

USN



Internal Assessment Test II – March. 2019

Sub:	INDUSTRIAL SAFETY					Sub Code:	15ME662	Branch:	MECHANIC AL		
Date:	20/04/2019	Duration:	90 min's	Max Marks:	50	Sem/Sec:	6 <sup>th</sup> Sem A&B			OBE	
<u>Answer any FIVE FULL Questions</u>								MARKS	CO	RB	
1.	Write the safety precaution while operating drill press.					[10]	CO3	L1			
2.	Write safety precaution while working with corrosive substance.					[10]	CO3	L1			
3.	Write safety precaution while working with welding equipment.					[10]	CO3	L1			
4.	(a) What is PPE? List out all the PPE's and their function.					[05]	CO3	L1			
	(b) Write a short note on portable safety sign boards.					[05]	CO4	L1			
5.	List the types of portable fire extinguisher. Explain any 3.					[10]	CO5	L2			
6.	Explain different detectors used to in fire fighting system.					[10]	CO5	L1			

**Solution of IAT-2**

**1. Drill press**

- a. Use PPE
- b. Make all drill press adjustments with the power shut off.
- c. Keep all guards and covers on the machine when it is on and running.
- d. Make sure the size of the bit is equal to or less than the capacity of the drill press.
- e. Do not exceed the recommended speeds for the type and size of drill bit being used or composition of the stock being drilled.
- f. Center punch the drill-hole location into the stock. Insert bit into drill chuck and tighten with the chuck key.
- g. Remove chuck key from the drill chuck before starting the drill press.
- h. Use a clamp or vise to securely fasten the stock to the drill press table. Never attempt to handhold stock while drilling.
- i. Drill into cylindrical stock using a “V” block.

- j. Long stock should be drilled with the excess to the left of the operator. If the stock rotates it will hit the post, not the operator.
- k. Support the underside of the stock to be drilled with a backer board secured to the drill press table.
- l. Never start the machine without the table clear of everything except the stock you are drilling.
- m. Keep hands and fingers at least 3" from rotating drill bits

## 2. Corrosive material

- a. Always handle containers of corrosives carefully. Damaged containers may leak
- b. Acid containers, such as drums and carboys, can cause particular problems if they are not handled and stored safely.
- c. Dispense from only one container at a time. Finish all the dispensing of one material before starting to dispense another
- d. Gain sufficient information about the material
- e. Proper ventilation should be provided
- f. Always store material at low temperature region
- g. Ensure valves are completely closed and any protection devices are secured.
- h. Use proper warning signs in areas where corrosive materials are stored.
- i. Keep corrosive materials in a location free from vehicle traffic, excessive heat and electrical circuits.
- j. Keep corrosive materials away from fresh material
- k. Use PPE.

## 3. Welding machine

- a. Wear PPE
- b. Remove all flammable material, such as cotton, oil, gasoline, etc., from the vicinity of welding.
- c. Keep a suitable fire extinguisher nearby at all times
- d. Do not leave hot rejected electrode stubs, steel scrap, or tools on the floor or around the welding equipment
- e. Do not permit unauthorized persons to use welding or cutting equipment.
- f. Proper ventilation should be provided
- g. Obey the instructions given by the instructor
- h. Gain sufficient knowledge before using machine
- i. Proper safety guard must be provided

- j. Do not touch work piece after the work with bare hand.
- k. Do not play with the machine.

**4. (a)** Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection.

#### **PPE for the Head**

Employees must wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts

Protective helmets into two different types and three different classes.

**Type 1** helmets incorporate a full brim (brim fully encircles the dome of the hat) helmets offer protection from blows to the top of the head

**Type 2** helmets have no encircling brim, but may include a short bill on the front. Helmets offer protection from blows to both the top and sides of the head

- Class A Helmets reduce the force of impact of falling objects and also reduce the danger of contact with exposed low-voltage electrical conductors. Helmet shells are proof-tested at 2,200 volts of electrical charge.
- Class B Helmets reduce the force of impact of falling objects and also reduce the danger of contact with exposed high-voltage electrical conductors. Helmet shells are proof-tested at 20,000 volts.
- Class C Helmets reduce the force of impact of falling objects, but offer no electrical protection

#### **PPE for the Eyes & Face**

Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion.

#### **(b)**

Safety signs in the workplace are an indispensable way of protecting employees from accidents. Their purpose is to convey information in a comprehensive way about objects and situations that can be dangerous. In case of a fire, for instance, well placed signs can speed up the evacuation of a building and help those giving first aid.

