CHAPTER 6: FIRE CONTROL SYSTEMS

Unit of learning code CON/CU/PL/CR/06/5/A

Related Unit of Competency in Occupational Standard Install Fire Control Systems

6.1.Introduction to the unit of learning

This unit specifies the competencies required to install fire control systems. It involves preparing working drawings, selecting tools and equipment for installation, quantifying and costing fire control materials and supplies, installation of fire control systems and maintenance and servicing of fire suppression systems applied in the construction industry.

6.2.Summary of Learning Outcomes

1. Prepare working drawing
2. Select tools and equipment
3. Quantify materials and supplies
4. Install sprinkler systems
5. Install hose reel systems
6. Install wet and dry risers
7. Maintain and service fire suppression systems

6.2.1 Learning Outcome 1: Prepare Working drawings

6.2.1.1 Introduction to the learning outcome

The objective of this learning outcome is to assist you develop competency in fire control drawings and symbols, fire control appliances and specifications

6.2.1.2 Performance Standard

1. Drawings are identified and selected based on the job.
2. Scale of the drawing is determined based on the specifications.
3. Measurements are converted based on scale.

4. Symbols are identified based on best practices.
5. Fire control piping appliances are identified based on the drawings
6. Manufacturers drawing and specifications are interpreted.
7. Working drawings are prepared based on specifications
8. Isometric working drawings are drawn based on best practices.

6.2.1.3 Information Sheet

Working drawings in fire control systems refers to the drawings that are designed to show the layout of the fire control system and appliances.

These fire detail drawings will give a clear idea of the fire evacuation plan for that premises and serve as a great tool when carrying out fire awareness drills & training for the occupants. Fire Plan drawings are also a requirement when submitting drawings for proposed building projects. .

The following additional information should also accompany the drawings:

1. Passive and active fire protection measures
2. Emergency and escape lighting
3. Fire alarm and detection systems
4. Engineered fire solutions used within the building
5. The dimensions of fire exit routes
6. Access and facilities for the fire service

Types of fire control drawings

1. Fire Safety provision drawings - These drawings show the protection features. That is including the extinguishing and smoke control requirements.
2. Fire alarm control panel - A *fire alarm control panel* (FACP), *fire alarm control unit* (FACU), or simply *fire alarm panel* is the controlling component of a *fire alarm* system. ... The *panel* may also supply electrical energy to operate any associated initiating device, notification appliance, *control*, transmitter, or relay.

3. Fire alarm wiring diagrams – This category of drawings clearly shows the connection and wiring of the alarm system.

4. Fire system drawings – This type of drawing clearly shows how fire control system is laid out and incorporated in the structural drawings of a building project.

Fire safety provision drawings.

