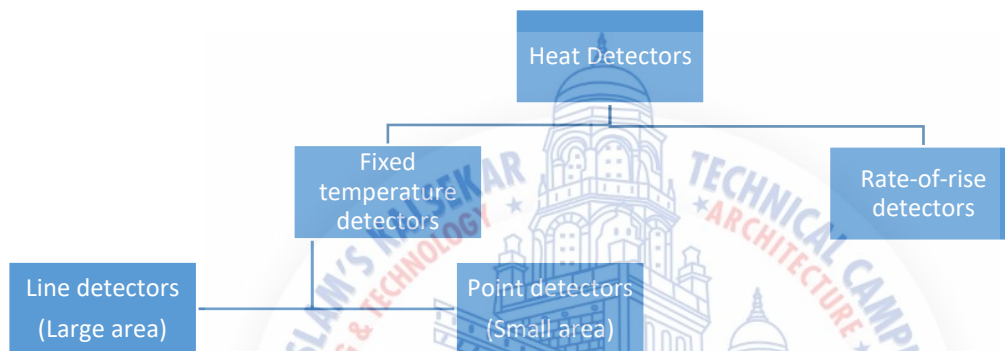


Heat Detectors:

- A heat detectors are fire alarm device designed to respond when the thermal energy of a fire increases the temperature of a heat sensitive element.
- It is a special safety device that responds to a rise in temperature and gets activated in case of a fire.
- Unlike smoke detectors, they do not respond to smoke and thus are designed to save property rather than life.
- Heat alarm are designed to provide extra time to put off a fire or evacuate people from a building.

Classification of heat detectors:



- There are two types of heat detectors:
 - (a) Fixed temperature detectors**, these detectors are designed to operate when the detecting mechanism or element reaches a pre-determined temperature. These can again be subdivided into two types:
 - (i) Point detectors, which are small, each protecting a limited area and (ii) Line detectors, which have a linear sensing device usually protecting a larger area.
 - the temperature range normally adopted for point detectors is from 550 C to 180 degree Celsius
- **(b) Rate-of-rise detectors** designed to operate when the temperature rises abnormally quickly, or when a pre-determined temperature is reached.
- The temperature range normally adopted for the rate of rise of the temperature is less than 10 degree C/min.

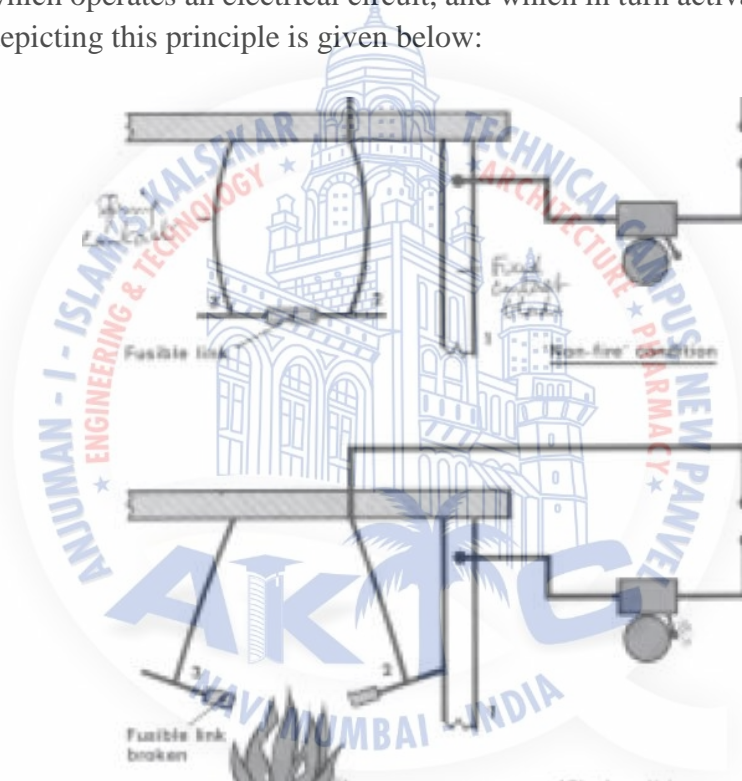
Methods used to detect heat:

Following are the methods to detect the heat

- a) By fusible metals or metal alloys
- b) Heat sensitive covering in cable assembly (thermostatic Cables)
- c) Expansion of metals
- d) Expansion of Gases (pneumatic detector)

a) By fusible metals or metal alloys,

- Fusible metals or metal alloys which melt when a pre-determined temperature is reached, which operates an electrical circuit, and which in turn activates the fire alarm.
- A figure depicting this principle is given below:



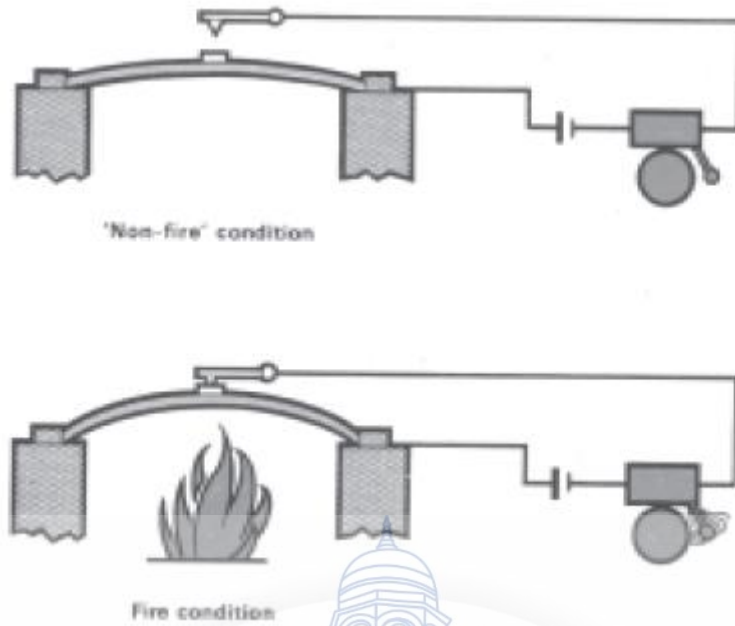
b)) Heat sensitive covering in cable assembly (thermostatic cables):

- In this, two conductors are insulated from each other by a heat sensitive covering. At the rated temperature the covering melts and the two conductors come into contact initiating an alarm.

c) Expansion of metals:

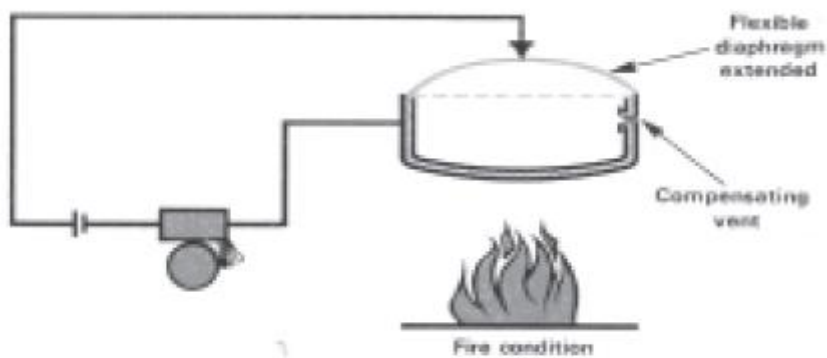
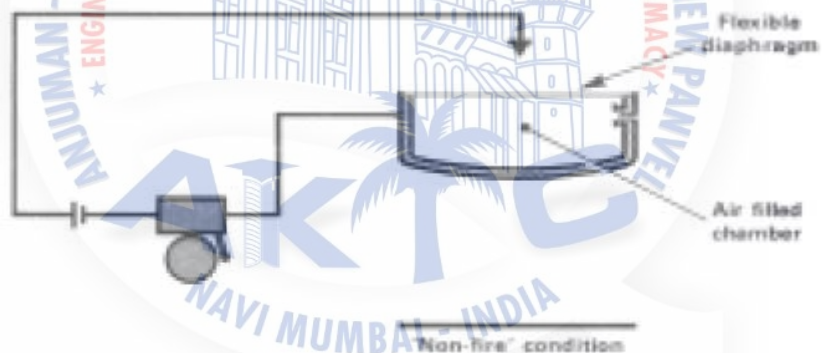
- The movements created by expanding metals or bi-metal strips are used to make or break electrical circuits. Figures depicting these principles are given below