OSHA Signs and Safety Signs warn of workplace hazards and instruct employees on the proper precautions to take to avoid injuries. Choose from Seton's extensive line of OSHA Signs, including Danger Signs, Caution Signs, Warning Signs, Notice Signs and many more. OSHA Signs and Safety Signs are available in sizes from large to small and in a variety of materials. Custom OSHA and Safety Signs are also available.

## Sign boards



Prohibition sign:

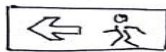
A sign prohibiting behaviour likely to increase or cause danger (eg, 'no access for unauthorised persons').



Warning sign - A sign giving warning of a hazard or danger (eg, danger, electricity)



Mandatory sign - A sign prescribing specific behaviour (eg, 'eye protection must be worn').

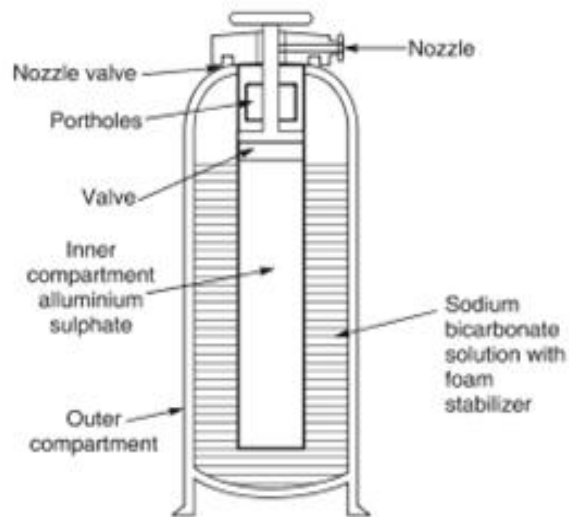


Emergency escape or first-aid sign - A sign giving information on emergency exits, first aid, or rescue facilities (eg, 'emergency exit/escape route')

## 5 Types of fire extinguisher

- Water fire extinguisher (Soda water acid type and gas pressure type fire extinguisher)
- Carbon di-oxide fire extinguisher
- Halons fire extinguisher
- Foam fire extinguisher
- Dry chemical fire extinguisher

### ➤ Foam fire extinguisher



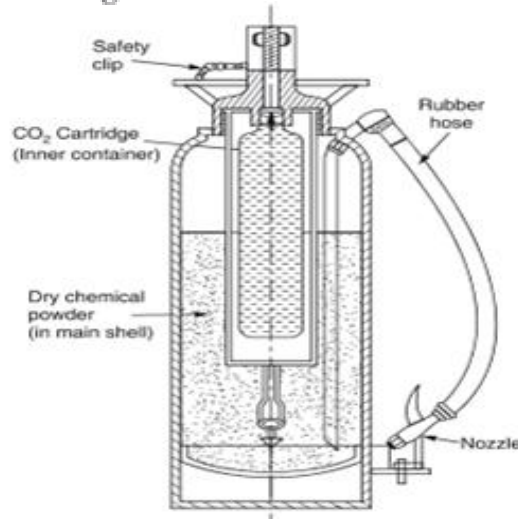
Portable extinguishers expelling foam are recommended for class B fires involving flammable liquids like oils, solvents, petroleum products, varnishes, paints, etc. The foam expelled by actuating the extinguishers forms a blanket over the surface.

➤ Dry chemical extinguisher

Dry Powder Fire Extinguishers are suitable for tackling petroleum fires, gas fires, fires in electrical equipments and for controlling surface fires in textile fibres. These extinguishers are noted for the speed with which they put out fires.

The chemical powders employed are usually sodium based and when applied to a fire, undergo chemical reaction. The free radicals which are responsible for sustaining any fire are out of action by the dry chemical powders and because of this, the fire dies out very fast.

Special dry powders containing sodium, potassium and barium compounds have been found useful in extinguishing fires in metals such as sodium and magnesium.



➤ Soda water acid type extinguisher

**Construction :** The various parts and contents of a soda acid extinguishers are shown in the Fig. 13.4.

The total liquid capacity of the body (or the solution containers) when filled to the specified level, should be 9 litres.

