything which has the potential to cause injury or illness.

**Whs Risk:** A WHS risk is the chance of someone becoming injured or ill as a result of a workplace hazard. This significance of the risk is determined by considering the likelihood of it happening and the consequences if it does happen.

**Whs Risk Control:** WHS risk control is action taken to eliminate or reduce the likelihood that exposure to a hazard will result in injury or illness to people or damage to property and the environment.

### 6.1.Hazards in the Workplace

There is no substitute for caution and common sense. A safe job is no accident; it takes work to make the job safe. Each person working must do what it takes to keep the job safe. Any type of job- whether industrial or manual, has a number of potential safety hazards. These hazards need not result in anyone being injured. Learning to work safely with these hazards is as important as learning to be a skilled worker.

Under the Commonwealth WHS and the state OSH legislation, employers have an obligation to provide a safe and healthy work environment for their employees.

The following three steps are involved in providing a safe environment:

- hazard identification
- risk assessment
- Hazard control.

### 6.2.Hazard identification

The first step is to determine the risk to the health of employees when they are working with potentially hazardous substances and equipment in the workplace.

Methods of identifying workplace hazards include:

- developing a hazard checklist
- conducting walk- through surveys
- reviewing information from designers or manufacturers
- analyzing unsafe incidents, and accident and injury data
- analyzing work processes
- Consulting with employees.

As part of the process of hazard identification, hazards are divided into the following six categories:

**physical hazards** – noise, lighting, electrical cords, fire, hot instruments, slippery surfaces

**chemical hazards** – gases, fumes, eg mercury, processing solutions

**radiation hazards** – x-rays, ultraviolet light, curing light

**ergonomic hazards** – chair design, equipment design, workstation design, manual handling

**biological hazards** – infection, bacteria, viruses

**Psychological issues** – workload, dealing with the public, harassment, discrimination, stress.

**6.3.Hazards in Auxiliary operations:**

The following physical hazards can be found:

**Mechanical: (**Vehicle/mobile equipment, vehicle fan belts)

**Hydraulic and Pneumatic: (**Pressurized hydraulic systems, Pressurized air or gas systems) **Electrical: (**Power supply to electrical equipment)

**Thermal: (**Hot mechanical components, hot liquids, fire)

**Chemical: (**Liquids such as fuels, cleaning products, acid and caustics)

**Radiation** (Ultra Violet (sun), welding arc flash, microwaves, lasers)

**Acoustic/Vibration**: Plant and machinery noise

**Chemical hazards**

The following materials can be hazardous in the dental surgery:

- phosphoric acid (etch)

- Battery acid
- Other chemicals

**Radiation hazards**

The following radiation hazards can be found in the Auxiliary operations:

- Welding hazards
- computer screens
- lasers

**Ergonomic hazards**

The following ergonomic hazards can be found in the Auxiliary operations:

- workstations – height and space
- Human factor
- Shop layout
- Material handling

**6.4.Risk assessment**

Risk assessment involves identifying the risk of exposure to persons in the workplace. This exposure relates to both materials and situations. Risk assessment should include:

- assessing the adequacy of training or knowledge required to work safely
- looking at the way the jobs are performed
- Machine operation and maintenance
- looking at the way of material handling
- assessing the number and movement of all people in the area
- determining the type of procedure to be performed
- determining the type of equipment to be used
- House keeping

**6.5.Workplace hazards control:** Below table 9.1 is the preferred order of control measures (hierarchy of control) ranging from the most effective to the least effective.

Table: 9.1- Hazard control

| |
|---|
| **Elimination:** removing the hazard or hazardous work practice from the workplace |
| **substitution** replacing a hazard or hazardous work practice with another less hazardous one, if possible |
| **isolation** separating the hazard or hazardous work practice from people not involved in the work; this can be done by installing screens or barriers, or marking off hazardous areas |
| **engineering control** may include modifications to tools or equipment, or providing guarding to machinery or equipment |
| **administrative control** introducing work practices that reduce the risk which could include limiting the amount of time a person is exposed to particular hazards |
| **personal protective equipment** should be taken into consideration at all times and include gloves, mask, safety glasses, aprons |

### 6.6.Emergency Situations

Emergency situations encountered in a workplace may include:

- Fire
- Emergency evacuation, Incident or injury.
- Electrical shock, weather, Entrapment.
- Fumes. Explosions.
- Emergencies resulting from working in remote locations

### 6.7.Identify your Responsibility in Emergency Situations

Every worksite will have specific procedures to be followed in response to emergency situations. These procedures will differ based on the type of emergency, its severity and the impact it will have on personnel/workers.

Depending on your role in the worksite, your responsibility in regard to emergency procedures will vary. At any time when working at a site you must identify your responsibility, and ensure that you understand your role in the event of an emergency situation developing.

If you are unsure of your responsibility on your worksite, seek clarification from supervisor or other Work Health & Safety (WHS) personnel/workers.

**Respond to and Report Emergency Situations**

It is essential to have adequate emergency response procedures in place in the event of an emergency. Your response to an emergency will depend upon your role and responsibility within the workplace.

**Apply Operational Safety Measures**

Operational or essential safety measures form the baseline of life safety within the workplace, relating to firefighting, emergencies, evacuation, alarm and first aid. Possible emergencies:

**Fire**

In the event of fire, a three-step procedure should be adopted.

1. Call 000 for the fire service.
2. Determine what type of fire it is, eg electrical, liquid, wood/paper.
3. Use a fire extinguisher.

Table: 9.2- Fire class and Extinguisher

| Type of fire | Extinguisher |
|---|---|
| Wood/paper | Water |
| Flammable liquid | Foam, $CO_2$ |
| Electrical | $CO_2$ |

Fire evacuation procedures have usually been set up in places of employment and these must be followed exactly.

**First aid:** First aid facilities should be available which are appropriate for the types of accidents which may occur.

**Identify Emergency Escape Route**

It is important to have an adequate emergency procedure in case of:

- Fires, Chemical spills.
- Release of toxic or flammable gases.
- Severe injury to personnel/workers.
- Other dangerous or emergency situations such as bomb threats.

**Ensuring a safe working environment**

There should be an ongoing program of workers training in matters relating to health and safety. This is just as important as training in the use of equipment and techniques.

**Sample Accident/incident report form**

This page is to be completed by, or on behalf of, the sick, injured or potentially injured person.