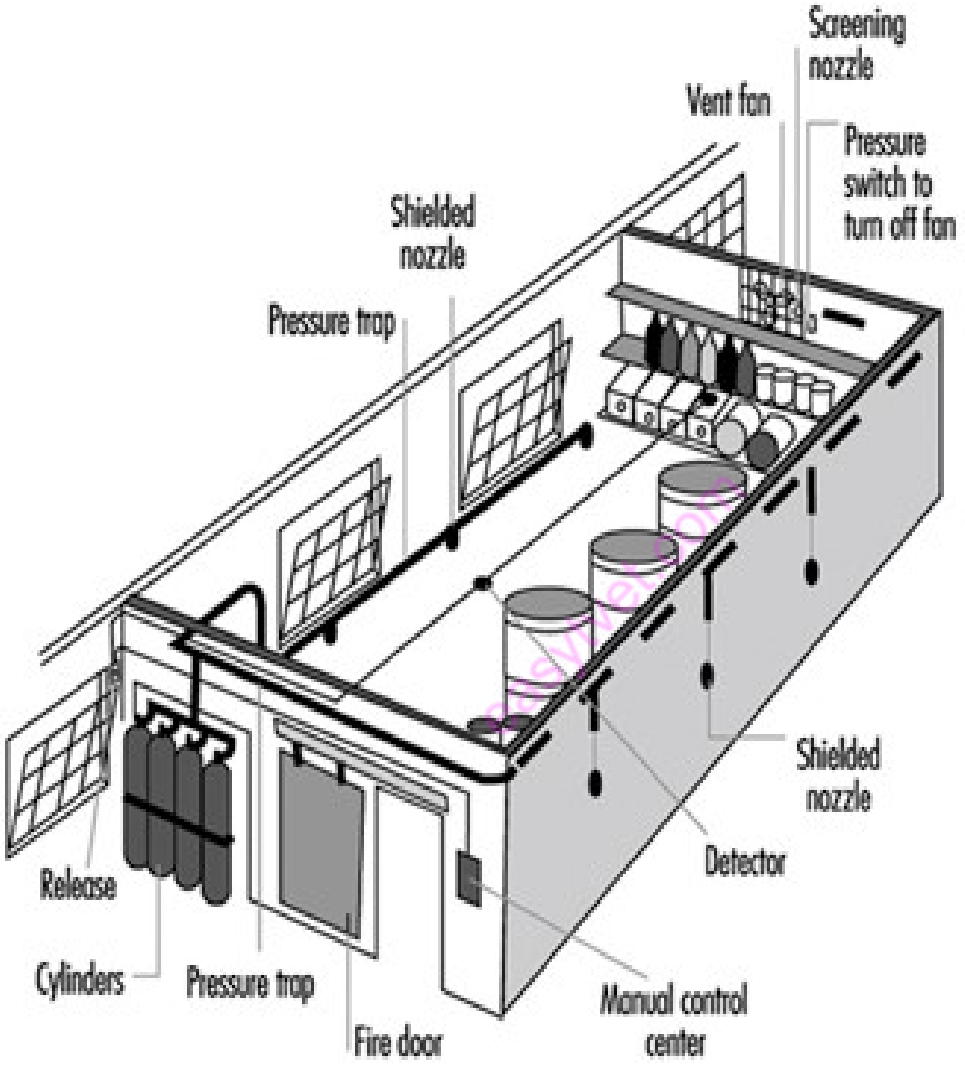

Figure 182- Fire Safety Provision Drawing

Fire alarm control panel

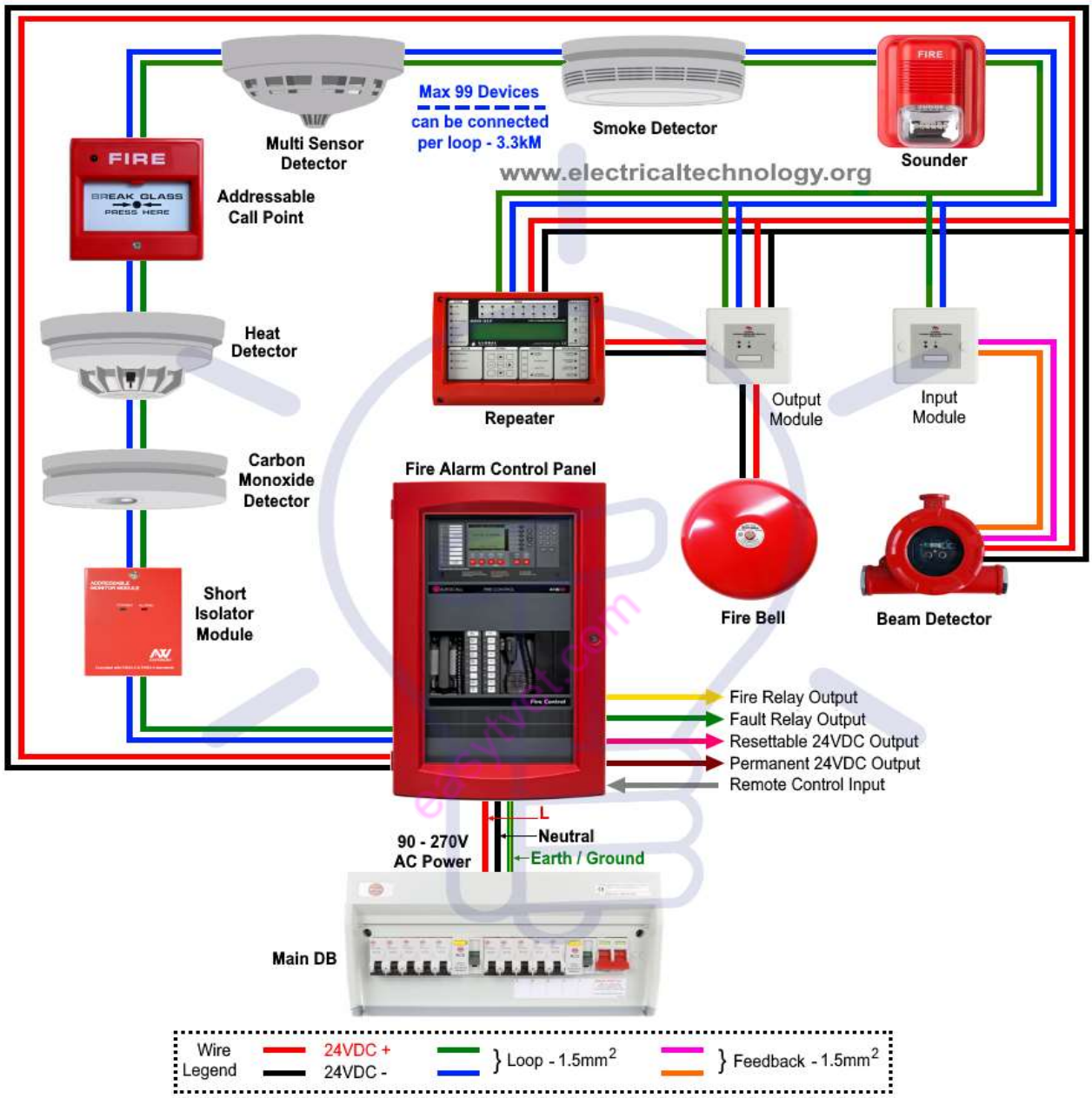

Figure 183 - Fire Alarm Control Panel

Fire alarm wiring diagram

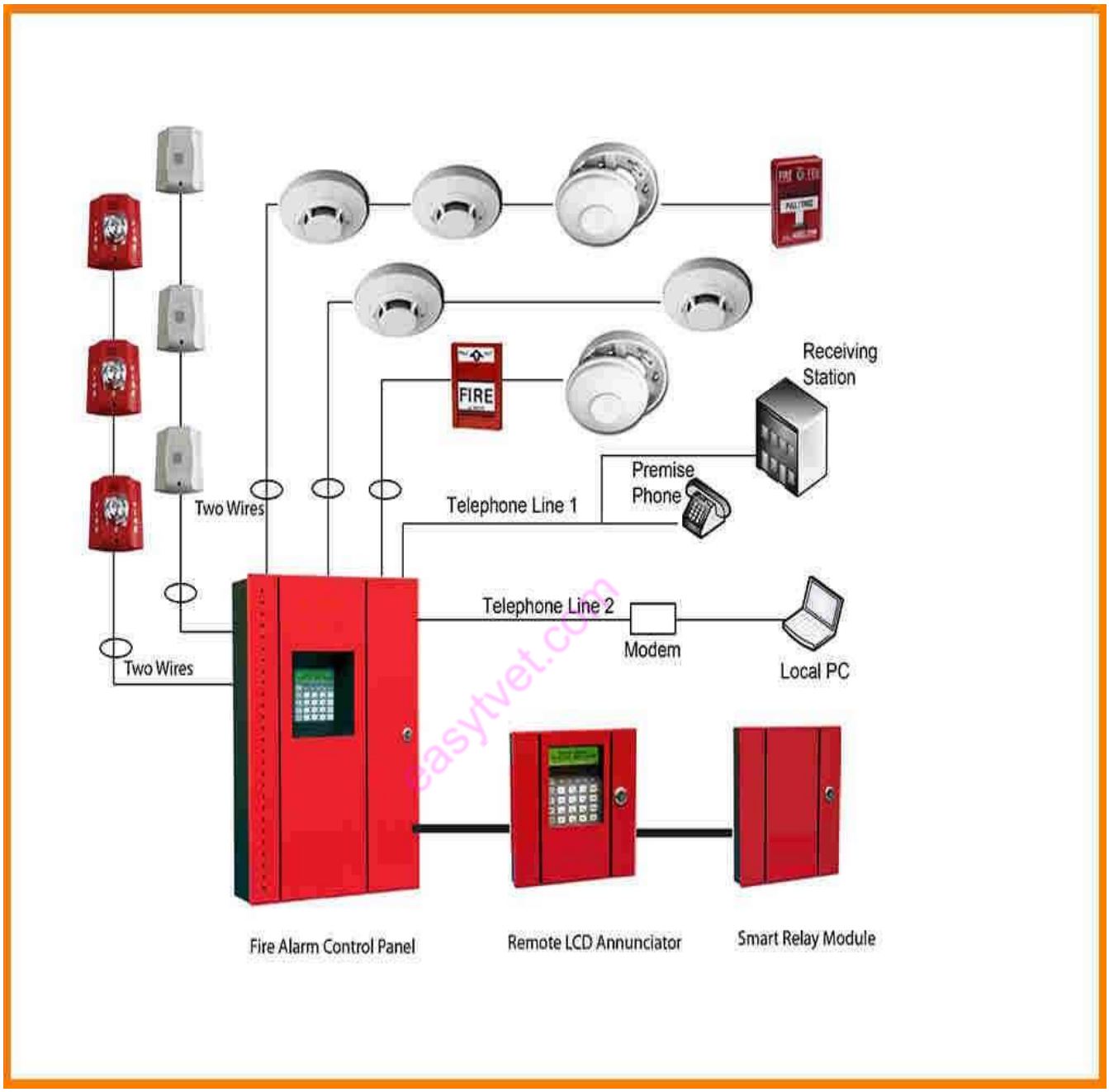

Figure 184 - Fire Alarm Wiring Diagram

FIRE ALARM SYSTEMS

These are the circuits which connect initiating devices such as smoke detectors, heat detectors, manual pull stations, and water flow alarms. Additionally, many system monitor devices important to the overall fire safety of the building also tie in to initiating circuits.

Purpose of Fire Alarm Systems

A properly designed, installed, operated, and maintained fire alarm system can reduce the losses associated with an unwanted fire in any building. These losses include property and, more importantly, human life.

The primary motivation for fire alarm system requirements in building and fire codes is to provide early notification to building occupants so they can exit the building, and to notify the fire service so it can respond to the fire. In settings such as hospitals the fire alarm system provides notification to staff so they can respond to the fire emergency (as opposed to evacuating the building).

Basic Components of a Fire Alarm System Fire alarm systems generally have the following components. Alarm Initiating Device Circuits These are the circuits which connect initiating devices such as smoke detectors, heat detectors, manual pull stations, and water flow alarms. Additionally, many system monitor devices important to the overall fire safety of the building also tie in to initiating circuits. These devices indicate an "abnormal" condition, not a fire or "alarm" condition. They are referred to as "supervisory devices." One example would be the valve supervisory switch or tamper switch of a valve controlling the automatic sprinkler system. These types of devices also may be connected to supervisory type circuits.

Supervisory Devices

1. Alarm Indicating Appliance Circuits

Audible and visible alarm indicating appliances tie in to these circuits to provide warning to the building occupants. Devices which send a signal off premises also can be connected to these circuits.

2. Fire Alarm Control Panel

The fire alarm control panel contains the electronics that supervise and monitor the fire alarm system. The initiating and indicating circuits are connected directly into this panel.

3. Primary Power Supply

The primary electrical supply powers the entire fire alarm system. Primary power for fire alarm systems typically is provided by connecting into the local commercial power service.

4. Secondary Power Supply

A separate power supply that will operate automatically when the primary power fails and is capable of operating the entire system is considered a secondary power supply.

Initiating Devices

Initiating devices fall into one of two main categories: either those that indicate an alarm condition, or those that indicate an abnormal condition of a monitored device.

Fire detection can occur by using any device that responds to conditions caused by fire. The most common byproducts of fire are heat, smoke, flames, and fire gases. In addition, people can detect a fire and initiate an alarm by activating a manual pull station. Also, when a sprinkler system activates and causes an alarm, it is a result of the sprinkler system detecting heat produced by the fire (if the sprinklers have fusible links).

1. Heat Detectors

Heat detectors commonly are used to detect fires. They are not as prone to false alarms and are less expensive than smoke detectors. However, the response of heat detectors may not be adequate in many instances, which limits their usefulness. Heat detectors are slower to respond to fires than are smoke detectors because heat detectors cannot respond to smoke. Heat detectors typically are best suited for detecting fast-growing fires in small spaces

FIRE CONTROL SYMBOLS

Symbols are used in *fire control* to provide a brief, accurate means of representing quantities which would otherwise require extended definition. The symbols should be well understood by the occupants or users of the building. This makes it easier to evacuate people in the case of a fire risk.

Direction arrow


Stairs


Double stairs

Elevator

Emergency exit

Handicapped emergency exit


Use stairs in fire


Fire escape / fire exit


Assembly point


Emergency phone 1


Emergency phone 2

Emergency contact information

Fire blanket


Fire alarm, black


Fire alarm, red


Fire extinguisher 1


Fire extinguisher 2


Fire hose

Fire hose with black text

Fire hose with red text


First aid


Direction


Left arrow


Right arrow


You are here


Entrance


Fire barrier


Underfloor hydrant


Transformer

Fire alarm systems

Fire alarm control panel

Fire department key depot


Biohazard


Radiation hazard


Obstructions


Fire escape


Hazardous materials storage


Danger compressed gas


Flammable material


Oxidant material

Harmful chemicals

Non ionising radiation

Corrosive material

High voltage

Dangerous chemical

Danger of death

Sprinkler connections

Private fire detection system

Exits and entrances

Water supplies

Elevator shaft

Nearest fire hydrant

Electric shut off

Knox box location

Water shut off

Other vertical openings

Roof access

Gas shut off

Figure 185 - Fire Control Symbols

FIRE CONTROL PIPING APPLIANCES

The piping appliance for fire control is set-out in a riser room. The piping appliance system is comprised of :

Fire Alarms

Pipework & Fittings (Tees, 45^0 elbows, 90^0 elbows, Wye-Tees)

Pressure Gauges

Valves

Mortar for pumping the water in the case of a fire risk

The main method of connection commonly used for fire protection pipework is by the use of flanges. The system will be connected to the alarm system that will be used to notify the occupants of a building of the risk of fire.

Figure 186 - Fire Control Piping Appliances

Plan of a Fire Control System

Figure 187 - Fire Control System

Isometric drawing for a fire control system

The isometric drawing will clearly show the orientation of the pipework and the method of connection. Type of fitting and method of fixing is also easily identified from the isometric drawings.

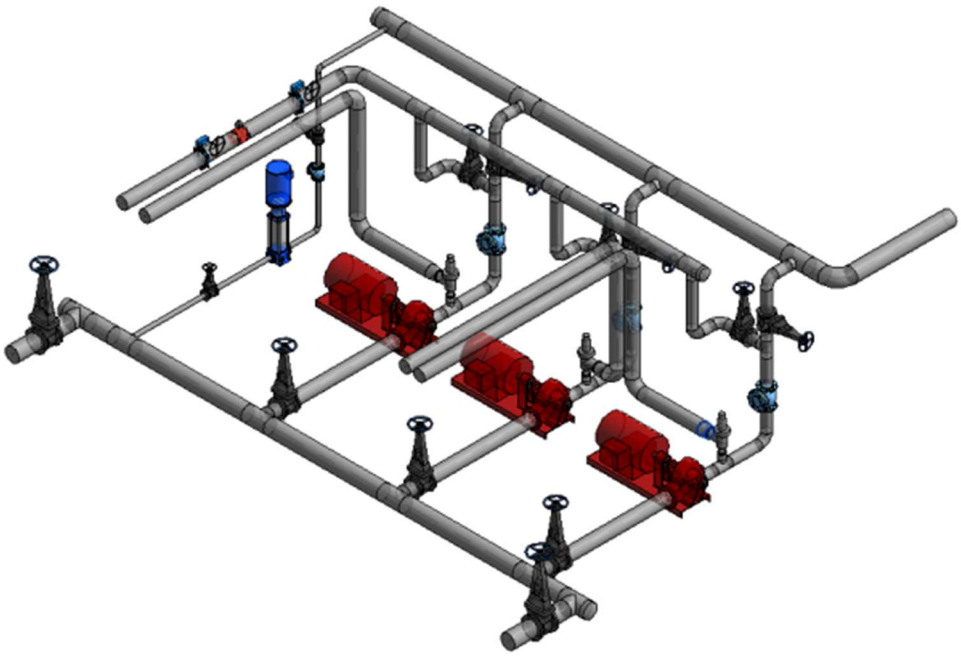

Figure 188 - Isometric diagram for a fire control system

6.2.1.4 Learning Activities

Practical Activities

You are required to visit a residential and a commercial building and identify the fire control piping appliances put in place to mitigate against the risk of fire.

6.2.1.5 Self-Assessment

1. Describe FIVE types of supervisory devices used for a fire alarm system
2. State FOUR types of fire control system drawings
3. State FIVE main components of a fire control piping appliance system
4. What is the use of heat detectors?
5. What is the purpose of fire alarm system?

6.2.1.6 Tools, Equipment, Supplies and Materials

Assorted Pipework

Assorted Fittings

Sample Drawings

May include but not limited to:

Materials.

- Screws
- Adhesives
- Cement
- Sand
- Pipes
- Traps
- Electric cables
- Caulking material
- Fittings
- Valves

Tools and equipment

- Mallet
- PPR machine
- Ball pein hammer
- Mason chisel
- PPR machine / Heat Fusion equipment
- Pipe bender

6.2.1.7 References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.1.8 Model Answers

1. **Describe FOUR types of supervisory devices used for a fire alarm** system

a) Alarm Indicating Appliance Circuits

Audible and visible alarm indicating appliances tie in to these circuits to provide warning to the building occupants. Devices which send a signal off premises also can be connected to these circuits.

b) Fire Alarm Control Panel

The fire alarm control panel contains the electronics that supervise and monitor the fire alarm system. The initiating and indicating circuits are connected directly into this panel.

c) Primary Power Supply

The primary electrical supply powers the entire fire alarm system. Primary power for fire alarm systems typically is provided by connecting into the local commercial power service.

d) Secondary Power Supply

A separate power supply that will operate automatically when the primary power fails and is capable of operating the entire system is considered a secondary power supply.

2. **State FOUR types of fire control system drawings**

a) Fire Safety provision drawings

b) Fire alarm control panel

c) Fire alarm wiring diagrams.

d) Fire system drawings

3. **State FIVE main components of a fire control piping appliance system**

   Valves, Pressure Gauge, Mortar, Assorted fittings, Pipework

4. **What is the use of heat detectors**

   Detecting fires

5. **What is the purpose of fire alarm system?**

   To reduce the losses associated with an unwanted fire in any building

6.2.2 Learning Outcome 2: Select tools and equipment

6.2.2.1 Introduction to the learning outcome

The objective of this learning outcome is to assist you develop competency in fire control drawings and symbols, fire control appliances and specifications

6.2.2.2 Performance Standard

1. ***Personal Protective Equipment*** is used in line with occupational safety and health requirements
2. ***Fire control tools and equipment*** are identified based on the requirements of the job.
3. Fire control tools and equipment are used based on manufacturer's manuals.
4. Fire control tools and equipment are cared for and maintained based on manufacturer's manual and workplace place policy.
5. Fire control tools and equipment are stored based on work place policies

6.2.2.3 Information Sheet

PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE).

P.P.E is important to make the workplace safe and to also ensure that people are working safely and responsibly to reduce cases of injury and accidents.

a) The lungs, eg from breathing in contaminated air
b) The head and feet, eg from falling materials
c) The eyes, eg from flying particles or splashes of corrosive liquids
d) The skin, eg from contact with corrosive materials
e) The body, eg from extremes of heat or cold

PPE must be properly looked after and stored when not in use, eg in a dry, clean cupboard. If it is reusable it must be cleaned and kept in good condition.

