# PREFACE

In the curricular structure introduced by this University for students of Diploma Programme, the opportunity to pursue Diploma course in any Subject introduced by this University is equally available to all learners. Instead of being guided by any presumption about ability level, it would perhaps stand to reason if receptivity of a learner is judged in the course of the learning process. That would be entirely in keeping with the objectives of open education which does not believe in artificial differentiation.

Keeping this in view, study materials on the Graduate level in different subjects are being prepared on the basis of well laid-out syllabus. The course structure combines the best elements in the approved syllabi of Central and State Universities in respective subjects. It has been so designed as to be upgradable with the addition of new information as well as results of fresh thinking and analysis.

The accepted methodology of distance education has been followed in the preparation of these study materials. Co-operation in every form of experienced scholars is indispensable for a work of this kind. We, therefore, owe an enormous debt of gratitude to everyone whose tireless efforts went into the writing, editing and devising of a proper lay-out of the materials. Practically speaking, their role amount to an involvement in 'invisible teaching'. For, whoever makes use of these study materials would virtually derive the benefit of learning under their collective care without each being seen by the other.

The more a learner will seriously pursue these study materials the easier it will be for him or her to reach out to larger horizons of a subject. Care has also been taken to make the language lucid and presentation attractive so that it may be rated as quality self-learning materials. If anything remains still obscure or difficult to follow, arrangements are there to come to terms with them through the counselling sessions regularly available at the network of study centres set up the University.

Needless to add, a great part of these efforts is still experimental-in fact, pioneering in certain areas. Naturally, there is every possibility of some lapse or deficiency here and there. However, these do admit of rectification and further improvement in due course. On the whole, therefore, these study materials are expected to evoke wider appreciation the more they receive serious attention of all concerned.

Professor (Dr.) Subha Sankar Sarkar
*Vice-Chancellor*

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# Diploma in Fire Safety and Security Management (DFSSM)

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Diploma in Fire Safety and Security Management

## Paper 1 : Safety Fire & Industrial Hazards



## Paper 2 : Security Operational Skill



## Paper 3 : Regulatory & Management Skills



## Paper 4 : Disaster Risk Management



## Paper 5 : Communication and Equipment Handling

**Paper-1**

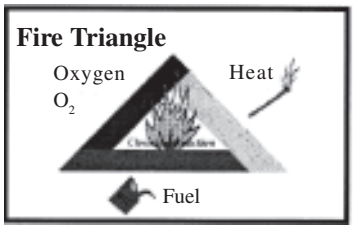
# Fire Safety & Industrial Hazards

# Unit-1 ❑ Introduction of Fire Safety & Management

**Structure**

## 1.1 Chemistry of Combustion

### FIRE CHEMISTRY




CONVENTIONALLY THE BASIC REQUIREMENT FOR A FIRE TO OCCUR IS OXYGEN, HEAT AND FUEL REPRESENTED AS **"FIRE TRAINGLE"**

### FIRE CHEMISTRY


BUT IT IS RECOGNISED THAT CHAIN REACTIOIN IS ALSO REQUIRED FOR AFIRE TO CONTINUE. THUS FIRE IS PICTORIALLY REPERSENTED IN THE FORM OF "FIRE TETRADEDRON"

### FIRE CHEMISTRY

IN SHORT FOLLOWING IS REQUIRED FOR FIRE TO OCCUR

1. FUEL: PRESENCE OF SOME FUELIOR COMBUSTIBLE MATERIAL
2. OXYGEN: ENOUGH OXYGEN TO SUSTAIN COMBUSTION REACTION (OR PRESENCE OF AN OXIDISING AGENT)
3. HEAT/ENERGY: THE COMBUSTIBLE MATERIAL MUST BE HEATED TO ITS PILOTED INGINTION TEMPERATURE OF SUFFICIENT ENERGY TO IGNITE/ PRODUCE HEAT TO SUPPORT FLAME SPREAD.

### FIRE CHEMISTRY

**4. SUSTENANCE OF CAHIN REACTION**

TAKE AWAY ANY ONE OF THESE THINGS AND THE FIRE WILL BE EXTINGUISHED

FIRE SAFETY, AT ITS MOST BASIC, IS BASED UPOON THE PRINCIPLE OF KEEEPING FUEL SOURCES AND IGNITION SOURCES SEPARATE.

## FIRE CHEMISTRY

ONCE FIRE STARS SUBSEQUENT BURNING OF COMBUSTIBLE MATERIAL IS DERCTLY DEPENDED ON THE HEAT FEED BCK FROM THE FLAME TO THE COMBUSTIBLE MATERIAL

1. THE BURING WILL CONTINUE UNTIL;
2. THE COMBUSTIBLE MATERIAL IS CONSUMED OR;
3. THE OXYGEN (OR OXIDISING AGENT) CONCENTRATION IS LOWERED TO BELOW WHAT IS REQUIRED TO SUPPORT COMBUSTION OR;
4. SUFFICIENT HEAT IS REMOVED OR PREVENTED FROM REACHING THE COMBUSTIBLE MATERIAL TO PREVENT FURTHER FUEL PYROLYSIS OR;
5. THE FLAMES ARE CHEMICALLY INHIBITED OR SUFFICENTLY COOLED TO PREVENT FURTHER REACTION.

## FIRE CHEMISTRY

**HAZARDS ASSOCIATED WITH HYDROCARBON**

1. HYDROCARBON VAPOURS ARE HEAVIER THAN AIR
2. LOW FLAMMABILITY LIMIT
3. SMALL ENERGY REQUIRED TO IGNITE VAPOUR/AIR-MIXTURE
4. LIGHER HYDROCARBONS HAVE VERY LOW FLASH POINT

## FIRE CHEMISTRY

**FLAMMEBLE LIMITS**

IT IS THE RANGE OF MIN AND MAX PERCENTAGE OF HYDROCARBON VAPOURS IN AIR WHICH CAN IGNITE IN PRESENCE OF IGNITION SOURCE.

| HYDROCARBON | LIMIT (%) |
|---|---|
| HYDROCARBON | 4.1-74 |
| NAPHTHA | 1.1-5.9 |
| GASOLINE | 1.3-7.6 |
| KEROSENE | 0.72-5.0 |
| DIESEL | 0.72-5.0 |
| LPG | 1.8-9.6 |
| ACETYLENE | 2.0-82.0 |

## FIRE CHEMISTRY

**AUTO OR SELF IGNITION**

TEMPERATURE GIVING OFF GAS AND VAPOURS WHICH WILL IGNITE WITHOUT ANY EXTERNAL SOURCE OF IGNITION.

| HYDROCARBONS | AUTO IGNITION TEMP |
|---|---|
| HYDROGEN | 585 |
| LPG | 405-405 (Propane 466; Butane) |
| NAPHTHA | 288 |
| GASOLINE | 350 |
| SKO | 254 |
| HSD | 256 |
| LSHS | 316 |
| FO | 262-407 |

## FIRE CHEMISTRY

**FLASH POINT**

TEMPERATURE GIVING OFF GAS AND VAPOURS TO IGNITEMOMENT BY AN OUTSIDE SOURCE OF HEAT:

| HYDROCARBON | FLASH POINT |
|---|---|
| NAPHTHA | –18 |
| BENZENE | –11 |
| GASOLINE | –7 |
| HSD | 32 |
| LD | 66 |
| LSHS | 66-166 |
| BITUMEN | 205 |
| MINERAL TURPENTINE OIL | 322 |

## FIRE CHEMISTRY

**FIRE POINT**

TEMPERATURE GIVING OFF GAS AND VAPOURS TO SUSTAIN FLAME WHEN IGNITED BY AN OUTSIDE SOURCE OF HEAT.

**Class of Petroleum Products**

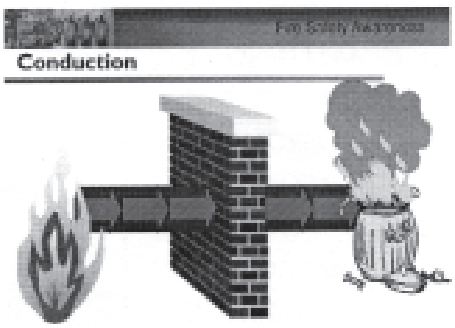
**Class-A** : FP Less than 23 deg. Cen

**Class-B** : FP 23-65 deg. Cen

**Class-C** : FP 65-93 deg.Cen

**Excluded : FP More than 93 deg. Cen**

**FIRE CHEMISTRY SPREAD OF FIRE**




## FIRE CHEMISTRY

**INCIPIENT STAGE:**

THTE INCIPIENT STAGE IS AN REGION WHERE PREHEATING. DISTILLATION AND SLOW PYROLYSIS ARE IN PROGRESS. GAS AND SUB-MICRON PARTICLES ARE GENERATED. AND MOVEMENT, AND TRANSPORTED AWAY FROM THE SOURCE BYU DIFFUSION, AIR MOVEMENT, AND WEAK CONVECTION MOVEMENT, PRODUCED BY THE BOUYANCY OF THE PRODUCTS OF PYROLYSIS.

**SMOULDERING STAGE**

THE SMOULDERING STAGE IS A REGION OF FULLY DEVELOPED PYROLYSIS THAT BEGINS WITH IGNITION AND INCLUDES THE INITIAL STAGE OF COMBUSTION. INVISIBLE AEROSOL AND VISIBLE SMOKE PARTICLES ARE GENERATED AND TRANSPORTED AWAY FROM THE SOUCE BY MODERATE CONVECTION PATTERN AND BACKGROUND AIR MOVEMENT.

## FIRE CHEMISTRY

**FLAME STAGE**

THE FLAMING STAGE IS A REGION OF RAPID REACTION THAT COVERS THE RERIOD OF INITIAL OCCURRENCE OF FLAME TO A FULLY DEVELOPED FIRE. HEAT TRANSFER FROM THE FIRE OCCURS PREDOMINANTLY FROM RADIATION AND CONVECTION FROM THE FLAME.

## FIRE CHEMISTRY

**IGNITION SOURCES**

1. OPEN FLAMES
2. HOT SURFACES
3. SMOKING
4. RADIATN HEAT
5. CUTTING & WELDING
6. SPONTANEOUS/AUTO IGNITION
7. FRICTIONAL HEAT OR SPARKS
8. ELECTRICAL SPARKS
9. OVENS/FURNACES/HEATING EQUIPMENT
10. SPARKS FROM VEHICLE EXHAUSTS
11. STATIC ELECTRICITY
12. LIGHTNING
13. HOT SURFACES

## FIRE CHEMISTRY

**FIRE**

FIRE IS A RAPID SELF SUSTAINED OXIDATION PROCESS INTENSE ENOUGH TO RELEASE OF ENERGY IN THE FORM HEAT AND LIGHT. COMBUSTION IS AN EXOTHERMIC, SELF-SUSTAINING REACTION.

**EXPLOSION:**

1. OXIDATION REACTION PRECEEDS AT A GREATLY ACCELERATED RATE.
2. THE HIGH PRESSURE DISSIPATES IN THE FORM OF SHOCK WAVE.
3. IT IS HIGH PRESSURE SHOCK WAVE THAT CAUSES THE DAMAGING EFFECT.

**DEFLAGRATION:**

RESULTNAT SHOCK WAVE WHAT PROPAGATE FROM THE POINT OF IGNITION AT A VELOCITY LESS THAN THE SPEED OF SOUND/ SHOCK WAVE VELOCITIES IN EXCESS OF THE SPEED OF FIRE.

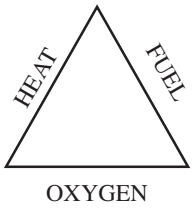
## 1.2 Chemistry of Combustion & Causes of Fire

**Introduction :** One of the best preparations one can have from and emergency situation is to have studied the general aspects of the situation before it happens. All the major disaster have happened recent and past, remind us because the people involved did not know what to expect and so had wrong plans and had erros in their operating procedures during fire fighting and before.

**Combustion :** Combustion is a chemical process that involves oxidation sufficient to produce heat or light, i.e., combustion is an exothermic reaction.

**Triangle of Combustion :**All combustion process involves three important factors :

1. A combustible material or fuel must be present
2. Oxygen, either from air or from some other Oxygen, supplying substance must be present
3. Heat (a portion of the two materials must be heated to temperature at which combustion will be initiated).




Combustion will occur as long as the three factors present. Removal of one of them caused the triangle collapse and further combustion stop.

**Fuel :** The fuel may be solid, a liquid or a gas. The burning of most materials produces a flame. This is caused by ignition of the gases or vapour given off by liquid or a solid.

**Exthermic Reaction :** A chemical reaction in which heat is produced:

**Example:** $C + O_2 \rightarrow CO_2 + 94{,}300$ calorie

or (Carbon + Oxygen) $\rightarrow$(Carbon dioxide) + 94,300 calorie

Endothermic Reaction: A chemical reaction in which heat is absorbed.

**Example:** $C + 2S \rightarrow CS_2 - 19{,}800$ calorie

Carbon + Sulphur Carbon disulphure – 19,800 calorie

**Heat :** Heat may be defined as energy possessed by substance due to motion of molecule. Total heat contained by a body is equal to the product of its mass, temperature and its specific heat.

Heat is most necessary to raise the temperature of the fuel to its ignition temperature in the particular circumstances encountered at the time of combustion. The amount of heat, needed will depend on various factors, such as , physical state, whether it is a powder or a solid lump or liquid or a gas. The concentration of supporter of combustion and the chemical nature of fuel.

The heat may come from spark, a flame or an exothermic chemical reraction.

## 1.2.1 Factors Involved in Combustion

1) **Oxidation :** An oxidation is said to be reaction which involves the addition of oxygen or any other electronegative element or radical or removal of Hydrogen of electro-positive element other than hydrogen.

   **Example:**

   a) **Addition of Oxygen :** The burning of Sulphur in presence of Oxygen (may be supplied by air to form Sulphur dioxide as:

   $$S + O_2 \xrightarrow{\text{Heat}} SO_2\uparrow$$

   or Sulphur + Oxygen + Heat Sulphur Dioxide Gas

   b) **Removal of Hydrogen :** Manganese dioxide removed Hydrogen from Hydrochloric acid is an example or Oxidation:

   $$MnO_2 + 4HCI \rightarrow MnCl_2 + 2H_2O + Cl_2$$

   Manganese dioxide + Hydrochloric Acid →Manganese chloride + Water + Chlorine

2) **Reduction:** Reduction is the reverse of oxidation, i.e., it involves the addition of Hydrogen or any other electropositive element or the removal of oxygen or any other electro-negative element or radical.

   **Example :**

   a) **Addition of Hydrogen:** The combination of Hydrogen with Chlorine to form Hydrogen :

Chloride Sunlight

$H_2 + Cl_2 \rightarrow 2HCl\uparrow$

Sunlight

or Hydrogen + Chlorine Oxygen $\rightarrow$Hydrogen Chloride

b) **Removal of Oxygen** : The reduction of cupric oxide to metallic copper by heating the former in a current of Hydrogen:

$CuO + H_2 \rightarrow Cu + H_2O \rightarrow$Copper + Water

**Note :** The term oxidation and reduction are complementary and one can take place without the other.

**Example:** $2HgCl_2 + SnCl_2 \rightarrow Hg_2Cl_2 + SnCl_4$

In this reaction $HgCl_2$ reduced into $Hg_2Cl_2$ and $SnCl_2$ oxidized into $SnCl_4$

3) **Oxidizing Agent**: The material that provides the oxygen necessary for the oxidation-reduction reaction of the diffusion flame combustion process is called oxidizing agent.

Following materials are oxidizing agents.

a) Oxygen and ozone (Air)

b) Hydrogen peroxide.

c) The halogens, such as fluorine, chlorine, bromine and iodine.

d) Concentrated Nitric Acid and Sulphuric Acid.

e) Manganese dioxide and Led dioxide.

f) Sodium Nitrate, Potassium Nitrate, Sodium Chromate, Potassum Chlorite, Potassium Chlorate, Silver Nitrate.

g) Sodium Chromate, Potassium Chromate, Sodium Dichromate, Potassium Permanganate, Sodium Hypochlorite and Hypochlorite.

4) **Reducing Agent:** A reducing is a substance which has tendency take up oxygen or any electronegative element or radical.

The following are some of the most important reducing agents:

a) Hydrogen and Nascent Hydrogen.

b) Carbon, Carbon Monoxide and Hydrocarbon.

c) Hydrogen Sulphide and Sulphurous acid.

d) Certain metal like, Sodium, Potassium, Alluminium, Zinc, Magnesium etc.

e) Metallic salt like, Ferrous sulphate and Stamous Chloride in Ageour Solution.

5) Combstible material plus a supporter of combustion other than Oxygen.

**Example :**

(a) Carbon dioxide has is projected on burning magnesium, the magnesium "break down" the carbon dioxide burn vigorously in the oxygen leaving free carbon.

$2Mg + CO_2 \rightarrow 2MgO + C$

Magnesium + Carbon →Magnesium Oxide + Carbon

(b) Many organic materials will burn readily in halogen gases. Such as a paper moisten with Turpentine oil, burns vigorously in presence of Chlorine gas.

$C_{10} H_{10} + 8C_{12} \rightarrow 16HCI + lOC$

Turpentine oil + Chlorine →Hydrogen Chloride + Carbon

(c) Nitrogen is not usually a reactive element but some metal like magnesium and aluminium will burn vigorously in this gas to form their Nitrides.

$3 Mg + N_2 \rightarrow Mg_3 N_2$

Magnesium + Nitrogen →Magnesium Nitride

## 1.3 Acids, Bases and Salts

Acids and bases are widely used in industry and are amongst the mast frequently encountered chemical hazards. The concept of acids and bases involves aqueous solution.

**Acid:** For aquous solution acid may be defined as a substance which will dive H + ($H_3$ + 0) ions in solution.

**Strong Acids:** Acids which are extensively dissociated (effectively 100%) into ion are described as strong acid. Strong acid will have a pH of 0 to 2. Hydrochloric acid (HCI), Nitric acid and Sulphuric acid ($H_2SO_4$)

**Weak acids:** Acids which are less than 100% dissociated are described as weak acid. Weak acids will have a l h. Of say 36. Examples are the organic acids such as acetic acid ($CH_3COOH$) oxalic acid ($H_2C_2$)

**Base :** A base may be defined as substance which react with a acid to give as salt and water only.

i.e., Acid + Base →Salt + Water

$HCl + NaOH \rightarrow NaCl + H_2O$

Hydrochloric acid + Sodium hydroxide →Sodium chloride + Water

This process frequently referred to a **neutralization.** This process can be used to reduce the harmful reflects of an acid if a spillage occur. Thus we say that an acid will **neutralize** a base will **neutralize** an acid.

A soluble base is referred to as a n alkali and its solution is referred to as alkaline.

**Common alkalies:**

(i) Caustic Alkalies :-

a. Sodium Hydroxide (NaOH)

b. Potassium Hydroxide (KOH)

(ii) Carbonates and Bi-carbonates

These are sodium carbonate ($Na_2CO_3$) calcium carbonate ($CaCO_3$), sodium bicarbonate ($NaHCO_3$) treated as weaker alkalies and with acid give carbon dioxide.

## General Properties of Acids

a) Acids are substances which contains hydrogen which may be replaced by metal.

**Example :** Sulphuric acid react with zinc to from zinc sulphate and hydrogen gas evolved.

**Reaction :** $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

Zinc + Dil. Sulphuric acid $\rightarrow$Zinc sulphate + Hydrogen

b) Acids will librate carbondioxide from a carbonate or bicarbonate.

**Example:** Sodium bicarbonate react with sulphuric acid to form sodium bisulphate, water and carbon diox ce gas.

**Reaction:** $2NaHCO_3 + H_2SO_4 \rightarrow Na_2SO_4 + H_2O + 2CO_2$

(Sodium bi-Sulphuric $\rightarrow$Sodium Sulphate + Water + Carbondioxide

Carbonate) acid

(c) Acids are often corrosive, attacking the eyes and the skin.

(d) All acids turn blue litmus to red

(e) All acids have a sour taste in Dilute solution.

## Sulphuric Acid ($H_2SO_4$)

**Physical Properties:**

(a) Sulphuric acid is colourless oil liquid.

(b) It is heavier than water.

(c) It has a specific gravity of 1.84.

(d) **Reactive towards water:** Sulphuric acid in concentrated solution is a very powerfull dehydrating agent, that is, it has an ability to absorb large quantities of water. When mixed with water considerable heat is evolved. Thus reaction occurs is exothermic reaction. If concentrated sulphuric acid is to be diluted, it is very dangerous to pour water into the acid. The reason is that being than the acid, it does not get easily mixed up. Owing to the diffinity of the acid much heat is evolved and water vapour is formed.

This vapour splash up together with the concentrated acid and causes burn if it comes in contact with the body. The concentrated acid should be added to water very slowly to prepare dilute sulphuric acid and the mixtures stirfed.

## 1.4 Types of Fire Extinguishes with Extinguishment

**Introductory:** Chemical Extinguishers are essentially a class of handy portable fire-fighting appliances, with a limited capacities of Fire Extinguishing media. 'They are also called portable fire extinguishers or First-Aid, fire-fighting appliances for use only on certain types of fire in the incipient stages .

Portable is applied to manually operated fire-extinguishers used especially on small fires, or in the interim between discovery of fire and the functioning of automatic equipment, or arrival of professional fire-fighters.

They are generally small and light in weight and can be carried easily from place to place. Larger Models of certain types know as trolly units and chemical engines are mounted on simple two wheeled chassis, fitted with length of hose to extend the available range. The extinguishing agents might be chemicals in the form of very fine solid particles, liquid or gas contained in the cylinders .

Fire can be divided into two groups-wanted and unwanted. The first group includes fires which provide various utilities to man, such as fires for cooking and warmth for power and locomotion for a travel to moon and back to earth etc. The Second Group of fires are the ones which are dreaded to lay man, the uncontrolled fires which burn down his dwellings, his work places, his forest wealth, his hard earned precious goods, and cause death, and misery to his near and dear ones. It is this group of fire for which the methods have been developed for their suppression and prevention.

The fire fighter of today, living in a world which is fast advancing in science and

technology-is far removed from his counter part of by - gone years. He confronts an increasing variety of fires, involving both natural and man made materials in ever growing complex combinations. His job involves much more than just throwing water on each and every fire. It has become necessary for him to know the nature and type of combustible materials and their behaviour in a fire in order to select the correct extinguishing medium and to achieve extinguishments at the minimum time without any risk to his own person.

He has therefore, to acquire an adequate knowledge in many diversified field and the range specialisation has expanded from use of plane water to the use of most modem vatpourising liquids.

## 1.5 Classification of Fires

The fire scientists have classified all fires into various categories on the basis of the nature of combustible materials, and to situations in which they might be found. As per I.S.S. 2190-1979 the classification of fires is given as under :

1 Class 'A' Fires Fires in ordinary combustible materials such as wood paper, textiles etc. where the cooling effect of water is essential for the extinction of fire.

2. Class CB' Fires Fires in inflammable liquids such as acids, organic solvents, petroleum products, varnishes, paints etc. where a blanketing effect is essential for the extinction of fire.

3. Class 'C' Fires Fires involving gaseous-substances Such as methane, propane, butane, acetylene, cooking gas including Natural gas. (Under Pressure), where, it is necessary to dilute the burning gas at a very fast rate with an inert gas or dry chemical powder.

4. Class 'D' Fires Fires involving burning and powders of combustible metals, such as magnesium, aluminium, zinc, or alkali metals, like sodium and potassium etc., where the burning metal is reactive to water and require special extinguishing agents and techniques.

**TABLE-1**

**Suitability of Different Type of Portable Fire Extinguishers for Different Classes of Fires**

| Sr No | Types of Fire Extinguishers | A | B | C | D |
|---|---|---|---|---|---|
| 1. | Water Type (Soda Acid) Fire Extinguisher (IS : 934-1976) | Suitable | Unsuitable | Unsuitable | Unsuitable |
| 2. | Water Type (gas pressure) Fire Extinguisher (IS : 940-1976) | ” | ” | ” | ” |
| 3. | Water Type (bucket pump) Fire Extinguisher (IS : 1924-1961) | ” | ” | ” | ” |
| 4. | Water Type (constant air pressure) Fire Extinguisher (IS : 6234-1976) | ” | ” | ” | ” |
| 5. | Foam Type Fire Extinguisher (IS : 933-1976) | Non-suitable | Suitable | ” | ” |
| 6. | Carbon dioxide type Fire Extinguisher (IS : 2878-1976) | -do- | ” | Suitable | ” |
| 7. | Dry powder Type Fire Extinguisher | -do- | ” | ” | Suitable |

## 1.5.1 Extinguisher which expel water or dilute-chemical solution

**A. Soda Acid Extinguisher :** This extinguisher essentially consists of a cylindrical or conical container which is normally filled with water to an indicating mark. This water is ejected on to the fire by the Pressure of gas generated by chemical action setup by allowing a charge of acid to reach with a carbonate or bicarbonate which has previously been dissolved in the water. The gas thus generated experts a downward force on the surface of the liquid and drives it out of the extinguisher through a nozzle. Sodium-bi-carbonate and sulphuric acid are the two chemicals normally used for generating the gaseous carbon-dioxide, which is used as the expelling medium. The reaction takes place according to the equation.

Sodium-carbonate + Sulphuric Acid = Sodium Sulphate + Carbon dioxide + Water

Equation : 2 Na $HCO_3$ + $H_2SO_4$ = $2H_2$ + $2CO_2$ +$Na_2$ $SO_4$ 2NaH $CO_3$ + $H_2SO_4$ = $Na_2SO_4$ + $2CO_2$ + $2H_2$

**Note** : It is the water in the form of dilute chemical solution, which extinguishes the fire by cooling effect and the $CO_2$ does not play any part in the extinction of fire.

**Discharge Performance : (IS : 934-1976)**

When the extinguisher is set in operation under normal conditions of temperature 27 + 2°C, the solution shall be expelled in the form of a jet which shall-maintain the effective throw of not less than 6 m for the minimum period given below provided that the solution shall be 95% discharged within maximum period specified.

(a) Minimum period during which jet shall be maintained at a length not less than 6 m- 60 seconds.

(b) Maximum period for discharge (95% Solution)- 120 seconds.

**The Charge :**

The charge shall consist of :

(a) Carbonate or dicarbonate of soda in solution of such strength that no Precipitation shall take place at 45°F (7.29°C) and

(b) An acid (in a Bottle) in such proportions that when the extinguisher is operated In the normal manner at 60°F. (15-6°C) the discharge liquid is alkaline.

**Note** : It is recommended that standard charge shall consists of 125 to 140 gr. Of sulphuric acid of specific gracity 1.833 and 1 lb. 2oz. (o.5kg.) if bicarbonate of soda for a 2 gl. (91trs.) extinguisher.

## 1.5.2 Soda Acid extinguisher in Upright Position

1. Conical type with plunger on the top : One of the common type is conical in shape with a nozzle near the top. Inside the body is a discharge tube, fitted at its lower and with a strainer to prevent small particles of glass etc. Clogging the discharge tube or nozzle. At the top is a screwed cap a cause will be found holding a glass phial and the outer-container water with bicarbonate in solution. Striking the plunger breaks the phial and allows the acid to escape and the us set up the necessary chemical reaction.

2. Cylindrical type with plunger on the top : this is same as above type, except that the body is cylindrical in shape.

3. Conical type with the puinger at base : This is conical in shape. It has a plunger at the bottom instead of at the top. This type of extinguisher is normally aduated in an upright position but operated almost horizontally.

4. Turn over type of Soda Acid Extinguisher : This types of extinguisher operate on a different principle, it is inverated to initiate the action and operated in this position.

Turn over type with plunger : This type is operated by first turning upside down and then driving in a plunger which shatters a glass phial.

It should be noted that the turn over types do not required sniffer valve as they are not fitted with a discharge tube. Any pressure which might be built up through temperature changes escapes immediately to atmosphere through nozzle.

**Note** : If a types operated in the upright position is inadvertently used in the turnover position the gas pressure will escape, through the discharge tube leaving the liquid contents behind whilst if a turnover type is brought into operation and then returned to its normal upright position, the $CO_2$ will be ejected through the nozzle and the liquid will remain in the extinguisher.

### 1.5.3 Testing

1. Check the Poll swing :
   1. Vent holen in the cap
   2. Nozzle
   3. Sniffer valve (where fitted)
   4. Washer in the cap :
   5. Liquid
   6. Acid phial:
   7. Plunger.

Must be kept clear of dirt, Metal polish etc.

2. Annual discharge test must be carried out on a due from last occasion when used at a fire or for test purpose.

3. Each extinguisher should be subjected to a hydraulic pressure test of 17 5 kg./cm. In rotation at an interval of 2 year,. (IS . 100 : 72).

### 1.5.4 Uses

1. Should not be used on live electrical wiring etc., as the jet is a conductor of electricity.

2. When using in a soda acid extinguisher in burning oils, Spirit or highly inflammable liquids, the jet will splash and spread the fire and the burning liquid with float on the top of the extinguishing medium.

3. When using a Soda Acid Extinguisher, wait until you are as near to the fire as possible

before actuating it. Direct the jet on to the burning material in the heart of the fire, disregarding flames and smoke.

### 1.5.5 Safety Devices

Usually the following safety devices are incorporated in the design of Soda Acid Extinguishers.

**(a) Vent Holes :** These are small holes drilled in the side of the head through the screw threads. As the cap unscrewed, these holes communicate with the interior of the container and the design is such that any residual gas pressure will discharge through them while the head is still held in position by the threads. They must be kept clear of dirt and metal polish and capable of fulfilling their function.

**(b) Sniffer Valve :** This is a valve communicating between the air space in the extinguisher and the atmosphere outside and permits the very small quantity of air to escape where the internal pressure rises slightly due to increase in the ambient temperature. It is a ball of rubber composition disc., which rest rightly on an office connecting with the body of the extinguisher. When the extinguisher is operated, the high internal pressure lifts the ball or disc firmly and seals the outlet.

Other similar devices in the form of expansion chamber or a thin rubber diaphragm might also be provided.

## B. Water (Gas Cartridge) Type

In this type the outer container is similar to soda acid Extinguisher and holds 2 gallons (9 litres) of water but the gas (excellent) is released from aninner container (cartridge), it has a sealing disc at the top which is pierce by a pointed striker at the lower end of the plunger, when the extinguisher is operated. The extinguisher is usually operated upright. The details of discharge rate tube, and safety devices are precisely the same as for Soda Acid Extinguishers.

**Types :**

(a) Low pressure type : The cartridge normally contains about 2 oz. of C02 at just below 500 Ibs./sq. inch (35 kg/cm2).

(b) High pressure omitted.

The uses are the same as for Soda Acid Extinguisher and since the expelled liquid consists of pure water only, there is no possible damage such as caused by chemically charged water discharged by a soda acid extinguisher

**Test :** The test specified are the same as for Soda Acid Extinguisher except that the gas cartridge should be weighed every three months to detect any loss.

## Main Advantages :

(i) Normally only water is expelled, thus risk of damage to cotton fabric etc. is reduced.

(ii) Cartridge can be easily and rapidly recharged.

(iii) Other liquids may be used to deal with special risk.

(iv) Non coffosive anti-freezing chemicals may be used in cold weather.

(v) Low temperature do not rated the discharge.

## C. Chemical Foam Extinguisher (2G.S.) Liters Capacity :

The appliance essentially consists of :-

(i) An inner container (ii) An outer container made of sheet metal lead coated inside to prevent corrosion and tested to a hydraulic pressure test of 17.5 kg./sq. inch for at least 2.5 minutes without leakage or distortion, in rotation at an interval of 2 years. (IS:2190-1979)

## Expansion Space :

The level of the liquid in the outer container is permanently indicated so that there is an air space above of not less than 5% of the total volume.

## Main body & Inner Container :

**1. Outer Container :** Hold a Solution 8% Sodium-bi-carbonate with about 3% of stabilizer such as Seponin, Liquioriees Turky red oil etc. dissolved in water.

**2. Inner Container :** Contains a solution of about 13% aluminium sulphate.

**Action :** When the extinguisher is brought into action, the two solution mix and a chemical reaction is set up which produces carbon-dioxide and foam.

The gas acts as the expellent as well as filling the foam bubbles.

The reaction is deplected below :-

Aluminium Sulphate + Sodium-bi-carbonate ; Sodium Sulphate + Almunium Hydroxide + Carbon-dioxide.

(Equation): $Al_2(SO_4)_3 + 6NaHCO_3 \rightarrow 2AL(OH)_3 + 3Na_2SO_4 + 6CO_2$

**Note** : The foam produced is a frothy produce which retains its texture for a comparatively long time. It is relatively insoluble in most liquids and owing to its weight, floats on the surface of the liquid, when applied correctly and in sufficient quantities it foams a blanket capable of covering the surface of the burning liquid and this normally effective in completely extinguishing the fire by smothering principle.

## Discharge Performance : IS 933 – 1976

The nozzle shall be incorporated with the cap in the double seal type and with the top end (dome) in the break seal in the plunges. The design of the area of office shall be such that when the extinguisher is operated in normal temperature condition 27+2°C, the foam solution shall be expelled in the form a jet which Fill maintain the throw of not less than 6m for the minium period of time given below, also provided that minimum of 95% of expelled foam shall be discharged from tile extinguisher within maximum period specified below :-

(a) Minimum period during which the jet shall be maintained as a length not less than 6m.- 30sec.

(b) Maximum period ; for complete discharge of 95% of Expelled foam-90 secs.

(c) Plunger type the inner compartment is sealed by means of a mica disc and strike knob mechanism sealed thus allowing the extinguisher to breath with variation of temperature.

**Testing :** At quarterly inspection, check vent holes in the cap nozzle, sniffer valve (where fitted) and must be kept clean of metal polish or dust. Check level for scaling devices and when replacing cap check washer and screw the cap fight.

2. Each extinguisher should be tested by discharge once a year this period to date from last occasion when it was used at a fire or for test purpose.

3. A hydraulic pressure test of 25kg./cm2 should be carried out every fourth year.

**Advantages :**

1. Foam costs the burning surface of the substance and excludes oxygen :

2. Foam bas considerable heat resisting qualities as an insulator and prevents reignition ;

3. Foam is not effected by draught;

4. Foam floats in the most liquids and quenches many types of liquid fires.

**Disadvantages :**

1. Foam mixes with certain types of liquids and renders them unmovable.
2. When used in conjunction with dry powder, it may break down the foam unless the powder is compatible with the foam.
3. Chemical foam and mechanical foam have detritus effect on each other.

## D. Carbon Dioxide or $CO_2$ Extinguisher :

1. Carbon dioxide as an extinguishing medium is widely used in portable extinguishers.

At ordinary temperature, it is a gas but liquefied when compressed for storage in cylinders. It produces chilling effect when released and part of the gas is solidified in fine particles in the form of dry ice. It rapidly vaporises and its expansion ratio is 1:450. The cooling effect is likely to play some part in extinguishing the fire but it is exclusion of oxygen which is of primary importance. The contents of the cylinder are held under a pressure of 744 lbs. Per sq. inch at 60°F.