Table: 9.3- Accident report form

| | |
|---|---|
| Given name | • Where did the incident or injury occur?<br>• What time did you finish? |
| Describe the nature of injury or illness apparent at the time of the report, eg muscular pain, cuts.<br><br>The date of the incident when symptoms were first noticed. | |
| Describe how the accident/incident occurred. | Initial treatment was given by: |

**HAZARD REPORT FORM**

Table: 9.4- Hazard report form

| | |
|---|---|
| YOUR NAME Date<br><br>WORKPLACE NAME | |
| HAZARD/RISK (What is the issue?) | LOCATION(eg room, piece of equipment |
| What do you think can be done to control this hazard? | |

| Self-Check -6 | Written Test |
|---|---|

**Multiple Choices:** Read and analyze the statement carefully. Choose the best answer and write the letter only in your answer sheet.

1. Hazards due to transfer of energy between an object and a worker.

a. Chemical Hazards b. Physical Hazards c. Biological Hazards d. Ergonomics Hazards

2. What classification of hazards when a welder's hand deadened because of unadvisable position during welding?

a. Chemical Hazards b. Physical Hazards c. Biological Hazards d. Ergonomics Hazards

3. Impact resulting from being struck by and struck against objects may cause serious accidents.

a. Chemical Hazards b. Physical Hazards c. Biological Hazards d. Ergonomics Hazards

4. Toxics pass through gastrointestinal organ. a. Ingestion b. Inhalation c. Absorption d. injection

5. People who work with animals, animal products or animal wastes have a greater risk of infection.

a. Chemical Hazards b. Physical Hazards c. Biological Hazards d. Ergonomics Hazards

***Note:*** **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-7 | Confirming whether the discharged water is dispersed as required |
|---|---|

Dewatering of mines is of great importance. If it wouldn't be done the mine would be filled with groundwater, making mining it impossible without developing submerged mining methods. Dewatering is also important in safety and economical aspects. The water pressure can make the walls of the mine unstable and thus increasing the risk of collapse, especially in open pit mines.Often times in industrial or mining work sites, accumulated water in trenches and excavations which, if left alone, can cause downtime due to work areas being inaccessible due to flooding. These areas must be dewatered so work can continue at a steady pace, and to provide additional safety for the crew operating the job.

## 7.1.**Dewatering Methods**

In most cases, dewatering from open trenches or excavation can be done a variety of different ways. The simplest method uses the omnipresent power of gravity. By creating drainage channels, water is carried away from the work site to the discharge point. Channels used for dewatering are usually protected with ditch linings to ensure the (sometimes contaminated) water does not seep into the ground soil.Some of the other common dewatering techniques involve submersible dewatering pumps, siphoning, or using large machinery buckets to catch the water and dump off-site. These techniques are performed when the water that needs to be removed is below the designated discharge area.To avoid further disruption of the environment such as soil eroding, it is imperative that the dewatering process is done properly. It is also important to select the best location for the discharge line, even when you might be a long distance from any bodies of water.

When choosing discharge areas for your dewatering, keep in mind:

- Water should never be pumped directly into slopes which can cause erosion or leave a potential for landslides.
- It is important to look for signs of erosion in the area and discontinue dewatering if any is found.
- If possible, water should be channeled into wooded or heavily vegetated areas.
- Never discharge water contaminated with grease, oil, or caustic chemicals directly into the ground to prevent contaminating the local environment.
- Sump pumps are the most common dewatering technique; however, they are limited by how much volume they can process so are not suited for large jobs.
- Additional permits may be needed from local, state, or federal governments.


Figure: Dewatering process

| Self-Check -7 | Written Test |
|---|---|

**Activity**

**3. Define the following(6pts)**

1. *Drawing* _____
2. *Why dewatering* _____

_____

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-8 | Completing work |
|---|---|

## 8.1.Maintain a Clean and Tidy Work Area

It is essential that all work areas are kept clean and tidy to ensure the safety of all personnel/workers and ease of work operations. All work areas should be kept free from debris and other material as a build-up of refuse can create risks such as fire hazards and injury from sharp objects.Equipment that is used regularly should be serviced or maintained regularly. Equipment should be stored in a safe place when not in use. Follow site and safety procedures when storing equipment and ensure that the storage area is clean and organized to help prevent slips, trips and falls. This prolongs the life of the equipment, and makes it easy to locate for other personnel/workers or yourself.

| Self-Check -8 | Written Test |
|---|---|

Activity

**I.Define the following(6pts)**

*Define how to clean and teady a work area* _____

_____

_____

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-9 | Recovering the dewatering system |
|---|---|

## 9.1. Recovering the dewatering system

**Monitoring and check:**Monitoring and check should be conducted to keep the dewatering system in satisfactory condition during operation.

**Inspections:**Inspection should be conducted to ensure that facility should go on with satisfactory working. Inspection should be required not only by external check but internal check of the facility. In inspection the facility should be looked closely at parts especially to check that everything is satisfactory.

Difference between a repair and an overhaul

- A repair simply replaces whatever component or components failed.
- An overhaul begins with a complete inspection and restores the machine back to standards or better.

## 9.2.**Dewatering pump system Recovery check list**

Prospective recovery action will be following;

Table: 11.1-PPE

| **Components** | **Action** | **Remark** |
|---|---|---|
| Valve | Clean or replace | |
| Seal and packaging | Repair of leaked part or damaged part | |
| Corrosive parts | Repaint to prevent corrosion | |
| pipe | Change or cleaning of pipe | |
| Tank | Cleaning in the tank | |
| flow meter | Cleaning of the flow meter | |
| bearings | Replace worn bearings and parts | |

| | | |
|---|---|---|
| Analyze motor | Surge Test, Winding, rotor, remove any moisture | |

### 9.3.Records of recovery

Records of recovery work after monitoring and check should include the following:

- Results of recovery work of adjustment, repairing and replacement
- Results of recovery work of repairing
- Name of facility and name of part including a No. of facility, Indication of location of part in facility by drawing or sketch
- Reason of repairing, Date of repairing and Name of person in charge of repairing work

9.4.**Reports**

Reports should include as follows:

- Report for recommendation
- Rehabilitation
- Repairing or replace
- List of spare parts that should be required to stock in the plant For supplementation.

| Self-Check -9 | Written Test |
|---|---|

**I. Describe the actions to be taken during pump system Recovery check list**

| Components | Action | Remark |
|---|---|---|
| Valve | | |
| Seal and packaging | | |
| Corrosive parts | | |
| pipe | | |
| Tank | | |
| flow meter | | |
| bearings | | |