Types of PPE you can use

Eyes

Hazards

Chemical or metal splash, dust, projectiles, gas and vapour, radiation

Make sure the eye protection chosen has the right combination of impact/dust/splash/molten metal eye protection for the task and fits the user properly

Head and neck

Hazards

Impact from falling or flying objects, risk of head bumping, hair getting tangled in machinery, chemical drips or splash, climate or temperature

Some safety helmets incorporate or can be fitted with specially-designed eye or hearing protection

Don't forget neck protection, eg scarves for use during welding of joints

Replace head protection if it is damaged

Ears

Hazards

Noise – a combination of sound level and duration of exposure, very high-level sounds are a hazard even with short duration

Provide the right hearing protectors for the type of work, and make sure workers know how to fit them

Choose protectors that reduce noise to an acceptable level, while allowing for safety and communication

Hands and arms

Hazards

Abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, radiation, biological agents and prolonged immersion in water

Avoid gloves when operating machines such as bench drills where the gloves might get caught

Some materials are quickly penetrated by chemicals – take care during selection.

Wearing gloves for long periods can make the skin hot and sweaty, leading to skin problems.

Using separate cotton inner gloves can help prevent this

Feet and legs

Hazards

Wet, hot and cold conditions, electrostatic build-up, slipping, cuts and punctures, falling objects, heavy loads, metal and chemical splash, vehicles

Footwear can have a variety of sole patterns and materials to help prevent slips in different conditions, including oil - or chemical-resistant soles. It can also be anti-static, electrically conductive or thermally insulating

Appropriate footwear should be selected for the risks identified

FIRE CONTROL TOOLS & EQUIPMENT

These are tools used to fight a fire outbreak and prevent the spread to adjacent property.

Common firefighting tools are

Halligans / Pry Tools- also known as a ***Halligan*** tool and is used as a forcible entry tool used by firefighters

Fire Department Hooks – This is a stout pole having a hooked metal head and used especially in firefighting for tearing down walls or ceilings.

Fire Department Axes – This is a special type of **axe** used by firefighters, typically featuring a pick-shaped pointed poll (area of the head opposite the cutting edge) and in a vivid color to make it easily visible during an emergency.

Shovels/Brooms/Rakes »

Rescue Tools – These are are used by firefighters and emergency response crews to rescue trapped victims from collapsed buildings or road traffic incidents. Rescue Tools can be battery operated or powered by hydraulics. These specialist **tools** are very powerful and can lift, move or cut with massive force.

Forcible Entry Tools – These tools are used by firefighters to force entry incase of a fire risk when normal means of entry are locked or blocked

Wildland Tools – This is a common multi-functional tool that has a wide range of use from breaking into a building to tearing down walls in case of a fire.

Spanner and Hydrant Wrenches – These are tools used for tightening lug and pin lug hose connections. They are used in lawn care, in-plant maintenance, and fire fighting operations

Door Chocks & Wedges- These are used by firefighters to control doors and prevent them from closing over. Gives great assistance especially during evacuations in the case of a fire outbreak.

Firefighter Hand Tools -

Seatbelt Cutters – Allows one to cut a jammed seatbelt

Edged Tools

Multi Tools

Window Punches is an instrument needed for evacuation from vehicles after accidents or other auto emergencies e.g fire risk. It is used by applying pressure with the tool on the safety glass of a car window, which will cause the window to shatter and allow for safe evacuation from the vehicle.

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Before selection of the tools it is important to understand the type of fire so that one is able to identify and pick the correct tool that is needed. There are FIVE main classes of fire

Type of Fire	Class

Fires that involve flammable solids such as wood, cloth, rubber, paper, and some types of plastics.	Class A
Fires that involve flammable liquids or liquefiable solids such as petrol/gasoline, oil, paint, some waxes & plastics, but **not** cooking fats or oils	Class B
Fires that involve flammable gases, such as natural gas, hydrogen, propane, butane	Class C
Fires that involve combustible metals, such as sodium, magnesium, and potassium	Class D
Fires that involve any of the materials found in Class A and B fires, but with the introduction of an electrical appliances, wiring, or other electrically energized objects in the vicinity of the fire, with a resultant electrical shock risk if a conductive agent is used to control the fire.	Class E

After controlling the fire, the tools should be cleaned and returned back in position. This is to ensure that the life of the tool is prolonged.

Care & Maintenance of Tools

This refers to processes and conditions taken to keep tools and equipment working correctly Make it a habit to clean **tools** after each use before you return them to storage. Wipe them down with a rag or old towel and be sure they are free of dust, grease and unwanted material before you put them into their proper places. This is also an opportunity to look for any damage or defects and perform the maintenance required.

Hand tool Safety

Some care and maintenance precautions to be observed on tools are:

- Lay tools to be used in a neat arrangement with the cutting edges pointing away
- Do not carry sharp edged tools in the pocket

- When passing sharp tools, first pass the handle to your colleague
- Do not test the sharpness of the edges with your fingers
- Use tools for their intended purpose
- Do not use axes with loose heads
- Cutting Tools should be sharpened to avoid injury

There are different methods of storage of tools

1. STORE

This is a room where firefighting equipment are kept until needed for a firefighting task.

2. TOOL RACK

These wall-mounted or free-standing units may be designed for specific tool types, or suitable for general use. Tool racks are used to store and organize tools in an exposed manner so that tools are easy to identify, retrieve, and return.

3. TOOL BOX/ TOOL KIT

This is a box or container in which one keeps or carries tools especially those used for a particular task.

6.2.2.4 Learning Activities

Practical Activities

You are required to visit a nearby factory and learn how fire control tools and equipment's are stored based on the factories work policies.

6.2.2.5 Self-Assessment

1. State FIVE classes of fire
2. What are the different methods of storage available for firefighting tools and equipment
3. Describe the different methods of care and maintenance of firefighting tools
4. State the use of the following firefighting tools
    a) **Door Chocks & Wedges-**

b) **Fire Department Hooks –**

5. State the types of fires involved in the following classes.
    a) Class A
    b) Class B

6.2.2.6 Tools, Equipment, Supplies and Materials

Assorted firefighting tools

6.2.2.7 References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.2.8 Model Answers

1. **State FIVE classes of fire**

    Class A – Combustible Materials

    Class B – Flammable liquids

    Class C – Flammable Gases

    Class D – Flammable metals

    Class E – Electrical Fires

2. What are the different methods of storage available for firefighting tools and equipment

    Tool box, tool rack, tool store

a) Describe the different methods of care and maintenance of tools
b) When passing sharp tools, first pass the handle to your colleague
c) Do not test the sharpness of the edges with your fingers
d) Use tools for their intended purpose
e) Do not use hammers with loose heads

f) Cutting Tools should be sharpened to avoid injury

3. State the use of the following firefighting tools

a) **Door Chocks & Wedges-** These are used by firefighters to control doors and prevent them from closing over

b) **Fire Department Hooks –** This is a stout pole having a hooked metal head and used especially in firefighting for tearing down walls or ceilings

4. State the types of fires involved in the following classes.
    a) Class A-solid fires e.g wood
    b) Class B-flammable liquids

6.2.3 Learning Outcome 3: Quantify materials and supplies

6.2.3.1 Introduction to the learning outcome

The main focus of this specific learning outcome is to develop knowledge on the estimation of fire control appliances and systems materials and supplies

6.2.3.2 Performance Standard

1. Materials and supplies for fire control systems are identified based on the drawings and specifications.
2. Fittings for fire control systems are identified based on the standards.
3. Fire control materials are quantified and costed based on best practice
4. A schedule of fire control materials is developed based on the drawing and specifications.

6.2.3.3 Information Sheet

Estimation refers to the calculation of a rough estimate or the value of something. After working drawings have been interpreted, the required materials are identified and quantified. The components of a fire system will be different depending on the type of the system.

The main components of a fire control system are:

a) Pipework
b) Assorted Fittings (900 elbows, 450 elbows, straight tees, sockets)
c) Control Valves

d) Pressure gauges

e) Meters

f) Mortar

The main type of materials used for fire system is Steel & Plastic.

TYPES OF FIREFIGHTING FITTINGS

Figure 189 - Fire control fittings

Procedure for estimation

An analysis of the drawing is carefully done to ascertain the type of system and appliances incorporated in the drawing

Similar fittings are counted and grouped together

Spooling is then done to calculate the length of pipework required for the task.

SPOOLING

This is the calculation of the length of pipework that is required for the pipework.

Spooling = Travel – Take-out

Travel refers to the length of the pipe including the fittings whereas take-out refers to the part of the fitting not occupied by the pipe but included in the calculation.

Takeout is equal to the diameter of the pipe.

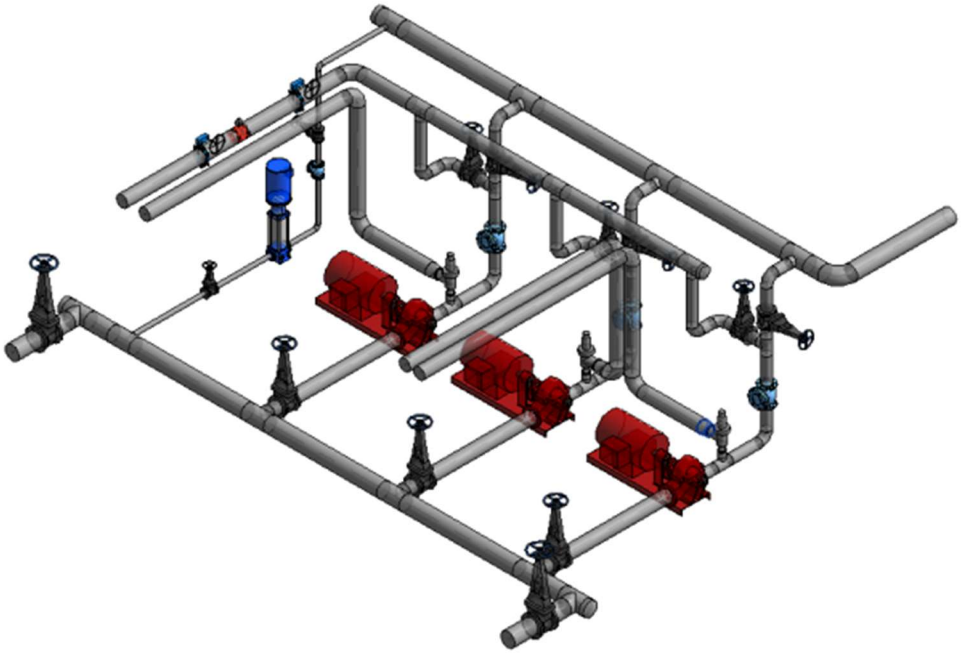
Measurements in a drawing may be given in three forms:

1. Centre to Centre (Includes takeout's at both ends)
2. Centre to end (Has only one fitting at the edge of the pipework.
3. End to End

This information is then compiled and represented in the form of a materials requirement schedule

MATERIALS REQUIREMENT SCHEDULE

Prepare a materials requirement schedule for the fire control system shown



Sample of a Materials requirement schedule

NO	TASK	Materials Required	Quantity	REMARKS
1	PIPEWORK	P.V.C 2" PIPE	10	
	FITTINGS	Straight Tees	14	
		90^0 elbows	13	
		45^0 elbows	6	
		Control Valves	9	
	MORTARS		3	
	METER		1	

The materials requirement schedule will be used to place an order for the delivery of the materials in advance

6.2.3.4 Learning Activities

Practical Activities

You are required to prepare a materials requirement schedule for the drawing given drawing.

6.2.3.5 Self-Assessment

1. Define spooling and state Three types of measurements
2. Sketch 8 types of fire control pipework fittings
3. Describe the procedure for estimation

6.2.3.6 Tools, Equipment, Supplies and Materials

Sprinkler System Test kit

Assorted tools

6.2.3.7 References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.4 Learning Outcome 4: Install sprinkler systems

6.2.4.1 Introduction to the learning outcome

The main focus of this specific learning outcome is to develop knowledge on the installation of the sprinkler system for firefighting.