**Hysical Properties :** $CO_2$ is a colourless, odourless gas and is a non-supporter of combustion. It has no poisonous effects but if inhaled in large quantities may lead to suffocation. It has also the physiological act of stimulating the respiratory action.

**Physical Data :** Specific gravity : 0.8. Boiling point 109° F, vapour density-1.5, specific heat and latent heat 0.2 and 345 B. TH.UT respectively ; gas generation 8 off/lb, inhibitory-factor W-29% and normal pressure in extinguisher 734. Ibs/sq. inch.

**Sizes :** The extinguishers are available in cylinder sizes of 2kg. to 6.7kg. of liquefied gas. Larger capacities are obtainable in the form of trolly units.

**Constructional features :** Tile $CO_2$ extinguisher essentially consists of steel cylinders of seamless construction and contains the liquefied gas filled to approximately 2/3 weight of its total water capacity and fitted at the top with sealing disc and a piercing mechanism or valve mechanism, it is also fitted with a discharge horn by high pressure flexible tube to larger sizes. For smaller models the discharge horn is rigidly connected to the valve mechanism.

The gas may be released by piercing the disc by means of either plunger or level or by opening the valve. The cylinder of the extinguisher is fitted internally with a discharge tube so that liquid $CO_2$ as released through the valve, without freezing.

**Discharge Performance : (IS : 2878-1976)**

| Nominal size | DISCHARGE PERIOD | |
|---|---|---|
| | Maximum | Minimum |
| 2 kg. | 8 secs. | 18 secs. |
| 3 kg. | 10 secs. | 20 secs. |
| 5 kg. | 10 secs. | 24 secs. |
| 6 to 7 kg. | 10 secs. | 30 secs. |

**Notes :**

1. The above rates are specified when the extinguishers is operated at an angle of 45 and ambient temperature at 27+2°C and that is expels 95% of the content.

2. In the case of extinguishers designed for intermittent, discharge t>pes they should be capable of operating satisfactory with an interrupted discharge cycle of 4 sec. Open and 4 sec's hut, and discharge the same proportion of the contents

**Discharge Horn :** The function of the discharge horn is not only to direct the gas on to the fire but also to reduce the velocity of the discharging gas and to prevent crtertainment of air without this the gas; will discharged in the form of below torch and will entrain air to intensify the fire.

**Advantages :**

1. It is extremely rapid in action and is independent of atmospheric temperature ;

2. It is clean and non-residual;

3. The gas is a non-conductor of electricity and can safety be used on live-electrical equipment;

4. It may be used in highly inflammable liquid like methyl-alcohol, other carbon-disulphide etc., which it does not contaminate as would foam ;

5. It can penetrate into other wise inaccessible position, being a gas.

**Disadvantages :**

1. The comparative weight of the extinguisher with the weight of the gas is considerable.

2. There is no visible check on the contents. Extinguisher must be accurately weighted at regular intervals to ensure that no leakage his taken place.

3. It has to be sent out for recharging.

4. It is to be used at a short range ;

5. Not effective on fires in materials which contains its own supply of oxygen.

**Testing :**

1. $CO_2$ extinguisher should be tested once in six months by weighting, there is a loss of 10% of they contents, they should be returned for recharging :

2. All $CO_2$ extinguishers should be hydraulically pressure tested to withstand pressure of 3360 lbs./sq. in (235 kg./$cm^2$).

3. In case of any evidence of external corrosion, it should be repeated every 5 years otherwise at interval of 10 years on first two occasions and subsequently every 5 years.

4. In addition to checking by weighting every 6 months, check hose, horn and valve assembly, check squeze grip control.

## E. Dry Power Extinguisher

Try power extinguisher using patented dry powder (or dry chemical) are available in sizes containing between 1 kg. and 13.5 kg. also as large units and fixed installations. The method of expelling the powder from the container is by a charge of compressed air or gas, which, when released 'fluidifies' the powder and ejects if via a discharge tube to the nozzle.

**Types :** There are two types of portable dry powder extinguishers

(i) Gas cartridge type (ii) Stores pressure Type (This is relative new type and not discussed here.) Constructional Features

(i) Gas cartridge typical Motael

In this type the expellent, usually carbondioxide is contained in a sealed gas cartridge, which is normally screwed the bottom of the operating read having a piercing mechanism in the form of a spring loaded plunger.

The container of the extinguisher which holds the dry powder charge is cylindrical in shape and made of solid eawn steel fitted internally with a tube. The carbon-dioxide gas cartridge is held in position inside the extinguisher in a sealed inner container Shell having gas parts protected by this rubber sealing ring.

A length of delivery tubing is tightly secured to the ports connection on the body of the container and is fitted a squeeze grip control for controlling the flow of powder after the plunger has been depressed.

A fully charge extinguishers normally contains only approximate half its volume as powder.

**Methods of Operation :**

1. Remove Safety clips ;
2. Depress the plunger;
3. Withdraw the nozzle from the rubber cap and press the squeeze grip ;
4. Direct the dry powder to the base of the flames with a fast sweeping motion.

**Recharge :**

1. After use before recharging, care should be taken to ensure that the powder remaining in the discharge tube, hose and nozzle is fully cleared.
2. When refilling once the new powder container is opened, the powder should immediately be transferred into the extinguisher and the appliance, should be sealed.
3. Personnel, handling of very fine powder particularly where the ingredients are poisonous as with some chlorides employed, should wear dust mask.

**Types of Dry Powder :** The composition of powder varies with different proprietary mixture. The main constituent of the powder in general use is Sodium Bicarbonate with which is mixed a water profine agent such as metallic stearate. (Although other agents are used). The action of the stearate is to prevent moisture absorption and subsequent caking of the powder and also to prevent corrosion of the container. When a finally divided dust of sodium-bicarbonate is blown into the gases and flames of a fire, rapid decomposition takes place and the flames are extinguished quickly by smothering effect.

**Uses :** Chiefly used for extinguishing fires in highly inflammable liquids, and live electric equipment. It should not be used with foam which is not compatible to it as otherwise the foam will break down quickly.

**Other Types of Powders :** Recent developments have produced the following main constituent of dry powders -

| | |
|---|---|
| 1. Borax : | Capable of dealing with |
| 2. Ammonium Phosphate : | Carbonaceous fires, |
| 3. T.E.C. (Ter nary Eucteetic chloride): | For dealing with metal fires, |
| 4. Potassium Sulphate | (Magnesium, Aluminium, Uramum, titanium etc.). These are capable of controlling/or extinguishing these fire whether it, be drippings swart or bulk.. This is a foam compatibles type of dry powder. |

**Constituents of some Proprietory Mistures**

| | | |
|---|---|---|
| (i) | 1. Sodium Bicarbonate | 97% |
| | 2. Magnesium + Stearate | 11/2% 1.5% |
| | 3. Magnesium Carbonate: | 1% |
| | 4. Tiicalcium Phosphate : | *V2V0* 0.5% |
| (ii) | 1. Bitumen : | 45% |
| | 2. Slate powder: | 45% |
| | 3. Aluminium + Stearate | 10% |
| (iii) | T.E.C. Powder | |
| | 1. Sodium Chloride : | 20 wt. % |
| | 2. Potassium Chloride : | 29 wt. % |
| | 3. Burium Chloride : | 51 wt. % |

Optium size of Particles (20 to 30 micron)

Discharge performance (IS : 2171-1976)

The extinguisher shall be capable of discharging 25% of total mass when operated at 45° at 27 + 2°C, the discharge performance shall be :

| Cap. of Ext. | Minimum period of Which jet shall be maintained | Maximum period of discharge of 85% of contents. | Ranges of throw |
|---|---|---|---|
| 1 to 2 kgs. | 8 to 10 Secs. | 10 Secs. | not less than 2 mt. |
| 5 kgs. | 15 Secs. | 20 Secs. | not less than 4 mt. |
| 10 kgs. | 23 Secs. | 30 Secs. | not less than 6 mt. |

**FIRE EXTINGUISHMENT**

- **CLASS A (PAPER, WOOD ETC ) - WATER, FOAM, DCP**
- **CLASS B (OIL) - FOAM, DCP, WATER, $CO_2$ .**
- **CLASS C (GASES) - DCP, $CO_2$, WATER**
- **CLASS D (METALS)-SPECIAL POWDERS**

## FIRE EXTINGUISHMENT

**METHODS O EXTINGUISHMENT :**

- o STARVATION—CUTTING OFF FUEL SUPPLY
- o SMOTHERING—REDUCING 02% TO BELOW 15%
- o COOLING—REMOVING HEAT
- o CHEMICAL FLAME INHIBITION :
- o BREAKING COBUSTION REACTION.

## FIRE EXTINGUISHMENT

**STARVATION : CUTTING OFF FUEL SUPPLY**

- o FIRE EXTINCTION BY STARVATION IS CARRIED OUT IN ANY ONE OF THE FOLLOWING WAYS
- o REMOVING COMBUSTIBLE MATERIAL SUCH AS THE TRANSFER OF FUEL FROM BURNING OIL TANKS, CLOSING THE VALVES ON THE GAS/FUEL LINE ETC. BY REMOVING MATERIAL ON FIRE NEAR TO THE COMBUSTIBLE MATERIAL SUCH AS PULLING APSRT A BURNING HAYSTACK OR A THATCHED ROOF.
- o BY SUB-DIVIDING THE BURNING MATERIAL TO SMALL SIZED ISOLATED FIRES TO BREAK CONTINUITY SUCH AS REMOVING ONE HUT FROM THE ROW OF HUTS ON FIRE.

## FIRE EXTINGUISHMENT

**SMOTHERING : REDUCING OXYGEN(02% TO BELOW 15%)**

COMBUSTION WILL CEASE IF THE OXYGEN CONTENT OF THE ATOMOSPHERE IN THE IMMEDIATE VICINITY OF BURNING MATERIAL CAN BE SUFFICIENTLY REDUCED, WHERE IT WILL NOT SUPPORT THE COMBUSTON PROCESS.

IN THE REFINERIES FOAM IS EFFECTIVELY USED AS A SMOTHERING AGENT FO FIGHTING OIL FIRES, SNIFFING A CANDLE AND CAPPING A BURNING OIL WELL. EMPLOY PRINCIPLE OF SMOTHERING ONLY.

## FIRE EXTINGUISHMENT

**COOLING : REMOVING HEAT**

IF THE RATE AT WHICH HEAT GENERATED DURING COMBUSTION IS LESS THAN THE RATE AT WHICH IT IS DISSIPATED. THE COMBUSTION CAN NOT CONTINUE LONG. THUS IF THE SURFACE OF THE BURNING MATERIAL IS COOLED BELOW THE TEMPERATURE AT WHICH WILL GIVE OFF SUFFICIENT VAPOURS TO SUPPORT COMBUSTION, THE FIRE WILL BE EXTINGUISHED.

CONTINUOUS THE APPLICATION OF WATER IN JET OR SPRAY TO EXTINGUISH FIRE IS BASED ON THE ABOVE PRINCIPLE.

## FIRE EXTINGUISHMENT

**CHEMICAL FLAME INHIBITION OR CHAIN BREAKING COMBUSTION REACTION**

THE CHAIN REACTION THEORY OF COMBUSTON ASSUMES THAT FREE RADICALS ARE PRESENT IN THE COMBUSTION ZONE AND THE REACTIONS OF THESE PARTICLES WITH EACH OTHER ARE NECESSARY FOR CONTINUED BURNING.

THE MOST ACTIVE FREE SPECIES HYDROCARBON COMBUSTON ARE OXYGEN & HYDROGEN ATOMS AND HYDROXYLRADICALS IE. O*, H* AND OH*. FIRE EXTINGUISHMENT BY DCP AND HALONS IS BASED ON THE ABOVE PRINCIPLE.

## FIRE EXTINGUISHMENT

**GENERATION OF CHAIN REACTION :**

$H_2 + E \rightarrow 2H^*$ $\quad\quad$ $H^* + O_2 \rightarrow OH^* + O^*$

$OH^* + H_2 \rightarrow H_2O + H^*$ $\quad\quad$ $O^* + H_2 \rightarrow H^* + OH^*$

**EXTINGUISHMENT WITH I) CP**

$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$ $\quad$ $Na_2CO_3 \rightarrow Na_2O + CO_2$

$Na_2O + H^* + OH^* \rightarrow 2NaOH$

WE CAN SEE THAT DISCHARGE OR DRY CHEMICAL POWDER INTO THE FLAMES PREVENTS REACTIVE PARTICLES FROM COMING TOGETHER AND CONTINUING THE COMBUSTION CHAIN REACTION.

## FIRE EXTINGUISHMENT

**FIRE EXTINGUISHING MEDIAS**

WATER

DRY CHEMICAL POWDER

FOAM

$CO_2$

## FIRE EXTINGUISHMENT

**WATER :**

- O SMOTHERING : BY REDUCING $O_2$ PERCENTAGE
- O COOLING : BY BRINGING DOWN THE TEMPERATURE
  - ❖ PROPERTIES OF WATER AS AN EXTINGUISHING MEDIA
  - ❖ ADVANTAGES OF WATER AS AN EXTINGUISHING MEDIA.
  - ❖ DIS - ADVANTAGES OF WATER AS AN EXTINGUISHING MEDIA

## FIRE EXTINGUISHMENT

**FOAM** :

- ❑ BLANKETING : BY CUTTING OF AIR
- ❑ COOLING : BY BRINGING DOWN THE TEMPERATURE
  - ❖ TYPES OF FOAM COMPOUND
  - ❖ DESIRABLE PROPERTIES OF FOAM FOR OIL FIRES
  - ❖ ADVANTAGES OF FOAM AS AN EXTINGUISHING MEDIA.
  - ❖ DIS-ADVANTAGES OF FOAM AS AN EXTINGUISHING MEDIA

## FIRE EXTINGUISHMENT

**DRY CHEMICAL POWDER.:**

- O INHIBITION : BY BREAKING COMBUSTION CHAIN REACTION
- O SMOTHERING : BY REDUCING 02 PERCENTAGE
  - ❖ PROPERTIES OF DCP AS AN EXTINGUISHING MEDIA
  - ❖ ADVANTAGES OF DCP AS AN EXTINGUISHING MEDIA
  - ❖ DIS-ADVANTAGES OF DCP AS AN

## EXTINGUISHERS

**DCP EXTINGUISHER**

| | **DETAILS EXT'R** | **DCP 10 KGS** |
|---|---|---|
| 1. | DESIGN CODE | IS : 2171 |
| 2. | CYLINDER TYPE | WELDED |
| 3. | TYPE OF POWDER | NaHC03 : MAP |
| 4. | $CO_2$ CARTRIDGE | IS : 4947 ; 200 gms |
| 5. | OPERATING PRESSURE | 10 KG/CM2 |
| 6. | HYDRO TEST PRESSURE | 30 KG/CM2 |
| 7. | FREQUENCY OF H.T | ONCE IN 3 YEAR |
| 8. | PERFORMANCE REQUIRMENT | 85% DISCHARGE IN 30 SEC. |
| 9. | THROW | 6 METERS |

## EXTINGUISHERS

**$CO_2$ EXTINGUISHER**

| **SL. NO.** | **DETAILS OF EXT'R** | **$CO_2$ 4.5/22.5 KGS** |
|---|---|---|
| 1. | DESIGN CODE | IS : 2878-1976 |
| 2. | CYLINDER TYPE | SEAMLESS |
| 3. | C02 FILLING PRESSURE | 30-35 $KG/CM^2$ |
| 4. | OPERATING PRESSURE | 10 $KGS/CM^2$ |
| 5. | HYDRO TEST PRESSURE | 210 $KGS/CM^2$ |
| 6. | FREQUENCY OF H.T | ONCE IN 5 YEAR OR AT THE TIME OF REFILING |
| 7. | PERFORMANCE REQUIREMENT | 95% DISCHARGE IN 10 SEC. |

## EXTINGUISHERS

**MAINTENANCE OF DCP EXTINGUISHERS IS:2190 MONTHLY**

- o EXTERNAL CLEANING
- o CHECKING OF THE FOLLOWING
- o NOZZLE, CAP, HOSE
- o PIERCING MECHANISM
- o CONDITION OF EXT'R

## EXTINGUISHERS

**MAINTENANCE OF DCP EXTINGUISHERS IS:2190**

**ANNUAL:**

- o CHECKING OF THE FOLLOWING
- o SEALING DISC OF CARTRIDGE
- o WEIGHT OF THE CARTRIDGE

- o INTERNAL PARTS
- o POWDER
- o BODY (INTERNAL & EXTERNAL)
- o CLEANING OF EXT'R WITH DRY AIR
- o FILLING AND FIXING ALL PARTS

## EXTINGUISHERS

**MAINTENANCE OF $CO_2$ EXTINGUISHERS**

- o CHECKING OF THE FOLLOWING
  - ◗ WEIGHT OF THE EXT'R
  - ◗ VALVE ASSEMBLY
  - ◗ DISCHARGE HOSE, HORN
  - ◗ BODY (EXTERNAL)

## EXTINGUISHERS

**MAINTENANCE OF DCP EXTINGUISHERS IS:2190 HYDROTESTING**

- o DCP EXTINGUISHER : ONCE IN 3 YEARS AT 30 $KG/CM^2$
- o $CO_2$ EXTINGUISHER : ONCE IN 5 YEARS AT 210 $KG/CM^2$ OR AT THE TIME OF REFILING
- o **MAINTENANCE / INSPECTION AT VR**
  - ◗ ALL THE CHECKS LISTED IN STANDARD ARE CARRIED OUT ON MONTHLY BASIS
  - ◗ RANDOM OPERATION OF DCP EXT'R IS CARRIED OUT (ONE EXTINGUISHER PER UNIT EVERY DAY)
  - ◗ ALL THE DCP EXTINGUISHERS ARE NUMBERED
  - ◗ DATA-BASE MAINTAINED IN PC

## 1.6 Smoke Management

**Preamble :** Smoke is always associated with fire. Smoke propagates in many directions and is more dangerous than fire. Most of fire case study reveals that a large number of fire deaths have been caused due to inhalation of toxic gases.

The propagation of smoke to various areas is uncontrollable as being lighter than air. It travels to various nooks and comers and especially during night-time fires its presence is undetected and this causes many sleeping people to succumb due to smoke.

Combust, on product contain gases, vapors and solid particles. The cellulose materials evolve less dense in presence of oxygen and high temperature. On the other hand, the synthetic materials release dense smoke from very initial stage of fire.

**Effect of Smoke :**

VISIBILITY - Poor visibility and asphyxiation due to irrespirable atmosphere created by smoke

TOXICITY - All smoke from fires contain gases which are toxic and if exposure to smoke is prolonged its effect may be lethal.

**Area of Dangers :**

The smoke filled in a compartment hampers fire fighting and rescue operations.

Toxic gases produced at fires lead to an environment that is inhabitable or even lethal after short exposure ; The potential danger from these toxic products in a fire has been increasing because of the increasing use of new and more complex materials in our daily life.

The toxic gases evolved in fire have significantly contributed to fire injuries and fatalities and therefore assessment and evaluation of toxicity of these gases have drawn considerable attention of those working in fire safety and allied areas. More and more new toxic products are being encountered in fires because of the increasing use of new and complex synthetic materials in daily life.

The plastics like PVC, polyurethane foam, Acrylics etc. have found an unavoidable place in our society and they are used for upholstery and decoration purposes and also as main building construction materials. Under fire conditions the CO and HCN produced from the above materials travel from one part of the building to the other part in no time and lay a death trap.

### 1.6.1 Role of Oxygen in Human Body

On breathing in a normal and unpolluted atmosphere, air is filled in the lungs of a person. The oxygen from air joins with the haemoglobin (Hb) of the blood and forms HbO.

$$O_2 + 2Hb = 2HbO$$

This oxidized haemoglobin (HbO) flows with the blood to al parts and cells of the body. The blood acts as a carrier of oxygen to all the cells of the body. Further HbO, on reaching the cells of the body, reacts with them and oxidizes them.

$$HbO + Cell \rightarrow Oxidized\ cell + Hb$$

Thus Hb becomes free and flowing with the blood through heat again reaches in the lungs and repeats the process. All the tissues and muscles of each part of the body et oxidized and generate energy in this process. Infect oxygen itself can he called as energy needed by the body

Under all situations (sleeping or awakened) the heart and brain of a person function continuously after getting energy ($O_2$) through blood circulation. In case blood does not reach the brain or heart they will become idle.

### 1.6.2 The Toxic Products Evolved on Combustion

| Sl. No. | Material involve in Fire | Toxic Gas or Vapour Generate |
|---|---|---|
| 1. | All combustible materials containing carbon, celluloid, polyurethanes | co, co2<br>Nitrogen oxides |
| 2. | Wool, silk, leather, plastics containing nitrogen, wood, paper | Hydrogen Cyanide<br>Acrolein |
| 3. | Poly-vinyl chloride, fire retardant plastics, fluorinated plastics. | Halogen acids, phosgene<br>Amonia |
| 4. | Nylon, Urea formaldehyde resins.<br>Phenol formaldehyde<br>Polyurethane foams<br>Fire retardant treated polyurethane foams. | Phenol<br>Iso-cynates<br>Sulphur-di-oxide<br>Bicylic phosphate |

## 1.6.3 Carbon Monoxide

**Carbon Monoxide spreads very fast in air**

The vapour density of air 14.4 and vapour density of CO is 14.0 obviously, the vapour densities of air and CO both are approximately same so CO mixes with air instantaneously and spreads very fast in air.

When a person breaths in a polluted atmosphere containing carbon monoxide, the CO gas goes inside along with other gases i.e., oxygen, nitrogen, oxygen etc. in the lungs. Carbon monoxide has 210 times more affinity to react with the Haemoglobin of blood than oxygen and forms stable compound after reacting with the haemoglobin of blood.

$$CO + Hb = COHb$$

Carboxyhaemoglobin

Carboxyhaemoglobin is very stable compound and forms a very strong layer around Hb and leaves no chance for Hb and Oxygen to form HbO and reach to the cells, tissues and other parts of the body.

At this stage, Hb is totally incapable to carry oxygen to different parts of the body like brain, heart etc. in the initial stages, due to non-availability of oxygen, the natural functioning of the brains gets retorted and the brain becomes idle. As CO enter in the body, the body is further deprived of oxygen, then chocking of the breath starts, man gets deeply fainted and finally, dies.

**Carbon monoxide is the main toxic gas in smoke generated from burning of all type of combustible materials, which produces the most deaths in real fire situation.**

## 1.6.4 Carbon Dioxide

Biologically Carbon-di-oxide is an important constituent of the human body and photosynthesis proces .' CO: is not considered as toxic agent at concentration observed in fire. Inhalation of CO2 causes rap c breathing to take more oxygen which in turn will accelerate uptake of possible toxic components from fire environment. It is not correct to assume that signs and symptoms of CO: toxicity will not occur in man. Inhalation of CO2 concentration above 10% has caused headache, narcosis in most of the people.

## 1.6.5 Hydrogen Sulphide

Hydrogen sulphide, $H_2S$, is a gas under normal atmospheric conditions it is also

extremely poisonous, much more so than hydrogen cylinder, but since it is incredibly foul smelling we can normally detect its presence long before the levels become toxic.

It occurs naturally in crude petroleum, natural gases, sour gases, in salt mines, in volcanic gases, hot sulphur springs, lakes, salt water ponds, undersea vents, marine sediments, swamps, stagnant bodies of water. It is also by-product or many industrial operations, such as petroleum refineries, petrochemicals plants, natural gas plants, Kraft paper mills, iron smelters, coke ovens, food processing plants and tanneries.

## 1.6.6 Characteristics & Properties of $H_2S$

$H_2S$ gas is toxic, irritant and asphyxiates. It is colourless, which, at low concentration, is accompanied by rotten egg dour.

It is more toxic than carbon monoxide and almost as toxic as Hydrogen Cyanide gas.

Heavier than air, specific gravity 1.189. Vapors may travel considerable distance to a source of ignition and flash back.

Burns with blue flame to evolve $SO_2$ which also is very toxic.

Threshold limit values-short term Exposure limit; 15 ppm Soluble in water, Alcohol, petroleum solvents and crude petroleum.

**Hazards associated with $H_2S$**

- Headache
- Dizziness
- Excitement
- Nausea
- Coughing
- Drowsiness
- Dryness & sensation of pain in nose, throat and chest.

## 1.6.7 Hydrogen Cyanide

The role of HCN in fire fatalities is less clear than that of CO. The extreme toxicity of cyanide most likely is due to the cyanide ion complexion with metals in enzymes and haemoglobin in the body and thus preventing nonnal metabolism. HCN is more toxic than HCL because of cyanide ion often bring out the maximum co-ordination number of a metal. It has been observed that the HCN is produced rapidly in the fire well before CO involve

materials those contain nitrogen in their structure. The concentration above 20 or— in the environment are considered as dangerous to Health. Higher concentration above 270 ppm. may bring immediate death.

Nitrogen in a polymer structure forms a very wide range of oxides. Nitrous oxide is used as an anaesthetic. Nitric oxide is unusually stable. It reacts with oxygen and gives nitrogen-di-oxide red brown poisonous gas. These oxides cause various degree of toxicity when they are inhaled. The lethal effects will occur when the atmosphere level reaches 250 ppm. and above in a relatively short period of time.

| Gas/Vapor | Maximum Allowable concentration for prolonged Exposure (ppm) | Concentration dangerous for short period exposure (ppm) |
|---|---|---|
| Carbon-di-oxide | 5000 | 100000 |
| Carbon monoxide | 100 | 4000 |
| Hydrocyanic acid | 10 | 300 |
| Hydrochloric acid | 10 | 1500 |
| Sulphar-di-oxide | 5 | 500 |
| Nitrogen-di-oxide | 5 | 120 |
| Hydrofluoric acid | 3 | 100 |

## 1.7 Control & Prevention

Smoke production can be controlled to some extent by using fire retardant materials or materials using fire resistant paints. This helps in acting as fire stops and regards the growth or fire as well as produces less smoke.

Compartmentation, pressurizing of staircase, pressurizing of Means of escape, pressurizing of Lift lobby, Installation of Fire & Smoke check Door at entry & exit point to create smoke free atmosphere.

Additionally, the early release of partially burnt gases which will accumulate at high level restricts the effects of explosions and flashover commonly associated with late venting after the fire is well established.

Smoke and heat ventilation systems can therefore be designed for both the protection of life and property in special structures, particularly large areas with large individual spaces such as factories, warehouses, shopping complexes, sports halls, basement areas and atria.

If a person is exposed to lethal concentrations of carbon monoxide and hydrogen cyanide, the chances of his survival are almost negligible. This is the reason that the use of polyurethane foam for upholstery and decorating purpose is discharged.

Installation of Fire & Gas Detection System. Installation of Sprinkler System.

Use of Mask, Breathing Apparatus during fire fighting inside toxic environment.

Use of Personal Protective Equipment etc.

# Unit - 2 ❑ Building Fire Safety System

**Structure**

## 2.1 Fire Prevention of Resort Complex

**Stipulation of National Building Code**

1. **Fixed fire fighting installation/requirement as per National Building Code**

**A. Wet Riser**

One wet riser-cum down per 1000 $m^2$ floor area. The riser shall be fully charged with adequate pressure all times, and shall be automatic in operation.

Capacity of underground static tank - 1,00,000 litres.

Capacity of Terrace tank - 20,000 litres.

Capacity of Pump

i. Near Underground tank

2400 litres per minute giving a pressure not less than 35 $kg/cm^2$ at the top most hydrant.

ii. At the Terrace Level

900 litres per minute giving a pressure not less than 35 $kg/cm^2$ at the top most hydrant.

**Note :**

1. Where more than one is required because of large floor area, the quantity of water recommended in this table shall be proportionately increased.
2. Any of the above categories may incorporate an automatics sprinkler, irenchar system, if the risk is such that it requires installation of such protective methods. Where sprinkler/dire char system is installed water requirements for such installation shall be in addition to those indicated in this table.
3. A minimum of two hydrants shall be provided within the courtyard.
4. Wet riser cum down comer is an arrangement for fire fighting within the building by means of vertical rising mains not less than 100 mm internal dia with hydrant outles and hose reel on eadh floor/landing connected to terrace tank for fire fighting purpose, through a booster pump, check valve and non return valve near the tank end and a fire pump, gate and non return valve, over the underground static tank. A fire service inlet at ground level fitted with a non return valve shall also be provided to the rising main for charging it by fire services pump in case of failure of static fire pump over the underground static tanks.

5. The performance of pumps specified above shall be at revolutions per minute nor exceeding 3000.
6. The terrace tank and pump need not be provided at the automatic pump at ground level can be maintained to the satisfaction of the local fire brigade.
7. The above quantities of water shall be exclusively for fire fighting and shall not be utilised for domestic or other use.
8. A facility to boost up water pressure in the riser directly from the mobile pump shall also be provided on the wet riser system with a suitable fire service inlets (collecting head with 2 Nos of 63 mm inlets for 100 mm rising main and 4 Nos of 63 mm inlets with check valves for 150 mm diarising main) with check valve and a gate valve.
9. Internal diameter of rubber hose for hose reel shall be minimum 12 mm. A shutoff branch with nozzle of 5 mm size shall be provided.
10. All arrangement of alternative source of power supply shall be provided to drive pumps, etc, in case of failure of normal power supply.

In addition to wet riser/wet riser cum down commer, first-aid hose reels shall be installed or all the floors of building.

**B. Automatic Sprinkler System :**

Automatic sprinkler shall be installed in

a) Housing essential services

b) Any room or other compartment of building exceeding 500 m2

c) All non-domestic floors of mixed occupancy which censtitute a hazard and are not provided with staircase independent of the remainder of the building.

**C. Automatic High Velocity Water Spray :**

Automatic high velocity water spray system shall be provided for protection of indoor transformer.

**D. Fixed Foam Installation :**

Fixed foam generating system shall be provided for protection of boiler room with its a ciliary storage of furnace oils.

**E. Carbon dioxide Fire Extinguishing System :**

Fixed carbon dioxide fire extinguishing installation shall be provided on premises where water or foam can not be used for fire extinguishing because of the special nature of the contents of the building/areas to be protected.

**F.** First-aid fire fighting appliances shall be provided & installed on all floors.

**G.** The building shall equipped with manually operated electrical fire alarm system and automatic fire alarm system.

FIRE FIGHTING EQUIPMENT SHALL BE SUITABLY LOCATED AND CLEARLY MARKED BY ILLUMINATED SIGNS

## 2.2 General Requirements for Fire Prevention

**Access to Fire Appliances :**

The building shall about upon a street or streets/or upon open space to give satisfactory access and working space for Fire Brigade appliances. The width of the street or approach road on which the building about shall not be less than 9.20 metres wide in case there are no bends and if there are bends or curves a sufficient width shall be provided at the curve to enable the fire engines to turn at least 8.70 m. The approach road to the building shall be hard surfaced and must be able to take the weight of a fire engine weighing 12000 kg.

Entrance to the site and archways, if any, leading to internal courts shall have a clear passageway of not less than 4.6 m width and height clearance of not less than 4.00 m. Access gates shall be open able from either side.

At least two sides of the building must have courty ards of minimum width of 9.20 m while the other two sides shall have courty ards of minimum of

In case of averaging of width 9.20 m, 6.10 m shall always the maintained free from car parking. The minimum widths of the a foreside courtyards shall be clear of any structure and also of projection such as chajjas, and balcomes to a height of not less than 4 mts from the ground level.

The courtyards must be hard surfaced so as to take the load of the fire engine (about 12000 kg).

**Car Parking Area :**

Car parking shall be permitted in basements, on ground floors on stilts and at upper levels provided the parking area is completely segregated from the dwelling occupancy by an adequate fire separation.

Car parking may also be permitted on courtyards of 9.20 m width and shall be along the periphery of the courtyard keeping at least 5 metre wide clear space free from any projections for the movements of fire appliances.

**Constructional Features :**

The building shall be of R.C.C or structural steel construction The structural R.C.C members and the structural steel members encased in fire-resisting materials, shall have a fire resistance of not less than two hours.

**Stair Cases:**

The minimum number of staircase to be provided and the travel distances shall be as given in requirement for each class of occupancy.

All staircases shall be of enclosed type throughout their height and shall have a fire resistance of not less than two hours.

Access to main staircases shall be gained through at least half an hour fire resisting swing door placed in the enclosed walls of the staircases. The swing type door shall open in the direction of the escape.

There shall be no glazing or glass bricks in any nearest or closing wall of a staircases.

No dwelling store or other fire risk shall open directly into the main staircase.

External exit door of staircase enclosure at the ground level shall open directly to the courtyard or may be reached without passing through any door other than a door provided in front drought lobby.

Main staircases width shall be 150 cms. Treads shall not be less than 23 cms wide measuring from riser to riser and riser shall not be more than 20 cms high and shall not be more than 16 riser in a flight.

**Staircase enclosure:**

The enclosing walls of staircase shall be of brick or R.C.C construction having a fire resistance of not less than two hours. Access to staircase shall be gained through self closing doors of at least half-hour fire resistance. There shall be swing doors opening in the direction of the escape.

The enclosed staircase shall be on the external wall in the building and shall be ventilated to atmosphere at each landing. No staircase shall be arranged around the lift shaft.

Permanent vent at the top equal to 21 per cent of the cross sectional area of such enclosure (enclosed staircase) and open able sashes at each floor area equal to 15 per

cent of the cross sectional area of enclosed staircase on the external wall shall be provided. The roof of the shaft shall be at least 1 mtr above the surrounding roof. There shall be no glazing or glass bricks in any internal enclosing wall of a staircase.

The mechanism for pressurizing the staircase shaft shall be so installed that the same shaft operate automatically, what the fire alarm and sprinklers (wherever provided) operate. The mechanism shall be also have facilities to be operated manually.

The floor number shall be indicated on the staircase lending.

**Staircase and Corridor Lighting :**

The staircase and corridor lighting shall be on separate circuit and shall be independently connected with inverter so that it could be operated by one switch installed on the ground floor easily accessible to fire fighting staff at any time irrespective of the position of the individual control of the light points if any.

Suitable arrangements shall be made by installing double throw switches to ensure that the case and the corridor do not get connected to two so.

Suitable arrangements shall be made by installing double throw switches to ensure that the installments to the staircase and the corridor do not get connected to two sources of supply simultaneously. Double throw switch shall be installed in the service room for terminating the stand-by supply.

The licenses sub-station shall be located in a separate independent building or any suitable place as approved y the licenses.

**Fire Lift:**

To enable Fire Brigade personnel to get to the upper floors with the minimum delay, one of the lifts shall be so designed as to be available for the exclusive use of firemen in an emergency and be directly accessible to every dwelling on every floor.

The lift shall have a floor area of not less than 1.4 Sq.m. It shall have loading capacity of not less than 545 Kgs (8 persons lift), with automatic closing doors.

The speed of he fire lift shall be such that it can reach the top floor from the ground level within one minute or 91.5 m per min. whichever is less.

The electric supply shall be on a separate circuit and the cables shall run in a route safe from free i.e. within the lift shaft.