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d) Expansion of Gases (pneumatic detector):

- This consists of an air chamber having a flexible diaphragm which can move an electrical contact. Heat causes the air pressure in the chamber to increase, making the diaphragm flexed to close the electrical contact. A figure of this follows:



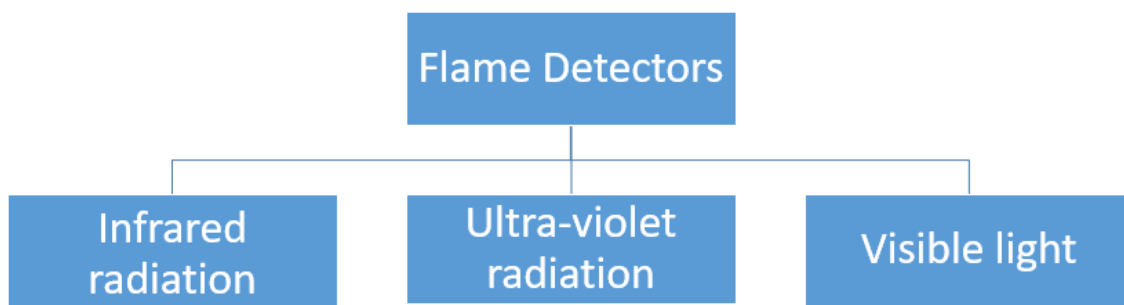
Flame/Fire detectors:

Fire detectors are the devices which sense one or more of the products or phenomena resulting from fire, such as smoke, heat, infrared and/or ultraviolet light radiation, or gas.

General requirements for automatic fire detection and alarm Systems.

- The systems consist of fire detectors and manual call points connected by cables to sector / zonal panels which, in turn, are connected to Control and Indicating equipment(C&I)
- The protected area should be divided into zones, each zone covering only one storey of the building or any other prescribed area like stairwell, lift shafts and other vertical shafts etc.
- Individual zones/sectors are necessary if the number of detectors in any area exceeds 20.
- One of the chief objectives of zoning is to make it easier to determine the location of fire.
- The sounders for the fire alarm should be electronic hooters / horns / electric bells having frequency range of 500 Hz. to 1000Hz.
- The distribution of fire alarm sounders should be such that they have a minimum sound level of either 65 dB (A) or 5 dB(A) above any other noise likely to persist for more than 30 secs., whichever is greater, and that the alarm is heard at all designated locations in the building.
- In large and / or high rise buildings and / or special buildings it may be necessary to have two-stage alarms for facilitating evacuation of the areas involving greater life hazard. In this case, while the alert signal will be sounding in all areas, the evacuation signal will be restricted only to the floor area as well as other areas immediately affected by the fire.
- A Control Centre should be provided especially for high rise and special buildings, preferably in the ground floor.

Classification of flame detectors:



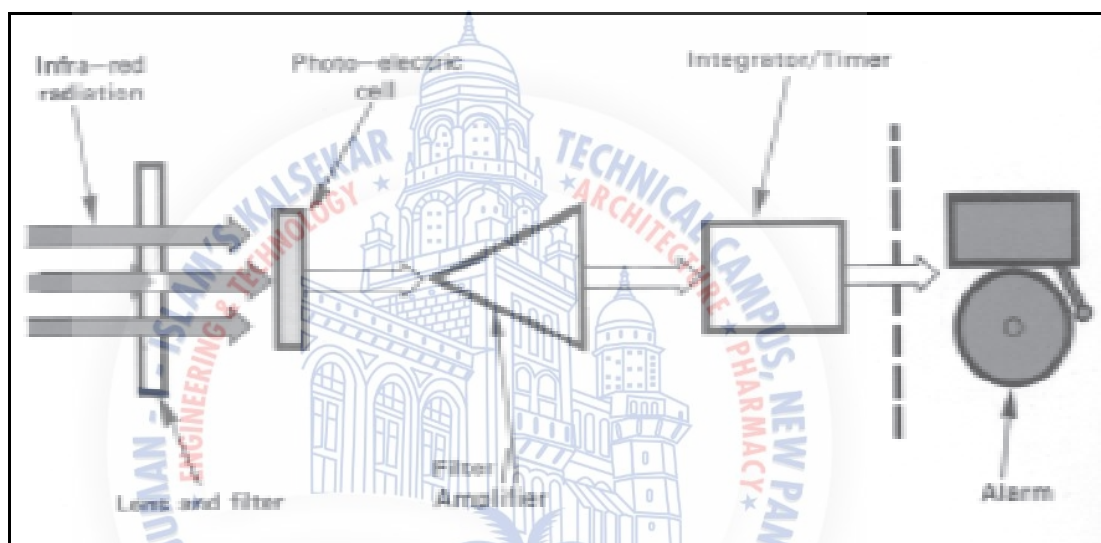
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Apart from producing hot gases, fire releases radiant energy in the form of Infrared light, ultra-violet light and visible lights. Flame detectors are classified based upon their ability to detect these different types of lights coming from a fire. Hence flame detectors are classified three main categories.