6.2.4.2 Performance Standard

1. Positions of fire control pipes are set out and marked based on working drawings.
2. Pipes are ***jointed*** in accordance with specifications.
3. Pipes are cut based on type of pipe, drawing specifications and job requirements
4. Pipes are fitted based on drawing specifications and requirements of the job.
5. Spools are calculated based on standards and job requirements
6. Sprinkler heads are fitted according to specifications
7. Sprinkler system is connected to water storage tank
8. Housekeeping is conducted as per workplace procedures.
9. Safety and health practices are observed based on OSHA.
10. ***Tests*** are conducted based on specifications.
11. Faults are corrected based on best practice.

6.2.4.3 Information Sheet

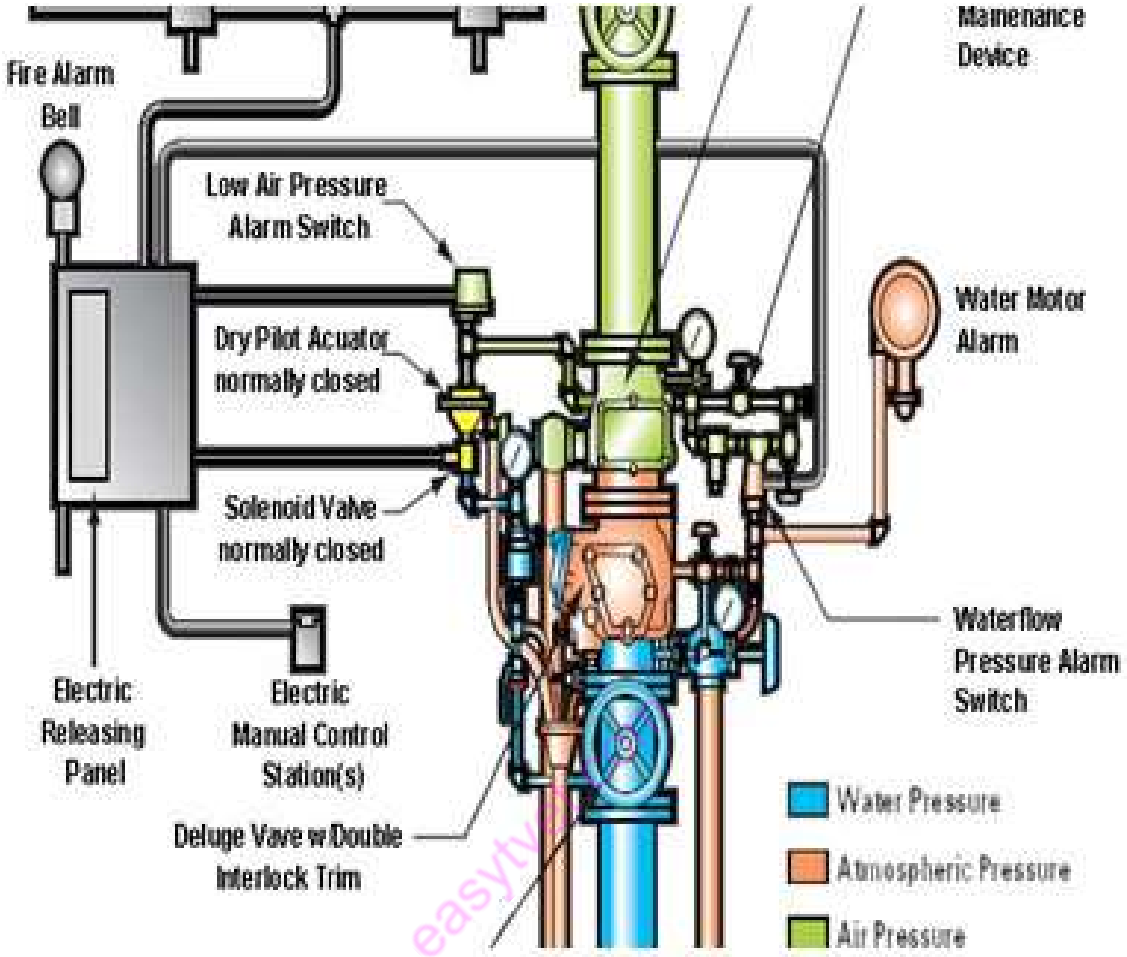
A fire sprinkler system is an active fire protection method, consisting of a water supply system, providing adequate pressure and flowrate to a water distribution piping system, onto which fire sprinklers are connected. Although historically only used in factories and large commercial buildings, systems for homes and small buildings are now available at a cost-effective price Each closed-head sprinkler is held closed by either a heat-sensitive glass bulb or a two-part metal link held together with fusible alloy. The glass bulb or link applies pressure to a pipe cap which acts as a plug which prevents water from flowing until the ambient temperature around the sprinkler reaches the design activation temperature of the individual sprinkler head. In a standard wet-pipe sprinkler system, each sprinkler activates independently when the predetermined heat level is reached. Thus, only sprinklers near the fire will operate, normally just one or two. This maximizes water pressure over the point of fire origin, and minimizes water damage to the building.

Types of Sprinkler systems

Pre-Action Fire Sprinkler Systems:

Like dry pipe systems, pre-action pipes do not hold water within the sprinkler piping and are instead filled with compressed air or nitrogen. Unlike a dry pipe system, the pre-action valve governs the flow of water. There are two types of pre-action systems:

- **Single Interlock:** This system requires a single, preceding fire detection event to occur. This event is almost always through the activation of a heat or smoke detector. Once this happens, the pre-action valve allows water to enter the piping system. If a sprinkler head activates before this, it will sound a trouble alarm, but no water will discharge.
- **Double Interlock:** Some businesses prefer the added layer of protection that a double interlock pre-action system provides. Double Interlock systems require that a preceding fire detection occurs in conjunction with an automatic sprinkler activation before water releases into the pipes. The activation of one alarm alone will not be enough.



Pre-action fire control system

Wet pipe systems

By a wide margin, wet pipe sprinkler systems are installed more often than all other types of fire sprinkler systems. They also are the most reliable, because they are simple, with the only operating components being the automatic sprinklers and (commonly, but not always) the automatic alarm check valve. An automatic water supply provides water under pressure to the system piping.

Dry pipe systems

Dry pipe systems are the second most common sprinkler system type. Dry pipe systems are installed in spaces in which the ambient temperature may be cold enough to freeze the water in a wet pipe system, rendering the system inoperable. Dry pipe systems are most often used in unheated buildings & in parking garages.

Water is not present in the piping until the system operates; instead, the piping is filled with air at a pressure below the water supply pressure. To prevent the larger water supply pressure from prematurely forcing water into the piping, the design of the dry pipe valve (a specialized type of check valve) results in a greater force on top of the check valve clapper by the use of a larger valve clapper area exposed to the piping air pressure, as compared to the higher water pressure but smaller clapper surface area.

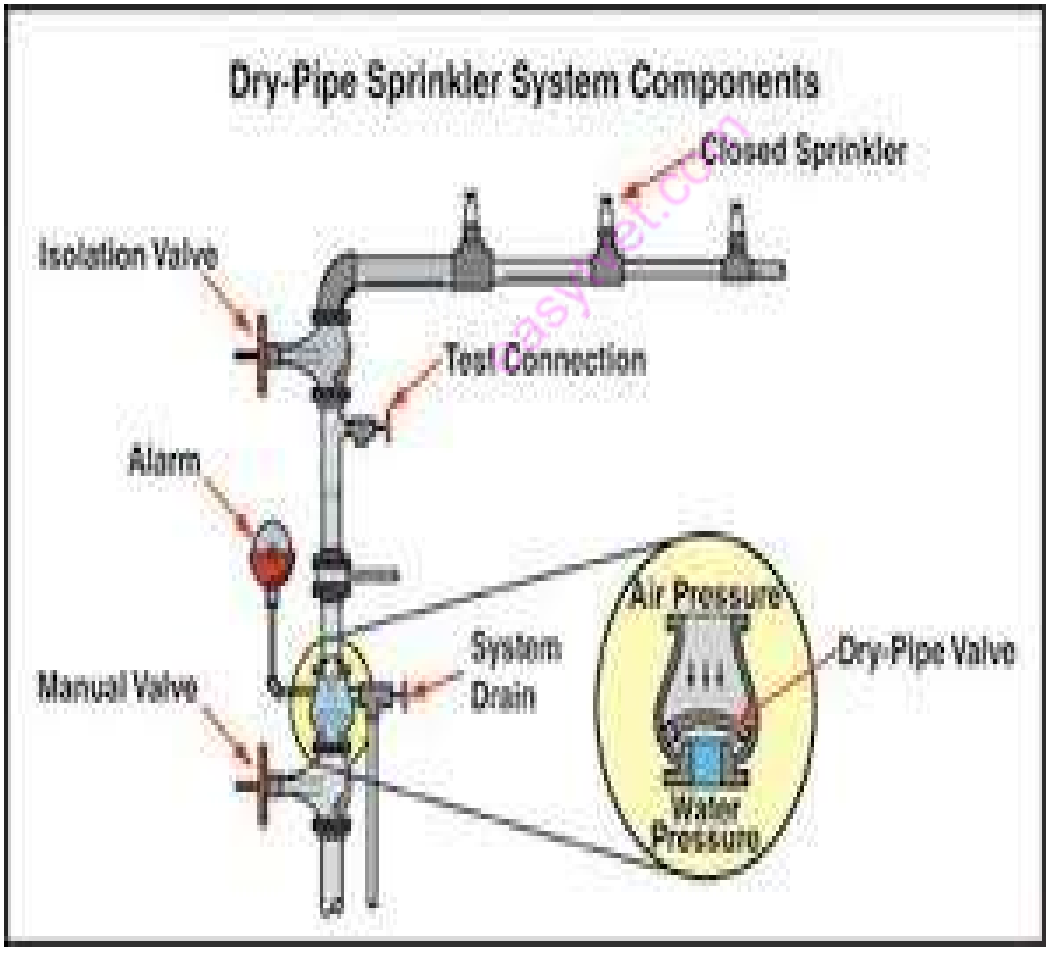


Figure 190- Dry sprinklers

Disadvantages of using dry pipe fire sprinkler systems include:

- If the sprinklers share the same standpipe system as the standpipe system which supplies fire hoses, then the water supply to the fire hoses would be severely reduced or even curtailed altogether.
- Increased complexity: Dry pipe systems require additional control equipment and air pressure supply components which increases system complexity. This puts a premium on proper maintenance, as this increase in system complexity results in an inherently less reliable overall system (i.e. more single failure points) as compared to a wet pipe system.
- Higher installation and maintenance costs: The added complexity impacts the overall dry-pipe installation cost, and increases maintenance expenditure primarily due to added service labor costs.
- Lower design flexibility: Regulatory requirements limit the maximum permitted size (i.e. 750 gallons) of individual dry-pipe systems, unless additional components and design efforts are provided to limit the time from sprinkler activation to water discharge to under one minute. These limitations may increase the number of individual sprinkler zones (i.e. served from a single riser) that must be provided in the building, and impact the ability of an owner to make system additions.
- Increased fire response time: Because the piping is empty at the time the sprinkler operates, there is an inherent time delay in delivering water to the sprinklers which have operated while the water travels from the riser to the sprinkler, partially filling the piping in the process. A maximum of 60 seconds is normally allowed by regulatory requirements from the time a single sprinkler opens until water is discharged onto the fire. This delay in fire suppression results in a larger fire prior to control, increasing property damage.
- Increased corrosion potential: Following operation or testing, dry-pipe sprinkler system piping is drained, but residual water collects in piping low spots, and moisture is also retained in the atmosphere within the piping. This moisture, coupled with the oxygen available in the compressed air in the piping, increases internal pipe corrosion, eventually leading to pin-hole leaks or other piping failures. The internal corrosion rate in

wet pipe systems (in which the piping is constantly full of water) is much lower, as the amount of oxygen available for the corrosion process is lower

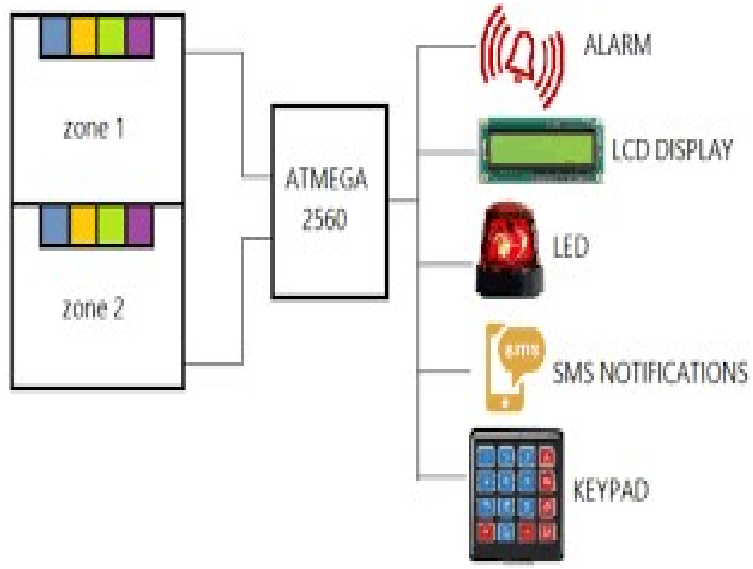
Automatic Fire Alarm Systems

Automatic fire alarm systems often play a major role in loss prevention during a fire emergency. The basic purpose of an automatic fire alarm system is to detect a fire in its early stages, notify the building occupants that there is a fire emergency and report the emergency to first responders. Below is a high-level overview of the components of an automatic fire alarm system.