The operation of the fire lift shall be by a simple toggle or two button switch situated in a glass fronted box adjacent to the lift at the entrance level when the switch is on

handling call-points shall become inoperative and the lift shall be on the car control only. When the switch is off, the lift will return to normal working. This lift may be used by the occupants in normal times.

**Lifts and Lift enclosures :**

The walls enclosing lift shafts shall have a fire resistance of not less than two hours. Shafts shall have permanent vents immediately under the Machine Room not less than 0.2 Sq.mt. in clear area. Lift motor rooms preferably be sited at the top of the shaft and shall be separated from lift shafts by the enclosing wall of the shaft or by the Machine Rooms.

**Landing :**

Landing doors of lift enclosures shall open in the ventilated lobby or pressurized corridor and shall have a fire resistance of not less than one hour.

Lift car doors shall have a fire resistance of one hour.

Shaft for fire lift in a lift bank shall be separated from each other by a brick masonry or R.C.C. wall of a fire resistance of not less than two hours.

If the lift shaft and lift lobby are in the core of the building, a positive pressure of 5 mm w.g. and not less than 2.5 mm w.g. and not more than 3 mm w.g. in the lift shaft and lift lobby created by an electrically operated blower shall be maintained. The mechanism for pressuring the lift shaft and lift lobby shall be so installed that the same shall operate automatically when the automatic fire alarm and sprinkler installation (wherever provided) operate.

The mechanism shall also have facilities to operate manually.

Exit from the lift lobby shall be through a self closing stop door of half-hour fire resistance.

The lift machine room shall be separate and no other machinery shall be installed therein.

Grounding switch at the ground floor level to enable the fire service to ground the lift cars in emergency shall be provided.

**Service Ducts :**

Service ducts shall be enclosed by wall having a fire resistance of not less than two hours. Doors for inspection or shall also have a fire resistance not less than two hours.

If the cross sectional area exceeds 1 sq. mt it shall be where it passes a floor by

carrying the floor through the duct. The floor within the duct shall be pierced for any service pipe or ventilation trunk and shall fit as closely as possible around any such pipe or trunk.

A permanent vent shall be provided at the top of the service shaft or cross sectional area not less than 460 sq. cm or 6.25 sq. cm for each 900 sq. cm of the area of the shaft whichever is more.

**Refuse chutes and refuse Chambers :**

Hoppers to refuse chutes shall be situated in well ventilated positions and the chutes shall be continued upwards with an outlet above roof level and with an enclosure wall of non combustible material with a fire resistance of not less than two hours. The hoppers shall not e located within the staircase enclosure.

Inspection panel and hopper (charging station) opening shall be fitted with tight fitting metal doors, covers having a fire resistance of not less than one hour.

Refuse chambers shall have walls and floors or routs constructed of non-combustible and unpervious material and shall have a fire resistance of not lss than two hours. They shall be located at a safe distance from exit routes.

**Electrical Services :**

The electric distribution cables wiring shall be laid on separate shaft. The shaft shall be sealed at every alternate floor with non-combustible materials having the same fire resistance as that of the shaft.

The inspection panel doors and any other opening in the shaft shall be provided with air tight fire doors having a fire resistance of not less than one hour.

Water mains, telephone lines inter-com liner, gas pipes or any other service lines shall not be laid in the shaft for electric cables. If the licenses agree to provide meters on upper floors, the licenses cables shall be segregated from the consumer's cables by providing a portion in the shaft.

Separate circuits for water pumps, lifts, staircase and corridor lighting and blowers for pressuring system shall be provided directly from the main switch gear panel and these circuits shall be laid in separate conduct pipes so that in one circuit will not affect the others.

Medium and low voltage wiring running in shafts, and within false celling shall run in metal conduct till such time fireproof cables are provided.

An independent and well ventilated service rooms shall be provided on the ground

floor with direct access from outside or from the corridor for the purpose of termination of electric supply from the licenses service and alternate supply cables. The doors provided for the service room shall have a fire resistance of not less than two hours.

**Air Conditioning:**

Escape routes like staircases, common corridors, lift lobbies etc. shall not be used as return air passage.

The ducting shall be constructed of substantial gauge metal in accordance with IS 665 (latest revision).

Wherever the ducts pass through fire walls or floors the opening around the ducts shall be sealed with fire resisting materials.

As far as possible metalhe ducts shall be used even for the return air instead of space above the false celling.

The materials used for insulating the duct system (inside or outside) shall have surfaces of very low flare spread.

The air handling unit room shall not be used for storage of any combustible materials.

**Hazardous or Inflammable Materials :**

No hazardous materials shall be allowed to be stored or kept in any aprt of the building either as storage or for handling processing or manufacturing etc.

Use of inflammable solvents for clearing carpets etc shall not be allowed inside the building.

No refuse dumps or storage places shall be permitted in the staircase wells .

Liquefied petroleum gas shall not be stored or used in basement.

Wooden or any other combustible material shall not be used in staircases, lift lobby and such other places which connect one floor to the other.

If the floor space on a floor exceeds 700 sq. mtrs it shall be separated by means of fire walls of not less than two hours fire resistance.

Kitchens shall be in a separate room situated away from staircase and other escape routes.

**Smoke Venting:**

Smoke venting facilities, where required for safe use of exits in windowless buildings,

underground structures, large area shall be automatic in action.

Natural draft smoke venting shall utilize roof vents or vents in walls at or near the ceiling level; such vents shall be normally open, or, if closed, shall be designed for automatic opening in case of fire, by release of heat sensitive elements, such as fusible links ; breakage of glass, or melting of plastic under the influence of heat; or by other approved means.

Where smoke venting facilities are installed for purpose of exit safety in accordance with the requirements of the code, these shall be adequate to prevent dangerous accumulation of smoke during the period of time necessary to evacuate the area served, using available exit facilities with a margin of safety to allow for unforeseen contingencies. It is recommended that smoke exhaust equipment should have a capacity of approximately a 5 air change. Where mechanical venting is employed, it shall be firesafe.

**Exit Requirements :**

An exit may be a doorway ; corridor, passageway(s) to an internal staircase, or external staircase, or to a verandah or terrace(s), which have access to the street, or to the roof of a building or a refuge area. An exit may also include a horizontal exit leading to an adjoining building at the same level.

**House Keeping:**

To eliminate fire hazards, good house keeping, both inside and outside the building, shall be strictly maintained by the occupants and / or the owner of the building.

**Control Room :**

For all buildings over 15 M in height and apartment buildings with a height of 30 M and above, there shall be a control room on the entrance floor of the building with communication system (suitable public address system) to all floors and facilities for receiving the message from different floors. Details of all floor plans along with details of fire fighting equipment and installations shall be maintained in the control room. The control room shall also have facilities to detect the fire on any floor through indicator boards connecting fire detecting and alann system on all floors. The staff in charge of the control room shall be responsible for the maintenance of the various services and fire fighting equipment and installations.

**Generator:**

A Generator shall be installed to supply power to staircase, corridor and compound

lighting circuits, fire lift/s, pressurisation blowers, smoke extraction and damper systems in case of failure of electricity supply. The generator shall be capable of taking starting current of all the machines and circuits stated above simultaneously. Where paralleled LT/HT supply is provided with appropriate emergency services a stand-by generator need not be provided.

**Kitchenette or Canteen Kitchen :**

Kitchenette or canteen kitchen, if provided on any floor, shall be in an enclosure having two hours fire resistance and shall be a located at the perimeter of the floor away from the exit route.

The entrance door of kitchenette/kitehen shall be self-closing type and shall have a fire resistance of not less than one hour.

In case of L.P. Gas cylinders are used, the requirements for its safe use shall conform to the requirements for "Handling of L.P. Gas cylinders prescribed by the Bombay Fire Brigade.

**Caretaker:**

A qualified Fire Officer with experience of not less than 3 years in the city fire brigade shall be appointed as a Caretaker who will be available on the premises at all times.

The Fire Officer shall:

i) Maintain the fire-fighting equipment in good working condition at all times.

ii) Lay out fire orders and fire operational plans,

iii) Impart training to the occupants of the buildings in the use of fire fighting equipment provided on the premises and keep them informed about the fire emergency evacuation plan.

iv) Keep proper liaison with the city fire brigade.

**The role of passive fire protection**

Passive fire protection can be defined as :

1. Providing compartmentation to a given building type in order to minimise the spread of fire and smoke.
2. Ensuring the integrity of compartments in case of fire by fire stopping any gap penetrating through those building sections.
3. Offering heat insulated solutions to eliminate possible self-ignition of combustible materials by the transfer of heat through building elements.

4. Protecting structural elements from deformation and collapse or minimising heavy repair costs of spalled concrete in the case of underground spaces such as tunnels.

Consequently, the implementation of passive fire protection principles can achieve the following results :

1. Contain smoke and flame in a safe cell for a given fire resistance period.
2. Safe evacuation of building occupants without being obstructed by smoke and flames.
3. Sufficient time for fire fighters to reach the site (this is not to be neglected especially during peak traffic hours in busy cities).
4. Allow fire fighters to operate quickly and safely in smoke-free zones.
5. Minimise the cost of property damages for the developer.

   Passive measures will ensure higher safety standards and offer cost effective solutions whenever active protection has reached its limits. For example, smoke will activate smoke detectors and will trigger a signal at the safety control room. This active form of fire protection is incomplete without the support of property designed smoke extraction system. This would in volve passive fire protection methods such

## 2.3 Fire Safety Management for your Organization

Fire safety strategy for any Industry is made up of three essential elements

A) Passive fire safety measures

B) Active fire safety measures

C) Management fire safety measures

**Passive Fire Safety Measures**

**Passive Fire** safety measures are features which are built into the structure of the **building/plant** and is called as structural **Fire** Protection.

**Active Fire Safety Measures**

Active Fire Precaution measures are systems which normally active or are required to be activated in the event of an outbreak of fire

## 2.4 Management Fire Safety Measures

a) Management Fire safety measures relate to the day to day management of fire safety in a plant.

b) There is a legal responsibility on persons having control over the Plant to take reasonable measures to prevent the occurrence of a fire and to protect the lives and safety of occupants & minimize the loss of property in the event of fire.

### 2.41 Emergency Procedures

All occupants must be capable of responding correctly in the event of fire. Accordingly, a plan should be prepared outlining the procedures to be followed. This predetermined plan can be further subdivided into a number of sections :

a) a procedure for raising the alarm ;

b) a procedure for calling the fire brigade ;

c) an evacuation procedure ;

d) an assembly point and roll call procedure ;

e) a procedure for fighting the fire ;

f) a procedure for assisting the fire brigade.

### 2.4.2 Evacuation Procedure

Evacuation procedure shall be initiated once the fire alarm has been sounded

### 2.4.3 Procedure for Fighting the Fire

1. In the early stages of a fire it may be possible to successfully contain it or extinguish it with first aid fire fighting equipment.
2. To accomplish this, staff members should be instructed in the use of hand held extinguishers and hose reels.
3. Certain members of staff may be designated as a fire fighting team as part of the emergency procedures & their function would be to assess and “if safe to do so” tackle the fire with the available equipment until the Fire Brigade arrive.

## 2.5 Procedure for Assisting the fire Brigade

When the Fire Brigade arrive they need to be given as much information as possible in order to take the best course of action. The type of information required includes :

1. Exact location of the fire ;
2. Type of materials involved in fire ;
3. Details of missing persons ;
4. Location of nearest fire hydrants ;
5. Location of all access doors to the building.
6. Location of any special risks adjoining to the fire location ;
7. Keys for access into any locked areas.

## 2.6 Fire Evacuation Drills

Drills should be carried out at regular intervals to test the effectiveness of the predetermined arrangements which will ultimately will play a key role for life safety.

## 2.7 Staff Instruction and Training

To ensure fire safety programme to be effective,

1. Staff must be familiar with the parts of the fire safety programme which relate to them.
2. Comprehensive instruction and training should be given to staff to enable them to carry out their functions under the programme.
3. All staff should receive instruction in :
   a) Everyday fire prevention measures
   b) Emergency procedures
   c) First aid fire fighting

## 2.8 Fire Safety Register

1. The 'Fire Safety Manager' is responsible for the implementation and oversight of the fire safety programme should keep a Fire Safety Register as a complete record of all fire safety matters on the plant.

a) Details of all Tire incidents and false alarms that occur and the actions taken as a result

b) The register will serve as a record and also as a checklist for the Fire Safety-Manager to ensure that checks and training which are required are being carried out on an ongoing basis.

## 2.9 Safety of Buildings against Fire

**Introduction :** The recent fire in India's historic trading hub Barra bazaar where several buildings packed with tarpaulin and textile material were gutted shows the needto implement fire safety norms especially in crowded market areas where different categories of buildings with respect to occupancy type coexist. The fire safety should include demarcation fire Zones classification of buildings based on occupancy with respect to fire probability, type of building construction according to fire resistance, restrictions and regulations to ensure minimizing fire break out, smoke, flame and panic. Although absolute safety against fire is difficult to achieve in practice, measure that ensure construction, occupancy and protection features that are necessary to minimize danger to life and property from fire must be implemented as per the current NBC 2005 code

## 2.10 Components of Implementation Strategy

The safety measures should be implemented under the following three categories.

1. **Fire prevention** : This covers aspects pertaining to design and construction of buildings on passive fire protection measures considering various types of building material and their fire rating based on the ability to resist fire,
2. **Life Safety** : This covers life safety measures in the event of fire addressing construction and occupancy features that are necessary to minimize danger to life from fire smoke, flames or panic (to avoid stampede etc)
3. **Fire Protection** : This covers correct type of equipment and their installation meant for fire protection of buildings depending on classification and type of building.

## 2.11 Fire Prevention

All buildings are classified according to use as residential, educational and storage etc. The city area is demarcated into distinct zones based on fire hazard inherent in the building

known as “Fire Zones” The design of any building and type of material used are important factors in making a building fire resistant either against complete burnout or spread of fire. The fire resistance in hours of resistance against specified fire load in kcal/sq.m against a certain intensity of fire. The fire resistance rating required for various components such as walls etc. of buildings are given in NBC code.

The thickness/dimensions required for various materials of construction for achieving this rating is also codified and given in NBC 2005, Hence, we can get the designs satisfying a specified fire rating.

## 2.12 Life Safety

Every buildings should be constructed equipped and maintained so as to avoid undue danger to life and property of occupants from fire, smoke, fumes and panic. This is achieved by the provision of proper location number size and access of openings. The provision of exits should be such that the total occupants for Type 1 construction and 1.5 minutes for (4 hour fire rating) Type 2 construction (2 hour fire rating). Is this possible in certain of our cinema halls and multiplex commercial market places storing combustible materials. Lifts and escalators should not be considered as exits because they will not function during fire. The number of exits and their location and passage way should satisfy the total capacity of exit requirements, If the buildings is a multistory high rise structure a proper external fire staircase is desirable.

## 2.13 Material design and fire loads

The design of any building and the type of materials used in its construction are important factors in making the building resistant to fire. Fire load is the measure of the maximum heat that will be released if all the combustibles in a fire area burned, including wall linings, material stored, wooden or combustible partitions, linings/coverings on floors and ceilings. The fire resistance of a building or its structural and non- structural elements is expressed in hours against a specified fire load (kcal/m2), and against a certain intensity of fire. The usual fire resistance ratings for structural assemblies, members, doors etc. are expressed in hours. For buildings 15 m in height or above, noncombustible materials should be used for construction and the internal walls of staircase enclosures should be of brick work or reinforced concrete or any other material of construction with minimum of 2h fire rating.

## 2.14 Multiple or Special Occupancy

A typical example of a mixed occupancy is a covered mall or super market building, which is a single building enclosing a number of tenants such as mercantile units, restaurants, entertainments and amusement facilities, offices, clinical laboratories etc. A recent development is the growth of multi-level building complex, botel/restaurants, and may be a few other ancillary occupancies. The unusually high fire and life hazards in such 'multiplexes' can well be imagined. Consequently, the design and construction of the building, as well as the fire protection and life safety measures becomes most important.

Fire Protection and Life Safety requirements as stipulated in National Building Code as well as IS 14435 : 1997 "Fire Safety in Educational Institutions-Code of Practice" gives guidance for measures to be complied with for all special buildings.

## 2.15 Fire Protection

All buildings depending upon occupancy use and height should be protected by fire extinguishers, wet riser, down comer automatic sprinkle installation etc. A satisfactory supply of water for the purpose of fire fighting should always be available in the form of underground or over head level static storage tank with adequate capacity to supply water at the rate of 10001/min for the period required.

## 2.16 Proper Exit

Every building shall be constructed, equipped, maintained and operated as to avoid imdue danger to life and safety of the occupants from fire, smoke, fumes or panic during the survival time available for escape. Safe exit for the occupants in a building on fire requires a safe path of escape from the fire in the shortest possible time. This path, which should be as short as possible, and easily negotiable, should be ready for use in case of emergency. Provision of two separate means of exits for every floor including basements is a fundamental requirement. In case of failure of electricity, lifts and escalators tend to suddenly stop in between floors trapping the occupants of the lift. Hence, Lifts and Escalators shall not be considered as exits. Building Codes advocate the traditional evacuation by stairs in fire affected buildings for up to 3 or 4 storeys. All buildings, which are 15 m in height or above, and all buildings used as educational, assembly, institutional, industrial, and occupancies having area more than 500 sq. m on each floor shall have a

minimum of two staircases. They shall be of enclosed type ; at least one of them shall be on external wall of building and shall open directly to place of safety. In taller buildings Fire lifts should be provided with emergency power supplies.

***Following minimum width shall be provided for staircases:***

| | | |
|---|---|---|
| a) | Residential buildings (dwellings) | 1.0 m |
| b) | Assembly buildings like auditorium shopping malls theatres and cinemas | 2.0 m |
| c) | Educational buildings up to 30 m in height | 1.5 m |

## 2.17 Structural Considerations

A structure or structural element should be designed to possess an appropriate degree of resistance to flame penetration ; heat transmission and failure. The fire resistance of a structural element is expressed in terms of time in hours it can withstand a fire of specified temperature. General requirements for fire protection are given in IS 1642. Minimum requirements of concrete cover and member dimensions for normal-weight aggregate concrete members so as to have the required fire resistance should be in accordance with IS 456 : 2000.

The reinforcement detailing should reflect the changing pattern of the structural section and ensure that both individual elements and the structure as a whole contain adequate support, ties, bonds and anchorages for the required fire resistance. Additional measures such as application of fire resistant finishes, provision of fire resistant false ceilings and sacrificial steel in tensile zone, should be adopted in case the nominal cover required exceeds 40 mm for beams and 35 mm for slabs, to give protection against spalling.

## 2.18 Building Code, safety, economy and the role or community

Safety is often reckoned as the opposite of risk. Greater safety means less risk at a slightly increased cost. A Building Code is a recommendation that sets forth minimum requirements for design and construction of buildings and structures. These minimum requirements are established to protect the health and safety and economic feasibility. Although builders and owners often establish their own requirements, the minimum Code requirements must be met. Features covered in these codes include structural design, fire protection, and means of egress, light, sanitation, and interior finish. The different parties involved in the construction of a building like architects, structural engineers, construction

engineers, promoters, contractors, owners and statutory authorities have all a roll to play ensuring fire protection measures in buildings.

## 2.19 Guidelines for Fire Drill and Evacuation Procedures for High Rise Buildings

In case of fire in a high rise building safe evacuation of its occupants may present serious problems unless a plan for orderly and systematic evacuation is prepared in advance and all occupants are well drilled in the operation of such plan. These guidelines are intended to assist them in this task.

**Alarm :**

Any person discovering fire, hear or smoke shall immediately report such condition to the Fire Brigade, unless he has personal knowledge that such a report has been made. No person shall make, issue, post or maintain any regulation or order, written or verbal, that would require any person to take any unnecessary delaying action prior to reporting such condition to the Fire Brigade,

**Drills :**

1. Fire Drill shall be conducted, in accordance with the Fire Safety Plan, at least once every three months for existing buildings during the first two years. Thereafter, fire drills shall be conducted at least once every six months.
2. All occupants of the building shall participate in the fire drill. However, occupants of the building, other than building service employees are not required to leave the floor or use the exits during the drill.
3. A written record of such drills shall be kept on the premises for a three years period and shall be readily available for Fire Brigade inspection.

**Signs and Plans :**

1. Signs at Lift Landing.
2. Floor Numbering Signs
3. Stair and Elevator Identification Signs
4. Stair Re-entry Signs
5. Fire Command Station shall be provided with floor plan of the building and other pertinent information relative to the service equipment of the building.

**Fire Safety Plan :**

1. Building Address
2. Purpose and Objective

   To establish method of systematic safe and orderly evacuation of an area or building by its occupants in case of fire or other emergency, in the least possible time, to a safe area by the nearest safe means of egress; also the use of such available fire appliances as may have been provided for controlling or extinguishing fire and safeguarding of human life.

   To provide proper education as a part of continuing employee indoctrination and through a continuing written program for all occupants, to ensure prompt reporting of fire, the response of fire alarm as designated, and the immediate initiation of fire safety procedures to safeguard life and contain fire until the arrival of the Fire Brigade.
3. Fire Safety Director
4. Deputy Fire Safety Director
5. Fire Wardens and Deputy Fire Wardens
6. Building Evacuation Supervisor
7. Fire Party

**Occupants Instruction :**

1. Evacuation Drills
2. Fire Command Station ,3. Signs
4. Fire Prevention and Protection Program
5. Building Information Form.
6. Representative Floor Plan
7. Fire Safety Plan Prepared
   - Date when prepared
   - Date when revised

**Duties :**

1. Fire Safety Doctor's Duties
2. Deputy Fire Safety Doctor's Duties
3. Fire Safety Warden's and Deputy Fire Safety Warden's Duties

4. Building Evacuation Supervisor's Duties
5. Fire Party's Duties
   - ❖ Organization Chart for Fire Drill and Evacuation Assignment.
   - ❖ Representative Floor Plan
   - ❖ Fire Safety Plan
   - ❖ Personal Fire Instruction Card

**For your own safety you should know :**

1. Two push button fire alarm boxes are provided per floor. You should read the operating instruction.
2. You should read the operating instructions on the body of the fire extinguishers provided on your floor.
3. The nearest exit from your table.
4. Your assembly point on ground floor.
5. FOR YOUR OWN PROTECTION YOU SHOULD REPORT TO YOUR FIRE WARDEN/ DEPUTY FIRE WARDEN.

**If you discover a fire :**

1. Break the glass of the nearest push button fire alarm and push the button
2. Attack the fire with extinguishers provided on your floor. Take guidance from your wardens.
3. Evacuate if your Warden asks you to do so.

**If you hear evacuation instruction :**

1. Leave the floor immediately by the South/ North staircase.
2. Report to your warden, at your predetermined assembly point outside the building.
3. Do not try to use lifts.
4. Do not go to cloakroom.
5. Do not run or shout.
6. Do not stop to collect personal belongings
7. Keep the lift lobby and staircase doors shut.

# A Few Section of Fire Prevention Act 1986

# West Bengal Fire Services Act, 1950

**Section :** 11. **Power to withdraw or suspend license.**—A licence granted under section 9 may, without prejudice to any other action that may be taken against the licensee, be suspended or withdrawn by the Collector after giving the licensee an opportunity of being heard, if in the opinion of the Collector it is necessary to do so in the public interest or in the case of a license to sell fire-works, if ther&has been a breach of any prescribed condition.

**11A. General public to take preventive measures for safety from fire etc.—** Subject to the provisions of the relevant municipal law, a local authority may require the general public residing in an area within its jurisdiction to take such preventive measures as may be required for safety from fire and other similar hazards.

**11B. Owner or occupier of building to make or carry out arrangements necessary for fire prevention etc.**—Subject to the provisions of the relevant municipal law and the building rules in force and in consultation with the Director, a local authority may, by general or special order, require the owner or occupier of any building of any or all categories to make or carry out such arrangements be necessary for fire prevention and fire safety in that area.

**11C. Owner or occupier of high-risk building to provide fire prevention safety measures.**—(1) The owner or, where the owner is not tradeable, the occupier of a high-risk building or part thereof shall provide fire prevention and fire safety measures in such building or part thereof and the occupier shall maintain the fire prevention and fire safety measures in good repair and in efficient condition at all times in accordance with the provisions of this Chapter or the rules made thereunder:

Provided that in the case of such building or part thereof, the construction of which has been completed on any date before the date on which this Chapter comes into force, the occupier and, in the case of such building or part thereof which is under construction on the date immediately before the date on which this Chapter comes into force, the owner shall undertake and carry out such additional fire prevention and fire safety measures as are specified in the notice served on him under section 35.

(2) The owner or occupier of a high-risk building, as the case may be,[1][shall obtain from the Director-General] or the nominated authority a 'Fire Safety Certificate' in the prescribed

form issued by a licensed agency in the manner prescribed.

(3) The State Government may require compulsory endorsement of 'Fire Safety Certificate' by the Director or by a superior nominated authority in respect of any class or classes of high-risk buildings as may be notified by the State Government from time to time :

Provided that the Director or a superior nominated authority shall not endorse any 'Fire Safety Certificate' unless he or it is satisfied about the fire prevention and fire safety measures including safety of electrical installations [2][, structural means of escape from where owner or occupier can evacuate the buildings or place to a place of safety at the time of fire emergency] and provision of supply of adequate quantity of water for fighting purposes made by the owner or occupier of such building.

(4) The occupiers of all high-risk buildings shall carry out a mock fire drill involving the watch and ward staff of such buildings every year under intimation to the Director or the nominated authority in such manner as may be prescribed and a certificate of performance of such drill shall be furnished to the Director or the nominated authority, as the case may be.

(5) No person shall tamper with, or alter, or remove, or cause any injury or damage to, any fire prevention or fire safety equipment installed in any such building or part thereof or instigate any other person to do so.

**11D. 'No objection' required under any other law.—**A fire safety certificate duly endorsed under sub-section (3) of section 11C shall be the 'no objection' regarding fire prevention and fire safety measures for a building or installation under the Indian Explosives Act, 1884 (4 of 1884), or the Explosive Substances Act, 1908 (6 of 1908), or the Petroleum Act, 1934 (30 of 1934), or the Inflammable Substances Act, 1952 (20 of 1952), or the Cinematograph Act, 1952 (37 of 1952), or the rules made thereunder, or under any other law for the time being in force, as required from the Director.

**11E. Special fee—**(1) With effect from such date as the State Government mayroy notification, appoint in this behalf, there shall be levied a special fee for the purposes of this Act on the owners of such class or classes of high- risk buildings within a local area in which this Act is in force as may be prescribed :

Provided that no special fee shall be levied on any such building or part' thereof, which by virtue of its being used for any of the purposes referred to in section 12, requires a licence under that section.

(2) (a) The State Government shall prescribe by rules the rate of special fee for different classes of high-risk buildings on the basis of the total floor area of all the floors of a building as shown in the approved building plan :

Provided that the rate of such special fee may be different for different local areas.

(b) The manner of imposition, assessment and collection of such special fee shall be such as may be prescribed.

**11F. Grant of license to act as licensed agency.—**(1) The Director may, from time to tifne and in accordance with such qualifications, experience or other matter in this behalf as may be prescribed in respect of such classes of buildings as may be prescribed, grant any person or association of persons, a license to act as licensed agency for the purposes of this Act.

(2) Every such license shall be renewed every three years.

(3) The State Government may, from time to time, prescribe a scale of fee for licensed agencies in respect of any class of building, if there is no written contract in this behalf to the contrary.

(4) Where the Director has reason to believe that any person to whom a license has been granted under sub-section (1) has contravened any provisions of this Act or the rules made thereunder or has failed to comply with the conditions of the license oris unfit to hold the license by reason of incompetence, misconduct or any other reasons, the Director may, after giving the person a reasonable opportunity to show cause, suspend or cancel the license, after recording the reasons in writing.

**11G. Bar to carry out work of providing fire prevention etc.**—No person, othefthan a licensed agency, shall carry out, in the manner prescribed, the work of providing fire prevention and fire safety measures or performing such other related activities required to be_carried out in any high-risk building or part thereof under this Act.

**11H. Bar to compromise fire safety.**—Where the wilful default on the part oil licensed agency in respect of fire safety of any building or premises is compromised, such licensed agency shall be liable to criminal prosecution and, in the event of any fire accident in such building or premises, shall make good all damages on account of such fire accident. .

**11I. Appeal against order of Director.—**(1) Any person aggrieved by an orderof the Director under this Chapter may, within thirty days of the service of the order, prefer an appeal to such authority as may be prescribed.

(2) The manner in which an appeal shall be filed and the manner of deciding the appeal shall be such as may be prescribed.

**11J. Penalty for contravention of provisions of Chapter IIIA—**Whoever contravenes any provision of Chapter IIIA or the rules made thereunder or fails to comply with any requisition lawfully made to him under any provision of Chapter IIIA or the rules made thereunder shall, without prejudice to any other action that may be taken against him under section 36 or section 37, be punishable with imprisonment for a term of-three years which may extend to five years or with fine of twenty thousand rupees which may extend to five lakh rupees or with both and, where the offence is a continuing one, with a further fine of one thousand rupees which may extend to ten thousand rupees for every day during which such offence continues after the conviction for the first such offence.

**11K. Penalty for furnishing false 'Fire Safety Certificate'.—**Any person associated with a licensed agency for any of the purposes of Chapter IIIA, who knowingly furnishes a false 'Fire Safety Certificate', 1[or false recommendation and misleading information in respect of such certificate,] shall be punishable with imprisonment for a term of three years which may extend to five years or with fine of twenty thousand rupees which may extend to five lakh rupees oryyith both.]

[2]**[11L. Offences cognizable and non-bailable** — All offences punishable under this Chapter shall be cognizable and non-bailable.]

[3]**[License for storing hazardous substances]**

[4]**[12. Bar to use of premises for storing or processing hazardous substances without license**—No premises in any area where this Act is in force shall be used for the purpose of storing or processing at any material point of time hazardous substances beyond such quantity as may be prescribed unless the owner or occupier thereof shall have previously been granted a license by the Collector.]

[1]**[13. Premises to conform to prescribed conditions.**—No license to use any premises for the purpose referred to in section 12 shall be granted unless such premises conforms to such conditions as may be prescribed.]

[2]**[14. Issue of license.**—An application for license referred to in section 12 made to the Collector in the prescribed form along with an authenticated the requisition for fire safety issued by a licensed agency and duly endorsed, in such manner as may be prescribed, by the Director or superior nominated authority, and such other documents as may be prescribed. The Collector shall, on scrutiny of the application, the requisition for fire safety and other documents, compute the annual fee payable by the applicant and shall, on payment of such fee in advance, issue the licence to the applicant on such terms and

conditions as may be prescribed :

Provided that any owner or occupier of any premises which requires a license under section 12 and who holds a valid license under this Act on the day immediately before the date of coming into force of the West Bengal Fire Services (Amendment) Act, 1996, shall not be required to apply for a license but shall, at the time of renewal, make an application for a fresh license under this Act :

Provided further that where any owner or occupier of any premises which requires a license under section 12 has made an application for a license under this Act before the coming into force of the West Bengal Fire Services (Amendment) Act, 1996, but has not been granted a license till the date immediately before the date of coming into force of that Act, such owner or occupier shall be required to make an application for such license in accordance- with the provisions of this Act.]

**15 [1][Conditions of grant of license].**—[2][(1) Non-fulfilment of any fire prevention and fire safety measures as may be referred to in the 'Fire Safety Certificate' shall be a breach of a condition of license.]

[3][(2) Every license granted under section 12 shall be required to be renewed annually; application for renewal of license along with duly endorsed 'Fire Safety to the Collector, who snail renew the license on such scrutiny as he may consider necessary and on payment of the prescribed annual fees :

Provided that if an applicant so desires, he may renew the license for three years at a time on payment of the prescribed fees.]

[1][(3) The annual fee shall be payable in advance in respect of the period commencing from the date from which the premises is used for the purpose referred to in section 12 in the case of new license, and from the date following the date of expiry of the license in the case of the renewal of license.]

(3a) When a license is granted under this section or on application under section 14 accompanied by a plan in duplicate of such building or place or when a license is renewed on application submitted with a plan in duplicate under proviso (b) to section 14, a copy of the plan authenticated by the Collector in the manner prescribed shall be returned to the licensee. Such authenticated copy shall be preserved in good condition by the licensee and he shall produce it before an inspecting officer for scrutiny whenever demanded.

(3b) Every license granted under sub-section (2) shall have effect from the date on which the license is granted and the renewal of every license renewed under sub-section

(3) shall have effect from the date following the date of expiry of the license which is renewed :

Provided that where for any reason no order either granting or refusing a license is made under sub-section (2) within a period of [2][sixty] days from the date of receipt by the Collector of the application for the license, the applicant may, on the expiry of such period and for so long as the license is not refused, use the building or place concerned for the purpose for which the license is applied for, and if the license is subsequently granted, the license shall have effect, from the date following the date of expiry of such period.

(4) A license or renewal of a license, for which an application has been duly made under [3][section 14,] shall not be granted if the Collector is satisfied that the area in which the [4][premises] proposed to be used or continued to be [5][used for the purpose referred to in section 12 is] unsuitable for the purpose. Where any such license (or renewal of license) is refused, the Collector shall record in writing the reason for such refusal and shall communicate his order of refusal to the applicant.

(5) An appeal shall lie to [1][any officer not below the rank of a Joint Secretary] [2][against] an order refusing a license or the renewal of a license. The period of limitation for presenting such appeal shall be thirty days from the date of receipt of the communication referred to in sub-section (4) :

Provided that no appeal shall be entertained unless the memorandum of appeal bears [3][such court-fee stamp as may be prescribed].

**16. Period for disposal of application for license.**—Every application for a license under section 14 [4][ * * * ] shall be disposed of within [5][sixty] days from the date of its receipt by the Collector and if it is not disposed of within that period, the applicant shall not be liable to any penalties under this Act, [6][for the use of the premises for the purposes referred to in section 12], after the said period of [5][sixty] days, so long as such application is not refused by the Collector.

[7][***]

**[8][18. Annual fee.**—(1) The annual fee for any premises, which requires license under section 12, shall be such as may be prescribed :

(2) A rebate in annual fee at such rate as may be determined by the State Government shall be allowed in the prescribed manner in respect of the premises where the owner or occupier maintains his own fire services, employing qualified and full-time fire personnel supported by adequate fire-fighting appliances :

Provided that a monthly return of the fire-fighting appliances, fire personnel and such other details as may be prescribed shall be furnished to the Director or the superior nominated authority and such fire services shall be subject to inspection by the Director or the superior nominated authority :

Provided further that in case the fire cover provided is found to be inadequate, such rebate may be withdrawn and the annual fee for the period commencing from the date on which the fire cover became inadequate, may be required to be paid.]