***Note:*** **Satisfactory rating - 14 points** **Unsatisfactory - below 7 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-10 | Clearing work area and disposing/recycling materials |
|---|---|

## 10.1. Housekeeping

5S is the acronym for five Japanese words: Seiri, Seiton, Seiso, Seiketsu and Shitsuke and they represent the five steps for a systematic technique for good housekeeping as indicated in the table below:

Table: 13.1. The five steps of Japanese 5 S

| Step | Corresponding action |
|---|---|
| *Seiri* **(Sort)** | Distinguish between necessary and unnecessary items. Remove the latter. |
| *Seiton* **(Set in order)** | Enforce the dictum 'a place for everything and everything in its place'. |
| *Seiso* **(Shine)** | Clean up the workplace and look for ways to keep it clean. |
| *Seiketsu* **(Standardize)** | Maintain and monitor adherence to the first three Ss. |
| *Shitsuke* **(Sustain)** | Follow the rule to keep the workplace 5S-right. Hold the gain. |

The general concept of the 5S is that they are intended to eliminate waste (Osada, 1993). Working in disorder is neither productive, nor safe. 5S is a simple and practical method to instil a quality culture at the work place. It is relatively easy to undertake, and requires minimal additional resources. The first and small investment made in time and effort pays off in a much bigger manner when the results are realized and maintained

Among the main benefits of implementing 5S are:

- the workplace becomes cleaner, safer, well-organized and more pleasant
- floor space utilization is improved
- workflow becomes smoother and more systematic and non-value added activities are reduced;

- time for searching tools, materials and document is minimized;
- machine breakdowns are reduced since clean and well-maintained equipment breaks down less frequently and it also becomes easier to diagnose and repair before breakdowns occur, therefore extending equipment life;
- consumables and material wastage are minimized;
- the morale and satisfaction of employees improves; and
- the productivity of the organization improves together with the quality of products and services.

The meaning, methods of implementing and benefits of each of the 5S are given below.

**1. SORT - SEIRI**

The emphasis of Seiri is on stratification management and being able to spot the unwanted and unnecessary before they become problematic (Osada, 1993).

Figure: Sort - Seir

## 2. SET IN ORDER - SEITON

Seiton in essence can be defined as neatness, having things in the right places or set up so that they are readily available for use, eliminating the need to search. Once everything has a right place so that it's functionally placed for quality and safety, it can then be deemed that the workplace is neat (Osada, 1993). While Seiri helps you to decide what items are needed, Seiton helps you to decide the way things are to be placed.


Source: 5S Best Practices( www.5sbestpractices.ning.com).

Figure: Set-in-order – Seiton

## 3. SHINE - SEISO

Seiso places emphasis on cleaning so that things are clean; in other words carrying out cleaning as a form of inspection i.e. getting rid of waste, and foreign matter. It is important to note that depending on the circumstance, with higher quality, higher precision and finer processing technologies, even the minute details may have the greatest ramifications, hence the importance to carry out cleaning as a form of inspection (Osada, 1993).


Figure: Shine – Seiso

### 4. STANDARDIZE - SEIKETSU

This aspect of the 5S focuses on standardization, making the first three S's, Seiri, Seiton, and Seiso a constant routine. The emphasis here is on visual management, an important aspect to attain and maintain standardized conditions to enable the individuals always act quickly (Osada, 1993

**Source:** Lean Expertise (www.tpmonline.com/articles_on_total_productive_maintenance/leanmfg/the5sindetail.htm)


**Source:** Concare Inc. (http://www.concare.com)

Figure: Standardize – Seiketsu

### 5. SUSTAIN - SHITSUKE

Shitsuke places emphasis on being able to forge a workplace with good habits and discipline. Demonstrating to others what needs to be done and encouraging practice amongst them. This is mainly a management responsibility.