Fire Alarm Control Panel (FACP); this is the center of the fire alarm system. The fire alarm control panel monitors initiating devices and then activates notification devices when an alarm signal is received. These panels range in scale from a single zone to multiple buildings.

Initiating Devices; Initiating devices detect a fire emergency and communicate it to the fire alarm control panel. These can be triggered both manually (pull stations), as well as automatically in a response to heat, smoke or flame. When one of these initiating devices is triggered, the control panel will go into an alarm state.

Notification Devices; after the control panel receives a signal for an initiating device and goes into an alarm state, the panel initiates output devices that signal to building occupants that there is an emergency situation. These include bells, horns, speakers, chimes, strobes and flashing lights that signal either audibly or visually that there is a fire emergency.



Automatic fire alarm system

Fire sprinkler heads

A fire sprinkler head is the component of a sprinkler system that discharges water when the fire has been detected. It comes in assorted designs.

Figure 191 - sprinkler head

Each sprinkler head contains a trigger mechanism, which opens to release water onto the fire. With conventional heads, suitable for most residential fire sprinkler systems, some water is discharged onto the ceiling.

Upright or pendant spray sprinklers aim all the water straight down and are suited to rooms with high ceilings.

Heads need not be obtrusive and may be recessed in the ceiling or covered with resin caps to make them more aesthetically pleasing.

Side wall sprinklers attach to a high point on the wall. They usually give wider water coverage than conventional sprinkler heads.

The plug inside the head that holds back the water may be made of Wood's metal, a mixture of bismuth, lead, tin, and cadmium that melts at a relatively low temperature, or a small glass bulb containing a glycerin-based liquid that expands and shatters when it gets hot, releasing the water.

Each sprinkler head activates independently. Only sprinklers above the fire will operate, maximizing water pressure over the fire and reducing fire and water damage to the building. Sprinklers use far less water than fire hoses.

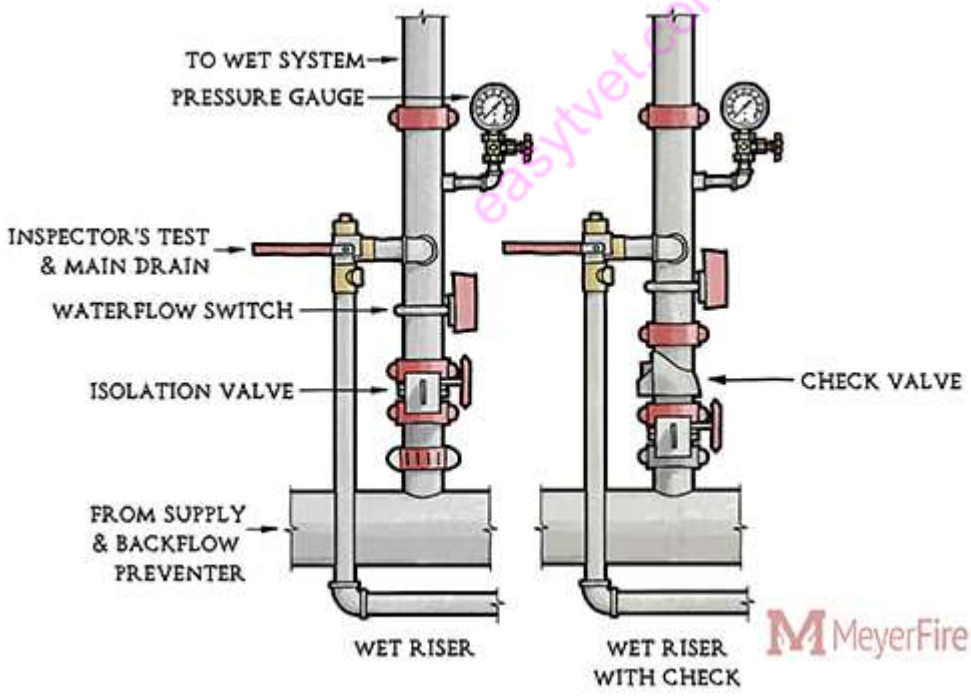


Figure 192- Wet pipe sprinkler system

Types of pipes

G.I (Galvanized Iron) pipes

Description: Galvanized iron pipe was once a popular method of plumbing water supply lines in the home, but it gradually fails due to corrosion and rust. For this reason, it is no longer commonly used and has been largely replaced with copper pipe or PEX plastic pipe. Galvanized iron pipe is difficult to cut and join and not easily fabricated on site by the homeowner. Repairs are usually done by replacing the pipes with copper or PEX.

Prevalent Use: Water supply lines and drain lines in older homes.

PPR pipes

PPR pipe is a straight and rigid cylindrical pipe, made from Polypropylene Random Copolymer plastic, produced through a continuous extrusion process. They are commonly offered in green or white color, and in outer diameter sizes ranging from 20mm to 110mm making the pipe walls far thicker than PVC. PPR pipe is accompanied by a series of connection fittings, parts, and accessories available for every pipe diameter.

Application of PPR Pipe

- **PP-R pipes** are used to build hot and cold water systems, including central heating systems.
- **PP-R pipes** are a part of building heating system, including floor, wall and radiant heating systems.

- **PP-R pipes** can be directly purified water drinking water supply systems.

- **CPVC**

Appearance: Dull white or cream-colored plastic.

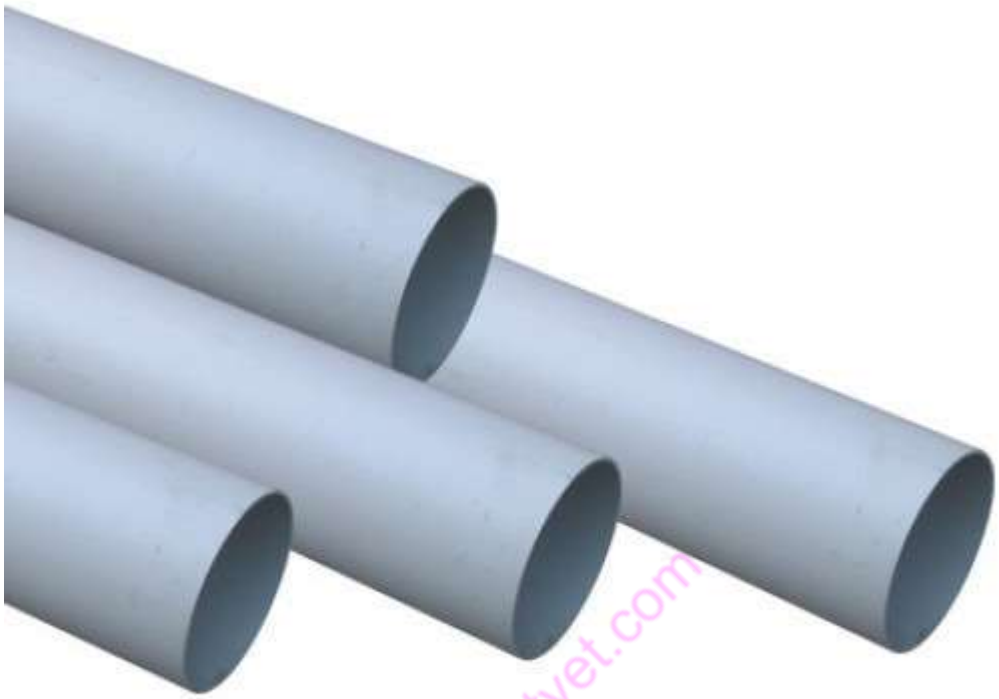
Description: CPVC is an inexpensive rigid plastic that is designed to withstand high pressure and temperature.

Prevalent Use: CPVC is used for hot and cold water supply piping.

Cutting and Fitting: The pipe is easily cut with a tubing cutter or hacksaw. CPVC is joined permanently together using plastic fittings and solvent glue, or with grip fittings where the pipes may need to be disassembled in the future.

PVC pipes (Polyvinyl Chloride)

PVC pipes are used in a wide variety of piping applications, from transportation of drinking water over drainage solutions to advanced fire-sprinkler systems. This popularity owes to a unique combination of properties: safety, durability/cost-efficiency, environmental performance and recyclability.



Joint Methods Used for Pipe and Tube

- Copper pipes are typically joined by soldering, brazing, compression fittings, flaring, or crimping.
- Plastic pipes may be joined by solvent welding, heat fusion, or elastomeric sealing.

Other methods of jointing includes;

- Soldering
- Bronze Welding
- Compression joints
- Flange joints

Fittings.

Pipe fittings are connected to piping using various end connections. Pipe fittings play an important role in the proper functioning of pipes and tubes in various applications.

- **Elbows**: Used to change the angle or direction of the pipe run. Most commonly in 90 degrees and 45 degree turns. The sweep of the fitting describes how fast a transition or change in direction is made.
- **Street Elbows:** One end of the pipe fitting has male threads and the other end has female threads. These are common in galvanized steel and copper pipe. They are convenient because they do away with the need for a nipple and work well in tight quarters.
- **Tee Fittings:** Shaped like the letter T. Allows for branch lines.
- **Couplings:** Used to join two straight pieces of pipe of the same diameter.
- **Reducers:** Used to join pipes of different diameters. Makes a gradual change in diameter.
- **Bushings:** Used to make the diameter of a pipe fitting smaller. They are different from reducers because they make an abrupt change in diameter and take little space.
- **Unions:** Used to join pieces of pipe where pipes cannot be turned or when a piece of equipment may have to be removed for maintenance or replacement.
- **Adaptor Fittings:** Used to change the end of a non-threaded pipe to male or female threads as needed. Most commonly used in copper and plastic plumbing jobs.
- **Caps:** Used to close the end of a dead-end pipe.
- **Plugs:** Used to close an ending on a pipe fitting normally used for inspection or cleanout.
- **Nipples:** Short lengths of pipe threaded at both ends.
- **Wyes:** Used primarily to gain inside access to DWV (drain-waste-vent) systems.
- **Valves:** Devices that control the flow of liquid or gas through or from a pipe. (Compression valves, ball valves, sleeve-cartridge valves, ceramic disc valves, etc)
- **PVC Fittings:** Come in a wide variety of configurations and may be glued (S) or threaded (T)

- **Copper Tubing Fittings:** Use compression fittings. Common fittings are couplings, ells, and tees.

Valves

A valve is a device that regulates, directs or controls the flow of a fluid (gases, liquids, fluidized solids, or slurries) by opening, closing, or partially obstructing various passageways

There are several valves available for use by plumber. They include.