**19. Change in occupation of warehouse or workshop to be notified.—**Whenever [1][* * *] a change in the occupation of any [2][premises requiring a license under section 12] occurs, the person entering into occupation of the same shall, within two weeks of his so entering into occupation, give notice in writing to the Collector of such change of occupation, and shall thereupon pay [3][such fee as may be prescribed;] and his name shall accordingly be substituted in the license in respect of the [2][premises requiring a license under section, 12] [4][in lieu of the name of the previous occupier],

**[5][20. Suspension or withdrawal of license.**—A license issued under section 14 may, without prejudice to any other action that may be taken against the licensee, be suspended or withdrawn by the Collector after giving the licensee an opportunity of being heard, if, in the opinion of the Collector, it is necessary to do so in the public interest or if there has been a breach of any prescribed condition,]

**"21. Magistrate may cancel or suspend license.**—The Magistrate, before whom the case instituted under the last preceding section is brought on for disposal," may, if he be 'satisfied after taking the evidence that there exists reasonable and proper grounds for cancelling or suspending the license, cancel such license or may suspend the same, for such time as he may think fit and may impose such conditions as to the reversal of such order of cancelment or suspension as may be consistent with the provisions under this Act for the grant of a license for a warehouse or workshop."

2. The words", not below the rank of Sub-Divisional Officer", omitted by s. 11 of the West Bengal Fire Services (Amendment) Act, 2002 (West Ben. Act XXVIH of 2002) w.e.f. 1.5.2003 which were earlier ins. by s. 29 of the West Bengal Fire Services (Amendment) Act, 1996 (West Ben. Act VII of 1996).

3. Subs, by s. 30(a) of the West Bengal Fire Services (Amendment) Act, 1996 (West Ben. Act VII of 1996) for 'performed also by—

4. Clauses (a) to (d) omitted by s. 30(b), *ibid.* Earlier these were as under :

"(a) the Director or such other officer as the State Government may specify in the order, or

(b) in Calcutta, the Commissioner of the Corporation of Calcutta, or

(c) in any other municipality, the Commissioner of the Municipality, or

(d) in Chandernagore, 'the Chief Executive Officer of the Municipal Corporation of Chandemagore."

5. Sub-sections (2) and (3) omitted by s.30(c). Before omission these were as under:

"(2) Where the State Government makes an order under sub-section (1) directing the Commissioner of the Corporation of Calcutta or the Chairman of the Commissioners of a Municipality or the Chief Executive Officer of the Municipal Corporation of Chandemagore to exercise or perform any powers, duties or functions of the Collector under this Act, such Commissioner, Chairman or Chief Executive Officer, may by order authorise any officer of the Corporation of Calcutta or of the Commissioners of the Municipality or of the Municipal Corporation of Chandemagore, as the case may be, to exercise or perform, subject to his control and supervision, any or ail such powers, duties and functions.

(3) Where the Commissioner of the Corporation of Calcutta or the Chairman of the Commissioners of a Municipality or the Chief Executive Officer of the Municipal Corporation of Chandernagore or any other officer acting in pursuance of an order • under sub-section (1) or sub-section (2) realises any fee under this Act, such fee shall be paid to the State Government at such times and after making such deduction for the cost of collection and other incidental expenses therefore as may be prescribed."

**22. Delegation of power by Collector.**—The Collector may delegate any of his powers, duties and functions under this Chapter to any officer or officers [2][ * * * ] subordinate to him.

**23. Powers of State Government to direct delegation of powers—(1)** The State Government may, by general or special order published in the Official Gazette, direct that such of the powers, duties and functions of the Collector under this Act as may be specified in the order, shall be exercised and

[3][performed also by such other officer or officers as may be specified therein.]

**Temporary Structures and Pandals**

**23A. Erection of temporary structures or pandals.**—(1) A person who intends to erect **a** temporary structure or pandal with roof or walls made of straw, hay, *ulu grass, golpata, hogla, darma,* mat, canvas or other like material [1][in an area where this Act is

in force] for use as a place where members of the public may assemble, shall apply to the Director [2][or the superior nominated authority along with the prescribed fees] for permission to erect such structure or pandal and such permission shall not be refused if the structure or pandal conforms to the conditions that may be prescribed in this behalf.

[3][Provided that the State Government may prescribe by rules the essential requirements of a 'Fire Safety Certificate' in respect of any class or classes of temporary structures or pandals.]

(2) No structure or pandal referred to in sub-section (1) shall be erected—

(a) unless it conforms to the conditions referred to in sub-section (1); and

(b) unless permission of the Director [4][or the superior nominated authority] has been granted under sub-section (1) :

Provided that where no order granting or refusing the permission is made within such period as may be prescribed in this behalf, the structure or pandal may be erected if it conforms to the conditions referred to in sub-section (1).

*Explanation*.—For the purpose of the above proviso, different periods may be prescribed for different kinds of structures and pandals.

**Penalties**

[5]**[23B. Dismantling of temporary structure or pandal,**—The Director or the superior nominated authority with the assistance of the local authority and under police protection shall dismantle a temporary structure or pandal erected in contravention of the provisions of sub-section (1), and the cost of such dismantling shall be charged to the person who so erects the temporary structure or pandal, as the case may be.]

**23C. Penalty for not giving way to fire brigade vehicles.**—Any person who, being in charge of a vehicle, contravenes the provisions of section 5C shall be punishable, on conviction [1][* * * ], with fine which may extend to [2][two thousand] rupees.

[3]**[24. Penalty for selling fire-works.**—Any person who sells fire-works without obtaining a license, or were a license to sell fire-works has been granted breaks any of the conditions specified in the license, shall be punishable on conviction, with fine of one thousand rupees which may extend to five thousand rupees.]

**25. Penalty on house-holders for allowing rockets, etc. to let off without license.**—If any rockets are let off or fire-balloons sent up from within the precincts of any private premises or compound without a license, the owner or occupier or person under whose immediate control the premises or compound is, shall unless he can prove that the offence

was committed without his knowledge, be punishable, on conviction [4][ * * * ] [5][with fine of one thousand rupees, which may exceed to five thousand rupees.]

**26. Penalty for not taking out a license for a warehouse or workshop**—Any person who without a license uses any [6][premises tor tne purpose referred to in section 12] shall be punishable, on conviction [7][* * *] [8][with fine of one thousand rupees which may extend to five thousand rupees] or with imprisonment for a term which may extend to two months or with both, and with [9][furtherfine not exceeding five hundred rupees] for each day during which he may continue to so use such [10][premises].

**27. Penalty fot using warehouse or workshop after refusal, etc., of license.—** Any person who [1][for the purpose referred to in section 12, uses any premises] in respect of which a license has been refused, or after the license in respect thereof has been cancelled or during the time for which such license has been suspended, shall be punishable, on conviction [2][* * * ] [3][, with fine of one thousand rupees which may extend to five thousand rupees] or with imprisonment for a term which may extend to two monthsor with both, and with [4][furtherfine not exceeding five hundred rupees] for each day during which he may continue to so use such [5][premises].

**28. Penalty for breach of conditions.**—Any holder of a license who breaks any of the conditions under which a license is held in respect of any [6][premises] shall be punishable, on conviction [7][* * *] [8][with a fine of one thousand rupees] or with imprisonment for a term which may extend to one month or with both for any on such offence.

**29. Penalty for failing to notify change in occupation of warehouse or workshop.—** If [9][ * * * ] there by a change in the occupation of [10][any premises referred to infection 12,] the person entering into occupation fails to give a notice and to pay the fees required by section 19 such person shall be punishable, on conviction [11][ * * * ] [12][with fine of one thousand rupees which may extend to five thousand rupees] for each during which he may so use or continue to use [13][such premises].

**"30. Penalty for giving false information to Collector responding license.—**Any person who gives false information to the Collector or to any person performing or exercising powers duties and function of the Collector under this Act, with tne object of inducting him to take action under section 209 shall be punishable, on conviction before a Magistrate, with fine not exceeding one hundred rupees or with imprisonment for a term which may extend to one month or with both.".

**"31. Penalty for using as residence of warehouse used for pressing jute or cotton.**—Any person who uses as a residence any portion of a warehouse used for

pressing or screwing of jute or cotton if jute or cotton be then stored therein shall be punishable on conviction before a Magistrate, with fine not exceeding one hundred rupees and with further fine not exceeding twenty rupees for each day during which he may continue to so use it.".

2. Section 32 subs, by s. 42, ibid (with effect from 1.11.1996). Earlier it was as under:

**"32. Penalty for using matchboxes, etc., in warehouse**—Any person who brings into a warehouse used for the pressing or screwing of jute or cotton (if jute or cotton) be then stored or used therein, any match-boxes, match-sticks or any artificial light not duly and thoroughly protected, shall be punishable, on conviction before a Magistrate, with fine not exceeding one hundred rupees for any such offence.".

3. Section 33 subs, by s. 43, *ibid* (with effect from 1.11.1996). Earlier it was as under:

**"33. Penalty for smoking within warehouse.**—Any person who smokes within a warehouse used for the pressing or screwing of jute or cotton (if jute or cotton) be then stored or used therein shall be punishable, on conviction before a Magistrate, with fine not exceeding one hundred rupees for any one such offence,".

[2]**[32. Owner or occupier of building or premises to compensate person affected by fire.—**Whenever on enquiry into an incident of fire by the District Magistrate or by the committee specially constituted by the State Government - under sub-section (1A) of section 8 it is established that the incident of fire was due to wilful default or negligence on the part of the owner or occupier of any building or premises, such owner or occupier shall be liable to compensate every person affected by such fire for the loss sustained by him in addition to his being liable to criminal prosecution.]

[3]**[33. Offences by companies.—**(1) Where an offence under this Act has been comitted by a company, every person who, at the time the offence was committed, was in charge of, and was responsible to, the company for the conduct of the business of the company, as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against .; and punished accordingly :

Provided that nothing contained in this sub-section shall render any such person liable to any punishment, if he proves that the offence was committed without his knowledge or that he had exercised all due diligence to prevent the commission of such offence.

(2) Notwithstanding anything contained in sub-section (1), where any offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of, or is attributable to any neglect on the part of, any

director, manager, secretary or other officer of the company, such director, manager, secretary' or other officer shall be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

*Explanation*.—For the purposes of this section,—

(a) "company" means a body corporate and includes a firm or other association of individuals; and

(b) "director", in relation to a firm, means a partner in the firm.]

**33A. Penalty for erecting structure, etc., in contravention of section 23A.**—Any person who erects any structure or *pandal* in contravention of the provisions of sub-section (2) of section 23A, shall be punishable, on conviction [1][ * * * ] [2][with fine of ten thousand rupees which may extend to fifty thousand rupees] or with imprisonment for a term which may extend to one month or with both, and with further fine not exceeding [3][three thousand] rupees for each day during which such contravention continues.

**33B. Penalty for obstructing persons exercising powers under section** 37A.—Any person who wilfully obstructs, or offers any resistence to, or impedes or otherwise interferes with the Director or any officer exercising powers under section 37A or any assistant accompanying the Director or such officer while exercising such powers, shall be punishable, on conviction [4][ * * * ] [5][with fine of one thousand rupees which may extend to five thousand rupees.]

**33C. Offences-bailable and cognizable.**—All offences punishable under this Chapter shall be bailable and shall, [6][ * * * ] be cognizable.

## Miscellaneous

[7]**[34. Inspection of building or premises.—**(1) The Director or the nominated authority may enter and inspect any building or part thereof or any premises at any time between sunrise and sunset where such inspection appears necessary for ascertaining the contravention, if any, of fire prevention and fire satety measures referred to in section 11C and of the conditions referred to in section 13:

Provided that the Director or the nominated authority may enter into and inspect any such building or part thereof or premises at any time if it appears to him or it to be expedient and necessary to do so in order to ensure safety of life and property.

(2) The Director or the nominated authority, as the case may be, shall be provided with all possible assistance by the owner or occupier, as the case may be, of such building or

part thereof or premises for carrying out the inspection under sub-section (1).

(3) When any such building or part thereof or premises used as a human dwelling is entered under sub-section (1), due regard shall be paid to' the social and religious sentiments of the occupiers; and before any flat or part of such building or premises in the actual occupancy of any woman who, according to the custom, does not appear in public, is entered under sub-section (1), notice shall be given to her that she is at liberty to withdraw, and every reasonable facility shall be afforded to her for withdrawing.

(4) Where the inspection is carried out by the nominated authority under the foregoing provisions of this section, it shall give a report of any such inspection to the Director or the superior nominated authority.

*Explanation*.—For the purposes of this section, "flat" shall have the meaning assigned to it in the West Bengal (Regulation of Promotion of Construction and Transfer by Promoters) Act, 1993.]

[1][**35. Issue of notice to owner or occupier to undertake fire prevention and fire safety measures.—**(1) The Director orthe suDerior nominated authority.

as the case may be, shall, after completion of the inspection of the building or part thereof or the premises referred to in section 34, record his or its views on the deviations from, or contravention of, the requirements with regard to the fire prevention and fire safety measures orthe inadequacy of, or non-compliance with, such measures provided or to be provided therein with reference to the structure of the building orthe premises orthe nature of activities carried on in such building or part thereof or premises and issue a notice to the owner or occupier of such building or part thereof or premises directing him to undertake such measures, and within such time, as may be specified in the notice. Where the owner is not available, the occupier shall undertake such measures in the interest of public safety, notwithstanding anything contained in any other law for the time being in force.

**"35. Police officer may arrest offenders under section 24.**—(1) Any person committing an offence under section 24 may, if his name and address be unknown, be arrested by any officer of police and forthwith conveyed before a Magistrate having jurisdiction in the place in which such offence has been committed, or shall be taken to the nearest police-station within the said jurisdiction, in order that such person may be detained until he can be brought before a Magistrate or until he shall enter into a recognizance with or without sureties for his appearance before a Magistrate.

(2) Whenever such person shall be taken to a police-station, the officer in charge of such station shall, as soon as possible, but in every case within twenty-four hours, cause

him to be conveyed before a Magistrate having jurisdiction in the matter.".

[1][**36. Compliance with notice issued under section 35.**—(1) The Director may, in the event of non-compliance with any notice issued under section 35, take such steps as may be necessary for the compliance with such notice.

(2) All expenses incurred by the Director in relation to any steps taken by him under sub-section (1) shall be payable, on demand, by the owner or occupier on whom such notice is served, and shall, if not paid within 30 days of such demand, be recoverable under the Bengal Public Demands Recovery Act, 1913.]

[2][**37. Recovery of fees.**—(1) The fees payable under this Act, if not paid within the time provided in this Act or the rules made thereunder, shall be recoverable as a public demand under the Bengal Public Demands Recovery Act, 1913.

(2) The State Government may remit payment of fees in such cases as may be recommended by the Collector.]

[3][**37A. Director or superior nominated authority to seal building.**—(1) If the Director or the superior nominated authority is satisfied that owing to inadequacy of fire prevention and fire safety measures, the condition of any high- risk building or part thereof is in imminent danger to person or property, then, notwithstanding anything contained in this Act or in any other law for the time., being in force, he or it shall, by order to be recorded in writing, require the persons in possession or occupation of such building or part thereof to remove themselves forthwith from such building or part thereof.

(2) If an order made by the Director or the superior nominated authority under sub-section (1) is not complied with, the Director orthe superior nominated authority, as the case may be, may direct any police officer having jurisdiction to remove such persons from such building or part thereof and such police officer shall comply with such direction.

(3) After the removal of the persons under sub-section (1) or sub-section (2), as the case may be, the Director or the superior nominated authority, as the case may be, shall seal such building or part thereof.

(4) No person shall remove such seal except under a written order made by the Director or the superior nominated authority *suo motu* or on application by the owner or occupier.

(5) Any person who contravenes the provisions of sub-section (4) shall be punishable with imprisonment for a term of three years which may extend to five years or with fine of twenty thousand rupees which may extend to five lakh rupees or with both.]

# Unit - 3 ❑ Fire Prevention

**Structure**

## 3.1 Good House Keeping

### 3.1.1 Introduction

In general, housekeeping means the care and maintenance of the property. But in terms of fire prevention, Housekeeping means a sence of cleanliness, orderliness, as well as repair and maintenance. All these aspects are important on the following reasons :

- **To prevent fire.**
- **To minimise the spread of fire.**
- **To preserve a clear escape route.**
- **To provide easy access for fire fighting.**

Good housekeeping is a basic requirement for all types of facilities from the simpliest dwelling to the most complex and largest industrial facility or warehouse.

It is important that each facility must have a written housekeeping programme in place. To be effective, this programme should include the involvement of all facility employees. An important part of this programme should be a fire safety plan that includes housekeeping practices which should include provisions for inspection, equipment layout, storage and handling practices and an effective preventive maintenance programme to limit or eliminate potential sources of ignition.

In addition to reduced fire hazards, a well planned housekeeping programme can get the following benefits :

- **Reduced operation costs.**
- **Increased production.**
- **Improved production control.**
- **Conservation of material and parts.**
- **Reduced product time.**
- **Better use of space.**
- **Increased traffic flow.**
- **Reduced accident time.**

### 3.1.2 Good Housekeeping Practice

Good housekeeping is not a sophisticated concept - it is just a common sense. It relates to keeping everything in its place, keeping facilities and equipment in good repair and in good operating condition and peeping processing areas free from accumulations of byproducts and waste materials.

**Statistics revealed that for each serious fire that is reported, there might be 10 major fires, 100 minor fires and 1000 "unsafe condition" near misses that could lead to a fire.**

The number of unsafe condition may be high or low but can cause a fire or are the factors that allows the fire to spread uncontrolled. If one can recognise these conditions and eliminate them, the potential for a disastrous fire will be substantially reduced. This can be accomplished through good inspection procedures and good housekeeping.

**Poor housekeeping increases fire and explosion hazards in several ways :**

- ❖ It provides more place for a fire to start.
- ❖ It creates a greater continuity of combustibles, which makes it easier for fire to spread.
- ❖ It provides a greater combustible loading for the initial fire to feed on.
- ❖ It creates the potential for flash fire or dust explosion when layers of lint or dust are allowed to accumulate.
- ❖ It allows spills or drips of flammable or combustible liquids to accumulate, which could catch fire (including spontaneous combustion in some situations).
- ❖ When not properly addressed, friction, static or electrical connections can be source of ignition.
- ❖ Poorly controlled smoking policies can lead to a source of ignition.
- ❖ It increases the potentials for spontaneous ignition.

In addition to the increased hazard, poor housekeeping can have a negative effect on production in the following way :

- ❖ Quality is hard to maintain when workplace is crowdy and noisy.
- ❖ Efficiency suffers, because people normally tend to work faster and more accurately if the surroundings are clean. This hamper due to bad housekeeping.
- ❖ Poor maintenance of workplace and inadequate aisles not only restricts the free flow of materials into and out of the workplace but also good exit capabilities.

Thus good housekeeping not only prevent fires and possibly save lives, but also it can improve production and employees moral as well.

The degree of effort and attention neded for proper housekeeping is influenced by the type of building, the processes going on, and the oppupanices of the facility.

Some processes produce more waste, leakage and vapour than others, thus contributing to the extents of housekeeping problems, in addition the acceptable level of cleanliness varies from occupancy to occupancy. What is satisfied in a foundry would probably not be acceptable in an office building.

For the purpose of good housekeeping, the programme must start at the top. The top facility management must set the tone and plan the programme. To effect this, all facility employees should be involved in the programme under the direction of individual supervision, or team leader, or crew leader at the department level. But the success of such effort will be much improved if the top management of the facility is behind the programme.

First of all, team leader (at all levels) must be trained to know what is meant by good housekeeping. Each level of leadership is then inspect the facility to have an idea about the present status of housekeeping maintained and to determine the following:

- ❖ Acceptability and adequacy of the present level of housekeeping.
- ❖ Availability of appropriate tools for general plant clean up and their availability for emergency cleanup.
- ❖ Adequacy of storage areas provided for both incoming raw materials and outgoing finished products.
- ❖ Requirement and involvement of leadership to improve housekeeping as per necessity of the facility areas.
- ❖ Provision of adequate and appropriate waste receptacles in different workplace of the facility.

Giving importance on the aforesaid subject, a fire safety plan including good housekeep as keystone to fire prevention, should be formulated for strictly observance in the facility.

Proper housekeeping does not just happen it requires support and direction from management as well as the cooperation and participation of all employees visitors and vendors. Good housekeeping requires effort from every one. The management should ensure the following :

- ❖ Set the tone, specially, the level of acceptable housekeeping.
- ❖ Enlist the aid of everyone to help.

- ❖ Solicit the employee ideas on how to maintain good housekeeping.
- ❖ Act on the ideas of employee to maintain good housekeeping and if not, explain the reason.
- ❖ Acceptance / confirmation of the responsibilities for housekeeping in their respective areas by all employees of the facility.
- ❖ Ensure that, materials, tools, wastes, and so on, are placed in their respective locations is the job of each employee who handles them.

When proper housekeeping does not exist, it is usually because inadequate attention is paid to or inadequate action is taken in, one or more of the areas of equipment, layout and storage, communications, environment, personnel etc.

## 3.2 Requirements for Good Housekeeping

There are three basic requirements for good housekeeping which are as follows:

**A) Proper Layout and Equipment**

Over crowding and improper layout is a major impediment to proper housekeeping. Blocked or restricted aisles limit the access and lack of sufficient workspace and storage capacity results inefficient operations, an inability to maintain order, and worker frustration. The creative use of racks, shelves, and bins, or making aisles and storage areas by painting lines on the floor can provide solutions.

Housekeeping efforts should not hamper from lack of necessary tools or equipment. The simple step of placing a sufficient number of easily accessible waste buskets or trash receptacles at points of need can reduce the amount of waste deposited on the floor or in the product.

A well planned preventive maintenance programme on all equipment will find and eliminate leaks of liquid, electrical hazards, static build up and friction caused by lack of lubrication.

**B) Correct Material Handling and Storage**

With the negative influence on good housekeeping, disorganised and haphazard storage is usually a detriment to effective fire protection as well. Fire extinguishers, hose reels, sprinkler system control valve etc can become blocked and inaccessible, while other fire and life safety equipment like fire doors, may not be aperable at the time of fire emergency.

As a result of which, in a fire emergency, it will be more difficult for the fire department to attack and extinguish a fire even in a sprinklered building. Proper material handling allows for materials to be moved to their specified location without stagging them in an area that does not contain the needed level of fire protection.

**C) Cleanliness and Orderliness**

The type of operation will dictate the level and frequency of cleaning required. Many locations will only require per day, but some manufacturing processes might require at the end of each shift, or even periodically during the shift.

In pursuing cleanliness and orderliness, effective care and maintenance of buildings require special housekeeping practices to reduce the fire danger to buildings with special attention to :

**i) Floor cleaning :**

When floor is concern, the general care, treatment, cleaning and refinishing of floor may present a fire hazard if flammable solvents or finishes are used or if combustible residues are produced in quantity. Some times flammable liquids are used to clean greasy spot on the floor from which fire may be resulted. In general cleaning solvents with flash point below room temperature are too dangerous to use to clean floors. When selecting a cleaning agent, care should be taken about its toxicity to human being and to the environment if it is discharged through the sewer system. Safe nonhazardous cleaning agents should always be preferred.

**ii) Dust and Lint Cleaning :**

The housekeeping procedure in many occupancies is the removal of combustible dust and lint accumulations from walls, ceiling and exposed structural members. The cleaning procedure should be performed safely as by vacuum cleaner or air moving (blower and exhaust) system, otherwise it may present a fire or explosion hazard. In some cases vacum cleaning equipment must be equipped with dust ignition proof motors to ensure safe operation in dust full atmosphere.

Care should be taken not to dislodge into the atmosphere any appreciable quantities of combustible dust or lint which might ignite or form an explosive mixture with air. Blowing down dust with compressed air may create dangerous dust clouds and such cleaning should be done only when other methods can not be used and after all possible ignition sources have been eliminated.

All duct systems can accumulate dirt and whatever other materials is dispersed in the facility. Frequent cleaning of these systems is necessary for good housekeeping. Filters must be changed frequently. Particular attention should be given to building ventilation systems, including fire cut-off devices.

The exhause ducts from the hoods over cooking range, such as those found in facility cafeterias present troublesome problems due to condensation of grease insides the ducts and on exhaust equipment which can be ignited by spark from the cooking range or by small fires in overheated cooking oil or fat.

There is no practical method for preventing all kitchen duct fires, but the danger can be minimized through the good practices i.g., to clean hoods, grease removal devices, fans, ducts and all associated equipment frequently. The exhaust system should be inspected daily or weakly, depending on its use.

In cleaning the exhaust system, avoid using flammable solvents or other flammable cleaning aids. Do not start the cleaning process until all electrical switches, detection devices, and extinguishing system supply cylinders have been turned off or locked in a "shut" position which should be returned to normal operating position once the cleaning process is completed.

The use of professional cleaning company or specially trained employees should be considered to ensure proper handling of the dust and dirt from the ducts. This is specially true if the dust is combustible or explosive, since special equipment is needed to clean this type of system.

## 3.3 Housekeeping Programme in Buildings

Special consideration must be given in housekeeping programme to disposal of rubbish, control of ignition sources and other housekeeping hazards. It is a good practice to cause an inspection by a responsible officer after employees has left the facility for the day or weekend. Special attention need for :

**a) Rubbish Disposal**

The intension of disposal of rubbish in regular basis is not to give fire a place to start. The proper handling and disposal of rubbish is an integral part of housekeeping programme and its success depends primarily upon preparing and observing a satisfactory routine. The proper and regular disposal of combustible waste products is of the utmost importance.

When combustible waste products are concern, it is needed the removal of such waste products at the end of each work day or at the end of each work shift in both industrial and commercial properties. In high fire hazard properties, more frequent waste disposal is necessary. In others, the collection, storage and disposal routine vary with the nature of the property use. To keep a place tidy and fire safe, enough waste buskets, bins, cans and other proper container should be provided, so that building users will find tideness convenient.

Non-combustible containers should be used for the disposal of waste and rubbish. Which is true even for small receptacles as ashtrays and waste buskets. Care should be taken to avoid mixing waste materials'where such mixing introduces hazards of its own.

It is not good housekeeping practice to dump all waste in a common or storage receptacle. Precautions should be taken to keep combustible items separate from each other and from non-combustible items.

**b) Control of Ignition Sources**

*i)* ***Control of Smoking :*** Inspite of repeated warning and prohibitory notice, there are still a significant number of people who do smoke in work place. The best policy is prohibit smoking all together which eliminates the possibility of smoking materials being improperly discarded. Where this is not a possible consideration, smoking regulations must be specific as to location, and preferably time. Areas in which smoking is permissible, as well as those in which it is limited or prohibited entirely, must be clearly marked by appropriate signs that leave no doubt as to what is allowed where.

In addition to sensible regulations, smoking control also requires adequate receptacles made of non combustible materials for spent materials in industrial buildings, large con tain ters of sand are often used to conveniently and safely extinguish and dispose of spent smoking materials.

Improperly designed ashtrays may constitute a hazard, particularly of they allow a lit cigarette to fall or roll away. There are thousand instances where fire is originated from a lighted butt come in contact with combustible materials.

*ii)* ***Control of Static Charges :*** Static charges can be produced by the flow of dissimilar materials past each other. As for example, liquid or dust conveyed through a pipe or duct produces an electric potential. If adequate oxygen is

present, a static discharge can occur that can ignite the flammable vapour or combustible dust. This can be avoided by providing adequate grounding and bonding of the apperatus or equipment.

As such, annual inspection and testing of all grounding including building grounding and bonding should be included in the annual maintenance programme.

*iii)* ***Control of friction :*** A preventive maintenance programme must be formulated and observed to identify and eliminate potential sources of friction. Lubrication, properly designed ball and bearing etc are important part of the programme.

*iv)* ***Control of Electrical hazards :*** Nearly 80% fires are originated from different defects and malfunctioning of electrical systems and equipment. Routine inspection can identify and rectify overloaded electrical circuits, excess electrical extension cords, missing grounding plugs, improper protective devices etc.

## 3.4 Housekeeping Programme in Industries

Due to nature of their operations, some industrial occupancies have some specific housekeeping problems as stated below for which specific planning and arrangements are necessary.

*a)* ***Lubricants and Coatings:*** Paints, greases, thinner and similar other combustibles are widely used in industrial occupancies, for which a good housekeeping programme must be established to collect and disposed them safety and regularly. Arrangement should be made to discharge the vapour from the spray boths directly to the outside and the residues accumulate safely.

*b)* ***Disposal of Corrosive and Flammable Liquids Wastes :*** The corrosive and flammable liquid waste often presents a serious problem while disposal. Any waste material that is a corrosive liquid (ph < 2 or > 12.5), or is a liquid having flesh point of 140°F (60°C) or less, is considered as hazardous waste. These waste products must be disposed of through an agency who is licensed to handle this waste.

*c)* ***Drip Pans :*** Drip pans are essential at many locations, e.g., under motor, machines; using cutting oils, and bearings, including boring and turning that may contain oil. Drip pans should also be used wherever flammable and combustible liquids are dispensed. Drip pans should be made of non-combustible material and contain an oil absorbing compound in the form of diatomaceous earth but not sand

or sawdust. It is recommended to remove the oil soaked material regularly.

*d)* ***Spillage of flammable liquid :*** Where flammable liquids are handled or used, it is anticipated that some form of spillage will be there and to cope up with these spell, some means and measures must be kept in hand. These include a supply of suitable absorptive material and special tools to help limit the spill. Arrangement must be there to cut of sources of ignition, proper ventilation of the area and safety dissipate any flammable vapour if so needed in emergency.

*e)* ***Storage of flammable liquids:*** No storage of flammable liquids should be allowed in the general storage area which should be stored in a segregated area with adequate fire protection, prevention and ventilation. Good housekeeping practices will ensure that only limited quantities of flammable and combustible liquids are kept on the production or work area which should the protected in suitable container.

*f)* ***Oily waste :*** Oily wiping rags, lint, clothing, sawdust and other oil soaked materials can be highly dangerous, particularly if they contain oils subject to spontaneous heating. A standard waste can for small quantities and heavy metal barrels with cover may be used for disposal of all such materials. Good practice calls for cans and barrels containing daily waste to be emptied daily.

*g)* ***Packing materials :*** Almost all packing materials used today are combustible, as such hazardous. Large quantities of packing materials should be kept in store room duly protected with automatic sprinkler system.

Used and waste packing materials must be removed and disposed of as quickly as possible in order to minimise the danger of fire. A specially marked area should be identified to accumulate this materials. This area should be cleaned frequently and the debris removed to an outside storage receptacle.

## 3.5 Outdoor Housekeeping Practices

Like indoors, good housekeeping practices of outdoors are equally essential. Failure to comply with good housekeeping practices, outdoor can threaten the security of exposed structures and goods stored outside. The most common outside hazards are accumulation of rubbish & waste and the growth of tall grass and weeds adjacent to the facility building or stored goods. Adequate precautions should have to be taken to protect the goods and building from outside hazard, some of them are listed below.

**a) Grass and Weed Control**

Dry weeds, tall grasses and bushes around the facility building, on railroad properties and along the streets of large industrial and commercial complexes present a definite fire hazard. Fire can spread from one building to another or from the vegetations to be building. To reduce this hazard, vegetations around buildings and outside storage should be control and destroyed through the use of common herbicides.

**b) Outdoor Storage**

Proper separation of outdoor goods stores from any structure of combustible materials or from other combustible storage should be ensured that might constitute an exposure hazard. These separation must not be blocked by contractors employees shed, discarded crates, pallets or other combustible. One of the important duty of the housekeeping staff to see that these separations are never blocked, even temporarily. Obstructed passage way or aisle and dedicated space separation not only help the fire to spread from one area of storage to another, but also hamper fire fighting operations.

Proper housekeeping also requires that smoking in outdoor storage areas be

**c) Outdoor Rubbish Disposal**

Outdoor storage of combustible materials awaiting for disposal as rubbish should be stored not less than 3 m and preferably 15 m from building and atleast 15 m from public roadways and sources of ignition like incinerators. They should be enclosed with a secure non-combustible fence of adequate height.

Regular collection and removal of rubbish from the premises is the most satisfactory solution in achieving good housekeeping. Burning of rubbish is general unsafe, but if its is permitted it should be done in a non combustible container.

## 3.6 Inspection of Housekeeping Programme

Housekeeping inspections as a part of the combined safety inspection programme are an important part of overall housekeeping programme. This type of inspection has many objectives, such as :

- ❖ Maintain a safe working environment.
- ❖ Control unsafe acts and actions of the machineries and employees.

- ❖ Maintain operational environment, result product quality and profit ability.
- ❖ Maintain fire and life safety systems and equipment in perfectly working contain.
- ❖ Restrict the spread of fire.
- ❖ General comfort and satisfaction of the employees and management.

There are several types of inspections. Some involve preventive maintenance of the equipment and systems and some involve inspection and testing of fire protection systems and equipment.

One of the most important part of an inspection is writing a report. In addition to normal registers, computers and barcoding can help to maintain inspection report. At the compeletion of the inspection, the informations is downloaded into a computer and a report is printed. This format also allows comments to be made where employees have made positive contribution to the housekeeping programme. This positive reinforcement will encourage employees to continue their good work.

To prevent inspection from taking considerable time, the inspection authority should

- ❖ Have a definite schedule.
- ❖ Inspect only one part of the department at a time.
- ❖ Rotate inspection responsibilities, among department members.
- ❖ Make housekeeping programme as a compulsory part of daily routine.

A sample fire preventive housekeeping check list highlighting the important points to be observed during inspection is shown in the table 3.1 :

**Table 3.1**

**Fire Preventive Housekeeping Checklist**

| Sl. No. | Item | Points to be checked during inspection |
|---|---|---|
| 1. | Housekeeping | Accumulation of rubbish. |
| | | Safe storage of flammables. |
| | | Clearness of the passages / asiles. |
| | | Storage of unneccessary combustible materials. |
| | | Spillage, leakage or drippling of flammable in the flower. |
| | | Obstruction of sprinkler head. |
| | | Materials blocking exit signs, mannual call point extinguishers etc. |

| Sl. No. | Item | Points to be checked during inspection |
|---|---|---|
| | | Free operation of fire door, blockage etc.<br>Regular rubbish disposal.<br>Floor cleanliness.<br>Use of cans, bin, receptacles.<br>Orderliness and cleanliness. |
| 2. | Fire Extinguishing equipment | Proper type and number.<br>In proper location.<br>In proper working order.<br>Last date of servicing.<br>Easy access to the system & equipment.<br>Training of the personnel in use of equipment. |
| 3. | Electrical equipment | Proper wiring and layout.<br>Serviceability of extention cords.<br>Proper maintenance of motors, switch gears and other tools.<br>Protection of the circuits with fuses, M.C.P. etc.<br>Approved equipment for use in hazardous areas.<br>Proper earthing and bonding.<br>Lightening arrester.<br>Fire protection in major electrical installations and equipments. |
| 4. | Friction | Proper lubrication of the machineries.<br>Proper adjustment and alignment of machinary.<br>Safeguard agaisnt static charges. |
| **5.** | Welding and cutting | Survey of the area for fire safety.<br>Removal or covering of combustible for the area.<br>Issue and observance of “Hot Work Permit”.<br>Inspection of the area on conpletion of the job. |

| Sl. No. | Item | Points to be checked during inspection |
|---|---|---|
| 6. | Smoking and matches | Marking of "No Smoking" everywhere.<br>Strickiest vigilance.<br>Restriction of carrying matches inside the facility. |
| **7.** | Spontaneous Ignition | Preservation of flammable waste materials in closed metal container.<br>Proper cooling, drying and ventilation of piled materials.<br>Frequent cleaning of flammable waste material contaners.<br>Daily clearence of trach receptacles. |
| 8. | Static Electricity | Proper grounding and bonding of flammable liquid dispensing vessels.<br>Maintenance of proper humidity.<br>Proper grounding of moving mechinaries. |
| 9. | Hot Surface | Clearance of combustible materials from hot pipes etc.<br>Clearance around boilers and furnaces.<br>Keeping of the combustible surfaces from soldering irons.<br>Ashes in metal container. |
| 10. | Open Flame | Keep away from spray rooms and flammable storage.<br>Maintenance of clearance between portable torches and flammable surface.<br>No gas lick. |

Atlast it can be summerised that housekeeping practices are an integral part of any programme to prevent or limit the source of ignition and spread of fire. Building care and maintenance, occupancy and process housekeeping (including disposal of rubbish and control of ignition sources), appropriate outdoor housekeeping practices and inspections are the key element to acheive the goal of success.