- 1) Infrared flame detectors
- 2) Ultra-violet flame detectors and
- 3) Multi-sensor detectors.

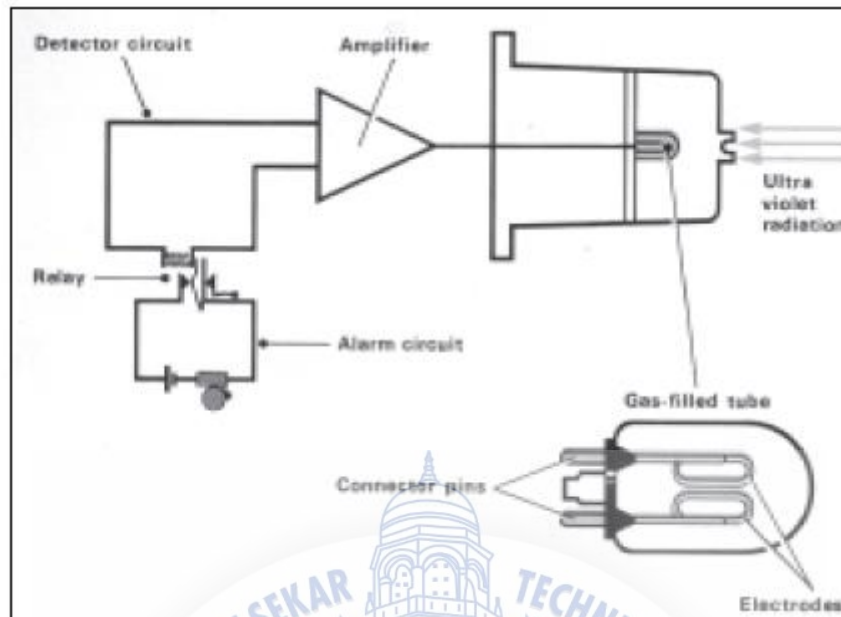
1) Infrared flame detectors:

- Infrared light is one of the most common type of light emitted from a fire source. Infrared waves are longer than those of visible light, their wave length is in the range of about 700 nano-meters (nm) to 1 milli-meter (mm).



- Any typical infrared flame detector is consist of a lens and filter, photo electric cell, an amplifier with filter timer and alarm system. The figure given above illustrates the basic components of this detector:
- In case of fire, the light passes through the lens and filters. The lens and filter will allow only Infra-red radiation to fall on the photo electric cell.
- On getting the radiation, the cell will transmit a to the filter / amplifier. The flame has a distinctive frequency, normally in the frequency range of 5Hz - 50Hz. The filter / amplifier will amplify signals in this range as well as filter out signals which are not in this range.
- The signals in this range are then fed to the integrator / timer which will activate the alarm circuit only if the signal persists for a pre-set period of normally 2-15 secs. Thus, false alarms are avoided or minimised. The detector has a neon flasher to indicate which head has been activated.

2) Ultra-violet flame detectors:



- The principle of operation of this detector is very similar to that of the ionisation detector.
- When ultra-violet radiation strikes the gas filled tube it ionises the gas in the tube. A small current is set up between the two electrodes, and the alarm is raised when there is a change in the current flow.
- The integrator helps reduce false alarms caused by external sources of ultra-violet radiation like lightning or even sunlight.
- This type of detector is commonly used for specialised applications, as for aircraft engine nacelles, fuel storage tanks, oil rigs, warehouses, paint spray booths etc.