1. Globe valves
2. Gate valves
3. Plug valve/ plug cork
4. Ball cork
5. Float valve/ ball valve

Common faults in fire sprinkler systems

1. Human Error – One of the top fire sprinkler system problems is human error. Many people believe that these pipes are indestructible, and use them to hang things like ropes and chains or to even help lift heavy objects. This could detrimentally damage the pipes and compromise the fire protection system.
2. Overheating and Freezing – As fire sprinkler systems are activated by heat, it is important to consider where they will be placed and if overheating could occur. This very common malfunction typically occurs when celling temperatures rise over 150-degrees Fahrenheit. Should this be a concern for your building, especially in the high Florida heat, consider different sprinkler heads that are designed to go off at different temperatures and have a sprinkler system installed that is equipped to handle these conditions. Alternatively, and not as common in Florida, the water in the pipes of a fire

sprinkler system has been known to freeze should the necessary precautions not be put in place. Frozen pipes can be prevented with insulation or antifreeze.

3. Mechanical Damage – Just like everything else in life, fire sprinkler systems require maintenance in order to work properly. Neglecting the system could result in mechanical damage.
4. Corrosion – Fire sprinkler systems are based on water, which makes corrosion a common problem. It can impact the functionality of the system and lead to leaks, which could cause water damage to your property. Fire inspections should be done to check for any potential leaks and to replace any pipes that are beginning to corrode.

TESTING OF THE SYSTEM

During a complete fire sprinkler system test, the technician should perform physical checks on all parts of your fire sprinkler system.

- **Smoke test**; forces smoke-filled air through pipe line. The smoke under pressure will fill the main line plus any connections and then follow the path of any leak to the ground surface, quickly revealing the source of the problem.
- **Air test**; it is done by isolating the section of pipe that needs to be tested using plugs, and setting two different pressures for five minutes each. Any change in pressure over those five-minute time periods is measured and recorded.
- **Pressure test**; it is performed to ensure the safety, reliability, and leak tightness of pressure systems. A pressure test is required for a new pressure system before use or an existing pressure system after repair or alteration. There are two methods for pressure tests: hydrostatic and pneumatic.

6.2.4.4 Learning Activities

Practical Activities

You are required to visit a site laying out the sprinkler system learn how the Positions of fire control pipes are set out and marked based on working drawings.

6.2.4.5 Self-Assessment

1. State the two methods of jointing plastic pipes.
2. Explain the following components of fire alarm control.

i. **Fire Alarm Control Panel (FACP**

ii. **Initiating Devices;**

iii. **Notification Devices**

3. State where the following fittings are used in pipe work.

i. Couplings:

ii. Reducers

4. State the two types of pre-action systems:
5. Disadvantages of using dry pipe fire sprinkler systems

6.2.4.6 Tools, Equipment, Supplies and Materials

Sprinkler System Test kit

Assorted tools

6.2.4.7 References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.4.8 Model Answers.

1. State the two methods of jointing plastic pipes.

   i. Solvent welding

   ii. Heat fusion or elastomeric sealing.

2. Explain the following components of fire alarm control.

   i. **Fire Alarm Control Panel (FACP)**; this is the center of the fire alarm system. The fire alarm control panel monitors initiating devices and then activates notification devices when an alarm signal is received. These panels range in scale from a single zone to multiple buildings.

ii. **Initiating Devices;** Initiating devices detect a fire emergency and communicate it to the fire alarm control panel. These can be triggered both manually (pull stations), as well as automatically in a response to heat, smoke or flame. When one of these initiating devices is triggered, the control panel will go into an alarm state.

iii. **Notification Devices;** after the control panel receives a signal for an initiating device and goes into an alarm state, the panel initiates output devices that signal to building occupants that there is an emergency situation. These include bells, horns, speakers, chimes, strobes and flashing lights that signal either audibly or visually that there is a fire emergency.

3. State where the following fittings are used in pipe work.

i. **Couplings:** Used to join two straight pieces of pipe of the same diameter.

ii. **Reducers:** Used to join pipes of different diameters. Makes a gradual change in diameter.

4. State the two types of pre-action systems

i. **Fire Alarm Control Panel (FACP)**; this is the center of the fire alarm system. The fire alarm control panel monitors initiating devices and then activates notification devices when an alarm signal is received. These panels range in scale from a single zone to multiple buildings.

ii. **Initiating Devices;** Initiating devices detect a fire emergency and communicate it to the fire alarm control panel. These can be triggered both manually (pull stations), as well as automatically in a response to heat, smoke or flame. When one of these initiating devices is triggered, the control panel will go into an alarm state.

5. Disadvantages of using dry pipe fire sprinkler systems

- Increased complexity
- Increased corrosion potential:
- Increased fire response time:

- Lower design flexibility
- Higher installation and maintenance costs:

6.2.5 Learning Outcome 5: Install hose reel systems

6.2.5.1. Introduction to the learning outcome

The main focus of this specific learning outcome is to develop knowledge on the installation of the hose reel system for firefighting.

6.2.5.2. Performance Standard

1. Positions of fire control pipes are set out and marked based on working drawings.
2. Pipes are ***jointed*** in accordance with specifications.
3. Pipes are cut based on type of pipe, drawing specifications and job requirements
4. Pipes are fitted based on drawing specifications and requirements of the job.
5. Spools are calculated based on standards and job requirements
6. Hose reels are fitted according to specifications
7. Hose reel system is connected to water storage tank
8. Housekeeping is conducted as per workplace procedures.
9. Safety and health practices are observed based on OSHA.
10. ***Tests*** are conducted based on specifications.
11. Faults are corrected based on best practice.

6.2.5.3. Information Sheet

Hose reel system

A fire hose reel is a first attack piece of fire-fighting equipment. This method of firefighting will be used for fire caused by combustible materials. The control nozzle attached to the end of the hose enables the operator to control the direction and flow of water to the fire. Hose reels provided for firefighting purposes must not be used for cleaning purposes

A Hose Reel is a cylindrical spindle made of either metal, fiberglass, or plastic and is used for storing a hose. The most common styles of hose reels are spring driven (which is self retracting), hand crank, or motor driven.

The hose reel system is generally started by opening a valve that is adjusted to the hose reel and control the flow of water. Then we move the hose reel in our desired place then pull the hose and fight the fire.

Fire hose reels are located to provide a reasonably accessible and controlled supply of water to combat a potential fire risk. The length of a fully extended fire hose is 36 meters with a diameter of 19mm (outside diameter).

These appliances are designed to deliver, as a minimum, 0.33L of water per second. A control nozzle attached to the end of the hose enables the operator to control the direction and flow of water to the fire. All fire hose reels come with a unique ball valve shut-off device, a plastic or solid brass hose reel nozzle and mounting bracket

Figure 193- Hose reel

Hose reels should only be connected to a dedicated ***fire*** line, not the water mains. Should be a minimum of 100mm clearance around all points of ***hose*** drum. Valve height should be between 900mm & 1100mm from floor level. Valve must incorporate an interlock for nozzle.

Basic features of the Fire Hose reel System

- Hose reel set consisting of the drum, hose, nozzle, nozzle clip, and mounting bracket
- Hose reel cabinet, where provided
- Operating signages, labels and instructions

- Pipes and fittings from the water source (either from the Fire Hose reel Water Tank, or direct PUB supply). Where a Fire Hose reel Water Tank is provided, the Fire Hose reel controller panel and pump sets are being inspected as well.

Procedure for installation

Attach the ***hose*** guide to a suitable location about 330 to 350 mm in the side and 330 to 350 mm down the center of the mounting plate. Lift the ***reel*** to the wall mounting plate.

Insert ***hose*** through the ***hose*** guide and place the nozzle into the bracket. Connect the water supply to the shut-off valve

The following tools shall be required for the installation of the hose reel system.

1. Portable hand tools
2. Portable drill machines
3. Grinder
4. Welding Machine
5. Pipe threading machine

Method of Connection to the storage tank

Spooling

This is the calculation of the length of pipework that is required for the pipework.

Spooling = Travel – Take-out

Travel refers to the length of the pipe including the fittings whereas take-out refers to the part of the fitting not occupied by the pipe but included in the calculation.

Takeout is equal to the diameter of the pipe.

Measurements in a drawing may be given in three forms:

1. Centre to Centre (Includes takeout's at both ends)
2. Centre to end (Has only one fitting at the edge of the pipework.
3. End to End

Testing Of the System

In addition to the annual inspection, the fire hose needs to be tested every three years, with the first time being 5 years after the manufacturing date. This test is referred to as the Hose Pressure Service Test. A fire safety professional can take care of this for you along with annual inspections.

As a general guide hose reel testing includes the following:

- Full inspection of hose, valves, re-wind, nozzles – The integrity of the drum gland nuts and internal operating valve is checked.
- Hose checks – hose reels are fully unwound and the condition of the hose and valves/nozzles checked.
- Pressure test – The equipment is filled with water presurised and inspected for any leaks to test the integrity of the reel and hose. Maximum working pressure usually 12 bar so test pressure is typically 18 bar.
- Flow test – The flow rate of the water delivered by the hose is tested with a flow meter to ensure that it delivers water at the required rate.
- Maintenance – Client is advised if any repairs or maintenance is required. Experienced engineers carry an extensive range of spare parts so wherever possible we can carry this work out immediately at a very competitive rate.
- Service labels – Details of these tests are recorded on service labels and attached to the equipment as required.

- Certificate of inspection – If required a certificate of inspection is completed and supplied to prove the fire hose reel has been tested by a competent person in line with BS-EN-671/3.
- Tidy & clean – At the end of the service, the hose reel is cleaned and rewound. Part of our service is to aim to leave the site cleaner and tidier than when we arrived!

6.2.5.4. Learning Activities

Practical Activities

You are required to visit a site laying out the hosereel system and get understanding of all concepts applied during installation and testing.

6.2.5.5. Self-Assessment

1. State five tools used in installation of the hosereel system
2. Describe the procedure for installation of the hosereel system
3. State three forms of measurements in drawing

6.2.5.6. Tools, Equipment, Supplies and Materials

Hose reel testkit

Assorted Plumbing Tools

6.2.5.7. References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.5.8. Model Answers

1. State five tools used in installation of the hosereel system
    - Portable hand tools
    - Portable drill machines
    - Grinder
    - Welding Machine
    - Pipe threading machine

2. **Describe the procedure for installation of the hosereel system**

    Attach the ***hose*** guide to a suitable location about 330 to 350 mm in the side and 330 to 350 mm down the center of the mounting plate. Lift the ***reel*** to the wall mounting plate. Insert ***hose*** through the ***hose*** guide and place the nozzle into the bracket. Connect the water supply to the shut-off valve

3. **State three forms of measurements in drawing**
    - Centre to Centre
    - Centre to end
    - End to End

6.2.6 Learning Outcome 6: Install wet and dry risers

6.2.6.1. Introduction to the learning outcome

The main focus of this specific learning outcome is to develop knowledge on the installation of wet and dry risers for firefighting.

6.2.6.2. Performance Standard

1. Positions of fire control pipes are set out and marked based on working drawings.
2. Pipes are ***jointed*** in accordance with specifications.
3. Pipes are cut based on type of pipe, drawing specifications and job requirements
4. Pipes are fitted based on drawing specifications and requirements of the job.
5. Spools are calculated based on standards and job requirements
6. Fire Hydrants are fitted as per specifications
7. Housekeeping is conducted as per workplace procedures.
8. Safety and health practices are observed based on OSHA.
9. ***Tests*** are conducted based on specifications.
10. Faults are corrected based on best practice.

6.2.6.3. Information Sheet

Dry riser: a system of valves and pipe work which enables the fire service to pump water onto upper floors of a building.

Wet riser: a system of valves and pipe work which is kept permanently charged with water, generally utilising pumps and tanks.