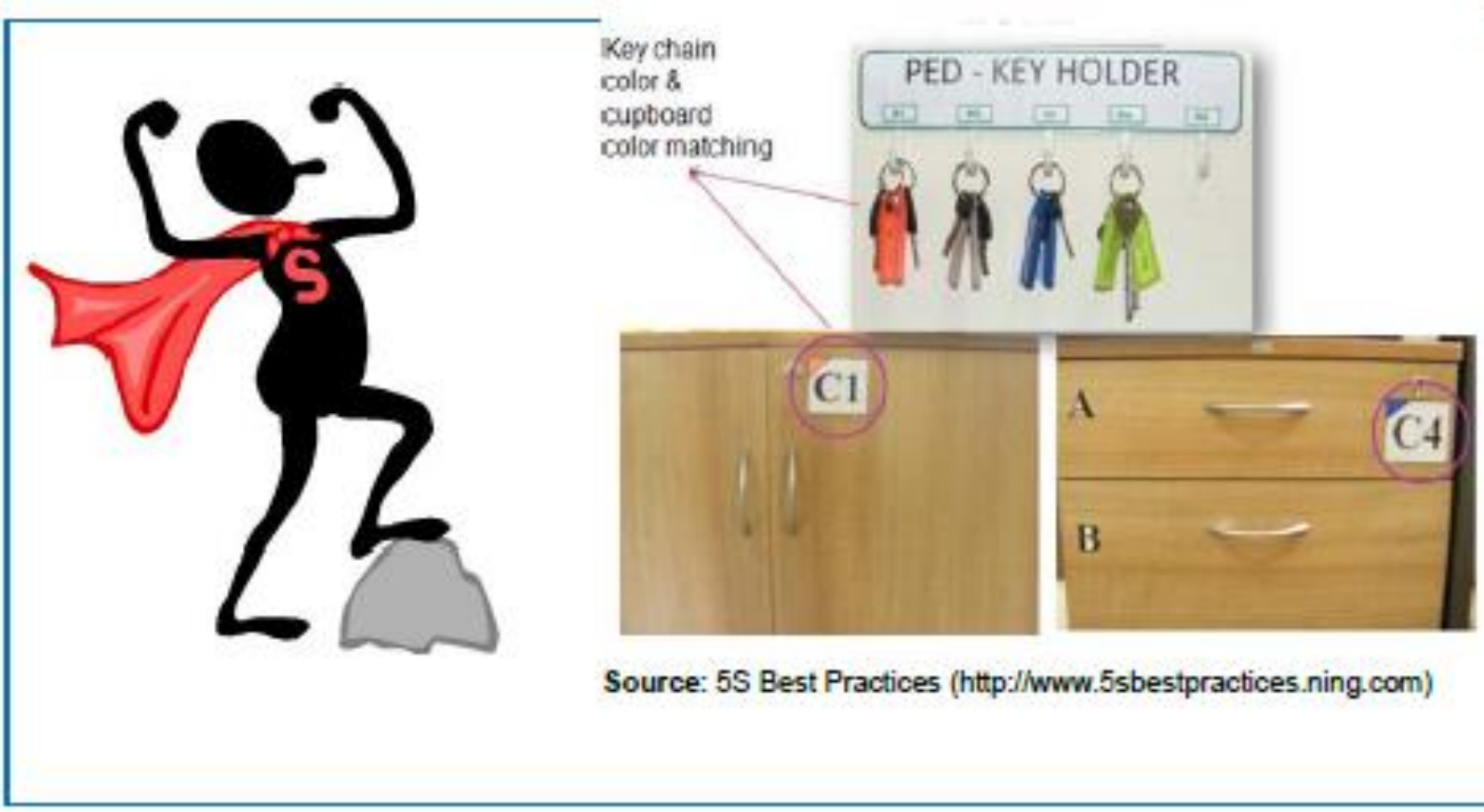



Figure: Sustain – Shitsuke

Table: Sustain – Shitsuke

| Meaning | Methods | Benefits |
|---|---|---|
| Sustain also means 'Discipline'. It denotes your commitment to maintain orderliness and to practice first 3S as a way of life. This also requires that your employees show positive interest and overcome resistance to change. | • Create awareness and publicize the system. For example develop 5S News, 5S Posters, 5S Slogans, 5S Day, etc.<br>• Create a structure of how and when 5S activities will be implemented.<br>• Formulate guidelines for audit/evaluation of 5S implementation.<br>• Provide management support by providing resources and leadership.<br>• Reward and recognize best performers. | Promotes habit for complying with workplace rules and procedures.<br><br>Creates healthy atmosphere and a good work place.<br><br>Helps you to develop team work.<br><br>Provides you with data for improving 5S. |

| Self-Check -10 | Written Test |
|---|---|

1. What is Kaizen

2. What do you know about 3S

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-11 | Testing lights start-up and shutdown |
|---|---|

## 11.1. Lights start-up and shutdown

Figure: Mobile lighting tower

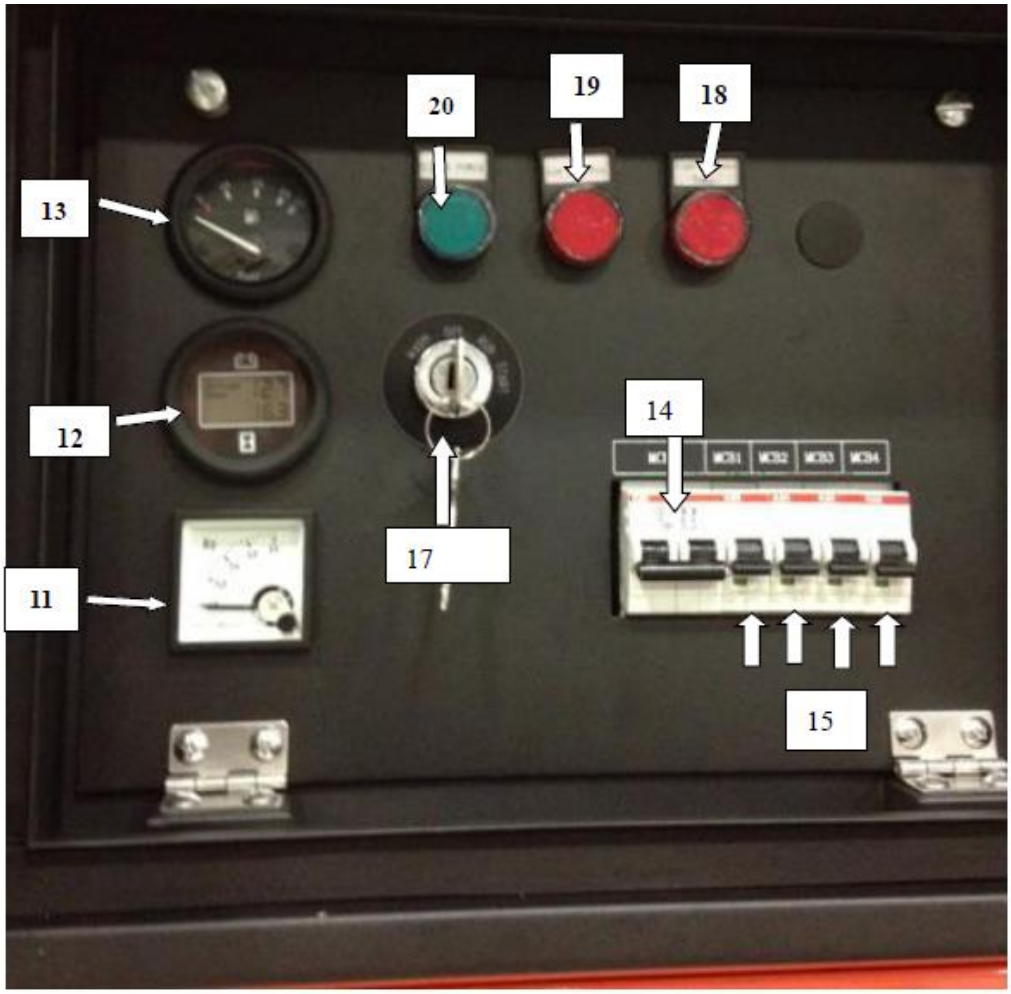



**Figure 1**

| Items | Description | Items | Description |
|---|---|---|---|
| 11 | Frequency Meter (Hz) | 12 | Hour Meter/Battery gauge |
| 13 | Fuel Gauge | 14 | Main circuit |
| 15 | Floodlight Circuit Breakers | | |
| 17 | Ignition switch | 18 | Low Oil Pressure |
| 19 | High Coolant Temp | 20 | Voltage Indicator |

| Self-Check -11 | Written Test |
|---|---|

**Activity**

**4. Define the following(2pts)**

3. *Drawing* _____
4. *manufacturing*_____
   _____
5. *maintenance*_____

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-12 | Activating lights |
|---|---|

## 12.1. Activating lights

Before commencing lighting operation:

- Check lighting tower performance
- Check work place
- Weather condition

Table: Checklist for lighting tower

| Components | yes | no | Action required |
|---|---|---|---|
| Electrical components, wiring | | | |
| | | | |
| Mast components | | | |
| Mast locking pins | | | |
| Trailer lights and reflectors | | | |
| Outriggers, leveling jacks and foot pads | | | |
| Winch | | | |
| Nuts, bolts and other fasteners | | | |
| Lamp fixtures, connections and bulbs | | | |
| Cable (kinks, frays and abrasions) | | | |
| Safety chains | | | |
| Engine and related components | | | |
| Fuel tanks | | | |

| | | | |
|---|---|---|---|
| Generator | | | |
| Grounding rod and lug | | | |
| **Work place**<br><br>The workplace inspection helps the operator determine if the workplace is suitable for safe machine operation. | | | |
| | **yes** | **no** | |
| unstable or slippery surfaces | | | |
| Wind | | | |
| hazardous locations | | | |
| inadequate surface support to withstand all | | | |
| load forces imposed by the machine | | | |

| Self-Check -12 | Written Test |
|---|---|

**Activity**

**I. Define the following(2pts)**

1. *Mast* _____
2. *work place*_____

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| Information Sheet-13 | Enhancing visibility lighting position |
|---|---|

### 13.1. Enhancing visibility lighting position

- For maximum light coverage locate the Light Tower at ground level or in a spot higher than the area being lighted.
- Position the trailer on a firm, flat surface clear of overhead wires and obstructions. Be sure that there is enough area for outrigger extensions to be fully extended.


Figure: 16.1- Mobile lighting tower positioning

Once the machine is moved and is on-site, proper setup is key. A lot needs to be done between pulling the light tower onto the jobsite and starting it up. Users need to level the light tower and set up the outriggers properly. Then, before raising the mast, make sure the lights are positioned and adjusted to the desired position. Once the tower is set up and the mast is raised, ensure that all of the switches are turned off prior to starting the engine.

Operators should always refer to the manufacturer's instructions for startup; once the engine is on and running, it is best to let the engine run for a few minutes before applying a load. Other concerns operators should be aware of is the wind speed outside. It's not only potentially damaging to the light tower but is also a safety issue. Light tower units are equipped with four-point stabilizer/outrigger systems and are typically built to withstand wind gusts up to 65 mph when the outriggers are properly deployed. Never operate light towers in winds higher than what has been rated by the manufacturer.

| Operation Sheet-1 | Positioning lighting tower |
|---|---|

**Preparing Trailer for Towing or Lifting**

1. Check that the mast cradle lock pin **(j)** is in place and secured with the safety pin.
2. Ensure that the tower is completely nested inside the transport cradle and the pin **(t)** is secure.
3. Make sure the doors are properly latched.
4. Return the outriggers to their travel position. Check that the outrigger bars and jacks are locked in place.
5. Crank the rear jack **(f)** all the way in and rotate it 90°. The Light Tower is now ready to lift. For towing, continue.
6. Use the tongue jack **(a)** to raise the trailer tongue up and then lower it over hitch on towing vehicle. Lock the hitch to coupling and attach the safety chains. Swivel the tongue jack 90° and lock it in place.
7. Connect the trailer wiring to the towing vehicle. Check the brake, turn, and tail lights for proper operation.
8. Position the light fixtures down **(k)**. For rough, off-road transportation remove bulbs from fixtures to avoid damage.
9. Check the tire inflation.
10. Attach a red flag to the end of mast before towing.

| Operation Sheet-2 | Installing pump |
|---|---|

Position the light tower at the desired work site.

1. Chock the wheels.
2. Disconnect the trailer lights and the safety chains.
3. Open the latch on the trailer hitch.
4. Pull the release pin on the tongue jack and rotate into vertical position.
5. Turn the leveling jack handle to lower the front outrigger foot pad and raise the tongue of the machine enough to clear the tow vehicle.

6. Release the spring pin on the side outriggers and slide them out into the deployed position. Make sure the outriggers are locked in place. Rotate the leveling jack into position.
7. Turn the leveling jack handles to level the machine. Level the machine using only the leveling jacks
8. Check the bubble level (if equipped) on the front of the machine to make sure the machine is level

| **Lab test** | |
|---|---|

Task 1 .prepare positioning **Standard operating procedure (SOP) for mobile tower.**

Task 2 .Prepare Installing for pump

| Self-Check -13 | Written Test |
|---|---|

**Activity**

**I. Define the following(2pts)**

1. *Lighting position*_____
2. *manufacturing*_____
3. *maintenance*_____
4.

***Note:*** **Satisfactory rating - 6 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

**Short Answer Question**

| LG #23 | LO #3- carryout operation maintenance |
|---|---|

**Instruction sheet**

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Inspecting mobile lighting and dewatering equipment and systems
- Carrying out Operational maintenance ,Servicing, lubricating and Housekeeping tasks.
- Processing and documenting records and reports

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Inspect mobile lighting and dewatering equipment and systems
- Carry out Operational maintenance ,Servicing, lubricating and Housekeeping tasks.
- Process and document records and reports.

**Learning Instructions:**

1.Read the specific objectives of this Learning Guide.

2.Follow the instructions described below.

3.Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

4,Accomplish the “Self-checks” which are placed following all information sheets.

5.Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

6.If your performance is satisfactory proceed to the next learning guide,

| Information Sheet-1 | Inspecting mobile lighting and dewatering equipment and systems |
|---|---|

## 1.1.Inspecting mobile lighting

Inspection should be conducted to ensure that facility should go on with satisfactory working. Inspection should be required not only by external check but internal check of the facility. In inspection the facility should be looked closely at parts especially to check that everything is satisfactory.

Inspection should be conducted periodically and frequency of inspection will be different from characteristics of facility or parts by importance, load in working, and possibility of occurring of trouble, and so.

### Fundamentals

It is the responsibility of the operator to perform a pre-operation inspection. The pre-operation inspection is a visual inspection performed by the operator prior to each work shift. The inspection is designed to discover if anything is apparently wrong with a machine before the operator performs the function tests.

### Employers' responsibilities

- Provide a safe place to work, Provide safe plant and equipment
- Provide a safe systems of work, Provide a safe working environment
- Provide and maintain work equipment
- Provide safe methods of handling, storing and moving goods and materials
- Provide any PPE required to safely undertake a task
- Consult with employees, or their representatives.