# 3.7 Electricity & Its Fire Hazards

## 3.7.1 General Introduction

Electgricity is something real which can not be seen but its effects are felt. It may be defined as a form of energy, energy can neither be destroyed not it can be generated. It can only be converted from one form of energy of the other. Electricity is generated by converting other forms of energy i.e., Thermal (Feat) energy, nuclear energy and energy stored in water (potential) energy. Similarly electricity can also be converted into other useful forms of energy viz., heat energy, methanical energy, light energy, etc. which finds a wider application in our day to day life.

## 3.7.2 Fundamentals of Electricity

Electricity may be defined as they flow of electrons. The continuous flow of electrons through the conductor is known as current and the path of its flow is termed as electrical circuit. The dynamic electricity (current) is of wo type vin.,

(i) the direct current (D.C.)

(ii) the alternating current (A.C.)

The direct current always flows from positive terminal to negative e.g. Battery torch where as in case of 'temating current (A.C.' there is a rapid change in direction of flow which occurs many times per second.

The flow of electricity through a conductor can be compared with the flow of water through pipes and, thus, has same flow of characteristics parameter like quantity, pressure resistance, etc. Which are defined below:—

**(i) Electromotive Force (E.M.E) 'V' :** This refers to the pressure or tendency to cause flow of electrons in a circuit, its unit is volt.

Current 'I' the flow of electrons is called current and its unit is Ampere.

(ii) Resistance 'R' : It is the property of the materials by which it opposes the flow of electrons (electricity) through them. Its unit is ohm.

**Ohm's Law:**—This law states that in any electrical circuit, current is directly proportional to the pressure (Volts) and inversely proportional to the resistance in the circuit provided the temperature does not change.

Mathematically,.

$I \alpha V$

and $I \alpha \frac{I}{R}$

Combining the two, we may write

Or $I = V/ R$

Or $V = RI$

Or

The above equation is known as ohm's Law, equation where 'V' is pressure in Volts, 'r' the current is Ampere and 'R' the resistance in ohm.

**Heating Effect of Electric current:**

When current passes through a conductor heat is produced. This is in fact the work, that is required to be done in sending the current against the resistance, which is converted into heat.

Heat produced in the conductor is directly proportional to

(i) square of the current passing through conductor $I^2$

(ii) The resistance of the conductor 'R' and

(iii) the time of flow 't' .

Combining the proportionalities, we may write

$\frac{V}{I} = R$

H = 0.242 FRT

Where 'H' is heat produced in Calorie, 'I' is current is Ampere 'R' the resistance on ohm and 't' is the time of flow in seconds.

This phenomenon is particularly important to fire-fighters as"the heat so produced if not dissipated safely, wil! raise the temperature which' ultimately' ignites the combustible materials available in the near vicinity.

**Conductors & Insulators :**

Conductors are the materials which allows the flow'of electrons through them with least resistance e.g. Copper, Allbrriiniunv ifoti, watef, etc. whereas the insulators are the materials which do not allow the flow of electrons through them e.g/ Wood (dry), rubber, plastic, glass, mica, etc.

## 3.8 Generation and Distribution of Electicity

The bulk production of electricity is done by converting other foriris of energy viz. heat

and potential energy at places which are known as power stations. In Inida, the most common power plants, indude

(i) Thermal power stations,

(ii) Hydropower station,

(iii) Nuclear power station,

In a thermal power station coal is burned to produce heat energy Which is utilized in converting water into steam (temperature about 535 C and pressure 150kgf/cm2) which in-tumruns the steam turbine thereby converting the pressure energy is further utilized in rotating the generators to produce electrical energy.

In hydro power station, water is collected at higher attitudes, which when allowed to flow at lower level discharges water at high pressure. This high pressure flow rotates the water turbine converting the pressure energy into mechanical energy which is subsequently utilized for running the generators to produce electrical energy.

In a Nuclear power station fission reactions in radio-active materials axe allowed to take place in Nuclear reactions which produce heat energy. This heat energy is used in converting water into steam for running the turbines which gives mechanical energy. The mechanical energy so produced is used in running the generators to produce electrical energy.

The electricity produced at either of the three power station is a low pressure (voltage) current and since, for distributing the electricity at distant places, high pressure (voltage) is as required and electrical equipments, namely transformer are used to increase the pressure and then through transmission lines electricity is transmitted to distant places. Since, low pressure (voltage) current is the requirement of the consumer hence wherever tapping done step down transformers are used to reduce the voltage depending upon the consumers requirement and then supplied to the users. Step up transformers are used at power generating stations where as step dowpitransformeis are used of electrical substations.

## 3.9 Common Causes of Electrical Fires and Remedial Measures

Fire hazards of electrical origin are mainly due to the improper use of electricity, improper electrical installation and lack of care in the maintenance of the electrical systems and apparatus. Fires are mostly originate mostly from the sparks of overheating of electrical equipments which may be caused by the following :

(1) Short circuit

(2) Failure of insulation

(3) Overheating of electrical equipment

(4) Improper selection of equipment/wiring

(5) Loose electrical contacts

(6) Discharge of static charges.

With few exceptions most of the fires originated by electricity can be prevented by

(i) Selecting the proper rating electrical equipment and wiring.

(ii) Avoiding the excess loading of electrical equipment.

(iii) Using proper capacity fuse /circuit breaker.

(iv) Ensuring effective earthing of electrical equipment and installation.

(v) Periodic inspection and testing of electrical circuit and equipments.

## 3.10 Static Electricity and its Hazards

As its name indicates it is the electricity at rest. Thus, flow of electrons does not take place instead positive and negative charges are developed. These charges go on accumulating if not dissipated.

Static charges are produced due to contact and separation of two non-conducting substances. The rate of production of static charges depends on how quick by contact and separation is taking place. The accumulated static charges causes high-voltage, built-up and these charged get dissipated, giving off sparks, if a connector is brought near to it. These sparks are capable of igniting the flammable gas/vapour air mixture which may lead to explosions.

Remember static charges pan not be prevented from generation but its hazards can be prevented by not allowing the accumulation of these charges. The production of static urges are most common in the following industries—

**(1) Textile Industry :—** Static charges are produced due to contact and separation of fabric to various machinery.

**(2) Rubber Plastic and Similar Industries :—** In such industries static charges are produced due to milling, mixing, spreading and extruding excesses.

The static charges are also produces on machinery belt drives, conveyor systems, paint and spraying, grinding, dry cleaning etc.

**Safety against hazards of static electricity :**

Remember the generation of static charges in any process is not hazardous but the accumulation of these charges on the equipment generating static charges is a cause of concern. The basic principle if safety against the hazards of static electricity is to prevent the accumulation of these charges and this can be achieved by—

(i) ensuring proper earthing if all equipment (connecting the equipment to the earth by a good conductor)

(ii) Artificial humidification (pressure of moisture in atmosphere)

(iii) Neutralizing the static charges using radioactive materials and/or by applying electrical field (high 'voltage) to Ionize the air in the near vicinity;

## 3.11 Electrocution

If a fireman comes in contact with a live conductor, he may receive Electric shocks, which may be even fatal. It effects the Hearts, the nerve centre in the brain governs the functioning of the respiratory muscles. For this Artificial respiration should always be done. The resistance of human body is 1500 ohm but when a firemen is wet or standing on water, it acts as in good conductor. A.C. with 30 V or more may produce a severe shock, currents in excess of 2 milliamps are most dangerous for D.C.

If a person is in contact of live electric wire, his body forms a part of the circuit and any effect to touch him is same in touching the live conductor, where high voltages arc involved, the best solution lies in isolating the current At lower voltages rubber gloves, dry hose may be used to pull the clear of the circuit. Woolen Jersey, Coat, Silken cloth may also be used for medium volts.

To switch off the curent whenever possible is to be made and artificial respiration must be resorted immediately to the victim.

## 3.12 Fire Fighting

In any fire involving current, the first essential is to render the circuit dead. Where it is not possible, non-conducting extinguishing media viz. COr vapourising liquid, DCP, Dry sand, asbestos, etc. are to be used normally. Foam and water streams may be used with great cam, keeping in consideration the danger of live wire. The safe distances for using water jet are :

| VOLTAGE | 1/2” Nozzle | 1” Nozzle | Spray, fog |
|---|---|---|---|
| 132KV | 29'—0 | 64ft | 9ft |
| 33KV | 18ft. | 44ft | 6ft |
| 11KV | 4ft | 32ft | 6ft |
| 40 volts. | 5ft | 10ft | 6ft |

Safe distance should never be less than 5ft Breaking or indirects jets are very effective and safe. Cutting off the current to a high voltage installation such as cables, Transformers switch gear, does not necessarily render it safe. A resistance charge (actually static electricity) may be present and mad’ Electrocution. For this reason, they must always be Earthed before it is touched.

If a fire occurs in underground cable, this street Box of other openings should not be filled with sand, as it may cause situation for explosion.

Fireman is frequently exposed to danger from Electricity in the dark or smoke and should be competent to recognise the hazards in advance, as Electricity is such a familiar and Extensive used energy that we often forget the risks involved in its use.

## 3.13 Electric Generating Plant

### Introduction :

Todays society increasingly relies on the socio economic benefits of electrical energy for residential, commercial and industrial applications. Over the years, in our everyday lives our dependance on electrically powered labour saving devices has greatly escalated. Now electricity is a part of our daily life.

The availability and reliability of the electric supply impacts our lives in many ways which include safety, security and the creation of employment opportunities. Certainly, today’s information hungry, service-oriented and computer-oriented society could not function without an adequate and releable supply of electricity.

The process of producting and delivering electrical energy to customers includes three distinctive elements e.g., generation, transmission and distribution. This chapter addresses fire protection for generation of electricity only from a variety of fuels.

There are many means and processes for generation of electricity. These are :

1. Coal Fired Power Plant — Converts fuel to produce steam that spins a generator to produce electricity.
2. Nuclear Power Plant — Use radioactive element's fusion energy to produce steam for spinning the generator to produce electricity.
3. Hydro Electric Power Plant — Uses kinetic energy to spin a generator for the same purposes.

   One other means are also available like wind power unit, solar power unit, Bio-gas power unit etc.

## 3.14 Coal Fired Power Plant

### 1) General Plant Design

The "power block" typically houses the steam generator (boiler-furnace), turbine generator and auxilary equipment. Besides this there are coal stacks, coal bankers, conveyor belts, fuel oil tanks, transformer and many other things neccessary for the generation and distribution of electricity in the plants.

Electric generating plants are usually large open structures, perhaps several stories high. Building construction is typically of heatfy structural steel frame with or without insulated metal panel walls depending upon the climate of the area where the plant is located.

In case of fire, the cost of damage can quickly run up into millions. Even fire damage in the secondary area (like coal conveyor belt system) can cause prolonged downtimes for the entire power generation process. In coal fired power plants, in particular, reliable operation is an absolute must, because, they are a crucial pillar of the basic energy supply.

In order to protect people, objects and the environment, a sophisticated and made to measure fire protection system is neccessary.

Power plants are charecterised by their complex overall systems made up of a range of difficult operating modules. In addition to this, conditions such as extremely hot surfaces and lubricating oils pose huge fire risks.

The following are the unique hazards of the coal fired electric generating plant which needs special fire protection systems and preventive activities to save life and properties from fire and explosion.

A) Coal Stockpiles and Coal Bunkers.

B) Coal Conveyor Belt System.

C) Fuel Oil Application System

D) Boilers / Furnaces.

E) Steam Turbine Generators.

F) Cable Channels.

G) e-Room / Server Room

H) Transformers

**A) Coal Stockpiles and Coal Bunkers**

Coal's principal hazards are combustibility, spontaneous ignition, and potentiality to create fugitive dust.

Coal is transported by a variety of means (by road or rail) and stored in open coal yards without protection against dampness and moisture. Coal bunkers, on the other hand, provide the means to store the coal in dry environment. Coal fired power plant are in general equipped with both storage options.

The damped coal stored in the open yard is susceptible to auto ignition quickly. This enormously increases the fire hazard in the open coal yard. As such, cold stored in open piles should be compacted to prevent spontaneous heating.

***Fire Protection :*** As fire fighting measures, hydrant system and water monitors is generally recommended for coal yard and coal bunkers which can combat fire from a safe distance and cool objects at risk of ignition. The monitors can be aligned with the target manually, electrically or hydraulically by remote control.

For monitoring purposes, thermal cameras showing the development of heat in the in the coal stockpiles are also used. In coal bunkers, generally, gas (carbon dioxide) emission detectors are used to detect a fire.

**B) Coal Conveyor Belt System**

A coal handling system moves the coal from the storage piles to the boiler furnace via coal crushing units through conveyor belts where it is consumed to produce steam for running the turbine etc. The typical coal conveyor belt is combustible and can ignite from friction between the conveyor belt and the roller, belt stippage, or static electricity. Uncontrolled hot work can also cause fires in coal handling areas. Dump coal can also ignite and therefore presents significant ignition potensity.

***Fire Protection :*** Housekeeping and dust control are vitally important, specially with the coals that are susceptable to spontaneous combustion. A pulverized coal system has significant explosion potential.

The installation of linear heat detectors, gas emission detectors or multicriteria detectors in non-visible area or areas difficult to access is a neccessary protective measure in order to ensure prompt fire detection and activation of the fire suppression systems. An automatic sprinkler system and / or deluge water spray system is needed to protect areas above and below the conveyor belt. Considering the extremely rapid spreading of coal conveyor fires, immediate and wide-spread activation dr extinguishing is required across the entire protected area. Fire retardant conveyor belts are recommended, but they burn under certain circumstances and therefore cannot substitute for automatic sprinkler or water spray projection.

**(C) Fuel Oil Application System**

In coal fired power plants, fuel oil is used for start-up operations to heat the boiler, before the combustion process is switched to the actual fuel. Some times, very little oil is being added to generation mix for economic reason. Some small capacity plants depend on oil-fired capacity only.

Fuel oil is often heated before it is pumped to the boiler burner tip. Heating equipment may be installed inside the power block. Pipe failure or human error can results in fires involving pumping and heating equipment that expose vital equipment.

***Fire Protection :*** Installation of automatic fire suppression systems to protect the hazard and a minimum of 2 hours fire barrier to isolate it is generally recommended.

Lightning strikes, sparks due to electro static charges and the ignition of the gases in the fuel oil tanks are also causes of fire in the fuel oil storage and systems. The fuel tanks should be protected with foam pourer system and deluge system to cool the side walls and if appropriate the roof of the tank.

**(D) Boilers / Furnaces**

As a rule, the boiler house is located directly to the machine house with the steam-turbing. The specific conditions in boiler houses mean that the area is particularly dirty, e.g., due to coal dust. Pollution in the form of coal dust deposits can quickly ignite when sparks are generated. In the event of fire, extremely rapid spreading is often the consequences.

Burner front fires are also a significant fire hazard associated with boiler furnace. Two types of burners are located in the burner levels ; Firstly, the coal burner for standard operation where the coal pulverised to dust is burnt and converted the thermal energy in the process; Secondly, the oil burner, which is used mainly for the start up operation, until the coal burner has reached the right temperature for burning coal.

The fire hazard is concentrated on the level of the oil burners. Oil emerging from leaking hoses or flange connections can easily ignite on the hot surface in the area of the burners or at the distribution stations of the oil supply.

***Fire Protection :*** In these areas, fires can spread extremely rapidly with high thermal load. Hence, targeted fire fighting action at the source of the fire, preferably with water mist systems is specially important at the burner levels.

**Steam Turbine - Generators**

In the steam turbine - generators area, extensive vibration, overspeed, human error, instrumentation failure, blade failure, and filtration failure are the main causes of fire. The fires in the steam turbine - generator area are most serious in nature which may involves live lost, huge property damage and forced outage of many many days.

The main fire challenge of steam turbine generators is the pressurised lubrication oil I system in the range of 10kg/cm$^2$to 17kg/cm$^2$, that uses a class III B combustible f liquid with a flash point ranging from 204°C to 260°C, and an auto ignition temperature of 371°C. Lubrication oil is released if the lubrication oil piping system is breached. Ignition may occur due to hot surface, which may cause a spray fire, thee dimensional fire, pool fire or a combination of all three, producing large quantities of smoke and heat.

***Fire Protection :*** Automatic sprinkler and heat detectors should be provided over all bearing. All lubricating oil piping, including instrumentation lines above the turbine operating floor and its lagging or skirt area, should be protected by automatic sprinklers. Protecting areas where oil can spread beneath the turbine generator with automatic sprinklers is vitally important. Smoke and heat venting is important in preventing structural roof failure.

Fire suppression is also recommended for the oil storage reservoirs and filtration equipment. Ideally, this equipment should be installed in a room with a minimum fire barrier rating of 2 hours.

The vast majority of generators are hydrogen cooled. Hydrogen explosions inside the generator are considered unlikely as hydrogen is typically 100% pure and therefore there is insufficient oxygen to support combustion. Inspite of that, hydrogen can contribute to turbine-generator fires and cause explosion damage, expected to be minor in comparison to the more severe fire damage associated with turbine lubrication oil.

**F) Electric Cable Channels**

Whether for power supply or data transmission, countless cables are required for the operation and supply of a power plant. Electric generating plants generally use insulated, jacketed cable for power, instrumentation and control. In order to provide adequate protection, in addition to the aesthetic reasons, cables are typically routed in open cable channels/trays throughout the power blocks.

The main reason for fires in such spaces is overheating with subsequent short circuits, which usually occur as a result of excess load. At the sametime, the enormously high risk of the fire spreading at a very high speed, favoured by the draft air and the numerous cables, must be taken into consideration. Fire which spreads through winding and often in accessible cable ducts can quickly cause interruptions to operation in the whole power plant.

***Fire Protection :*** It is recommended to install cable that posses the standard fire propagation tests. The insulation and for jacketing of many newer cables are of materials that are difficult to ignite. However, under certain circumstances even those cable burns.

A fire risk evaluation should be performed to determine the need for automatic fire sprinkles systems in areas with significant amounts of grouped electrical cables. In area where cables are installed, fire detection systems with optical smoke detectors are used. Ideally smoke aspirating types are favoured, because this system help to detect fires even earlier.

**G) e-Room and Server Room**

e-rooms such as control room and systems are extremely sensitive and highly valuable facilities. They serve to control the elementory process in a power plant. This makes them simply indispensable.

In these locations, fires mainly occur as a result of short circuits caused by overheated cables or electric / electronic components.

***Fire Protection :*** Concerning fire protection solutions for these areas and the type of extinguishing agents used is crucial. In order to prevent damage to the facilities through the extinguishing media, a completely residue free extinguishing is fundamental. For these areas, total flooding inert gas extinguishing systems using argon or nitrogen is essential. A fire detection system using aspirating type smoke detectors ensures reliable fire detection at the earliest possible stages.

Similarly the server room equipped with computers and servers, monitor etc and control all essential processes of a generating plant.

Faulty or overloaded electronic components can easily cause a smouldering fire or open flame fire. Reliable and residue-free extinguishing action through total flooding system ensure the best level of protection for sensitive equipment in the event of a fire. For server rooms, a reliable fire detection system to detect fire at the earliest stage by means of point or aspirating type smoke detector is recommended.

**H) Transformers**

Transformers make sure that electricity is ready for network distribution. They function as links between the turbine, the turbine generators and the network. They consist typically of the transformer housing with a cooler, expansion deposits and oil filled insulators.

Electric generating plants use both indoor and outc^oor transformers, usually indoor transformers are relatively small, air insulated and used for individual plant service. Large oil cooled transformers used for main generator voltage step up and for station service are located outdoors. These transformers are usually grouped in an area close to the generator to minimise the length of the isolated-phase bus duct from the generator leads to the main power transformer.

The amount of cooling oil can range from 75000 to 94000 liters. Internal high energy faults can be violent, expending tremendous power, rupturing the transformer casing, releasing oil and subsequently igniting. There have been cases of a transformer fire propagating to the generator, or from the generator to the transformer, resulting two fires simultaneously.

***Fire Protection :*** Transformers with an oil capacity of 1900 to 19000 liters should be separated from adjacent transformers and from buildings by a minimum distance of 7.5 meters or by a fire wall. For best practice, installation should include lightning protection, a drainage system, fire barriers, and automatic

water spray extinguishing systems for controlling fire, limiting damage and minimizing plant downtime.

In modern generators, the system is provided that as soon as overheating is detected, the transformer will automatically de-activated in order to prevent a fire from breaking out.

## 3.15 Life Safety

Life safety consideration is a critical component of the overall design of a electric generating plant. In general, nationally adopted codes govern life safety design for both existing and new construction.

Coal fired electric generating plants are unique structures due to the equipment arrangement required for their operation, and maintenance. These equipment requirements often present challenges in designing for life safety and egress. Large enclosed boiler buildings can be upto 70-75M high and typically consist of multiple grating levels providing access to equipment for maintenance, inspection, testing and repairs. This arrangement requires a continuous vertical opening up to the boiler and in the event of fire, presents a potential smoke hazard to any personnel performing these operation.

In emergency situations, performance of emergency shutdown procedure often delays escape of control room personnel. Therefore, control facilities should have a means of escape separate from other plant areas. At many existing plants, the control room location is such that there is a serious risk of exposure to smoke heat and fire, because it is too close to likely areas of fire origin, such as the turbine generator. Adequate fire barriers and escape facilities are required.

### General Fire, explosion and Other Hazards in Coal Fired Power Plant

#### A) Fire Hazards

The following are the hazard in the thermal power plant having potential to cause a fire.

***a) Coal Handling Plant :*** Coal dust accumulation on conveyor decks, cable trays, head and tail pulleys, crasher house and vibrating screen floors, bunker house etc.

***b) Conveyor Belt System:*** Belt sway, belt tension, failure of belt joints, snapping of belt, partially damaged belt in operation etc.

*c) Smouldering coal in bunkers.*

*d) Jamming of idlers and pulleys.*

*e) Cables in cable galleries and on trays in plant section.*

*f) Coal dust deposited on cable trays in mill area.*

*g) Fuel oil handling and oil tanks (HSD, HFO, Patrol etc).*

*h) Storage and use of transformer oil, turbine oil, control flude etc.*

*i) Electrical system.*

*j) Heat path damaged insulation.*

*k) Dry grasses.*

*l) Accumulation of waste materials etc.*

**B) Explosion Hazard Area**

The following are the explosion hazard areas of the plant

*a) Hydrogen plant.*

*b) Turbo generators where hydrogen is used for cooling of generators.*

*c) Transformer (oil cooled).*

*d) Boiler (coal / oil fired).*

*e) Coal dust in mills and boilers.*

**C) Brusting Hazard of Pipelines, Vessels etc.**

The following are the areas of brusting of pipelines, vessels etc which may cause potential danger to the plant.

*a) Water / steam pipe due to high pressure / temperature.*

*b) Hydrogen gas cylinder and gas lines.*

*c) Acid / alkali tanks.*

*d) Compressed air header.*

*e) Compressed air receivers.*

*f) Hydrogen gas holders.*

**D) Release of Liquids, Gases and Dusts**

The following are the areas where release to liquid, gas dust can be expected which may cause danger situation in the plant.

*a) Acid and alkali tanks in water treatment plant.*

*b) Chlorine in water treatment plant.*

*c) Fuel oil tanks in fuel oil handling sections.*

*d) Turbine oil and seal oil leakage.*

*e) Hydrogen in turbo generator area of main plant.*

*f) Pulverized coal dust from mills and associated piping.*

*g) Fly ash from chimneys and ash ponds, hoppers and ash system.*

*h) Coal dust in transfer point, coal handling plant, crushers etc.*

*i) Fuel gas from the ducts.*

## 3.16 Inspection, Testing and Maintenance

Fires in the electric power generating plants can have costly and even fatal consequences. Yet, the operators of many plants have paid little attention to proper fuctioning of the fire suppression systems installed in the plant. As a result of which in many cases fire suppression systems fail to operate as expected in the event of fire and caused major destruction of the plant even loss of lives. This type of incident can be prevented with a good documented inspection, testing and maintenance programme, which will result in achieving reliability of the fire suppression equipment.

It has already discussed that fire hazards such as large quantities of fuel, combustible/ flammable liquids and gases, electrical hazards, combustible dusts and warehousing are common in the thermal power plants. A wide range of fire protection and detection systems is found in these facilities. These include fire pumps, hydrant networks, fire extinguishers and systems using sprinklers water spray, dry chemical, ! alon alternatives, carbon-dioxide etc and fire detection and alarm devices.

In addition, some people in charge of the fire protection from the plant side do not have an adequate knowledge of neccessary inspection and testing frequencies, or they use the minimum frequencies prescribed by their authority having jurisdiction. Fire protection and detection systems are a combination of mechanical and electrical components and, like power generation equipment need regular attention. There are few steps to be followed to carryout proper inspection and maintenance and determining the frequencies of testing for the fire protection systems in the electric generating stations. The steps are as follows :

A) The first step in establishing an inspection, testing and maintenance programme is to generate a list of all the fire protection and detection systems at the plant. These typically range from portable extinguishers to sophisticated fire detection and alarm system and automatic suppression systems.

B) Once this list is complete, plant management needs to decide which tasks will be completed by inhouse personnel and which will be contracted out.

This will depend on the number and complexity of the systems as well as the availability and qualification of the inhouse personnel.

C) The next step is to determine the fequencies of the tasks. The sources for determining frequencies include the local fire department, manufactures instructions, property insurance carrier etc.

D) Then a documentation system needs to be implemented. This can consists of paper forms, a computerized preventive maintenance programme or a modern barcode scanner system. Whichever method of documentation is chosen, the records should be reviewed by management for discrepancies, acceptability of the results and any problem noted. Tliis record should be filed in chronological order in an accessible location for review and use by other parties such as fire department, insurance companies etc.

Many fires can be prevented and damage can be minimise by improving the reliability of fire suppression equipment. An effective, documented inspection, testing and maintenance programme can help make sure that the system will not fail when it is mostly needed.

## Management Policy and Fire Safety Programme

A key element in a well protected plant for management is to establish a policy and follow through on a programme to protect lives, conserve property and ensuring continuity of operation. For an operating electric generating plant this includes.

a) A written plant fire prevention programme, i.e., control of combustibles, good housekeeping, hot works controls etc.

b) A fire emergency plan i.e., action to be taken for control a fire in different sectors, fire and evacuation drill procedures etc.

c) Inspection, testing and maintenance programme of all fire and life safety systems, equipment etc.

In all electric generating plants, an action plan should have to be formulated to ensure that all fire hazards are identified and appropriate strategies are establish to cope with those hazards.

The establishment of a plant fire brigade should be made after considering few variables. Some plants are located in areas remote from immediately available professional fire departments. For these plants, the establishment of a fire brigade may be neccessary. The trend in the power generating industries today is to reduce the size of the plant operating staff which obviously affects the pool of qualified personnel who can perform fire brigade duties. Some smaller plants even operate unmanned or with very few people on a shift. As such rigid automatic fire suppression system and stringent fire prevention activities on those situation are absolutely neccessary.

Fire fighters (plant fire brigade or local fire department) who are expected to respond to the electric generating plant fires should be trained in unique hazards that they could face.

# Unit - 4 ❑ Industrial Hazards

**Structure**



## 4.1 Fire Protection of Hazardous Industries

### Introduction :

The use of nuclear materials has continued to increased worldwide mainly for the production of electric power besides limited use for the purpose of medical, research, industrial, weapons operations etc.

The use and storage of nuclear materials present special fire protection concerns. Although the general fire hazard in facilities that use or store nuclear materials are the same as those of similar facilities that do not include nuclear materials, fires in nuclear facilities may have more significant consequences. Neccessary protection of the employees

and emergency response personnel against direct exposure to nuclear radiation is essential. Importance must be given to establish that general public and environment should not be unneccessarily exposed to radiation hazards.

The subject matter will be discussed in the following heading :

- Nuclear Reactor.
- Nuclear Safety.
- Fire Protection and Prevention.

## 4.2 Nuclear Reactor

A nuclear reactor is a device or assembly for initiating and maintaining a controlled nuclear chain reaction in a fussionable fuel (uranium or plutonium).

Nuclear reactors are used to produce energy, to study the fusion process, or to produce radioactive materials within the reactor. Basically nuclear reactors may be divided into two categories :

- Large nuclear power reactors, upto 3500MW or more.
- Research reactors that operate at power levels from a few watts to many mega watts.

  Nuclear reactors that include a contaminent vessel, generating equipment, and heat removal equipment can be as large as largest coal fueled electric generating plants.

  Objectives for achieving and maintaining adequate nuclear reactor safety include the following :

- Provide means to safely shutdown the reactor and maintain it in safe shutdown condition during and after accident conditions.
- Provide means to remove residual heat from the reactor core after reactor shutdown, including during and after accident conditions.
- Provide means to reduce the potential for radioactive releases within acceptable limit.

To meet these safety objectives, different reactors designs provide redundant safety

systems so that initiating events, such as fire, do not prevent safety systems from performing their required functions. The modern and advanced reactor designs include a high degree of safety system redundancy. Earlier designs of reactors include less redundancy, as such for those reactors the need to protect each system from the effect of fire and explosions increases. Improved passive fire protection, increased physical separation, and greater use of fire detection and suppression systems often provide this protection.

A higher degree of fire protection is neccessary to ensure that fire will not significantly degrade the level of nuclear safety. The "defense-in-depth" concept can achieve this safety. It includes three principle objectives :

- ***Preventing fires from occurring :*** It requires that plant design and operation be such that probability of fire is minimized.
- ***Detection and quickly extinguishing those fires that do start, thus limiting fire damage :*** This objective concerns early detection and extinguishing of fires by combination of automatic and/or manual fire fighting techniques and relies on active fire protection measures.
- ***Preventing spread of those fires, that have not been extinguished, thus minimizing their effect on essential plant functions :*** This objective places particular emphasis on passive fire barriers and physical separation. This is the last line of defence if the first two objectives are not met.

### 4.2.1 Power Reactor

Nuclear power reactors have many of the common and special fire protection hazards that are frequently encountered at large industrial facilities. Unique to nuclear power plants are fire consequences that could result in loss of ability to adequately cool the nuclear reactor or that could result in release of radioactive materials. Special attention must be paid in controlling fire hazards in nuclear power plants so that the nuclear safety risks are successfully managed.

### 4.2.2 Nuclear Safety

Safety performance goals, objectives and criteria can be used to implement an effective fire protection programme for nuclear power plants. Performance based or

deterministic approaches for nuclear safety can be used to meet performance criteria. The performance elements are summarized in the table below :

**Table 7A.1**

Performance **Based Approach to Maintain Nuclear Safety, Prevent Radioactive Release and Provide Life Safety**

| Subject | Goal | Objectives | Criteria |
|---|---|---|---|
| Nuclear Safety | Maintain fuel in safe and stable | ❖ Achieve and maintain sub critical conditions<br>❖ Achieve and maintain decay heat removal and inventory control functions.<br>❖ Prevent fule clad damage. | ❖ Prompt negative reactivity insertion to subcritical condition.<br>❖ Maintain coolant level to prevent fuel clad damage.<br>❖ Maintain sufficient heat removal to keep fule safe and stable.<br>❖ Maintain vital auxiliary support for nuclear safety criteria functions. |
| Radioactive Release | Reasonably prevent radiological release that adversely affects the public, plant personnel or the environment | ❖ Maintain containment integrity or<br>❖ Limit source term. | ❖ Radiological release as low as reasonably achievable and less than regulatory limits |
| Life Safety | Reasonably prevent loss of plant occupants due to fire. | ❖ Protect occupants not intimate with fire from loss of life and improve survivability of those intimate with fire. | ❖ Provide safe egress or area of refuge for occupants other than essential personnel. |

| Subject | Goal | Objectives | Criteria |
|---|---|---|---|
| | | AND<br>❖ Provide adequate protection for essential and emergency personnel | ❖ Provide adequate protection and lighting for essential personnel to perform neccessary functions. |
| Plant Damage | Assure acceptable risk of economic consequences | ❖ Limit property damage to levels acceptable to the operator of the plant<br><br>❖ Limit plant downtown to levels acceptable to the operator. | ❖ Limit the probable maximum loss (PML) due to fire to levels acceptable to the operator of the plant.<br>❖ Limit the plant downtime due to PML fire to levels acceptable to the operator of the plant. |

The performance based approach to nuclear power plant fire protection allows for innovative solutions that may be more risk-specific and risk effective than solutions developed through other approaches.

Beyond the effects that fire might have on nuclear safety functions, the fire hazards in nuclear electric generating stations include large volumes of combustible lubricating oils, concentrations of combustible cables, oil insulated transformers, and similar hazards that are common to all other electric generating plant which has already discussed in the portion of coal- fired electric generating plant.

## 4.3 Fire Protection and Prevention

Fires in any facility that store or use nuclear materials are particularly dangerous because of the hazards associated with nuclear radiation and contamination. In all types of nuclear reactors, a high degree of fire protection is neccessary to ensure that fire will not significantly degrade the level of nuclear safety. The primary goal of fire protection are,

- ❖ Preventing fires from occurring.
- ❖ Detecting and quickly extinguishing those fires that do start.
- ❖ Preventing the spread of those fire that have not been extinguished.

These goal can be achieved by plant construction design, a combination of automatic and / or manual fire fighting techniques, and passive fire barriers and physical separation.