WET RISERS

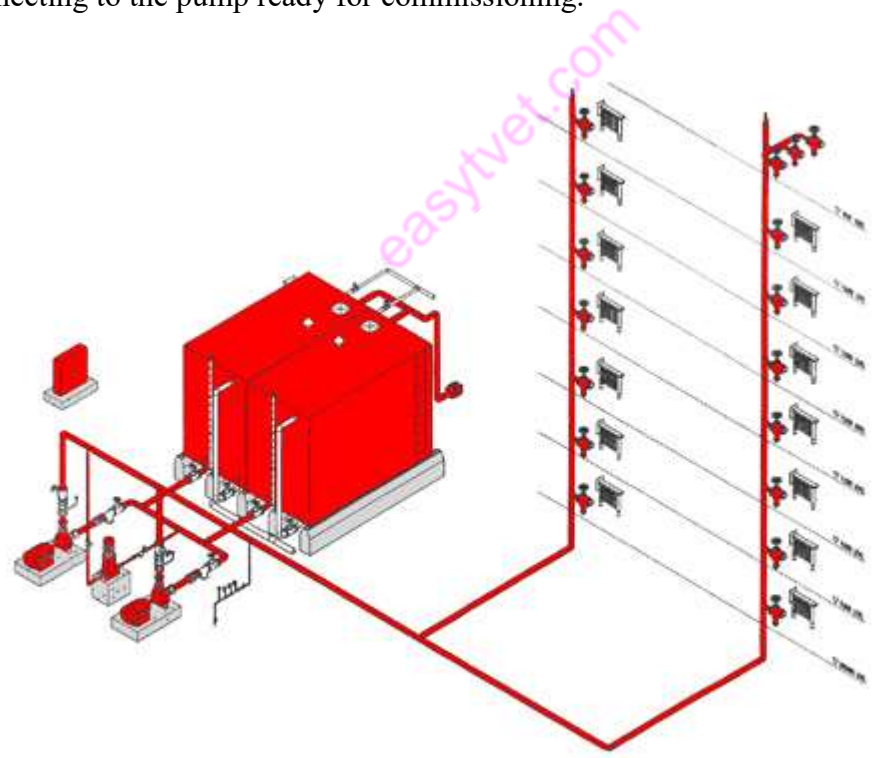
Wet rising mains are fitted in tall buildings due to the excessive pressures required to pump water to high levels. A **Wet riser** is a supply system intended to distribute water to multiple levels or compartments of a building, as a component of its firefighting systems.

They are advantageous to the fire service in two respects. Firstly they provide a fixed distribution

Wet Riser Installation

- A Wet Riser System is installed with a Landing Valve at pre-specified locations on each floor
- Typically, a Wet Riser is installed up to and over 50m. The system will be designed to provide high pressure flow at the upper floors.
- A test riser is installed in parallel to the wet riser to allow the evacuation of water from the Wet Riser for flow test purposes.
- PRVs are installed at every floor to ensure the required optimum pressure is delivered in the event of an emergency

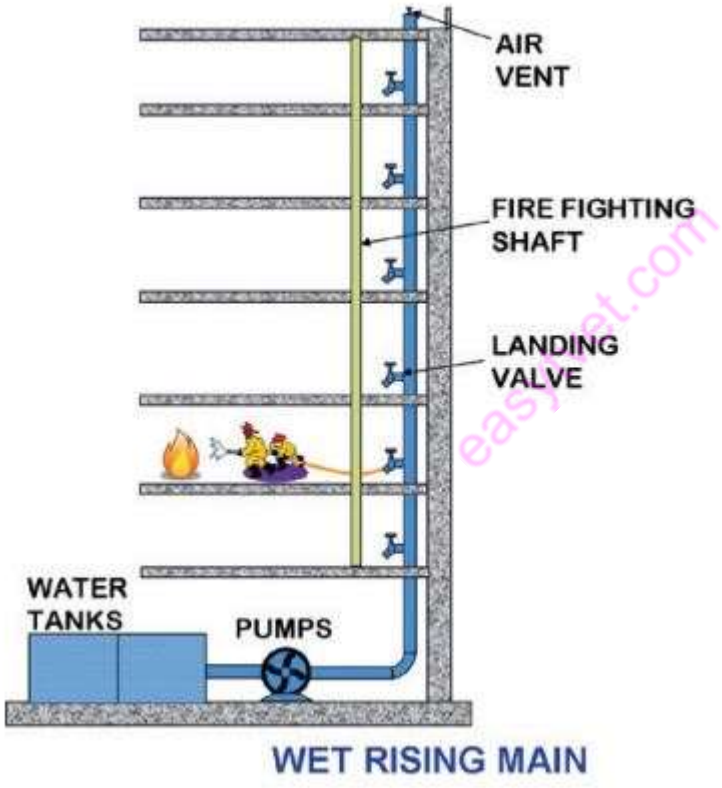
Dry Risers Direct will work with you to supply and install the pipework, PRVs and test drain and connecting to the pump ready for commissioning.



The tanks are fitted with an automatic warning system to indicate a low water level.

At protracted incidents the wet rising main tank may need to be augmented and this can be acheived using conventional Fire appliances and additional water supplies (Hydrant, Open water etc)

Wet rising mains are designed to supply 1500 litres per minute for 45 minutes as a minimum. Due to the height of the building and the pressures used, water pressure reduction valves are fitted to the outlets at each floor. Buildings constructed prior to 2006 will have outlet pressures of 4 to 5 Bars. Changes to BS 9990 in 2006 now recommend an outlet pressure of 8 Bars, this recommendation does not affect installations installed before this date.



Maintenance and Testing

Fire crews should be familiar with the layout and function of any dry riser in their risk area. If any buildinga are fitted with a Wet riser. then it is a special risk (PRM/SSRI). Specific and

detailed information on the riser's size, location and performance limits should be included within the risk data.

Wet raiser testing

The annual testing and maintenance of both Dry and Wet Risers is the responsibility of the property owners or managing agents.

• Static pressure shall not exceed 7 bars

• Running pressure 3.5 to 5.5 bars

• Flow rate: – 27 l/s (residential) – 38 l/s (non-residential)Possible failures and corrective measures for wet pipe sprinkler systems and fire detection systems

Riser failure

A defective or otherwise inoperative dry riser will seriously effect fire service operations. Riser failure can be brought about through many factors. An open outlet, restrictive blockage, mechanical failure of the pipework, vandalism and more recently theft of the inlet/outlet fittings.

For all problems, consult equipment and component manuals for troubleshooting directions. Check fuses/lights/breakers/etc., for continuity, check equipment calibration and settings, check for clogged strainers, check for closed manual shutoff valves, check for improperly adjusted valves and equipment and look for faulty equipment and connections.

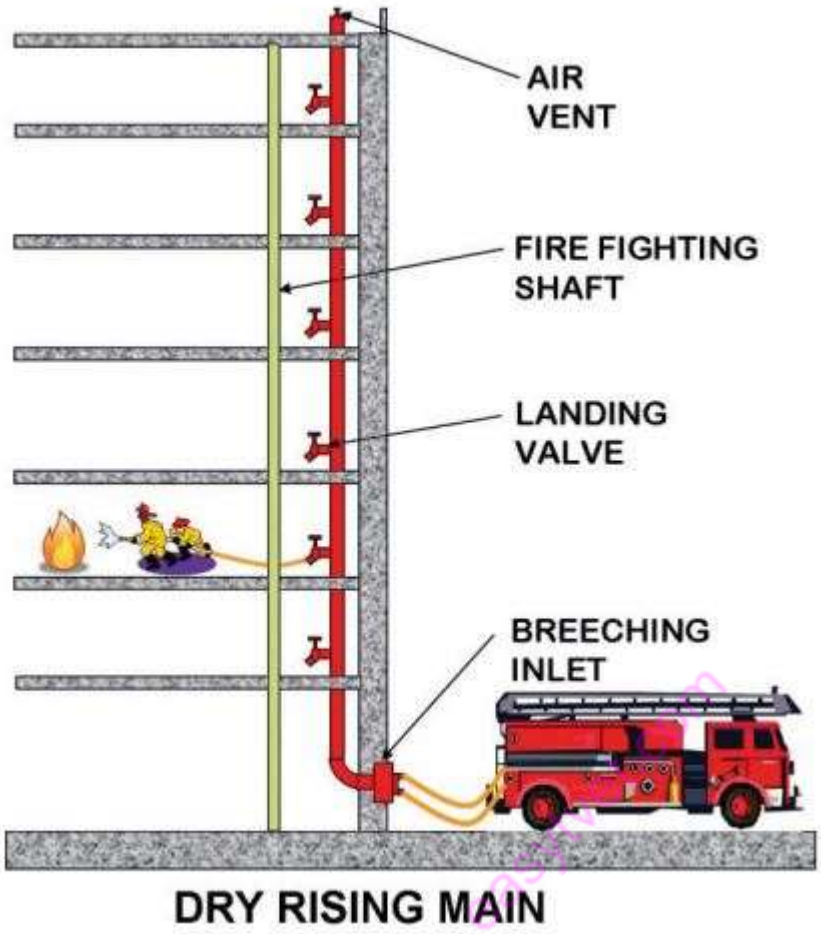
a. ***Repair of wet pipe sprinkler system and fire detection system*.** It is recommended that adjustments and corrections to wet pipe sprinkler and fire detection systems be done by licensed and bonded fire sprinkler companies and fire detection companies.
b. ***Fire code compliance*.** It is imperative that the NFPA Fire Code standards and manufacturer's recommendations relative to each suppression, detection and alarm system be consulted before any operation is performed on any of these systems.

	Areas to Check
Fire detection system	
Devices will not close/trip	Check mechanical alignment of tamper switches Check flow switches Check interlocks and safeties Check for mis-wired circuits Check control panel program Check power supply Check battery back-up power supply Check grounds
Devices trip inadvertently	Check protective device settings and operation Check for mis-wired circuits Check control panel program Check for system overload or short Check grounds Check local environmental conditions
Wet pipe sprinkler system	
Does not flow, flows at a reduced rate	Check shut off valves Check strainers and check valves Check city water supply Check pressures Check safeties and interlocks to fire protection systems Check for open drain valves
Water motor driven alarm does not sound	Check retard chamber Check for closed shut off valves Check strainers and drain Check for clogged water motor

Possible Failures and Corrective Actions for a Wet Pipe Sprinkler and Fire Protection System

Dry risers

A dry riser is a system of pipe work and valves that runs up through a building. The system allows fire fighters to easily access water from each individual floor of the building. It consists of a vertical pipe with a water inlet on ground level located on an external wall and outlets known as landing valves, which are usually located in a dry riser cabinet on each floor. The dry risers are usually located in the fire fighting shaft.



Dry raising main operations

Fire Service Inlets

The dry riser inlet is installed at the fire brigade access level. This breeching connection is usually housed in a red glass fronted box with the wording ‘Dry Riser Inlet’. This inlet should be positioned as close as possible to the rising main in order to reduce pressure losses. The inlet box and breeching inlet should be installed with the lower edge of the box between 400mm and 600mm above the ground.

Landing Valves

The landing valves are fitted with a wheeled valve connected directly to a 65mm instantaneous female coupling with a removable blank cap and retaining strap. They are installed at each floor level except the ground floor and should preferably be housed in a red lockable box marked 'Dry Riser'

Dry Riser Maintenance & Servicing

The pipes in wet risers are full of water at all times and have pumps that deliver the water to the outlets, these pumps draw water from storage tanks. The pumps operate when the pressure in the mains drops when a landing valve is opened.

All riser systems installed by our experts are put through extensive visual inspection and pressure testing.

Annual Wet Test

Dry risers are checked and pressurized to a test pressure of 12 bar for a minimum of 15 minutes. All inlets and outlets are checked for leaks and any missing or faulty items replaced. Flow testing is also carried out. If any valves need to be replaced, a further pressure test will be carried out before certification is issued.