**Inspection check list**

| When | where | what | Reference |
|---|---|---|---|
| Time frame: daily, weekly, monthly or annually | List of Equipments or part of a machine | Checking oil, grease, wear, vibration, joints and others | Manufacturer manual |

**Inspection check list-1**

**Engine**

| When | where | what | Reference |
|---|---|---|---|
| | Fuel tank | Fluid level | Time use Manufacturer manual |
| | coolant level gage | Check coolant level | |
| | wheel | Check grease | |
| | shaft | Check lubrication | |
| daily | Oil tank | Check Oil leak | |
| | battery | charge | |
| daily | Coolant tank | Coolant leak | |
| | Battery | Add distilled water if needed | |
| Time from maintenance plan | Check entire machine | Dents or damage to machine | |

| | | | |
|---|---|---|---|
| Time from maintenance plan | Check entire machine | Cracks in welds or structural components | |
| daily | Check entire machine | Excessive rust, corrosion or oxidation | |
| Time from maintenance plan | Fuel filter | Fuel filter dirty | |
| Time from maintenance plan | battery | battery discharge | |

**Inspection check list-2**

**Mast components**

| When | where | what | Reference |
|---|---|---|---|
| daily | Mast locking pins | Check lose | Manufacturer manual |
| | Trailer lights and reflectors | Check defect | Manufacturer manual |
| | Outriggers, leveling jacks and foot pads | Check Miss place | |
| daily | Winch Nuts, bolts and other fasteners | Check lose | |
| daily | Lamp fixtures, connections and | Check lose | |

| | | | |
|---|---|---|---|
| | bulbs | | |
| daily | Safety chains | Check In place | |
| | Check entire machine | Dents or damage to machine | Time use Manufacturer manual |
| | Wire ropes | Check wear and rear | Manufacturer manual |

To ensure that equipment is in a safe condition, the standard requires a variety of inspections. The following inspections are required of all equipment:

- Shift inspections
- Monthly inspections
- Annual inspections
- Shift, monthly, and annual wire rope inspections

**1.2.Inspecting dewatering equipment and systems**

**Pump inspection.** Dismantle the pump and inspect thoroughly each year according to the following schedule:

a) Remove and examine all valves, valves seats and springs. Reface valves and valve seats as necessary and replace worn or defective parts.

b) Remove all old packing and repack.

c) Check the pump and driver alignment.

d) Check the plunger or rod for scoring or grooving.

Clean the interior and exterior surfaces. Paint the interior with suitable underwater paint or protective coating. Paint the exterior.

| When | Where | What | Reference |
|---|---|---|---|
| Daily | packing | leakage | |
| daily | electric | Voltage and current. | |
| daily | Shaft coupling | Check alignment | |
| | water tank | Clean the tank | |
| | Impeller | wear | |
| Annual | Rings | Wear | |
| | Mechanical Seals | wear | |
| Weekly, | Bearings | Check the bearing temperature and lubricant level | |
| Annual | Generator or Motor | Thoroughly inspect stress carrying parts of rotor for cracks | |

| Self-Check -1 | Written Test |
|---|---|


What actions to be taken?

**Mast components**

| When | where | what | Reference |
|---|---|---|---|
| daily | Mast locking pins | | Manufacturer manual |
| | Trailer lights and reflectors | | Manufacturer manual |
| | Outriggers, leveling jacks and foot pads | | |
| daily | Winch Nuts, bolts and other fasteners | | |
| daily | Lamp fixtures, connections and bulbs | | |
| daily | Safety chains | | |
| | Check entire machine | | Time use Manufacturer manual |
| | Wire ropes | | Manufacturer manual |

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 5 points**

Score = _____

Rating: _____

| Information Sheet-2 | Carrying out Operational maintenance tasks |
|---|---|

## 2.1. Carrying out Operational maintenance tasks

Maintenance refers to all measures regarding the preservation, evaluation and restoration of the system status.

**Reaon carry out maintenance activities**

- Maintain and extend operational readiness
- Protection of personnel, system and environment
- Keep machines or systems operating at peak efficiency
- Protect personnel and environment under legal requirements

**2.1.Types of Maintenance**

**Service**: Measures to maintain required status

**Inspection**: Measures to determine and evaluate the actual status

**Repairs:** Measures to restore the required status

- Shut down the machine when performing any repairs or maintenance.
- Whenever opening the control panel, take the necessary measures to prevent electrical shocks.
- Only qualified persons are permitted to do repair work and use only approved spare parts by the manufacturer

**Daily maintenance**

- Clean All parts
- Check for any leaks, such as fuel, oil, or coolant.
- Check the water level in the radiator.
- Check the oil level at the dipstick and fill with correct oil to the specified position when insufficient.
- Check for the tightness of engine mounts.

## 2.3. Maintenance of the Dewatering pump

The manufacturer's instructions should be referred to in the development of maintenance and repair programs. Maintenance and repair programs should specify:

- where servicing is required;
- the extent of servicing required, the nature of the servicing required, the frequency of servicing;
- who is responsible for maintaining repair and maintenance programs;
- How defects will be corrected; and performance testing and evaluation standards.

**Safety during Maintenance**

Performing maintenance on mechanical equipment can be hazardous. Electrical and mechanical energy can cause injury and death if not managed properly. All maintenance activity should be conducted in accordance with Reclamation *Safety and Health Standards*. A job hazard analysis (JHA) must be conducted as well.

**Basic pump maintenance**

Common maintenance tasks on centrifugal pumps include the following:

- Bearing lubrication and replacement
- Mechanical seal replacement
- Packing tightening and replacement
- Wear ring adjustment or replacement
- Impeller replacement
- Pump/motor alignment
- Motor repair or replacement.

**lubricating**

In industrial equipments / machineries, the surface of the mechanical parts will have physical contact on the neighboring parts to establish a relative motion between them. During the operation of the equipments, those contacting surfaces are subjected to friction which depends on the area of material, properties of material etc which in undesirable. The

primary objective of lubrication is to reduce wear and heat between contacting surfaces in relative motion. Lubrication also aids to

Reduction of rust formation

- Reduce oxidation Transmit
- Seal against clust, dirt and water.

**Lubrication:** Manufacturer's manuals cover lubrication frequency for special cases, but the following generally applies. (Caution: Do not lubricate totally enclosed equipment or insufficiently guarded equipment while it is moving.)

**2.4.Repair mobile lighting bulb**

**Replacing Bulbs**

**Removal:**

1. Shut down the engine and allow the bulb to cool.
2. Remove the screws **(a)** securing the flange rings **(b)** and remove the flange rings.
3. Remove the lens **(c)** with the gasket **(d)** attached.
4. Remove the hardware securing one side of the bulb stabilizer **(e)**. Once removed, swing the bulb stabilizer to the side and unscrew the bulb **(f)**.