**a) Planning for Handling and Controlling Fires**

The problems associated with plants using nuclear reactor, radiation machines and other facilities handling radioactive materials are not those types of problems that can be solved by simply calling the public fire department. In any facility handling radio active materials, emergency planning and coordination with the local fire department are essential. The planning should consider the following :

a) The areas where special attention is neccessary must be identified and the procedures to the followed for those special should be thoroughly understood by all plant / facility personnel.

b) Provisions for prompt notification of any fire incident through a reliable fire detection and alarm system.

c) Measures to prevent the spread of contamination and to promptly decontaminate the area in case of accidental release of radioactive substances.

d) The plant fire protection department must preplan fire fighting operation with the local fire department so that they will the properly coordinated with the plant's own emergency plants.

e) Fire fighters and other emergency personnel operating in areas where radiation exposure is a danger must be fully trained and be provided with suitable protective clothing including respiratory protective equipment.

f) Competent radiological advisors, equipped with instruments for measuring area and local exposure, are neccessary to guide emergency personnel.

g) A nuclear reactor site must have a generous water supply to facilitate fire control and decontamination operations. Facilities also must be pre-arranged for safe disposal or storage of water that may be contaminated.

h) The use of non-combustible materials for reactor buildings and equipment will help to avoid complications of fire hazards. For example, all finish materials

used for decorative, acoustical, or insulation purpose, should be both non-combustible and easy to decontaminate.

i) All equipment used for handling and processing radioactive materials should be designed to minimise fire and explosion potentials, as well as to protect the personnel against harmful radiation exposure and prevent damage to property by contamination.

j) The hazard of a reactor structure exposing other building to radiation should be prevented by appropriate distance separation or fire barriers.

k) Wiring ducts in floors introduce an opportunity for fire or contaminated liquid or gas to spread from one space to another. Good duct seals separate one space from another.

l) The operations for the preparation of fuel element for reactor should be carried on in work areas separated from the reactor so that fire cannot reach the reactor space.

## 4.4 Fire Fighting Equipment

Automatic sprinkler systems or specially designed piped water spray system (watermist, high velocity water spray etc) are the first choice for fire protection in any location where fire may occur in nuclear reactor plant, properties housing radiation machines, and facilities handling radioactive materials. Sprinkler can operate with full effectiveness under radiation or contamination conditions that would make approach by fire fighter impossible.

In spaces where water used in fire fighting is subject to possible contamination, as such, the collection and disposal of this water must be provided in the facilities, which means the facilities should have water proofed floors and controlled floor drainage of substantial capacity.

In some facilities where liquid metal is sued as a reactor coolant / moderator, water should not be used which requires special extinguishing systems like inerting with any inert gas like argon, nitrogen etc.

Provisions of hand hold water jet system, hose-reel system, fire extinguishers etc also have to be provided in the facilities for fighting small fires or if the fire turned uncontrolled due to explosion or collapse etc.

## 4.5 Hydroelectric Plants

Hydroelectric plants do not posses many fire hazards common to coal fired generating plants with respect to combustible fuels and large pressurised lubrication oil system that operate under high pressure. On the other hand, hydroelectric plant present unique fire protection challanges, the most common are life safety (particularly when facilities are several hundred feet below ground level), use of oil filled cable and grouped electric cable, minimum staffing or un-attended operations, transformer exposure, use of hydraulic control and lubrication oil system for pen stock or wicket gates and use of generator windings.

### 4.5.1 Fire Protection

In general, carbon dioxide fire protection systems have been commonly used to protect hydroelectric generators. However, there are widespread efforts in the international hydro tactic industry to replace these systems.

In some instances, the trend is to replace carbon dioxide system with deluge water spray or water mist systems. This addresses a grass-roots life safety concern with the use of carbon dioxide in below grade area as it is heavier than air gas, and addresses a nationwide effort to reduce green house gas emission. In the water spray system, generally a water ring header is installed above and below the rotor, with nozzles and orifices directing water towards the stator windings. Flow rates depend on iK diameter. Sophisticated interlocks and protective relays ensure that all fields in the generator are de-inergized prior to water flow. Windage inside the rotating generator helps convert the spray to fine mist to penetrate deep seated insulation fires.

In some instances, the trend is to replace carbon dioxide with FM 200 or ine gen. This addresses a life safety concern with the use of carbon dioxide which c >u: migrate to potentially occupied spaces.

However, the implementation of extinguishing system and agent depends upon tht suitability, acceptability, funding etc of the plant and operator.

p) The floor of the manufacturing area should be water proofed. When flammable luqids are stored or used, it should be curved and drained to a point of safe discharge to safeguard property and to prevent against damage by overflow of flammable liquids or by water in the event of fire.

q) The various areas should be separated by fire walls to provide the following :

i) Raw and semifinished material storage area. ..

ii) Moulding, extrusion, or processing area.

iii) Finished material storage, and

iv) Maintenance and utilities area.

r) In order to properly ventilate a room where manufacturing processes are carried out involving flammable vapours or combustible dusts, air intakes and outlets should be provided in the compartmentation wall on the location befitting for the particular chemicals.

s) Exhaust fans should be provided to remove flammable vapours and combustible dusts from inside the building to the outside in a manner to prevent drift back into the building through air intake equipment of the building.

### 4.5.2 Electrical Installations

The following electrical safety measures should be incorporated in the electrical distribution system in the chemcial plants.

a) All electrical installations should be in accordance with IS : 1646-1982 and there shall be separate sources of supply to main and ancillary connections.

b) All electrical motors and lighting fittings, and switches should be flameproof and dust proof in hazardous areas as defined in IS : 5572 (Part-I)-1978.

c) Provision should be made for remote control of all electrical circuits, so that the current for lighting and power in the building and facilities can be switched off by switches outside the building at a distance of 1.25m from the nearest doorway. Provision may also be made for switching off the whole factory by switecbes located at one or more central points, such as the office or wachman's cabin.

d) Electrical switches should not be mounted on any machine which produces vibration, while in operation.

e) All incoming feeders from main substation should be through underground cabas.

f) Emergency power supplies system should be provided for adequate supply of power to all emergency lighting, cooling tower, fire pumps, means of escape and other equipment required for safe shut down of the plant.

### 4.5.3 Control of Spills

As chemical plants process larger quantities of materials, it becomes impractical to provide ever-increasing separation of units. Where toxic, flammable, reactive or otherwise hazardous materials may be spilled, the logical approach is to :

- ❖ Minimise the possibility of uncontrolled spills.
- ❖ Minimise the size of the possible spills. If spills do occur, the design features should keep them small.
- ❖ Minimise the spread of possible spills. If spills are large in volume, design features should keep them confined.
- ❖ Prepare alarm and evacuation plans, if toxic release can occur.
- ❖ Control sources of ignition.
- ❖ Provide protection for exposed propetly, if ignition does occurs.

Large flammable liquid spills should be confined where they may occur. Although diking is often used, it may not prevent liquid around the spill source from burning. Equipment may be damaged further or the spill aggravated unless effecient, prompt and preferably automobile fire control measures are taken.

A number of means are available to control spills, few such techniques are state below :

a) To provide diking or curbing to restrict the spread of spill.

b) To provide drainage to an impounding basin located where a fire, if not extinguished, can burn out harmlessly or a non burning toxic material can be appropriately neutralized.

c) Total confinement of a large flammable gas or vapour spill is not possible, due to gaseous nature of the spill. The use of water spray, using either a fixed sprinkler or water spray system with monitor nozzles (in some cases remotely controlled) to wash out the vapour from the atmosphere is the answer. This method is most appropriate for vapours that are water soluble and also for liquids that can be expected to be released as a mist.

d) Steam frogging systems have also been used to help dissipate vapour release in plants where a large steam supply is always immediately available for this purpose,

e) Foam may be applied to cover the liquid spill so as to restrict the vaporisation

of the liquid, carefully considering the physical and chemical properties of the liquid to make sure that the foam is compatible.

Flazardous spills can be kept small by keeping the amount of hazardous materials used in the process small. Where this is impractical, valves to isolate all large quantities of material should be provided. These valves should be installed at each outlet of any large container through which material might escape accidently.

The Distinction between a small spill and a large one must be fixed individually for each plant. A small spill is one that can easily handled by the exposure protection and confinement means. All others are large spills.

### 4.5.4 Storage and Handling of Materials and Processing Safety.

In the chemical industries, proper storage practice and correct handling of hazardous materials demand prime importance to achieve adequate fire safety in the plant.

There are hundreds of such safety requirements in the chemical plants, few important of which are highlight below in accordance with IS : 11457 (Part-I)-11985.

a) Solid materials should be stored in outside areas provided no hazardous chemical reactions occur due to moisture or direct sun.

b) Bulk storage of combustible, whether raw materials or finished products should be kept separate from manufacturing areas.

c) Only minimum materials required for batch or shift operation should be stored in work areas.

d) Vessel used for storage of products having a flash point below 65°C should be vented to the outside of the building.

e) If should be ensured that no flammable liquids or vapours can be present in the buildings or sections used for storage of combustible materials.

f) Flammable liquid drum storage should be located atleast 20m from all buildings and other storage unless separated therefrom by solid masonary walls.

g) Access drives and areas in the vicinity of the drum storage should be smoothly paved to prevent absorption of flammable liquids. Drums should be stocked at intervals of 5m of separations to permit effective approach.

h) All combustible open storage areas should be'fenced and openings should be provided for fire fighting purposes.

i) Outdoor storage areas should be graded to drain spills away from building and

other exposures. Catch basics should be flame trapped to prevent flame travel or ignition in exposure areas.

j) Flammable liquid tanks should be surrounded by bundwalls or dykes of sufficient height to contain the entire contents in case of rapture. Adequate drainage facility should be provided to carry liquid to some areas where it can burn without endangering adjacent buildings or other storage/structure.

k) Tanks should be substantially supported either by resting on the ground or on massonry supports. Full or particial underground tanks are preferable.

l) All openings to the tanks except required vents should be kept securely closed. The vents open to atmosphere should be fitted with flame arrestors or pressure vacuum vents. Each tank should be clearly marked regarding its capacity, flammability and nature of contents. All tanks should be suitably earthed to dissipate static charge.

m) safety containers with anti-flash device and self closing spouts (safety cans) should be used. Open containers should not be used.

n) Durms of solvents should not be stored in working areas.

o) Exhaust fans should be provided to prevent excessive accumulation of dust. When visible in air, it is to be considered as excessive.

p) Storage of volatile chemicals such as benzene, toluene, ethyle accetate etc are highly hazardous to cause fire and explosion which should be stored in, buildings with ventilation both floor and roof level.

**Processing Safety**

a) Effective cooling arrangement should be provided for removal of heat in the process or operations where heat is likely to be generated to prevent combustion of materials.

b) Provision should be made to control temperature with trip set for a predetermined temperature with alarm.

c) To reduce dust in atmosphere, a dust removal or exhaust system should be provided with hoods located at each operating point where dust is released.

d) All equipment such as hoppers, storage bins, collectors, conveyors, ducts, grinders and blenders should be dust tight.

e) All material separation chambers and dust collectors should be located outside the building.

f) No open flame, naked light, smoking, electric or gas cutting and welding should be permitted within the building containing equipment fdr different chemical process or in flammable tankage areas.

g) All hot work that is welding, cutting, grinding etc which can provide a source of ignition should be conducted only after observing safety controlled conditions with written approval from appropriate authority.

h) All equipment should be earthed to ensure effective dissipation of static charges.

### 4.5.5 Fire Protection, Detection and Suppression Systems

The fire safety assessment for individual chemical plant shall determine the type of active and passive fire protection system required for that plant. Fire water systems comprising fire water reservoir, fire hydrants, water spray systems, deluge systems, sprinkler systems, fire water monitors are common features that installed in larger facilities. Such systems are activated once the information is received from the scene of the fire that protection is required.

For quick extinguishment of small fires, dry chemical extinguishers are used. Other agents such as foam, steam and carbon-dioxide are also used to provide extinguishment capability.

Similarly careful use of fire resistant materials, such as fire proofing, fire rated cables and heat resistant wiring, can help to prevent a fire from spreading and limit its

damage.

Typically fire proofing is provided for critical structures, vessel and column skrits and supports, exposed pipe-rack columns and control wirings and power cables neccessary for safe plant shut down.

While designing fire protection and suppression system in the chemical industries, the following systems and arrangement should be considered to achieve a reasonable fire safe condition in the plants. These are :

A) Fire Water Supply.

B) Fire Water Pumps and Fire Water Mains.

C) First Aid Fire Fighting Extinguishers.

D) Fire and Gas Detection Systems.

E) Some Other Fire Protection Requirements.

## Fire Water Supply

Based on the high risk, adequate supply of the water is-the back bone of fire fighting operations in chemical industries.

The purpose of a fire water distribution system is to guarantee the supply of sufficient water for the prime purpose of fire control and possibly extinguishment at the desired pressure and discharge in the required area. The reliable water supply should, therefore, have following charecteristics.

- ❖ Instantaneous availability at all the points in the plant area.
- ❖ Enough quantity with sufficient pressure.
- ❖ Reliability and continuity.

The capacity of the water storage facilities shall be sufficient for the expected duration of the fire. The storage capacity can be determined with account being taken of periodic maintenance requirements of the fire storage facilities and the available reliable replenishment rates during fire water consumption at maximum flow rate.

In cases where the fire scenarios are not clear or where a longer duration fire can not be excluded, a minimum of 3 hours to 4 hours (depending upon size and chemical proccessed) uninterrupted water supply at maximum required rate shall be provided. It is strongly recommended that water storage facility for fire water and process water should be kept separate. If combined, however, arrangement shall be made so that quantity of water reserved for fire fighting purpose can not be drawn upon for any other purposes. The segregation should be achieved by physical means and not by instrumentation like level switch etc.

## Fire Water Pumps and Fire Water Mains

### *a) Fire Water Pumps*

The capacity of fire water pump/pumps should be worked out on the basis of requirement of water supply for fire fighting for atleast one major fire in the plant. The capacity of the pump should be such that it will continue to supply water for fire fighting at the rated capacity without any interruption at a minimum pressure of 7kg/cm$^2$. Provision of jockey pump(s) shall be made to keep the water main under pressurised condition at desired pressure.

Fire water shall be prvided by atleast two identical pumps, each of which is able to supply the largest required flow rate to the fire water ring mains system. Another better alternative with higher reliability is the installation of three identical pumps, each able to

supply 50% of the largest required flow rate.

The fire water pumps shall be installed in a location which is considered to be safe in the event of fire anywhere in the plant, where it is unlikely to be engulfed in an explosive vapour cloud originating in the plant.

Pumps drivers should preferably be electrical driven with same number of stand by diesel driven pumps. Alternative emergency power supply can be supplied to part of the pumps.

***b) Fire Water Mains***

Fire water ring mains of the required capacity shall be laid to surround all processing uni ts, storage facilities of flammable materials, loading and unloading facilities, process filling facilities, tanker berthing area, utility, process laboratory etc. The ring main shall be provide with block valves so that sections can be isolated for maintenance. The main shall be laid underground with carbon steel pipes with suitable protection against corrosion and duly protected below roads against damages by moving automobiles. Few important requirements of the ring main fire water system is state below :

i) Fire water main should preferably be minimum of 150 mm in diameter.

ii) No pressure regulating valve should be permitted except where it is absolutely neccessary.

iii) Fire water system should be independent and not connected to process water systems or any other water supply system.

iv) Standard fire hydrant with two outlets for hose connection of 63 mm size should be installed with not greater than 30m spacing between the fire hydrants. The distance requirement between hydrants can be relaxed to 45m for auxiliary building, laboratory etc and relatively less hazardous plants.

v) Suitable type of water spray system shall also be provided to the storage tanks so that the exposed to radiate heat due to fire in nearby vicinity, can be easily protected from the threat of fire.

vi) Supplementary fixed water monitor protection for cooling of vessels is highly recommended.

vii) Highly exposed critical pipe racks, valve manifolds, control equipment shall also be protected with water spray system.

viii) Monitors and fire hydrants should not be closer than 7.5m from plant equipment, buildings or structures.

**First Aid Fire Fighting Extinguisher**

Portable fire extinguishers shall be provided to enable operating personnel to quickly attack small fires. They shall be located at process, areas, storage areas, loading racks, pump area, compressor houses, electrical equipment and similar facilities etc. Scale of extinguisher at those areas are stated below :

**Table 7E.1**

**Scale of Fire Extinguisher in Chemical Plants**

| Sl. No. | Description of Extinguisher | Location/area to be protected |
|---|---|---|
| (a) | Dry chemical powder fire extinguishers of 10kg capacity. | At process units, pump houses, chemical storage area, tank truck/tank wagon loading and unloading area, electrical equipment, transformer, substation, work shop, laboratory etc. |
| (b) | Dry chemical powder fire extinguishers of 25/50/75 kg on wheels. | At critical operating areas, chemical storage house etc. |
| (c) | $CO^2$ extinguishers of 4.5 kg or 6.8/9.0 kg on wheels. | At sub-station and power station, all other electrical and electronic equipment room etc. |

- The number should be determined based on the maximum travelling distance of 15m in the area as mentioned in the (a).
- Atleast one fire extinguisher of 10kg DCP type should be provided for every 250 $cm^2$ of hazardous operating areas.
- Atleast one 25/50/75 of DCP fire extinguisher shall be provided for every 750m2 of the hazardous operating areas.

## Fire and Gas Detection Systems

Fire and gas detection system in all types of chemical industry is a must as the f rst line of defence against fire and explosion hazards. Detection and alarm systems provide prompt detection of a potential hazardous condition. At the same time, prompt detection provides time by notification of personnel, activation of automatic fire suppression and control systems during the early stages of an incident, thereby minimizing the impact of the fire.

A gas detector is designed to give a warning of the presence of flammable or toxic gases or vapours in air, well before they reach dangerous concentrations. Normally, the detector provides visible and audible alarm signals, but frequently it also performs a further action by imitiating control action such as increasing ventilation, shuting of sources of gas etc.

Fire detection system operates faster than the gas detection system. However both fire and gas detection system shall be considered in major chemical plants.

The areas in any chemical plant where gas and fire detectors should be provided with other details are stated below :

**a) Gas Detection System**

Spot type detectors should be installed is areas where there are potential leak sources like pumps, compressors, tank car and tank truck facilities, control rooms and air inlets in the vicinity of potential large flammable gas releases, ditches, trenches, sumps and other low points where heavy flammable vapours cloud accumulate. Gas detection systems should also be used for emergency functions like shut down of processes, activation of emergency ventilation etc.

The gas detectors should be located in accordance with the manufactures instructions. Regular checking of recorded callibration and maintenance is important to keep the system functional.

**b) Fire Detection System**

Fire usually begin small. Therefore specially in chemical factories dealing with highly flammable and combustible materials, it is very important to detect a fire as quickly as possible so that immediate action'can be taken. In case of a fire, the actions taken in the first minute are the most important to avoid a large fire with consequent injury to personnel and damage to equipment. In areas with low manning level (automated plant) automatic fire detection and alarm system is manditory.

The processing areas, storage areas, all pumping facilities, offices and other important areas alongwith ventilation and air conditioning ducts etc should be provided with automatic fire detection system and should comply with relevent local laws, regulations, guidelines and standards.

## Some other Fire Protection Requirements

a) The foam water spray system comprising of foam induction unit in the distribution piping and foam water spray nozzles shall be provided in the areas and equipment where oil fire is expected, with local and remote (control room) operation.

   The fire safety assessment shall determine the required foam-water application rate and duration. Typically, an application rate of 6.5 to 7m3/min/m2 for the floor surface area to be protected, shall be maintained for duration of 30 minutes.

b) While designing gaseous extinguishing systems, the fire safety assessment shall determine the type of extinguishing agent, the spaces to be protected by each system and the methods of activating the system. Only extinguishing agents which do not have a negative impact on environment, non toxic to humans, and those who are not electrically conductive shall be applied in the system. Gaseous extinguishing systems are only effective in enclosed or semi-enclosed spaces of the plant.

   i) Carbon-dioxide system shall be provided for total flooding of enclosures such as those of gas turbines. The system shall be automatically activated by gas or fire detector and must have extensive safeguards built in to ensure the safety of the personnel present in the enclosure.

   ii) Inert gas system shall be provided to prevent the creation of flammable conditions inside equipment normally containing flammable products, such as vapour space of storage tanks.

   iii) Steam from the fixed steam system can be used to smaller fires, to dilute gas/ air mixtures in enclosed areas, to control flange fires in plants and on equipment handling flammable products at or above their auto-ignition temperature.

c) Some and heat venting system must be installed in the chemical plant specially at the process area, storage area and all other enclosed hazardous areas of the plant. The opening of these vents should be automatic with local or remote (control room) operation and should be independent of general electric power.

d) Explosion protection safeguards shall be provded the areas where flammable liquids and /or gases are stored and handled including combustible dusts in accordance with the standard norms and requirements for the system.

e) Sprinkler installation in high piled storage should be hydraulically balance with

adequate water supply together with automatic roof venting. The sprinkler heads shall have adequate discharge for controlling fires.

f) Self contained breathing apparatus should be kept readily available for personnel safety as most of the chemicals on fire produce heavy smoke containing toxic gases such as carbon monoxide, hydrocyanic gases, nitro fumes etc. Operating personnel should be trained for use of breathing apparatus.

g) "No Smoking" and "Fire Orders" containing what to do incase of fire in large letters on a back ground of contrasting colours should be conspicuously displayed in all hazardous areas of the plant.

h) Boards indicating name and stock of flammable/hazardous materials should be displayed at places accessible from outside at all tanks and storage houses.

## 4.6 Passive Fire Protection Measures

Although adequate fire protection is provided in an installation, passive fire protection measures as indicated below should be adopted wherever required to minimise the chance of fire and also to restrict the spread of fire of the adjoing areas.

a) Fire proofing of structural members.

b) Spark arrestors and flame arresters.

c) Fire separation walls in concealed space/electrical substations/transformer yard / bays / cable galleries.

d) Fire seals in underground sewer system / flare knockout drum,

e) Impounding basins / dyke walls,

f) Lightening arrestor.

g) Pressurisation of enclosure.

h) Venting facilities of process equipment.

i) Electrical relays and fuses, earth leakage circuit breakers, neutral current circuit breakers.

j) Fire retardant coatings and tapes for cables.

k) Fire resistant low smoke (FRLS) insulation cables.

l) Flame proof and flame resistant electrical equipment and enclosure.

# Paper 2
# Security Operational Skills

# Unit-1 ❑ Introduction, operating skill requuired for planning crisis (Management)

**Structure**



## 1.1 Objectives

**Crisis Management team primarily focuses on:**

- ❖ Detecting the early signs of crisis.
- ❖ Identifying the problem areas
- ❖ Sit with employees face to face and discuss on the identified areas of concern
- ❖ Prepare crisis management plan which works best during emergency situations
- ❖ Encourage the employees to face problems with courage, determination and smile. Motivate them not to lose hope and deliver their level best.
- ❖ Help the organization come out of tough times and also prepare it for the future.

**Crisis Management Team includes:**

- ❖ Head of departments
- ❖ Chief executive officer and people closely associated with him
- ❖ Board of directors
- ❖ Media Advisors
- ❖ Human Resource Representatives

The role of Crisis Management Team is to analyse the situation and formulate crisis management plan to save the organization's reputation and standing in the industry.

## 1.2 Introduction

Crisis management is a situation-based management system that includes clear roles and responsibilities and process related organisational requirements company-wide. The response shall include action in the following areas: Crisis prevention, crisis assessment, crisis handling and crisis termination. The aim of crisis management is to be well prepared for crisis, ensure a rapid and adequate response to the crisis, maintaining clear lines of reporting and communication in the event of crisis and agreeing rules for crisis termination.

The techniques of crisis management include a number of consequent steps from the understanding of the influence of the crisis on the corporation to preventing, alleviating, and overcoming the different types of crisis. Crisis management consists of different aspects including:

- Methods used to respond to both the reality and perception of crisis.
- Establishing metrics to define what scenarios constitute a crisis and should consequently trigger the necessary response mechanisms.
- Communication that occurs within the response phase of emergency-management scenarios.

Crisis-management methods of a business or an organization are called a crisis-management plan. A British Standard BS11200:2014 provides a useful foundation for understanding terminology and frameworks relating to crisis, in this document the focus is on the corporate exposure to risks in particular to the black swan events that result in significant strategic threats to organisations. Currently there is work on-going to develop an International standard.

Crisis management is occasionally referred to as incident management, although several industry specialists such as Peter Power argue that the term "crisis management" is more accurate.

A crisis mindset requires the ability to think of the worst-case scenario while simultaneously suggesting numerous solutions. Trial and error is an accepted discipline, as the first line of defense might not work. It is necessary to maintain a list of contingency plans and to be always on alert. Organizations and individuals should always be prepared with a rapid response plan to emergencies which would require analysis, drills and exercises.

The credibility and reputation of organizations is heavily influenced by the perception of their responses during crisis situations. The organization and communication involved in responding to a crisis in a timely fashion makes for a challenge in businesses. There must be open and consistent communication throughout the hierarchy to contribute to a successful crisis-communication process.

The related terms emergency management and business continuity management focus respectively on the prompt but short lived "first aid" type of response (e.g. putting the fire out) and the longer-term recovery and restoration phases (e.g. moving operations to another site). Crisis is also a facet of risk management, although it is probably untrue to say that crisis management represents a failure of risk management, since it will never be possible to totally mitigate the chances of catastrophes' occurring.

**Types of Crises**

During the crisis management process, it is important to identify types of crises in that different crises necessitate the use of different crisis management strategies.151 Potential crises are enormous, but crises can be clustered.

Lerbinger categorized eight types of crises

1. Natural disaster
2. Technological crises
3. Confrontation
4. Malevolence
5. Organizational Misdeeds
6. Workplace Violence
7. Rumours
8. Terrorist attacks/man-made disasters

**Natural Disaster**

Natural disaster related crises, typically natural disasters, are such environmental phenomena as earthquakes, volcanic eruptions, tornadoes and hurricanes, floods, landslides, tsunamis. storms, and droughts that threaten life, property, and the environment itself.

Example: 2004 Indian Ocean earthquake (Tsunami)

**Technological Crisis**

Technological crises are caused by human application of science and technology. Technological accidents inevitably occur when technology becomes complex and coupled and something goes wrong in the system as a whole (Technological breakdowns). Some technological crises occur when human error causes disruptions (Human breakdowns151). People tend to assign blame for a technological disaster because technology is subject to human manipulation whereas they do not hold anyone responsible for natural disaster. When an accident creates significant environmental damage, the crisis is categorized as *megadamage*. Samples include software failures, industrial accidents, and oil spills.™

Examples: Chernobyl disaster. Exxon Valdez oil spill, Heartbleed security bug

**Confrontation Crisis**

Confrontation crisis occur when discontented individuals and/or groups fight businesses, government, and various interest groups to win acceptance of their demands and expectations. The common type of confrontation crisis is boycotts, and other types are picketing, sit-ins, ultimatums to those in authority, blockade or occupation of buildings, and resisting or disobeying police.

Example: Rainbow/PUSH's (People United to Serve Humanity) boycott of Nike

**Crisis of Malevoience**

An organization faces a crisis of malevolence when opponents or miscreant individuals use criminal means or other extreme tactics for the purpose of expressing hostility or anger toward, or seeking gain from, a company, country, or economic system, perhaps with the aim of destabilizing or destroying it. Sample crisis include product tampering, kidnapping, malicious rumors, terrorism, and espionage.

Example: 1982 Chicago Tylenol murders

**Crisis of Organizational Misdeeds**

Crisis occur when management takes actions it knows will harm or place stakeholders at risk for harm without adequate precautions. Lerbinger specified three different types of crises of organizational misdeeds: crises of skewed management values, crises of deception, and crises of management misconduct.

**Crises of Skewed Management Values**

Crises of skewed management values are caused when managers favor short-term economic gain and neglect broader social values and stakeholders other than investors. This state of lopsided values is rooted in the classical business creed that focuses on the interests of stockholders and tends to disregard the interests of its other stakeholders such as customers, employees, and the community

Example: Sears sacrifices customer trust

**It has 3 stages** -precrisis -acute -chronic and -conflict resolution

**Crisis of Deception**

Crisis of deception occur when management conceals or misrepresents information about itself and its products in its dealing with consumers and others.

Example: Dow Coming's silicone-gel breast implant

**Crisis of Management Misconduct**

Some crises are caused not only by skewed values and deception but deliberate amorality and illegality.

**Workplace Violence**

Crises occur when an employee or former employee commits violence against other employees on organizational grounds.

Example: DuPont's Lycra

**Rumors**

False information about an organization or its products creates crises hurting the organization's reputation. Sample is linking the organization to radical groups or stories that their products are contaminated.

Example: Procter & Gamble's Logo controversy

## 1.3 Operating Skills for Media Interactions

- Each team member must be trained with regard to Media Relations because any wrong information or rumor relating to any security aspect or incident can endanger lives and create emotional distress .
- There must therefore be an Official spokesperson at the scene to ta/k about a security incident and issue a statement to the media regarding a security related incident.
- Only information cleared by the Local Team Leader should be released by the Official spokesperson. Live interviews should be avoided.
- In the event of death or injury, no figures should be disciosed without clearance from the Controlling Officer.

## 1.4 Operating Skills for Crowd Control Management

- Introduction
- During a crisis, we often find unauthorized people assembling and occupying a place. We aiso see groups of persons crowding a place trying to draw attention to a particular cause or grievance.
- Sometimes the crowd tries to protest and draw attention to an issue.
- In this Chapter, the Security Personnel shall be taught how to skiiffuiiy manage large group of people and safeguard lives and properties during civil unrest and commotion.

- We must first know, what is a Crowd.
- A Crowd is a lawful' gathering of people who are not hostile, aggressive and unruly.
- On the other hand, a crowd which is hostile, aggressive ,unruly and has gone out of control is called a Mob.
- A mob does not have a good motive, it can be a motive to kill, or a motive to loot or rob or otherwise it may be a crowd which is not hostile but runs helter shelter in order to escape from any untoward inddent/situation.

## Guiding Skills for Crowd Control

- The cardinal rule for Crowd Control are :
- A ) Plan action in advance through Warnings, announcements, public awareness etc. so that precautionary measure can be taken before hand This is caiTed Pre-emptive action.
- B) Talk and negotiate with the representatives of the Crowd or know their grievances and reasons for protest and unrest This is called Defusing a tensed situation.
- C) Arrange for adequate Security and protection by Police or other authorized forces in order to restrain , isolate and contain the crowd. This Is called containing trie crowd.
- The Primary task for the Security personnel would be to Assess the crowd /mob in the foiiow manner
- Judge the size and strength of the crowd / mob.
- Study the mood and intention or the crowd
- Find out if the crown is calm or are trying to move ahead
- See if any weapons or harmful objects are noticeable in the crowd
- Assess if there is danger to life and property
- Ask for heip from Police and the local administration
- On the basis of the above assessment, the Security personnel must analyze the crowd psychology before taking a decision about the next course of action. Crowd unrest can occur if:
- People do not know what is happening or something that has already happened.

- People get restless and impatient awaiting a result
- There are persons who intend to cause harm, injury or sabotage
- The people managing the crowd misbehaves or instigates the crowd and hurts their sentiments.
- Now, the stage is reached where the Security Management must frame its strategies in order to ensure that the crowd does not get out of control. The following skills must always be kept in mind:
- Make the community aware about the crowd and the ensuing tension
- Train the community members to form small Groups or clusters and position tbemseives at strategic locations to fend themselves if needed
- Meet the ieaders from the crowd and talk to them and know their intentions. Remember to give them due respeci and dignity.
- If confronted with a hostile crowd, face them with self- confidence and discipline.
- Always avoid harsh or aggressive eye contact or body language and never offend the opposition and make him feel that you are afraid, nervous or are angry and you intend to cause them harm.
- Arrange to send feed back to all people in the Community Groups so that they do not get tensed and scared not knowing what is happening. That will help the community to take right decision as the situation demands.
- Security personnel inside a vehicle should lock their doors and windows and try to drive off to a safe place.
- At a distribution event, where a crowd awaits the function to begin, always check that the quantity available for distribution is sufficient as against the number of recipients assemble for receiving.
- In case an untoward incident is anticipated, never take a chance. Always inform the police or arrange for adequate skilled Security personnel.
- Always try to make the crowd members sit down first and then caii selective representatives for discussion and negotiation.
- Remember, never to engage in any aggressive or hot discussions and always make the opposition feel that their grievances and message during their protests shall be heard and dealt with properly. A bad handling of a crowd can turn the crowd into a Mob.

- ❖ Therefore, in a nut shell, a crowd should be managed by Non-violent means, with the help of local security, through negotiation with a handful of representatives from the crowd and by not allowing them enough time and scope.
- ❖ Unarmed Security personnel should deal with a crowd untii the situation demands deployment of armed personnel' as a iast resort.
- ❖ Efforts should always be made to build mutual faith and respect between the Authorities and the Crowd leaders who are protesting or demonstrating.

## 1.5 Operation skills for crowd control management

### Introduction

As the Task Force sought information on crowds and public safety, it became increasingly clear that the primary factor in assuring a safe and comfortable environment for large crowds is the planning for their management. There is considerable emphasis in this report on crowd management planning and implementation because the Task Force believes that it is the key to providing safe events in Cincinnati.

Crowd management must take into account all the elements of an event especially the type of event (circus, sporting, theatrical, concert, rally, parade, etc.), characteristics of the facility, size and demeanor of the crowd, methods of entrance, communications, crowd control, and queueing. As in all management, it must include planning, organizing, staffing, directing and evaluating. Particularly critical to crowd management is defining the roles of parties involved in an event, the quality of the advance intelligence, and the effectiveness of the planning process.

### Crowd Behavior

**A. Crowd Actions :** To have an effective plan, facility management must be aware of the characteristics of the audience attracted by a particular event. Once the facility operator, police commander and event promotor know their crowd they must plan accordingly. Sociologist Dr. Irving Goldaber has pointed out that the way patrons perceive the environment and the various "sociological signals" they receive at an event whether consciously or unconsciously can escalate or de-escalate patron emotion and influence their behavior. For example, the general attitude of the facility staff and of the interior and exterior security and law enforcement personnel, as well as the promulgation and enforcement of patron house rules combine to produce additional "signals" to influence patron behavior. Other "signals"

include reliable door opening policy and truthfulness in communicating about alterations in event programming. When people are informed of changes and delays and the reasons for them, they can more readily accept those delays. While patrons are waiting, the provision of necessary comforts becomes crucial and can diminish discomfort and impatience.

Hundreds of thousands of events are held nationally and few, if any, have problems. But unquestionably, new and unexpected difficulties have been arising. In major cities, for example, some police officers have informally estimated that at any one time anywhere from one half to two percent of the spectators at sporting events are carrying handguns. Dr. Goldaber speaks of four types of conditions that can create crowd management problems:

1) Problems created by a crowd from within;

2) Problems created for a crowd from outside;

3) Environmental catastrophe; and

4) Rumor. These threats must be considered by those responsible for managing crowds.

**B. Public Education :** Schools, governmental and social service agencies have prepared us to confront many situations which pose serious threats to our personal safety. Fire drills teach effective escape procedures; driver educations courses encourage safe driving; and first aid, saving lives. Yet, there is little to guide the public to anticipate and respond to danger signals in crowds. Education about crowd dynamics and the role of individuals in crowds is sorely needed on a national basis. The consequences of the various modes of individual and groups behavior should be afforded equal importance with other safety programs by governmental, educational, and public services agencies. It is time to include this safety concern with others taught to the public.