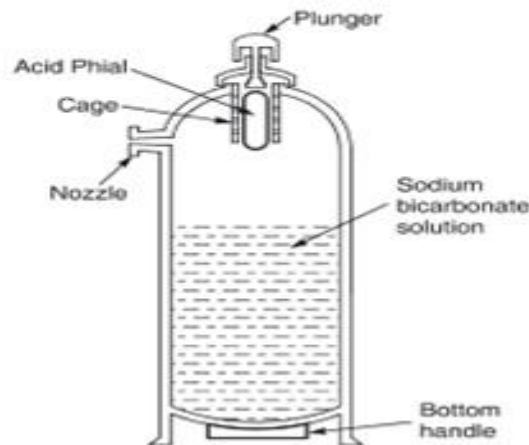
During manufacture, the body is required to be tested to an internal hydraulic pressure of  $25 \text{ kgf/cm}^2$  for 5 minutes.

**Method of operation :** The operational instructions given on the body of the extinguishers should be read carefully. It should be confirmed whether soda acid extinguishers are of **up-right type** or **turn-over type** depending on their method of working. The type of the extinguishers provided at a given place must be known and method of operation must be practiced well in advance during training.

**Principle of Operation.** When the plunger is struck the acid phial (bottle) ruptures. The sulphuric acid and sodium bicarbonate solution react together to release carbon dioxide ( $\text{CO}_2$ ) gas.

The  $\text{CO}_2$  generated creates internal pressure which forces the water out of the extinguishers.

**Note.** The  $\text{CO}_2$  gas acts only as a propellant and the water extinguishers the fire by **cooling effect**. Such extinguishers are recommended only for class A fires.



6.

Detection of fire at an early stage can prevent a catastrophic fire as necessary automatic/manual fire extinguishing action can be initiated without delay. A fire generally develops in three stages namely – incipient, smoldering and flame stage. Fire detectors are also designed to detect all the three stages of a full-grown fire. These fire detectors along with additional systems can perform a number of functions such as actuation of fire doors, smoke dampers, and shut down of power-operated equipments and of course annunciation and activation of fire suppression system. Fire detectors are mainly classified based on

(i) Principle of fire detection (smoke/flame/heat)

(ii) Area of coverage (spot/line type).

(a) **Smoke Detectors** : These detectors detect fire, based on the products of combustion. Smoke detectors are further classified into

(i) **Ionization Detector.** This type of detector consists of one or more chambers, which has a radioactive element (Alpha source)

to ionize the air inside the chamber. The two charged electrodes inside the chamber conduct a current due to ionisation of air. The detector operates when smoke enters into the chamber and reduces the conductivity of the air inside below a pre-defined level, which in turn reduces the current between the electrodes.

(ii) **Photoelectric Detector.** This type of detector employs the light scattering principle of smoke for detection. A light source (pulsed IR LED) and a light sensor (Photo diode) are arranged in a chamber in such a way that major portion of the light does not fall on the sensor. When smoke particles enter the light path inside the chamber, the light is scattered and this scattered light falls on the sensor which converts it into a signal for further action.

(iii) **Beam type Detector.** This type of detector operates on the principle of obstruction of light. A light transmitter transmits a pulsed beam of IR light, which is being received by the receiver. When the received beam intensity goes below the preset level due to smoke particle, the detector issues a signal for further action.

(b) **Flame Detector:** This kind of detector works on the detection of radiant energy of the flame at different wavelengths. Basic types are Infra Red and Ultra Violet type. IR radiation is produced in all flames during burning of carbonaceous materials such as alcohol, mineral insulated oil, petrol, diesel etc. UV radiation is emitted where hydrogen and certain materials involving sulphur are burnt. IR type flame detectors have an infrared cell (PbS cell) as sensor and UV type flame detectors have a vacuum photo diode GM tube as a sensor.

(c) **Heat Detectors :**

(i) **Fixed Temperature Detector.** This type of detector initiates a signal when the air surrounding it goes above a preset temperature. The sensor is usually a bi-metallic strip that closes a contact or a thermistor (whose resistance decreases with temperature) along with associated circuitry.

(ii) **Rate of Rise Temperature Detector.** This type of detector operates when the rate of rise of temperature of the air surrounding the detector exceeds the preset rate of rise. This is normally an electronic type of detector, which has two sensing elements (thermistors). One element is exposed to the surrounding while the other is insulated from the surrounding. Both sensor data are compared and checked with preset rate of rise for signal actuation.

(iii) **Linear Heat Sensing (LHS) Cables.** These are unique heat sensing cables made of polymer insulating material having a negative