**Installation:**

5. Insert the bulb and secure it with the bulb stabilizer **(e)**.
6. Install the gasket **(d)** around the lens **(c)** and secure the lens to the reflector with flange ring **(b)** and screws **(a)**.

**2.5.pump maintenance**

**1.Bearings**

Bearings should be lubricated semiannually or annually. Operators should pay particular attention to the following:

For grease-lubricated bearings, add grease as described in the technical manual for the pump. Be careful not to over grease bearings, because this interferes with the ball or roller motion and might cause overheating.

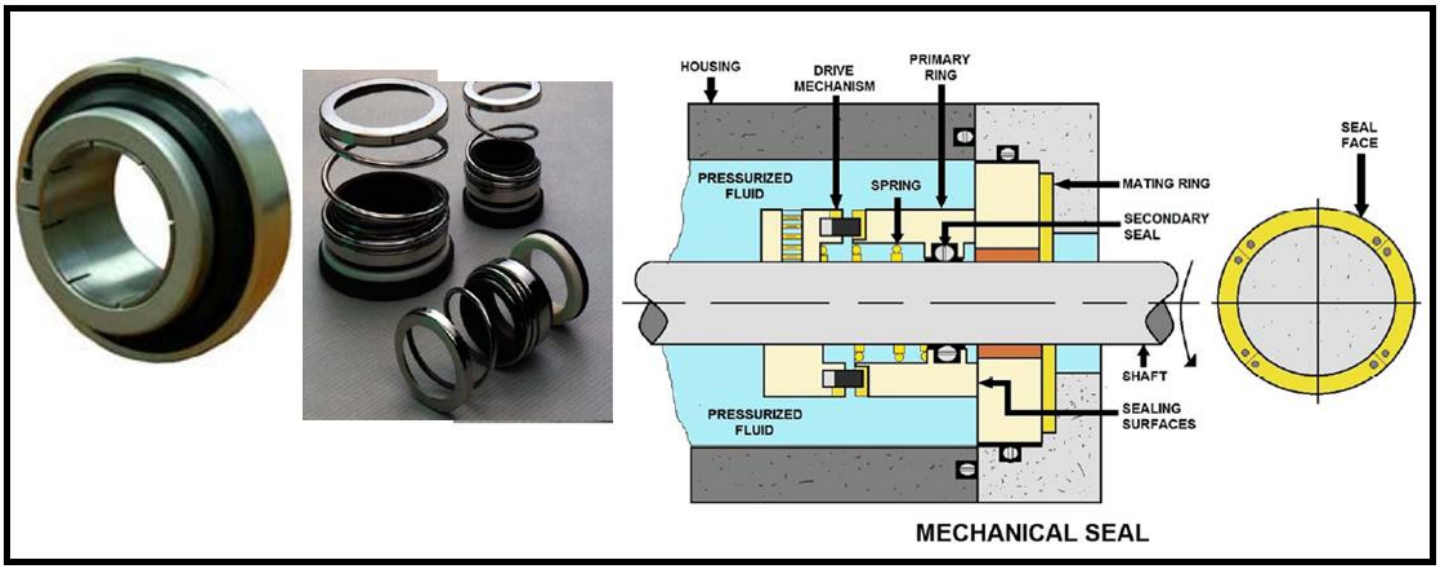
For oil-lubricated bearings, check the level and quality of the oil. If necessary, add or replace oil. Do not overfill the oil reservoir

2.**Packing:** Check for leakage around the packing and adjust it according to the instructions of the pump and packing manufacturers. Allowable leakage is usually between 2 and 60 drops per minute. Add packing rings or, if necessary, replace all the packing.

3.**Wearing Rings**

Wearing rings, or seal rings as they are also called, provide a renewable seal or leakage joint between a pump impeller or a turbine runner and its casing. As the name implies, these rings can wear over time; and as the clearance increases, efficiency can decrease. As a general rule, when the wearing ring clearance exceeds 200 percent of the design clearance, the wearing rings should be replaced or renewed.

**4.Mechanical Seals:** Check for leakage. If leakage exceeds the manufacturer's specifications, replace the seal.




**5.stuffing boxes and packing**

Stuffing boxes should be carefully cleaned and the packing placed in them. Be sure that sufficient packing is placed at the back of the water seal cage. If the water to be pumped is dirty or gritty, sealing water should be piped to the stuffing boxes from clean outside source of supply in order to prevent damage to the packing and shaft.

**6.Motor/Pump Alignment.** Since shifting of the pump foundation feet or piping can cause pump/motor misalignment, check the alignment periodically. Alignment is typically measured

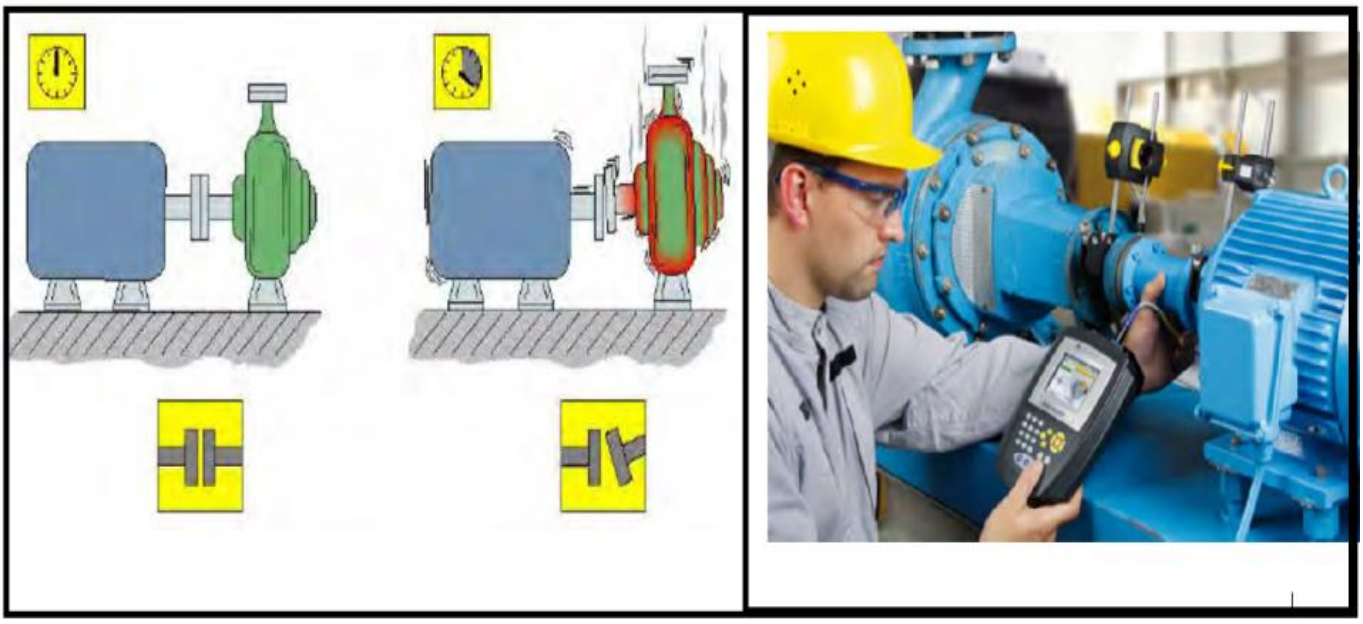
by using a dial indicator and reading the *total indicated run out*, or TIR—also known as *full indicator movement*, or FIM—of a pump/motor coupling. Regularly scheduled vibration readings can reveal changes in the status of a bearing.