The media can also play a significant role in public education by promoting special features, programs, and public service announcements relating to crowd safety and personal and group responsibilities. They can help discourage present safety hazards at large events such as the use of open flames and firecrackers. They can also monitor the crowd management techniques of facilities at indoor and outdoor events for their audiences. Facilities, too, can educate the public by publicizing and enforcing their house rules and by setting a courteous, professional level of conduct for their staff.

## Drugs and Alcohol Abuse

Drug and alcohol abuse is a national crisis, not just a problem at rock concerts. That recognition does not, however, diminish the problem at rock concerts and at other events where patrons use illegal drugs or abuse alcohol. The complex and overwhelming task of

enforcing drug and alcohol laws at major events without violating individuals rights has facilities and law enforcement agencies directing their attention to drug sellers rather than to users. This, in turn, has created a belief among patrons that the illegal use of drugs/ alcohol is possible if not acceptable at major events. New and equitable methods of enforcing relevant laws are needed. This is an area where facility operators and law enforcement agencies must cooperate and patrons, regardless of age or social standing, must assume the consequences of breaking the law.

The sale of alcoholic beverages at rock concerts and other events where rowdy audiences are expected or where a high percentage of the audience will be under the legal age for consuming alcohol can have adverse effects. When these conditions exist - rowdiness, high level of excitability - the potential for and detrimental effects of alcohol abuse become very real. Even though a prohibition on alcohol sales may reduce concession profits, many facility operators by such action reflect their concern for the safety of their patrons.

## Roles and Responsibilities

The role and responsibility of those parties involved in an event should be specified in writing and known to all prior to an event.

There must be a clear understanding by all involved of the chain of command and the duties that each person is to perform. An important aid in this endeavor is an event management plan produced by the facility or promoter with the cooperation of public agencies that specifies names, duties and location of the people at the event; lines of communication; contingency plans; door opening; method of plan implementation; a checklist of personnel, equipment and procedures; expected crowd size and characteristics; and normal and emergency egress/ingress procedures.

Those with a role in planning, organizing and controlling events cooperatively must find ways to: 1) anticipate potential sources of danger in public gatherings, 2) take steps to prevent trouble when and where possible, and 3) be prepared to respond to trouble quickly and effectively when, and if, necessary.

**A. Local Government :** Through laws and their enforcement, local government influences the character of event management by establishing building and safety codes and by determining facility capacity, seating configurations, and other related items. Government also influences an event by the manner by which it provides such services as police, waste collection and traffic control.

**B. Police :** In 1972, an American Bar Association report, The Urban Police Function,

noted that police responsibilities are frequently the result of "design and default". Because it is often assumed that police can and will take on all manner of broad responsibilities, they sometimes carry out duties and functions for which there are no written policy directives. While the need for law enforcement remains the paramount duty of the police, there is an ever increasing demand in the other areas of policing. This is especially true where crowd management is required. Generally speaking, the role of police at events is to enforce laws and to manage crowds on or adjoining public property in cooperation and with the necessary support of the facility operator and/or event promoter.

**C. Fire :** The Fire Division is responsible for making unscheduled and routine inspections of facilities to enforce local fire and building codes. It also has the responsibility of citing a facility operator or patron for violation of safety laws. Their authority to require safe exiting conditions, as well as to enforce capacity and safety regulations, and their relationship to other personnel should be clearly defined in advance. Fire personnel, like other appropriate city personnel, should be involved in the advance planning of an event to assure an acceptable level of compliance with fire and life safety codes.

**D. Facility Management :** Next to local government, facility management has the most influence on crowd safety and on the activities of promoters and entertainers. No matter how a contract between a facility and promoter is written, local facility management must acknowledge and accept its obligation for the safety of the community that it serves. Facility management has primary responsibility for assuring safe conditions in compliance with applicable statutes and reasonable standards. That responsibility also requires cooperative efforts with law enforcement and other event managers. But that cooperation should not relieve facility management of its accountability for providing resources for safe and successful events. Of course law enforcement officials can take over direction and control in emergencies, but that should not dilute management responsibility for taking all reasonable steps to assure that emergencies don't happen.

The establishment of house rules and the strict enforcement of those rules and local laws determine how the patrons, promoters, and the entertainers will behave. Many facilities train their crowd management personnel and provide orientation manuals for staff and security. These manuals describe audience characteristics, problem areas, staff functions, house rules, and emergency plans and facility layouts. They deal will types and levels of security and familiarize personnel with management objectives. The use of such manuals underscores the notion that the best crowd management results are obtained when there is active cooperation between facility management and personnel, promoters, and public agencies.

**E. Promoter :** The promoter is the broker between the entertainer and the facility and plays a critical role in preparation of contracts. The promoter obtains the use of the desired facility, prepares appropriate contracts between facility and entertainer, arranges for event promotion and ticket sales, and pays for security requirements. The promoter is also likely to pay the taxes on the entertainers' profits and may even arrange to provide the entertainers' meals and snacks. Promoters are paid by the performers to organize the event and most often work independently of facilities.

The promoter's responsibilities are to coordinate all aspects of an event with facility and government officials to assure that an event complies with local safety laws. Promoters often prepare their own event management plan for an event, listing personnel responsibilities and an event timetable, and usually share this material with the other parties in an event.

**F. Entertainers :** Entertainers have varying degrees of influence over the promotion and execution of their performances. The most popular can often demand a certain type of seating, determine the audience size, within the legal capacity of a facility, set ticket prices and promotional arrangements, and stipulate when the doors will be open prior to their show.

Most entertainers realize the influence they maintain over their audiences and do not exploit it. With their support, a facility is better able to discourage open flames, blocking aisles, use of fireworks, drug and alcohol abuse, etc. There are, however, those who will intentionally and irresponsibility incite their audiences to a level of behavior where fighting, vandalism, or rowdyism may occur. If this happens the performers must be held fully accountable for their actions.

**G. Private Police :** Some private police are commissioned in Cincinnati by the Police Chief and employed by private businesses or individuals. Some private police are hired to perform security functions but are not commissioned. Whether commissioned or not, their authority is limited to the premises of their employer. Although there are similarities between public law enforcement officers and private police, there is a fundamental difference: the law enforcement officer has more extensive authority, responsibility and training.

**H. Ushers :** In additional to seating patrons, an usher's duties include enforcing of house rules, maintaining order, reporting security problems to private police or others, keeping people out of the aisles, and enforcing open flame and smoking regulations. Ushers should remain at their posts until and event is completed.

**I. Peer Security :** Peer, or Tee-Shirt security is a product of rock concerts. Hired by promoters to protect the stage area, screen patrons for contraband and to do other special assignments, peer security personnel are people of similar age and background to

the patrons and, therefore, presumably have good rapport with them. Peer security can also serve as an effective buffer or mediator between uniformed security and patrons in tense situations.

They are usually recognizable by the specially designed tee-shirts that they wear. The Spectrum, in Philadelphia, has departed from this casual look of peer security and supplies specially designed outfits for their own youthful security personnel.

**J. Patrons :** Though a careful and elaborate crowd management plan may be implemented, it cannot be fully effective without patron cooperation. Nor can it protect individuals from self-inflicted harm.

In a crowd, patrons should always be aware of the possible effect of their actions on the safety of the whole group. Pushing, fighting, spreading rumors, the use of firecrackers or projectiles all can cause severe repercussions that the instigator may never have considered. An audience's tolerance of abusive actions further jeopardizes its own safety.

Responsible patrons will acquaint themselves with local laws and facility house rules and should not hesitate to report situations that threaten their safety to the facility management, promoter and/or the media. In many instances, the pressure of public opinion is the best regulator of private industry.

## Tickets and Queueing

**A. Sale of Tickets :** Tickets for most events in Cincinnati, including rock concerts, are sold through Ticketron, Inc., a computerized ticket system with outlets in stores and shopping centers. By using computer technology and standardized ticket design, Ticketron can sell tickets to an event at both local and non-local sites for the convenience of its patrons. The elimination of festival seating and restrictions on general admission seating may have unexpected repercussions at ticket outlets, especially for "superstar" performances. While reserved seating largely removes the factors which cause early and overwhelming crowds to gather hours before an event, reserved seating can instead result in the early gathering of large crowds at ticket outlets who have come to purchase tickets for the limited prime seating areas. These factors can cause problems and difficulties for ticket outlets. To help relieve this problem, two options are suggested: 1) The actual date, time and location that the tickets are to go on sale should not be announced prior to the time that tickets are released for sale. 2) When the demand for tickets is expected to exceed the available seating capacity, a mail order system of ticket sales should be implemented.

**B. Appearance of Tickets :** At present, all Ticketron tickets are similar in color and

overall appearance. Hence it may be difficult for ticket takers and others to screen patrons with bogus tickets, especially when the rate of patron flow is high.

A variation in ticket color or format would aid those facility and security officials attempting to prevent patrons with invalid tickets from gaining access to an event at which they do not belong.

A ticket should also state the specified entrance the ticket holder is to enter.

**C. Ticket Taking :** In determining the number of ticket takers to be employed, most facility operators use a ratio of one ticket taker for about every 1,000 ticket holders. The actual ratio may vary and depends on the actual crowd size, location of contraband searches, type of entertainment and the architectural design of the building. The efficient movement of ticket holders is critical in preventing crowds from gathering outside a facility. Limiting entrances and using fewer doors, or opening and closing doors to control crowd movement are very dangerous practices. They only serve to increase anxiety in a crowd and make it more difficult to manage. It is much more effective to separate people in a crowd by using many entrances, by queueing, and by providing for the proper ratio of ticket takers and doors to patrons. Dispersing entering crowds through multi-entrances is particularly effective in processing people efficiently into a facility.

**D. Queueing :** Whenever large crowds gather for the purpose of peaceably entering an area it is vital that the processing of those people be organized, orderly and disciplined, and, if ticket taking is going to take place, that it be coordinated with the queueing of patrons.

There are two major types of queues, linear and bulk, as described by pedestrian planner Dr. John Fruin in his book entitled Pedestrian Planning and Design. In linear queueing people line up in single file. In a bulk queueing there are no defined lines, but simply a large amorphous mass.

Many facility in cooperation with law enforcement agencies queue their patrons in zig-zag lines, around buildings, and on sidewalks. Often queues are further organized by metering (when sections of a queue enter a facility in a measured and regulated manner). In this way, patrons can claim a particular space, feel less anxious about their ability to enter in an orderly fashion and can judge better the length of time it will take them to enter, as they progress in a line. Using a queue means having control over a large crowd. It also prevents the potential hazard of a mob craze-the sense of urgency causing a rush toward an entry point. This sense of urgency or anxiety is the crucial factor that must be removed. The type of queueing to be used, along with the other procedures, like metering must be planned in order to minimize the potential for crowd disorders outside of a facility.

## Contraband Screening

Searching patrons for contraband has become increasingly prevalent. Pre-admission screening is a reasonable preventive measure to prohibit or reduce such items as weapons, dangerous objects, alcohol, drugs and other undesirable objects and substances from being introduced on to the premises. City Council should specify by ordinance contraband materials not allowable at major events and also require the contraband prohibition to be posted at the event and on tickets.

Legal considerations suggest that the screening of patrons for contraband is best performed by private security and not public law enforcement officers.

## Crowd Management Planning

Safety aspects at facilities are routinely inspected by the Fire Division and Building Department to assure their compliance with City regulations. The adherence to numerous City codes is pivotal to providing safe environment for the public. What is needed beyond that is a method for assessing a facility management's or an event promoter's preparedness to accommodate its patrons safety. Having a formal crowd management plan is equally as important as compliance with safety regulations. The City should require crowd management plans of all facilities and/or event promoters contemplating hosting or sponsoring events attracting 2,000 or more people. These plans should be prepared in writing and presented to the City for public filing. Plans could be written for categories of events and, when necessary, for specific events. The format and requirements of a plan should be determined by the City, facility operators, private security, promoters and other concerned parties.

A copy of a facility's crowd management plan should be on file with the City and accessible to the public so they may understand what kind of crowd management to expect. The required filing of a plan will make it difficult for complacency to return to the issue of crowd safety.

**Recommendations :**

1. City Council should study and implement new and equitable methods of enforcing all laws governing events.
2. The sale of alcoholic beverages should be prohibited at events where unruly audiences are expected or where a high percentage of the audience is under the legal age for consuming alcohol.

3. The roles and responsibilities of parties involved in an event should be specified in writing and made known prior to an event.
4. Facility management must accept responsibility for the safety and enjoyment of the people who patronize its facility. Management should coordinate its efforts with police, fire and medical personnel.
5. Facility management should train its personnel in crowd management and provide manuals for staff and security.
6. Entertainers should cooperate with public safety laws.
7. The entertainment media should promote special features, programs, and public service announcements relating to crowd safety and individual and group responsibilities.
8. Ushers should remain at their posts until an event is completed.
9. Patrons should be encouraged to report situations that threaten their safety to the facility personnel, promoter, local government officials and/or media.
10. Public education in crowd dynamics should be afforded equal importance to other safety programs by government, educational and public service agencies.
11. Facilities should educate their public by publicizing and enforcing their house rules, local laws, and by setting a courteous, professional standard of conduct by their personnel.
12. The date that tickets to an event will go on sale should not be announced until the tickets are available for sale.
13. When the demand for tickets to an event is expected to exceed the capacity of ticket sales outlets to accommodate ticket buyers or to pose problems for ticket sales sites, a mail order system for ticket sales should be implemented.
14. When more than one entrance to a facility is to be used, tickets should specify the particular entrance the ticket holder should enter.
15. Tickets should be printed with a clear warning against contraband such as, "Alcohol, drugs, and weapons are not permitted on premises."
16. A facility should separate crowds by using multi-entrances, queueing, and by providing a proper ratio of doors and ticket takers to patrons.
17. Facility security personnel should screen patrons for contraband, not City police officers.

18. The City should require facility managers and/or event promoters sponsoring events that are expected to attract more than 2,000 people to file crowd management plans. Copies of such plans filed with the City should be available to the public so citizens can know the levels of crowd management to expect.

**Operational Skills and Tactics (OST) training**

The Service has Operational Skills and Tactics (OST) training which is based on the 'Situational Use of Force Model' together with the introduction of more effective accoutrements. Home OPM Issue 54. Public Edition | September 2016 | Page 7 Chapter 14

**Order :** Unless otherwise exempted by the relevant district officer or public service equivalent:

i) all watchhouse officers are to successfully complete the specific OST training course which reflects their available use of force options each calendar year;

ii) all police officers are to undertake Blocks 1 and 2 OST training each calendar year;

iii) all police officers who have successfully completed a Taser training course are also to undertake Block 3 OST: 'Conducted Energy Weapon (CEW)(Taser)' training each calendar year (see s. 14.23.27: 'Taser training' of this chapter);

iv) all police officers who have successfully completed Service rifle training with the Service rifle, are also to undertake Block 4 OST training each calendar year; and

v) unless exceptional circumstances exist and in order to facilitate the Taser as a use of force option during the interactive scenarios of Block 2, Taser qualified officers must complete and be deemed competent in Blocks 1 and 3 OST training before they can complete Block 2.

If an officer fails to demonstrate the required standard of competence during:

i) Block 1, 2 or 3 OST training, for which they have previously qualified, they are immediately deemed not competent and the officer:

   (a) is to relinquish the specific accoutrements in question to the OST instructor or to their respective officer in charge; and

   (b) cannot perform operational duties, until the officer successfully completes the training and is deemed competent; or

ii) Block 4 OST training, for which they have previously qualified, the officer is not

to use the Service rifle until the officer successfully completes the training and is deemed competent.

Police officers and watchhouse officers who undertake OST training are required to maintain and demonstrate the required standard of competence with their operational skills and will be assessed as competent or not competent by an OST instructor.

First Year Constables who successfully complete the relevant initial Service firearms, CEW (Taser) and policing skills qualifying courses are considered 'OST qualified' for 12 months from the date the officer last qualified.

The Chief OST Instructor is responsible for ensuring the necessary systems are in place to enable OST training for watchhouse officers and police officers to take place.

**Issuing of OST training exemptions**

**Policy :** Officers who are unable to complete the practical skills component of the OST training requirements in accordance with this section, may make application for an exemption in accordance with 'OST (Operational Skills and Tactics Training) Exemptions' of the HR Policies.

Exemptions may be granted by the relevant district officer or equivalent for a period of 12 months.

Exemptions apply to practical skills training only. Exempted officers are required to undertake any computer based or non-practical skills training associated with the exempted year's curriculum.

**Procedure :** Where an officer is unable to complete OST training, an application for exemption is to be made on a QP 0913: 'Application for Exemption from Operational Skills and Tactics (OST) Training'.

**Order :** District officers or public service equivalent are to:

i) maintain a record of officers in their area of responsibility, who are, or have been, exempted from undertaking OST training;

ii) ensure officers who are exempted from undertaking the practical component of OST training complete any computer based or non-practical skills curriculum training;

iii) assess on a needs basis whether inspectors within their districts are required to complete Blocks 3 and 4 OST training. Factors for consideration in determining whether an inspector should complete Blocks 3 and 4 OST training are to be based on the officer's duties; and

iv) forward a copy of any exemptions from OST training issued to the Assistant Commissioner, Ethical Standards Command. Home OPM Issue 54 Public Edition | September 2016 | Page 8 Chapter 14

The Assistant Commissioner, Ethical Standards Command is to maintain a central register of all officers who are exempted from OST training.

**Policy :** Officers who fail to demonstrate competence in OST training or who are exempted from the requirement to complete OST training are not to be deployed to perform any duties, including special services, which may require competence and currency in operational skills and tactics.

Where an officer is not qualified in Blocks 1 and 2 OST training, they are to travel to and from work in plain clothes.

**Returning from OST training exemptions**

**Policy :** Where an officer returns from an OST training exemption, the officer is to undertake and complete the OST training curriculum for the exemption period prior to undertaking the current OST training curriculum.

Where an officer is able to complete OST training and has been exempt from the requirement to complete OST training for 3 or more years, members from the officer's Education & Training Office are to:

i) conduct a training needs analysis of the officer; and

ii) deliver any additional training in order to meet the required standard of competence in OST.

## 1.6 CONCLUSION

- Try to pre-empt or defuse or contain a crowd.
- Allow a handful of representatives spokesperson from the crowd to come forwards for discussion and/or negotiation.
- Take the representatives to an isolated area where they do not have access to easy electronic communication . Use jammers if possible
- Always give top preference to personal safety or personnel and property
- Efforts should always be made to build mutual faith and respect between the Authorities and the Crowd leaders who are protesting or demonstrating.
- Maintain your cool and calm composure so as to ease all round tension.

# Unit - 2 ❑ Skill for Guard Force

**Structure**



## 2.1 Objectives

Integrity, honesty, transparency and professionalism are words that are embedded throughout our company and essential to delivering a service required by all that seek our services

Our company is dedicated to improving and advancing the service delivery of all those employed within this industry. We have completed a structural plan that guides us towards achieving our aims both as a company but also how we intend to influence and enhance the skills base of operatives throughout the UK.

All of those operatives that represent our company are given detailed briefings that set out our expectations and standards. These specific goals are contained within performance sheets in order that we can continue to assess and monitor our service ensuring that we are maintaining our professionalism and achieving our goals.

## 2.2 Introduction

Almost every company facility has security guards. Security guards are found at access control points, reception areas, around buildings and in industrial areas. They are in usually in uniform and they represent an image of the company to the outside world and to employees and contractors. Every guard is seen as a representative and a symbol of the security function of a company as a whole.

But in many parts of the world, guards are ill-trained, ill-disciplined, and generally disrespected. Why then do we employ security guards?

The overall objective of employing a guard force is to provide risk-based security services. They protect personnel and assets and to deter, delay and detect unauthorized intruders and to respond to incidents. They provide reassurance to the workforce and support other functions concerned with safety and emergency response.

A guard force is ideally motivated, competent, trained, engaged and responsive. If achieved, respect for the guard force follows and it will be easier to have a reliable and effective security function in place. If not, there is a serious risk that a guard force will be seen as a costly burden that serves no useful purpose and this will reflect generally on the security function at any given location, and on the company operation as a whole.

This report provides advice, and sets out the principles and guidelines to develop an effective guard force, as well as discussing administrative and contractual elements of guard force engagement. The principles and guidelines set out are based on the collective knowledge and experience of members of the IOGP Security Committee. Interested readers may wish to refer to numerous publications and websites for more detailed guidance. One example is the UK's Centre for the Protection of National Infrastructure (CPNI) paper on guard force motivation. The American Society for Industrial Security (ASIS) recommends 'Guard Force Management' as a reference document for this subject.

- Introduction
- It must be kept in mind that it is not possible for the State Poi'ice to manage security aspects at (ocai programmes. Therefore, Private Security Guard Force must be developed as a parallel force.
- The Private Security Guards must be imparted with adequate training to handle required men and equipments at different situations.

- ❖ The Initial Training
- ❖ The training can be on General Security aspects and specific security issues or problems requiring specialized personnel.
- ❖ Training programme of Security Guards should generally cover:
  - Provisions of the Civil law and rules
  - Capability to assess general threats and security risks
  - Use Fire Extinguishers and Fire alarms at different locations
  - The specialized training includes handling situations viz. threat from Fire, Bomb explosions and includes bomb search and building evacuation
  - Provide persona! security to general staff and to Executive Staff
  - Use of personal security equipments such as Baton, handcuffs, radio / mobile telephones etc.
  - Access Control and use of Fire Alarm Systems
  - Security protection of facilities at Offices, factories, installations and even residences.
  - Denial of access to unauthorized persons
  - Use of access control procedures such as Electronic body and package search equipment, persona! searchers vehicle search, building search for suspected bombs, visitor control procedures like issuance of badge and visitor entry and exit monitoring.
  - Maintenance of Guard force Records, Daily Log Books and preparation of incident reports.
  - Use of Communication Equipment for incident notification to the Appropriate Authorities
  - Maintenance of Personnel deployment and postings at specified areas / locations.
- ❖ Specialized Training should cover:
  - Access Control for Pedestrians to include search of men and women and what to do if weapons are discovered or persons are found to be disorderly of if they are carry illegal items.

- Visitor Control procedures such as issuance of badges and visitor entry and exit monitoring , providing escorts for visitors within the premises
- Package and mail search through bomb search with electronic equipments and manual search
- Use of alarm systems
- Vehicle access control and search procedures covering driver identification, vebide compartment and body frame search, truck and vendor access procedures, vehicle and cargo search etc.
- Somb Threat Reaction to cover procedure for building searches, bomb disposal procedures and intimation to Appropriate Authorities
- Personnel identification procedure for identification of Staff members, their dependents, official visitors and checking their identification documents
- Training in use of physical force in self defence
- Training in tactfully restraining of persons and use of restrain equipments
- Skill in reading messages and alters generated by surveillance equipments like CCTVs, Sensors etc.
- Skill in reading the body language and behavior of persons
- Skill in giving First a»d and Cardio-pulmonary resuscitation to a sick or injured person during an armed attack or in the event of a violent attack
- Use of hand held and vehicle-mounted Radio communication Systems etc.

❖ Equipment training should cover the following areas:

- Wearing proper Uniforms
- Know the use of Weather protective clothing
- Use of flash lights
- Use of Batons
- Use of whistles and special signals for alert communication
- Use of High Frequency Mobile Radios
- Use of Walkie Talkies
- Driving of vehicles

## Self-contained breathing apparatus

A self-contained breathing apparatus, or SCBA, sometimes referred to as a compressed air breathing apparatus (CABA), or simply breathing apparatus (BA), is a device worn by rescue workers .firefighters, and others to provide breathable air in an "Immediately Dangerous to Life or Health" atmosphere (JDLH). When not used underwater, they are sometimes called industrial breathing sets. The term "self-contained" means that the breathing set is not dependent on a remote supply (e.g., through a long hose). If designed for use under water, it is called SCUBA (self- contained *underwater* breathing apparatus).

An SCBA typically has three main components: a high-pressure tank (e.g., 2,216 to 4,500 psi (15,280 to 31.030 kPa). about 150 to 300 atmospheres), a pressure regulator, and an inhalation connection (mouthpiece, mouth mask or face mask), connected together and mounted to a carrying frame.111

A self-contained breathing apparatus may fall into two different categories. These are open circuit and closed circuit.

**Closed-circuit SCBA :** The closed-circuit type filters, supplements, and recirculates exhaled gas: seerebreather for more information. It is used when a longer-duration supply of breathing gas is needed, such as in mine rescue and in long tunnels, and going through passages too narrow for a big open-circuit air cylinder. Before open-circuit SCBA's were developed, most industrial breathing sets were rebreathers, such as the Siebe Gorman Proto. Siebe Gorman Savox. or Siebe Gorman Salvus. An example of modern rebreather SCBAs would be the SEFA. Rebreathers used underwater have the advantage of not releasing tell-tale bubbles, making it more difficult to detect divers involved in covert operations (see frogman).

**Open-circuit :** Open-circuit industrial breathing sets are filled with filtered, compressed air, rather than pure oxygen. Typical open-circuit systems have two regulators; a first stage to reduce the pressure of air to allow it to be carried to the mask, and a second stage regulator to reduce it even further to a level just above standard atmospheric pressure. This air is then fed to the mask via either a demand valve (activating only on inhalation) or a continuous positive pressure valve (providing constant airflow to the mask).

An open-circuit rescue or firefighter SCBA has a fullface mask, regulator, air cylinder, cylinder pressure gauge, and a harness with adjustable shoulder straps and waist belt which lets it be worn on the back. The air cylinder usually comes in one of three standard sizes:

4 liter, 6 liter, or 6.8 liter. The duration of the cylinder can be calculated with this formula: volume (in liters) * pressure (in bars) / 40 - 10 in minutes (the 10 is subtracted to provide a safety margin), so a 6-liter cylinder, of 300bar, is 6 X 300 / 40 - 10 = 35 minutes working duration. The relative fitness, and especially the level of exertion of the wearer, often results in variations of the actual usable time that the SCBA can provide air, often reducing the working time by 25% to 50%.

Air cylinders are made of aluminium, steel, or of a composite construction (usuallycarbon-fiber wrapped.) The composite cylinders are the lightest in weight and are therefore preferred by fire departments (UK: fire and rescue services previously called fire brigades), but they also have the shortest lifespan and must be taken out of service after 15 years. Air cylinders must be hydrostatically tested every 5 years. During extended operations, empty air cylinders can be quickly replaced with fresh ones and then refilled from larger tanks in a cascade storage system or from an air compressor brought to the scene.

**Fullface masks :** The fullface masks of breathing apparatus designed for use out of water are sometimes designed in a way that makes them unsuitable for scuba diving, although some may allow emergency very shallow submersion:

- The seal at the edge of the mask is a wide tube with thin, flexible walls running around the edge of the mask, full of air at atmospheric pressure. On the surface it pushes against the edges of the wearer's face, causing a tight seal despite small variations in head shape. At more than a few feet depth pressure(underwater or in a caisson) this tube collapses, destroying the seal and making the mask leak.
- Curved window which underwater would severely distort the image by refraction.

  The mask can have a big fullface window, or small eye windows.

  The mask might have a small orinasal breathing mask inside, reducing breathingdeadspace.
- Link to image and description of a negative-pressure fullface mask

  The mask can also incorporate a two-way radio communicator.
- See also Full face diving mask

  Some old industrial rebreathers (e.g., the Siebe Gorman Proto) had a mouthpiece and attached noseclip instead.

## Positive pressure (preventing inward leaking)

Open circuit SCBAs utilize either "positive pressure" or "negative pressure" operation.

- A "negative pressure" SCBA may be used with a type of fullface mask which could be used as a gasmask (with a filter canister on the facepiece's air inlet) or with an open-circuit breathing set connected to the air inlet. Air is delivered to the wearer when she breathes in, or in other words, reduces the pressure in the mask to less than outside pressure, hence the name "negative pressure". The limitations of this are obvious, as any leaks in the device or the interface between the mask and the face of the wearer (caused for example by small face skin wrinkles) would reduce the protection offered.
- "Positive pressure" SCBA addresses this limitation. By careful design, the device is set to maintain a small pressure in excess of the surrounding air pressure inside the facepiece. Although the pressure drops when the wearer breathes in, the device always maintains a higher pressure inside the mask than outside of the mask. Thus, even if the mask leaks slightly, there is a flow of clean air out of the device, automatically preventing inward leakage under most circumstances. Although the performance of both types of SCBA may be similar under optimum conditions, this "fail safe" behaviour makes a "Positive pressure" SCBA preferable for most applications. As there is usually no air usage penalty in providing positive pressure, the older "Negative pressure" type is, in most cases, an obsolete configuration and is only seen with older equipment. However some users refuse to use this technology as in case of a damage or loss of the facepiece the air will be released uncontrolled. The leakage rate can be so high that a fully charged SCBA will be drained in less than three minutes, a problem that does not happen with "negative pressure" SCBA systems.

**Types of use :** There are two major application areas for SCBA: fire fighting: and industrial use. A third use now coming into practice is medical; for example, the American National Institutes of Health prescribe use of SCBAs for medical staff during treatment of ebola.

For fire fighting, the design emphasis is on heat and flame resistance above cost. SCBA designed for fire fighting tend to be expensive because of the exotic materials used to provide the flame resistance and to a lesser extent, to reduce the weight penalty on the fire fighter. In addition, modern firefighting SCBAs incorporate a PASS device (Personal

Alert Safety System) or an ADSU (Automatic Distress Signal Unit) into their design. These units emit distinctive high pitched alarm tones to help locate firefighters in distress by automatically activating if movement is not sensed for a certain length of time (typically between 15 and 30 seconds), also allowing for manual activation should the need arise. In firefighting use, the layout of this breathing set should not interfere with ability to carry a rescued person over the firefighter's shoulders.

The other major application is for industrial users of various types. Historically, mining was an important area, and in Europe this is still reflected by limitations on use in the construction of SCBAs of metals that can cause sparks. Other important users are petrochemical, chemical, and nuclear industries. The design emphasis for industrial users depends on the precise application and extends from the bottom end which is cost critical, to the most severe environments where the SCBA is one part of an integrated protective environment which includes gas tight suits for whole body protection and ease of decontamination. Industrial users will often be supplied with air via an air line, and only carry compressed air for escape or decontamination purposes.

**Safety specifications :** In the United States and Canada, SCBAs used in firefighting must meet guidelines established by the National Fire Protection Association, NFPA Standard 1981. If an SCBA is labeled as "1981 NFPA compliant", it is designed for firefighting. The current version of the standard was published in 2007. These standards are revised every five years. Similarly, theNational Institute for Occupational Safety and Health (NIOSH) has a certification program for SCBA that are intended to be used in chemical, biological, radiological, and nuclear (CBRN) environments. See NIOSH Approved SCBAs.

Any SCBA supplied for use in Europe must comply with the requirements of the Personal Protective Equipment Directive (89/686/EEC). In practice this usually means that the SCBA must comply with the requirements of the European Standard EN 137 : 2006. This includes detailed requirements for the performance of the SCBA, the marking required, and the information to be provided to the user. Two classes of SCBA are recognised, Type 1 for industrial use and Type 2 for fire fighting. Any SCBA conforming to this standard will have been verified to reliably operate and protect the user from -30 °C to +60 °C under a wide range of severe simulated operational conditions.

The Royal Australian Navy uses the Open Circuit Compressed Air Breathing Apparatus (OCCABA), a backpack-style, positive pressure breathing apparatus, for fire-fighting roles.

**Effect of temperature on pressure gauge readings :** The pressure gauge's indicated gas pressure changes with ambient temperature. As temperature decreases, the pressure inside the cylinder decreases. The relationship between the temperature and the pressure of a gas is estimated by using the formula PV= nRT. (See Universal gas constant.) What is particularly important to understand from the formula is that the temperature is in Kelvin, not degrees Fahrenheit. Consider the freezing point of water at 32 degrees Fahrenheit (0 degrees Celsius, 273.15 kelvin) and compare it to 96°F (35.6°C or 308.71 K; normal human body temperature is 37°C). While 96 is arithmetically three times 32, the difference in temperature from a scientific point of view is not threefold. Instead of comparing 32°F to 96°F, temperatures of 273.15K and 308.71 K should be compared.121 The actual scientifically valid change in temperature from 32 to 96°F (0 to 36°C) is by a factor of 1.13 (308.71 K/273.15K), not 3. If an air cylinder is pressurized to 4,500 psi at 96°F and later the temperature drops to 32°F, the pressure gauge will indicate 4,000 psi (4,500/1.13). Stated differently, a drop in temperature of 10 degrees Fahrenheit (5.5 degrees Celsius) causes a pressure decrease of about 82 psi. Failure to accurately account for the effect of temperature on pressure readings can result in underfilled air bottles, which in turn could lead to a firefighter running out of air prematurely.

**Types :** Among the leading manufacturers of SCBA for the North American fire service are:

- Scott Health and Safety
- Avon-ISI
- MSA Fire
- Draeger
- Survivair
- Interspiro
- ISI (International Safety Instruments).

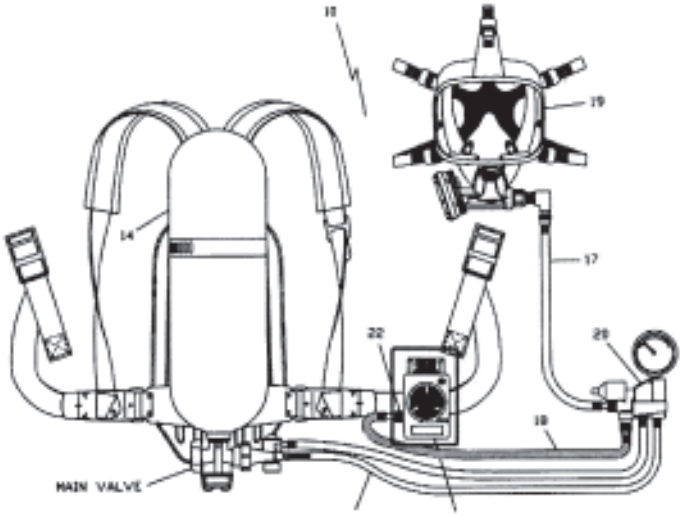
Among the leading manufacturers of SCBA for the European fire service and industrial safety:

- Honeywell Safety Products
- Scott Health and Safety
- Spasciani

- Interspiro
- MSA
- Draeger

Siebe Gorman produced these makes of open-circuit SCBA units:

- Airmaster MK 1 (blue back plate)
- Airmaster MK 2 (chrome plated back plate)
- Firefighter
- Specials for the armed forces




In Australia, different firefighting agencies refer to SC BA by different acronyms in general terms. For example:

- In South Australia both the Country Fire Service and the Metropolitan Fire Service refer to SCBA as "CABA" or Compressed Air Breathing Apparatus during training and in the field they refer to SCBA as simply BA or Breathing Apparatus. The New South Wales Rural Fire Service follow the same principles as South Australia
- The Fire and Emergency Services Authority of Western Australia Brigades, New South Wales Fire Brigades and Queensland Fire and Rescue Service call it BA, Breathing Apparatus.