Six Monthly Visual Test

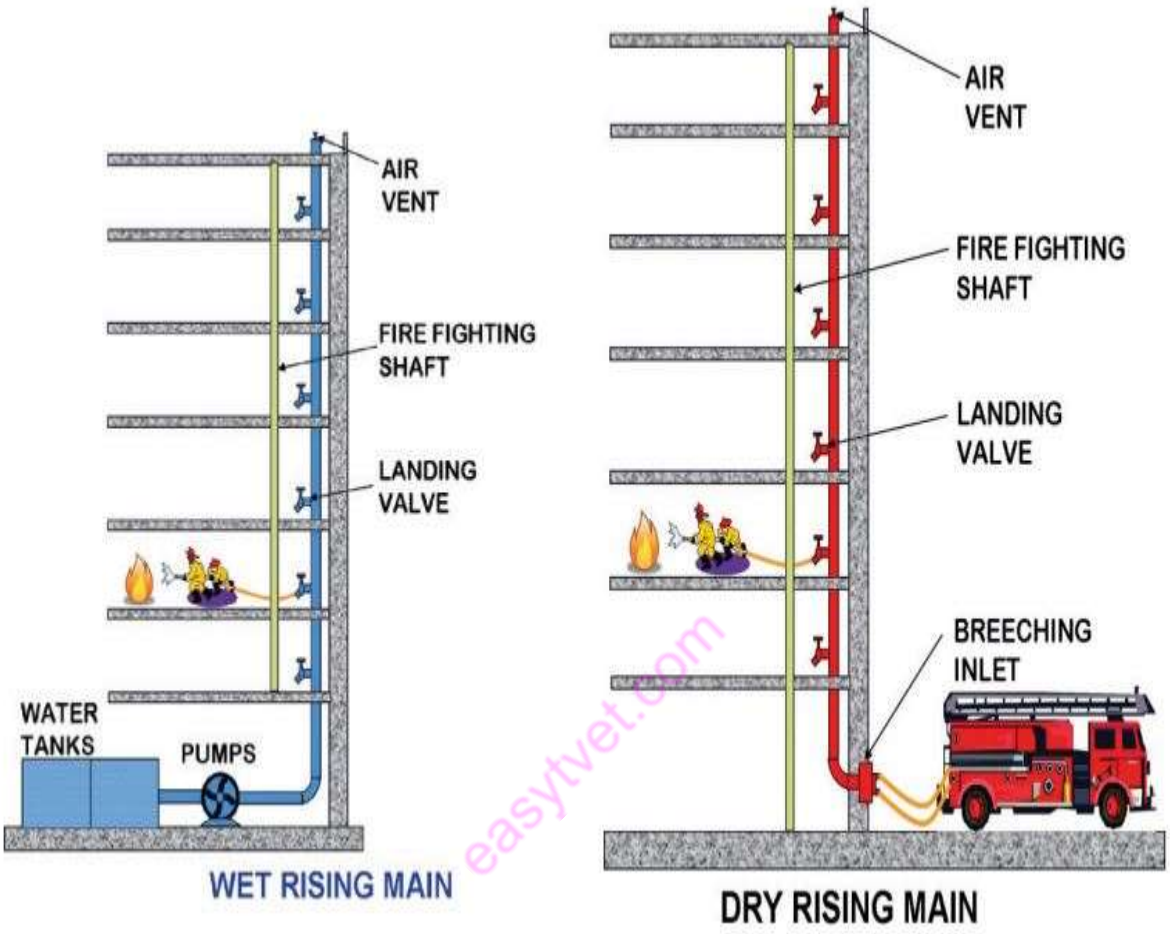
This test involves a visual inspection only as required by British Standards. Any missing or damaged items are replaced during the inspection.

Difference between a **dry** and **wet riser**

A **dry riser system** is designed to be charged with water by the fire brigade. A **wet riser system** is kept full of water via water tanks and pumps.

Advantage of a wet riser over a dry riser for firefighting operations?

The **wet riser** system is similar in design to **dry risers** and can usually be found in buildings **over** 50m tall. Unlike the **dry riser** system, it is kept constantly charged with water, in order that it can provide the same level of protection against a fire in the upper reaches of taller properties as on the lower floors.



Spooling

This is the calculation of the length of pipework that is required for the pipework.

Spooling = Travel – Take-out

Travel refers to the length of the pipe including the fittings whereas take-out refers to the part of the fitting not occupied by the pipe but included in the calculation.

Takeout is equal to the diameter of the pipe.

Measurements in a drawing may be given in three forms:

1. Centre to Centre (Includes takeout's at both ends)
2. Centre to end (Has only one fitting at the edge of the pipework.
3. End to End

TESTING OF THE SYSTEM

Dry Riser - Annual *Wet Test Dry Risers* are checked and pressure tested to 150 PSL or 10 bar for a minimum duration of 15 minutes. All inlets and outlets are then checked for leaks. If any valves or components have to be replaced a further pressure *test* will be carried out before certification is issued.

Wet Riser - The Annual Static Pressure ***Test*** The is very similar to the ***Dry Riser*** static pressure ***test***, however the system is already charged full of water. A pressure reading is taken at each landing valve and additional actions are completed as follows: Check internal cleanliness of storage tanks.

6.2.6.4. Learning Activities

Practical Activities

You are required to visit a site laying out the riser system and get understanding of all regarding Positions of fire control pipes are set out and marked based on working drawings.

6.2.6.5. Self-Assessment

1. Differentiate wet system from dry system
2. Describe the procedure for installation of the wet riser system
3. Describe annual wet test for dry risers.
4. Sketch a wet rising main.

6.2.6.6. Tools, Equipment, Supplies and Materials

Riser testkit

Assorted Plumbing Tools

Overall

6.2.6.7. References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.6.8. Model Answers.

1. **Differentiate wet system from dry system**

   A **dry riser system** is designed to be charged with water by the fire brigade. A **wet riser system** is kept full of water via water tanks and pumps.

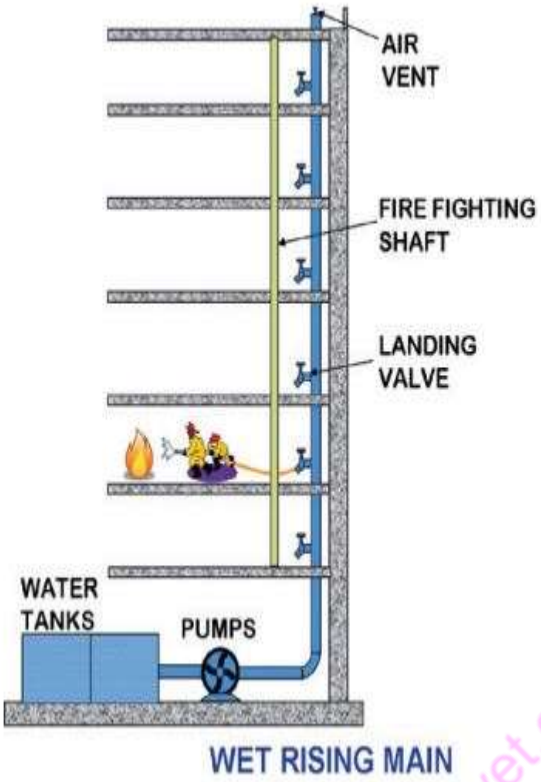
2. **Describe the procedure for installation of the wet riser system**

- A Wet Riser System is installed with a Landing Valve at pre-specified locations on each floor
- Typically, a Wet Riser is installed up to and over 50m. The system will be designed to provide high pressure flow at the upper floors.
- A test riser is installed in parallel to the wet riser to allow the evacuation of water from the Wet Riser for flow test purposes.
- PRVs are installed at every floor to ensure the required optimum pressure is delivered in the event of an emergency

3. **Describe annual wet test for dry risers**

   .Dry risers are checked and pressurized to a test pressure of 12 bar for a minimum of 15 minutes. All inlets and outlets are checked for leaks and any missing or faulty items replaced. Flow testing is also carried out. If any valves need to be replaced, a further pressure test will be carried out before certification is issued

4. **Sketch a wet rising main.**



6.2.7 Learning Outcome 7: Maintain and service fire suppression systems

6.2.7.1. Introduction to the learning outcome

The main focus of this specific learning outcome is to develop knowledge on the maintenance of fire suppression systems

6.2.7.2. Performance Standard

1. Types of maintenance are classified based on standards
2. Regular checks are conducted based on best practice
3. Regular servicing and cleaning are conducted in based on standards
4. Faults are rectified based on best practice

6.2.7.3. Information Sheet

Maintenance

Maintenance is the work necessary to keep the fire system operating properly. One form of maintenance is simply a **response to a failure** identified by a visual inspection or a test of the

equipment. Service personnel should notify the system owner immediately whenever deficiencies are found during routine inspection and testing procedures. Considering the fact that life safety and/or mission continuity may be at risk, **repairs should be made as soon as feasibly possible** by qualified personnel. Whenever repairs are not made immediately, a temporary alternative means of protection should be put in place until the fire system is returned to an acceptable level of readiness. Another important form of maintenance is of a preventative nature. Many components in a fire protection system will require **preventative maintenance at a prescribed frequency**. These maintenance activities address components that degrade over time, have a finite lifespan or require periodic resetting or calibration. For example, most fire alarm systems utilize lead-acid type batteries as a secondary (backup) power supply

Maintenance refers to the process of preserving a condition. It is carried out:

- to prevent problems arising,
- to put faults right
- to ensure equipment is working effectively.

Maintenance may be part of a planned program or may have to be carried out at short notice after a breakdown.

Maintenance may be classified into following categories:

(a) Corrective or breakdown maintenance,

(b) Scheduled maintenance,

(c) Preventive maintenance,

Corrective or Breakdown Maintenance:

Corrective or breakdown maintenance implies that repairs are made after the equipment is out of order and it cannot perform its normal function any longer.

Disadvantages of Breakdown Maintenance:

(i) Breakdowns generally occur at unforseen times. This leads to poor, hurried maintenance and excessive delays in performing repairs.

(ii) Reduction of output.

(iii) Faster equipment deterioration.

(iv) Increased chances of accidents and less safety to both workers and the fire suppression system.

(v) More spoilt material.

(vi) Might result to losses especially if the lack of periodic maintenance has a negative effect.

Scheduled Maintenance:

Scheduled maintenance is any repair and upkeep work performed within a set timeframe. It details when given maintenance tasks are performed and by whom. Scheduled maintenance may occur at repeating intervals or in response to a work request.

Scheduled maintenance is a stich-in-time procedure aimed at avoiding breakdowns. Breakdowns can be dangerous to life and as far as possible should be minimized. Scheduled maintenance practice incorporates (in it), inspection, lubrication, repair and overhaul of certain equipment which if neglected can result in breakdown.

Inspection, lubrication, servicing, etc., of these equipment are included in the predetermined schedule.

Preventive Maintenance:

Preventive maintenance (PM) is **the regular and routine maintenance of equipment and assets in** order to keep them running and prevent any costly unplanned downtime from unexpected equipment failure. A successful maintenance strategy requires planning and scheduling maintenance of equipment before a problem occurs.

6.2.7.4. Learning Activities

Practical Activities

You are required to take a visit to a facility managers office and gather information of the different methods of maintenance performed on their fire suppression systems

6.2.7.5. Self-Assessment

1. State four disadvantages of breakdown maintenance.
2. Describe the corrective maintenance method

3. Differentiate preventive from schedule maintenance
4. State three classification of maintenance.
5. State the purpose of maintenance

6.2.7.6. Tools, Equipment, Supplies and Materials

Notebook & Pens

6.2.7.7. References

Curry, B , Smith C.J, 2015. The Motivate Series: Plumbing Principles and Practices (3rd Edition). Macmillan

6.2.7.8. Model Answers

1. State four disadvantages of breakdown maintenance

- Reduction of output.
- Faster equipment deterioration.
- Increased chances of accidents and less safety to both workers and the system.
- Might result to losses especially if the lack of periodic maintenance has a negative effect.
- More spoilt material.
- This leads to poor, hurried maintenance and excessive delays in performing repairs

2. **Describe the corrective maintenance method**

   Corrective or breakdown maintenance implies that repairs are made after the equipment is out of order and it cannot perform its normal function any longer.

3. **Differentiate preventive from schedule maintenance**

   Preventive maintenance is the regular and routine maintenance of equipment and **assets in** order to keep them running and prevent any costly unplanned downtime from unexpected equipment failure while **Scheduled** maintenance is any repair and upkeep work performed within a set timeframe.

4. **State three classification of maintenance**.

a. Corrective or breakdown maintenance,
b. Scheduled maintenance,
c. Preventive maintenance

5. State the purpose of maintenance

- To prevent problems arising,
- To put faults right
- To ensure equipment is working effectively.