**Symptoms of shaft misalignment**

- Loose or broken foundation bolts
- Loose shims packs
- Excessive oil leakage at bearing seals
- Loose or Brocken coupling bolts

**7.Shaft Alignment**

The procedure for alignment depends on the type of equipment and its design.



**Vibration :**Vibration is simply the movement of a machine or machine part back and forth from its position of rest. A weight hanging on a spring is the simplest example of how vibration works. Until a force is applied to the weight to cause it to move, we have no vibration. The most common problems that produce vibration are:

- unbalance of rotating parts
- misalignment of couplings and bearings

- bent shafts, bad drive belts and drive chains, bad bearings

**Trouble shooting centrifugal pump**

| **TROUBLE SHOOTING** | |
|---|---|
| **low discharge or no-discharge** | |
| ▪ Inadequate submergence.<br>▪ Direction of rotation improper.<br>▪ Wearing ring clearance too much.<br>▪ System static head is more than full close head of the pump. | ▪ Improper inlet system turbulence in sump.<br>▪ Air mixed with oil.<br>▪ System head is more than rated head.<br>▪ Rotational speed less than rated. |
| **LOW PRESSURE** | |
| ▪ System head is less than rated.<br>▪ Air mixed up with oil.<br>▪ Wearing ring clearance too much | ▪ High frictional losses.<br>▪ Rotational speed less than rated.<br>▪ Specific gravity of oil less than specified. |
| **NOISE AND VIBRATION** | |
| ▪ Inadequate submergence.<br>▪ Turbulence inside the tank.<br>▪ Damaged flexible member of the coupling. | ▪ Miss fitting of the parts.<br>▪ Damaged antifriction bearing or lower bush bearing. |
| **. JAMMING** | |
| ▪ Misfit ting of the parts.<br>▪ Bend in shaft. | ▪ Dry running of pump.<br>▪ Failure of bearings. |
| **RAPID WEARING OF PARTS** | |
| ▪ Misfit ting.<br>▪ Damaged journal bearing. | |

**troubleshooting submersible pumps**

Disconnect power unless required for testing.

- Have electrical testing done by a qualified electrician.
- Most problems occur above ground. Remove pump only as a last resort.

When troubleshooting or servicing the pump, use all precautions for the voltages involved.

**2.6. House keeping**

**2.6.1.Maintain a Clean and Tidy Work Area**

It is essential that all work areas are kept clean and tidy to ensure the safety of all personnel/workers and ease of work operations. All work areas should be kept free from debris and other material as a build-up of refuse can create risks such as fire hazards and injury from sharp objects.

Equipment that is used regularly should be serviced or maintained regularly. Equipment should be stored in a safe place when not in use. Follow site and safety procedures when storing equipment and ensure that the storage area is clean and organized to help prevent slips, trips and falls. This prolongs the life of the equipment, and makes it easy to locate for other personnel/workers.

bad

good

| Self-Check -2 | Written Test |
|---|---|

**Activity**

I.Define the following(9 Points)

1. **Service**
2. **Inspection**:
3. **Repairs**

***Note:*** **Satisfactory rating - 9 points** **Unsatisfactory - below 5 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

| Information Sheet-3 | Processing and documenting records and reports |
|---|---|

### 3.1. Processing and documenting records and reports

**Documents and reports :**Some jobs require paperwork to be done as part of the organization's requirements. Paperwork is important for the following reasons.It gives the organization an overview of the cost and efficiency of the work and shows where most of the resources and effort have gone

Problem areas or faults that are reported or repaired are identified from the reporting process. This helps to identify maintenance and quality issues, work procedures and equipment problems.

Having a written history of the performance of equipment allows you to identify and avoid problems and take planned maintenance action to prevent downtime. Regular performance monitoring also allows you to make adjustments where and when it is necessary to maintain efficiency.

### 3.2.Types of documents

The types of documents used to collect this information might include:

- Shift reports, Log books, Timesheets
- Pre-start checklists
- Maintenance checklists

**Maintenance Schedules and Documentation**

Complete, thorough, and current documentation is essential to an effective maintenance program. Whether you are performing preventive, predictive, or reliability-centered maintenance, keeping track of equipment condition and maintenance performed or planned is critical. Maintenance recommendations contained in this report should be used as the basis for establishing or refining a maintenance schedule.

| Self-Check -3 | Written Test |
|---|---|

**Activity**

I. List types of documents used to collect information

***Note:*** **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

**Answer Sheet**

Score = _____

Rating: _____

Name: _____ Date: _____

## Reference Materials

*Lighting tower operating and maintenance manual*

*TEREX operator's manual*

*Generac Mobile Products Srl*

Fire Protection Services Act

Environmental Health Licenses

http://www.servicenl.gov.nl.ca/licenses/env_health/ -

Mines and Infrastructure Industries

Work safely and follow WHS Policies and Procedures (civil safety )

www.canadaone.com/ezine/dec03/privacy_checklist.html

www.canadaone.com/ezine/feb2012/ontario_customer_service_standard_accessibility.

**https://www.brampton.ca/EN/Business/BEC/resources/Documents/What%20is%20a%20Standard%20Operating%20Procedure(SOP).pdf**

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**The trainers who developed this learning guide**

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