All these initials mean the same type of open-circuit equipment.

In New Zealand, SCBA is generally referred to by New Zealand Fire Servicepersonnel as BA, Breathing Apparatus. Unofficial names include "air pack" "air tank" or simply "pack" mostly used in firefighting as in a firefighter "packing up".

## 2.3 Barkhamsted Fire District

### Purpose :

- To establish a guideline to indicate the proper maintenance, training, use, and cleaning of self-contained breathing apparatus in order to ensure the safety of the fire department personnel. To meet the requirements of the Respiratory Standard and Fire Brigade Standards

### Responsibility :

- It is the responsibility of the Chief or a designated officer to assure that the SCBAs are kept in working order and that all member of the fire department are trained in accordance with the written policy and Standard Operating Procedure.

### Policy :

**Inspection and Records:**

- An assigned person shall make monthly inspections on all SCBA in use. The inspections shall consist of a checking the entire unit for deteriorated components, air tightness of cylinders, valves, gauge comparison, reducing valve, and bypass valve operation, regulator, exhalation valve and low air alarm. The face piece and harness shall also be visual inspected. The entire SCBA will be cleaned and dried, if necessary. The P.A.S.S. device shall be tested and attached to each of the SCBA. The hydro test dates will be checked on each cylinder and sent to be hydro tested if needed. Records shall be kept on each of the inspection. If there is any malfunction found the SCBA shall be taken out of service until it is repaired.
- Inspections shall be made before and after each use. This inspection shall consist of a visual check of the face piece, harness, and cylinder pressure. The user shall also check for leaks, gauge comparison, proper fit, and the air bottle is fully charged.
- A qualified person shall conduct annual inspection and service of SCBA; this inspection shall be preformed according to manufactures recommendations.

**Maintenance:**

- SCBAs that need maintenance work done to them; will be done by trained maintenance personnel only. If repair work is needed on a SCBA it shall be taken

out of service, tagged with a note describing the problem, and reported to the officer in charge. O-rings are the only part that can be replaced by a firefighter; at no time shall any firefighter open the regulator to do repairs.

**Training:**

- SCBA instructors shall train emergency responding firefighters, the firefighter shall pass all requirements and documentation of training should be on file with each respective department.
- The firefighter shall demonstrate competence in the proper donning and doffing procedures, identifying hazardous areas, and knowledge of equipment. Training shall be provided for SCBA practice during the year.

**Emergency Scene Use:**

- SCBA will be used by all firefighter who are exposed to respiratory hazards or will respond to IDLH immediately dangerous to life and health atmospheres without warning. The hazards can include car fires, dumpster fires, interior structure fires, outside area where there is a possibility to encounter heat and/or smoke, liquid propane leaks, chemical contaminated areas, oxygen deficient areas, and any other hazardous atmosphere.
- Responding firefighters shall abide by OSHA's two in and two out rule when entering hazardous areas. Firefighters must maintain constant communication with each other. It is critical to account for the number, identities, location, function, and time of entry, of the firefighters inside.
- At no time shall the integrity of the SCBA be breached.
- Two firefighters with SCBAs shall be "standing by," available for rescue, this is also known as a Rapid Intervention Crew.
- When the evacuation signal is sounded (three long blasts of an air horn, pause then repeated until everyone is accountable), everyone inside the hazardous area will immediately withdrawal from the building and report to staging for roll call.

**Face Piece Seal:**

- Eyeglass frames, facial hair, and beards that interfere with the seal of the face piece shall be prohibited. This mean there shall be skin contact around the whole seal.
- Annual fit test program shall be conducted on each firefighter qualified to wear a SCBA upon medical clearance.

**Personal Protective Equipment:**

- Personal protective equipment shall be worn in accordance to Standard Operating Procedure # 2.
- All SCBAs must be provided with and indicator that automatically sounds and audible alarm when the remaining service life of the apparatus is reduced to within a range of 20-25 percent of its rated service time.
- The P.A.S.S. device shall also be worn and activated.
- Nomex hood shall be worn over the face piece harness.
- All respirators worn for interior structural fire fighting operations must be of the pressure demand or positive pressure type.

**Two Bottle Rule:**

- Firefighter that use two air bottles shall report to rehab or ambulance crew to have vitals checked. This will allow the firefighter time to recover, rehydrate, and be monitor for signs of fatigue. If the incident should continue, rehab shall be needed between each bottle after the initial two bottles.

**Low Air Alarm:**

- When the low air alarm is activated for any reason, all firefighters on the team will exit the hazardous area.

**Cascade System:**

- Only trained firefighter shall fill air bottles form the cascade system.
- A mobile cascade system should be used at incidents that will deplete the supply of air bottles.

**Cleaning and Returning to Service:**

- Return all straps to the loosest position.
- It is recommended to follow manufacturers guidelines for cleaning procedures
- Clean harness, airlines, and regulator of dirt and debris, using air hose (wear safety goggles), brush, or wash with warm water and mild detergent, than rinse with warm water.
- Clean face piece with 10:1 warm water, bleach solution, rinse with warm water, then spray with disinfectant, allow setting for 10 minutes, and then rinsing with warm water.
- Replace air cylinder with full air cylinder, the pressure shall be between 2000 PSI and 2216 PSI.

- ❖ The SCBA need to be fully dried before they are returned to service.
- ❖ It is for the safety of ever firefighter to keep the self-contained Breathing Apparatus in proper condition. Regular inspections, maintenance, and training of the SCBAs can accomplish the level of safety needed during an emergency. It is essential to use the SCBAs whenever the situation dictates and to follow this standard operating procedure. Following this standard operating procedure will help in preventing injuries that can occur from smoke and heat that can damage your lungs. These injuries can have an acute or chronic, effect on your health. The chronic effects may not be noticed for years.

## 2.4 Working with breathing apparatus

It is important that every man who is required to wear breathing apparatus is not only adequately trained and thoroughly understands the 'Procedure' in all its aspects, but also that he faithfully and meticulously carries out the 'Procedure' at a fire or other incident, for on each member of the team or crew will depend the success of the operation in hand. It is not only a question of the man's own safety, but also that of his colleagues with whom he may be working at the time or subsequently. The success of breathing apparatus operations does not rest alone with those men working inside the building. It is not sufficient for men to be completely confident in their ability to work with breathing apparatus in hazardous conditions; they must also have full confidence that the control and support arrangements outside the building are beyond reproach. The whole success of any breathing apparatus job is team work, and it is incumbent on all those engaged in the operation to ensure that they are competent and fully conversant with their breathing apparatus and with the 'Procedure' for its use.

### Wearing of breathing apparatus

Breathing apparatus is worn at a fire or other incident only on the instructions of the officer-in-charge who may, in fact, be a leading fireman or even a fireman in charge of the first appliance to arrive. The general principle should be that breathing apparatus is worn whenever its use will facilitate the location and extinction of a fire, or at any other incident when, by wearing breathing apparatus, discomfort and possible injury to a fireman's respiratory organs can be avoided.

The decision to order breathing apparatus to be worn will depend on a number of factors, such as the volume and type of smoke; whether the atmosphere is deficient of

oxygen, is toxic or has a high temperature; the length of time men are likely to be exposed; or whether there is a hazard from radioactive substances.

As soon as instructions have been given for breathing apparatus to be worn, the officer-in-charge must nominate a BA Control Officer so that Stage 1 of the 'Procedure' can be put into operation. This is a simple act which need cause no delay as the control officer could be the pump operator who accepts the tallies from the wearers before they go in, having first made sure that the information required on the tallies, including the cylinder pressure, has been checked by the wearer when he dons his set, and is recorded on the tallies.

**a. Precautions when donning breathing apparatus :**

The method of donning breathing apparatus and the sequence for starting up oxygen and compressed-air sets in general use by fire brigades, is detailed in the *Fire Service Drill Book* and need not be repeated here. For other types of set, the manufacturer's instruction • books should be consulted.

Breathing apparatus must always be donned and started up in fresh air, and men standing by at a B A Control should make sure that they remain in fresh air until required. The practice of men rigging in fresh air but not putting on their face masks, or not putting in their mouthpieces, until they reach smoky atmospheres and then starting up their sets, is extremely dangerous and must not be permitted.

Only in most exceptional circumstances should an officer or man who has already inhaled smoke, oxygen deficient or toxic fumes, subsequently rig in breathing apparatus; the reason for this is that once smoke or toxic fumes are present in the lungs and respiratory passages, it takes an appreciable time for them to be completely cleared. If closed-circuit breathing apparatus particularly is donned after smoke has been inhaled, the smoke will be continually circulated and will cause irritation to the respiratory system and discomfort to the wearer. If carbon monoxide or other toxic fumes have been inhaled the continual circulation could have serious consequences.

When donning *Proto* breathing apparatus, care should be taken to ensure that the complementary strap is not too tight or that the breathing bag is not strapped too close against the body. When crawling in a confined space or when assuming a crouching position it is normally better to release the complementary strap and allow the bag to hang free; if the bag is not free in such circumstances it may be flattened or doubled up with the result that the oxygen may be forced out of the pressure relief valve, the face mask or mouthpiece, which besides wasting oxygen will cause discomfort to the wearer. When working in difficult and restricted conditions, care should be taken to ensure that the breathing tubes do not become kinked.

Reasonable care should be taken in the handling and movement of breathing apparatus at all times, particularly so with *Proto* apparatus, in order to prevent movement of the absorbent which could result in particles entering the valves or breathing tubes.

**b. Removal of mouthpiece or face mask :**

The mouthpiece or face mask of a breathing apparatus set is designed to prevent any external atmosphere from entering the respiratory system, and it is exceedingly dangerous for the mouthpiece or face mask to be removed when the wearer is in a smoky or toxic atmosphere. Once the mouthpiece or face mask is removed, smoke, carbon monoxide or other toxic gases can enter the respiratory system and the conditions described above will be created to a dangerous degree. *If a mouthpiece, nose clip or face mask is dislodged whilst the wearer is in a smoky or toxic atmosphere, it is vital that the wearer should hold his breath and immediately replace the dislodged part.* If, for any reason, there is a likelihood of delay in doing so, the wearer should contact the other members) of his crew, and he should be accompanied to open air as quickly as possible, even though he may not feel any ill effect from the few breaths of contaminated air which he has been forced to inhale. The victim of carbon monoxide poisoning may not appreciate the presence of the gas until it is too late for him to call for assistance or to make his way out of the contaminated atmosphere.

**c. Closing down**

When a breathing apparatus wearer has completed his task and returns to normal atmosphere, the set should be closed down as follows:

**(1) Full face mask :** The headstraps should be slackened, the face mask removed and then the cylinder valve should be closed.

**(2) With mouthpiece and nose clip :** The goggles should be raised and then the nose clip and mouthpiece should be removed. The cylinder valve should then be closed.

## 2.5 Entering the building

**a. General :**

If the incident is seen to be large or is likely to be protracted, Stage II of the 'Procedure' may be necessary before action is started. In such cases the officer-in-charge may decide to await reinforcements before committing men to work if his availability is inadequate at the time; for example, the officer-in-charge may decide that communications equipment, which might not be available on the first attendance, is necessary before the men enter the premises.

When plans of the building or hazard are available, they should be referred to as soon

as possible, or if an occupant of the building who has a comprehensive knowledge of the layout of the building is present, he should be consulted. Any time devoted to consultation and study of the situation may result in a considerable saving of time and effort later.

Inside the building it may be found that visibility is extremely poor or non-existent due to lack of lighting (either daylight or artificial), because of smoke of varying density or colour, or because of fumes which are translucent. Lamps are always carried as part of breathing apparatus equipment, but even electric lamps may be of little or no use in heavy smoke conditions. No man should enter or be left alone in a building and the 'Procedure' requires that there must always be a minimum of two men working together.

When passing through compartments or corridors or negotiating stairs, breathing apparatus men should keep to the same side and avoid, where possible, crossing from one side to the other. This is particularly important if a guide line is being secured or a line of hose is being taken into a building as it will avoid confusion or difficulty to subsequent breathing apparatus crews.

**b. Working by touch :**

Working in pairs engenders confidence, and contact should be maintained as far as possible by physical touch and by speaking when face masks with speech diaphragms are worn. When mouthpieces and tubes are used with breathing apparatus, speech between men should *not* be attempted. Trying to speak 'round the mouthpiece' is dangerous as smoke or toxic fumes could gain ingress.

When in strange surroundings and unable to see, the only course is to work by touch and to follow the elementary precautions of shuffling along with the feet and feeling with the back of the hand for obstructions. In this way any danger of bumping into obstructions or falling down openings in floors or stairways will be minimised. If the leading man halts for any reason, the men following will become aware of this by contact, and the reason for the halt should be communicated as far as possible to the others. This is easy when speech is possible but where speech between the men is not possible and the men following the leader need to halt (as may be necessary when a guide line or communication cable is being laid and secured), an effective method is for the man to give a single tap on the shoulder of the man in front. If some action is required, such as making fast a guide line, the action can be mimed or indicated by sense of touch. When all is ready for moving forward again, the man in front should be tapped twice on the shoulder to indicate readiness to proceed. Another method which can be used when a breathing apparatus man without speech facilities requires to draw attention to himself (for example, to obtain an indication of direction), is for the man to give intermittent loud *slow* hand claps. Whenever such handclapping is heard, the reason for this signal should be investigated by the remaining crew members.

## 2.6 Emergency procedure

**a. Distress alarms**

A distress signal warning device (Fig. 6.2) is provided with every breathing apparatus set in order that a breathing apparatus wearer who is in distress can summon assistance. These distress signal warning units should be carried in a standard position (Fig. 6.1) and it is recommended that they be carried on the right-hand side of the set, chest high, with the buzzer facing downwards.

In the unlikely event of a distress signal warning device failing to operate, the warning device of another member of the crew should be operated. When a distress signal warning is sounded, all men hearing the signal must go towards the sound of the signal. The rendering of assistance must take precedence over the work in hand, but due regard must be paid to keeping an escape route open, and once sufficient help is available to deal with the emergency, any branches temporarily abandoned must be got to work again with the minimum of delay.

**b. Evacuation of premises**

Although a standard evacuation signal of repeated short blasts on a whistle has been recommended by the Central Fire Brigades Advisory Council *(see* the *Manual,* Part 6A: page 73-Book 11 in the new format), such a signal cannot be operated by men wearing breathing apparatus, and evacuation instructions to crews would normally be given via the communications equipment, if in use. If men wearing breathing apparatus, however, hear repeated short blasts from a whistle, they should immediately make their way out of the premises.

**c. Entrapped procedure**

The object of the entrapped procedure is to enable a man to extend the duration of the breathing apparatus he is wearing in the event of his being trapped and unable to withdraw. In such circumstances, he should relax in as comfortable a position as possible, breathe shallowly and operate his distress signal warning device. If the low- cylinder-pressure warning whistle sounds, the air supply to it should be turned off where a valve is provided.

**(1) Oxygen apparatus :** These sets have a constant flow or a controlled flow of oxygen from the cylinder, and the entrapped procedure is to allow the breathing bag to fill and then to turn off the cylinder valve. If a man is unconscious or trapped in such a way as to prevent him operating the controls of his set, it should be done for him by another man, if he is in a position to do so. When the oxygen in the circuit has been consumed,

the cylinder valve is opened again and the procedure repeated. For sets fitted with an automatic relief valve, it is important to allow the bag to fill only to the point at which the relief valve operates.

The entrapped procedure, when applied correctly to oxygen sets, can extend the duration of a fully-charged cylinder for several hours.

**(2) Compressed-air apparatus :** As these sets function on the 'demand' principle, no operation of the controls is necessary on the part of the wearer. A man would, therefore, be protected for a prolonged period even if he were unconscious. The procedure to be followed is simply to breathe as shallowly as possible in order to reduce the consumption of air. When completely relaxed, consumption of air may be reduced to about 10 litres a minute, which is about one-quarter of the average consumption.

## 2.7 Line signals

There may be occasions when a fireman wearing breathing apparatus has to be lowered down a shaft or sewer to effect a rescue or for other reasons, and some means of communication should be provided. Breathing apparatus communications equipment would be perfectly suitable, and in some cases, such as in cliff rescues, radio or even loud hailers may be used; these, however, do not allow both hands to be free at all times, which is usually essential for cliff rescues. As an alternative, or where breathing apparatus communication equipment is not available, recourse may be made to line signals. The following signals should be employed:

| *Signal on line* | *Given by wearer* | *Given by attendant* |
|---|---|---|
| 1 pull | I am all right | Are you all right? |
| 2 pulls | Pay out more line. | I am paying out more line. |
| 2 pulls—pause—2 pulls | Stop lowering. | I am ceasing lowering. |
| 3 pulls | Haul in slack line, or | I am hauling in slack line, |
| Repeated, sharp pulls | Haul up. | or I am hauling up. |
| | Danger—help me out. | Danger—I am hauling up as quickly as possible. |

In every instance when line signals are employed, they should be acknowledged by the recipient of the order repeating the signal to show that it has been understood and is being acted upon.

## Working in high expansion foam

Because high expansion foam is opaque, visibility in it is nil; also the audibility of speech between breathing apparatus operators when using speech diaphragms may be reduced. In addition, the intensity of the low-cylinder-pressure warning whistle and the warning signal emitted by the distress signal unit is reduced, so there is a need for even greater control when breathing apparatus men have to enter high expansion foam.

Immersion in high expansion foam may, therefore, give a feeling of complete isolation because sounds are virtually inaudible and reports have indicated that firemen may experience psychological effects similar to claustrophobia much more strongly than in smoke. Men should always maintain physical touch with each other and full use should be made of the safeguards provided by guide lines and communications equipment which embodies earpiece facilities.

## Working in special gases or vapours

The safety of breathing apparatus wearers depends, of course, upon much more than the efficiency of their sets. It is essential that they should have complete confidence in their sets and in their own ability to cope with all conditions they are likely to encounter in practice. This can only be achieved by thorough basic and regular continuation training.

There are, of course, certain aspects of instruction and training which cannot very well be demonstrated by practical trials. For example, special, care is necessary if breathing apparatus is to be used in trichlorethylene vapour. This substance is a non-flammable toxic liquid used in industry as a solvent and degreasing agent. It is a powerful rubber solvent and trichlorethylene vapour will, in time, penetrate rubber parts of a breathing apparatus. It is essential, therefore, that breathing apparatus should not be worn for longer periods than are absolutely necessary in an atmosphere containing this vapour.

Hydrogen cyanide is another substance which is extremely dangerous, as it can be absorbed through the skin, and so special precautions are necessary. Special precautions are also necessary for ammonia gas which, in strong concentrations, causes acute irritation of the skin, particularly those parts of the body which are wet or covered with sweat. For this reason, special protective clothing (Fig. 9.1) is often worn with breathing apparatus when dealing with incidents involving ammonia.

Fig. 9.1 Ammonia suit worn with breathing apparatus

## Working in hot and humid atmospheres

There are a number of factors which may affect the upper tolerance limits for men at work in hot conditions; the most important of these are dry bulb temperature,* wet bulb temperature,* air movement, clothing and duration of exposure. Professor Haldane as long ago as 1905 concluded that wet bulb temperature was the most important single factor limiting a man's ability to withstand heat. It will be seen, therefore, that the worst atmospheric conditions for working are high temperatures associated with high humidity and lack of air movement. Such conditions can build up over a period of time, but it is unlikely that these conditions would occur at fires attended by fire brigades in the United Kingdom. A limited degree of humidity may arise from the combustion of materials containing substantial amounts of water, and of course the humidity will rise when a fire is first attacked with jets of water, but this will also bring down the temperature and create air movement.

In fire situations where there is a lack of ventilation, such as in basements, ships' holds,

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* A measure of humidity of the atmosphere. A pair of similar thermometers are mounted side by side, one having its bulb wrapped in a damp wick dipping in water. The rate of evaporation of the water from the wick, and the consequent cooling of the 'wet bulb', is dependent on the relative humidity of the air. The amount of humidity can be obtained by means of a table from the readings of the two thermometers.

etc., high temperatures will be encountered, and the length of time men will be able to work in them will be governed by the actual amount of physical effort required, the men's ability to withstand heat and not the working duration of the breathing apparatus. Under such conditions, provision must be made to relieve the men at frequent intervals; in extreme cases reliefs at 15-minute intervals may be required.

There is a considerable variation in individual response to heat which may not necessarily bear any relation to the man's physical fitness or his ability to perform the task. The following is a brief outline of the effects of heat on the human body.

The human body is normally constantly generating heat, and surplus heat is dispelled through the skin and by ventilation through the lungs. If the temperature rises in the body due, for example, to exertion or to high ambient temperature, it is dispelled by sweat, which has a cooling effect on the skin as it dries; also some 10 per cent of body heat is dispelled through the lungs, i.e. in exhaled breath. The normal body temperature is about 37°C, and if a man is unable to get rid of the heat he generates through exertion or other reason, the body temperature will rise. If the temperature rises much above 39°C, symptoms similar to those experienced when one has a fever will develop, which will lead to lassitude and lightheadedness. If the temperature rises still further to about 41 °C, the man will become unconscious. The rate at which heat can be dispelled from the body is, of course, slower in hot than in cold conditions, and in hot conditions it is slower if the temperature is humid than if it is dry.

Under hot and humid conditions the moisture in the air makes it more difficult to get rid of body heat because it prevents the evaporation of sweat and the exhalation of moisture and consequent heat from the lungs. For this reason it is desirable that breathing apparatus sets provide so far as possible cool air to breathe, and this is why a cooler is fitted to the regenerative apparatus.

Hot and humid atmospheres are encountered in mines because of the presence of inherent moisture and water together with a lack of ventilation. This condition is, of course, aggravated by fire, and the National Coal Board have had a great deal of research carried out to establish working times for mines rescue teams under varying conditions. Some information about this research may be of interest.

Extensive tests have been carried out at the Mines Rescue Station, Doncaster, and the Department of Human Anatomy at Oxford University, as a result of which conclusions have been reached as to the safe working times for men wearing breathing apparatus in conditions similar to those of the tests. The work routine at the Mines Rescue Station was designed

to represent a mines rescue task, and two types of breathing apparatus were used: the *Proto* and a liquid air set, which, as would be expected, generally gave slightly better results than the oxygen gas set. The men were in two age groups, i.e. 19 to 31 years and 39 to 45 years of age, and the Doncaster tests indicated that there was no effect upon 'tolerance time' due to age; the men of the older group continued to work for as long as the men of the younger group.

The results of the tests show that rescue men wearing *Proto* breathing apparatus may be expected to work in saturated air environments for about 60 minutes when the saturated temperature is 27°C and 19 minutes when the saturated temperature is 38°C. With a dry bulb temperature of 38°C and a wet bulb temperature of 31°C a working time with *Proto* apparatus of 56 minutes was observed. Where the dry bulb temperature was 49°C and the wet bulb temperature was 26°C, the working time was about 55 minutes. The working times at these temperatures were slightly longer when the liquid air sets were used because these sets allow men to breathe cool, dry air.

These figures suggest that firemen wearing breathing apparatus may be able to work in conditions similar to those of the tests for up to one hour. With lower wet bulb temperature, somewhat high dry bulb temperatures could be withstood or longer periods of work undertaken. The normal operational duration of breathing apparatus in use by fire brigades is within the hour, and if men work for the full duration of their sets they should always be rested before they are required to undertake further work.

It should be borne in mind, however, that the working times arrived at as a result of the National Coal Board research are only applicable where the conditions, including the work rate, are the same as those used for the tests. The results should, therefore, be taken as a broad guide only, as fire-fighting conditions may differ considerably from those of the tests. The working times of men wearing breathing apparatus should be determined solely by the conditions obtaining at the time, and as already stated, 15 minutes' working may not be excessive in certain situations under severe conditions.

## 2.8 Front Office Administrator — Reception & Office Manager

**The Role**

You are the first point of contact - the face and voice of Olive Group. You will welcome visitors and take calls in a warm and professional manner. You will appreciate the

importance of reception and the significance of being at the forefront of a successful business. You will also act as the Office Manager in ensuring the smooth and efficient running of the office and all ancillary operations.

***Key Responsibilities:***

- Accommodate visitors, clients and job candidates
- Operate switchboard and direct potential clients to relevant departments
- Control distribution of conference call numbers
- Coordinate conference room bookings and appointments
- Record, file and track all outgoing and incoming courier and sort mail
- Manage all matters pertaining to reception/office appearance and utilities
- Cooperate with Office Manager on local facility
- Maintain database of suppliers and service providers
- Procure office furniture and supplies
- Maintain inventory of office stationery
- Assist Office Manager with office fit out requirements
- Record all incoming invoices in PDB register, gaining appropriate approval where necessary, and forward to Finance Department in a timely fashion
- Prepare expense claims for UK staff, gaining appropriate approval where necessary, and forward to Finance Department in a timely fashion
- Prepare petty cash records and cash count on a monthly basis, and send information to Finance Department by the end of the month
- Maintain updated list of UK staff names, contact information, birthdays and movement records
- Assist with administrative tasks and provide research and administrative support to all departments and individuals, where necessary
- Ad hoc duties as required and directed by your line manager

**Requirements :**

***Essential Skills:***

- Excellent communication and telephone skills (fluent, spoken and written English)
- Good computer skills - efficiency in MS Office (Outlook, Word, Excel, PowerPoint)
- Administration skills

***Key Characteristics:***

- Friendly personality - approachable, outgoing, assertive
- Good organisational skills: ability to prioritise, follow up and multi-task
- Flexible and resourceful at problem-solving
- Ability to work independently or as part of a team

**About the Company**

Olive Group is a global provider of integrated security and risk mitigation solutions that enable governments, non-governmental and international organisations, and commercial customers to assure high-value assets.

The company offers an array of security services and technology-enabled solutions to support critical infrastructure protection, post-conflict reconstruction, humanitarian work and emerging market requirements.

Olive Group operates in over thirty countries with principal offices in Dubai, London and Washington, D.C.

### 2.8.1 Operating Skills for Security of Office Premises

- Introduction
- Security of Office Premises is required for the safety of employees as weii as for the security of information, Office Equipment and all valuables that may be inside the Office.
- The extent of security shall depend on the type and nature of the operations being carried out from the concerned office.
- Extent of security may also depend on security situation of the area where the office is situated.
- Types of security.
- Security may initially cover the physical barrier and a dose screening of visitors at the reception area.
- There may be a Silent Trouble Alarm with a button with an officiaf to control it which if pressed may aiert the Security Guards or other employees or even the local police station who can then respond to such distress call.
- There must be a procedure in vogue for Badge issue and control of badges and for Escort of certain visitors and the details of security staff engaged at specified hours in such escort services

- In specific cases, visitor may be asked to establish their identities
- In high security zones, the Entry Door may be opened only to authorized visitors
- General Office Security
- Security personnel should not allow strangers to carry strange objects or ieave behind anything in the office where they enter
- Security personnel must check the office at the end of the day to see if any strange object is left behind or even to see if any file marked “Confidential” is left on the desk
- Security persons must check ir any valuables or money is left behind on the office table or elsewhere
- The Name of the Fire Safety !n-charge during specified hours must toe logged by the Security Department
- There must be fire drills conducted and the dates of such drills must be logged.
- The Security personnel must check every fire extinguisher and see that the refills are done on time and that those equipments are not tampered with
- Fire extinguishing “Sand Buckets” and “Water Buckets” must be maintained.
- Fire Safety Inspection must be done periodically and logged by the Security personnel
- Security personnel must be provided with Communication Equipments
- The list of High Frequency / Very High Frequency Radios, mobiles. Waikie - talkies, wireless phones etc. must be recorded along with the names of persons to whom those units are allotted.
- The Security personnel must have a list of all Office Vehicles and the names of all the drivers and helpers engaged on each day.
- The Security personnel must also have a list of ail equipments installed in specific vehicles viz. -Radios. Wireless sets etc.
- Special Security Aspects
- Visitors must not be allowed to loiter near the office
- It a threat is perceived, such as a bomb or extortion threat, the security person must stay calm and ‘listen carefully and try to trace the calier or keep options open so that the caller can be traced later.
- Security persons must not fake any risks keeping in mind the overall personal safety or ail staff members

- In case intruders manage to penetrate and enter the office, the security persons should tactfully isolate those persons in an area where they do not get access to telephones and other communication equipments.
- Efforts must be made to alert the appropriate Authority about a threat
- After the threat is over, no security person other than the Authorized Spokesperson shouid issue a statement to the press or any other media
- A Threat analysis shouid be done and that should cover:
  - General threats
  - Threats based on Political factors
  - Threats based on economic factors
  - Threats depending on local factors

    involving criminals and hostile organizations.
- Security persons must keep track of all property removed by maintenance staff or outside service personnel or vendors.
- Security personnel must take into consideration Office Computer Security aspects such as - List of all Desktop and laptop Computers, location of the Servers and the number of Workstations.
- The Securitv personnel must know who controls the Keys of afi the iocfcs including the duplicate keys and their custody. Control and procedure for handling situation where keys might get iost must be taken care by the Securitv personnel.
- The Security Personnel Operating in the Office, must know the details of all Local Staff, Number of Direct Staff- employees, Number of Contract-employees , Number of Trainees and the Number of Labours and Workers engaged on a particular day with deiaiis of their time of entry and their departure.
- Conclusion
- From the above areas required to be dealt with by the skmed Security staff personnel deputed at the Office premises, we can sum up by saying that:
- Skilled Office Security Operations should cover areas such as:
  - Physical Security Control
  - Access Control
  - Communication Control Contingency planning under threat / crisis situations
  - Deployment of local guards
  - Assistance from the iocai community

Almost every company facility has security guards. Security guards are found at access control points, reception areas, around buildings and in industrial areas. They are in usually in uniform and they represent an image of the company to the outside world and to employees and contractors. Every guard is seen as a representative and a symbol of the security function of a company as a whole.

But in many parts of the world, guards are ill-trained, ill-disciplined, and generally disrespected. Why then do we employ security guards?

The overall objective of employing a guard force is to provide risk-based security services. They protect personnel and assets and to deter, delay and detect unauthorized intruders and to respond to incidents. They provide reassurance to the workforce and support other functions concerned with safety and emergency response.

A guard force is ideally motivated, competent, trained, engaged and responsive. If achieved, respect for the guard force follows and it wilt be easier to have a reliable and effective security function in place. If not, there is a serious risk that a guard force will be seen as a costly burden that serves no useful purpose and this will reflect generally on the security function at any given location, and on the company operation as a whole.

This report provides advice, and sets out the principles and guidelines to develop an effective guard force, as well as discussing administrative and contractual elements of guard force engagement. The principles and guidelines set out are based on the collective knowledge and experience of members of the IOGP Security Committee. Interested readers may wish to refer to numerous publications and websites for more detailed guidance. One example is the UK's Centre for the Protection of National Infrastructure (CPNI) paper on guard force motivation, which can be found at http://www.cpni.gov.uk/documents/ publications/ 2011/2011024-personnel security-guard force motivation. pdf?epslanouaoe=en-ob . The American Society for Industrial Security (ASIS) recommends 'Guard Force Management' (Lucien G Canton, 2003, ISBN 978-0750677417) as a reference document for this subject.

## 2.9 Procurement and contracting

The procurement process or engaging a guard force can be time-consuming and requires careful planning.

Sufficient time should be allowed to:

- construct a scope of work

- ❖ establish technical criteria on which to assess potential contractors
- ❖ carry out appropriate due diligence enquiries on prospective contractors
- ❖ conduct a tender and bidding process
- ❖ carry out technical and commercial evaluations, including inspections of sites already served by the candidate contractors
- ❖ execute the contract.

A comprehensive risk assessment should be undertaken to identify what security services are required from a guard force.

This can vary enormously depending on a very wide range of factors. At one end of the scale, a company could be looking for a static reception and access control service and, at the other, a well-trained, disciplined force capable of dealing with hostile incidents.

Specific regulatory requirements should be taken into consideration that could dictate the nature of the security response available and impose some procedural commitments on the company, such as additional clearances for firearms and/or payments to government for security services.

## 2.10. Guard Forces

International law and custom hold the host government responsible for the protection of diplomatic missions. However, the United States and other nations often supplement security forces provided by the host government. The United States uses Marine Security Guards and local contract guards for this purpose. This program is particularly important in those numerous cases where the host is unable, or unwilling, to provide our overseas posts with adequate security. In this section of the report, the Panel provides comments and recommendations concerning local guard forces and Marine Security Guard Detachments.

The Panel studied individual post assessments of the foreign contract guard forces that are assigned to perimeter security duties at missions overseas. The picture that emerged from the post assessments is that the Department of State's guard force program is lacking in several areas. There is no consistency in the quality of the local guard force programs from post to post, even within the same country. The Panel found no correlation between the quality, training and preparedness of the guard force at a post and the level of threat.

The Department of State's Regional Bureaus allocate varying sums for contract guard

forces to the posts. Also, widely varying pay scales for contract guards exist. Regional or post security officers are responsible for supervising the contract guard force. However, the level of training they receive does not appear to be adequate. Many of the problems cited by the posts, including illiteracy, lack of standardized equipment, and inadequate training, can be attributed in part to the fact that the Department of State has not published a guard force manual establishing minimum but precise standards. It is increasingly important, considering some of our posts in highly threatened environs, that the Department explore new and aggressive means of upgrading and standardizing the guard force program. In summary, the Panel believes that broad reforms are necessary in the guard force program.

Almost every company facility has security guards. Security guards are found at access control points, reception areas, around buildings and in industrial areas. They are in usually in uniform and they represent an image of the company to the outside world and to employees and contractors. Every guard is seen as a representative and a symbol of the security function of a company as a whole. But in many parts of the world, guards are ill-trained, ill-disciplined, and generally disrespected. Why then do we employ security guards? The overall objective of employing a guard force is to provide risk- based security services. They protect personnel and assets and to deter, delay and detect unauthorized intruders and to respond to incidents. They provide reassurance to the workforce and support other functions concerned with safety and emergency response. A guard force is ideally motivated, competent, trained, engaged and responsive. If achieved, respect for the guard force follows and it will be easier to have a reliable and effective security function in place. If not, there is a serious risk that a guard force will be seen as a costly burden that serves no useful purpose and this will reflect generally on the security function at any given location, and on the company operation as a whole. This report provides advice, and sets out the principles and guidelines to develop an effective guard force, as well as discussing administrative and contractual elements of guard force engagement. The principles and guidelines set out are based on the collective knowledge and experience of members of the IOGP Security Committee. Interested readers may wish to refer to numerous publications and websites for more detailed guidance. One example is the UK's Centre for the Protection of National Infrastructure (CPNI) paper on guard force motivation, which can be found at http://www.cpni.gov.uk/documents/publications/2011/2011024- personnel security-guard force motivation. pdf?epslanguage=en-gb . The American Society for Industrial Security (ASIS) recommends 'Guard Force Management' (Lucien G Canton, 2003, ISBN 978-0750677417) as a reference document for this subject.

# Unit - 3 ❑ Skill for Security of Women & Children

**Structure**



## 3.1 Objectives

**Mission**

- Follow-up the implementation of international convention and national Laws pertinent to women, children and Youth conduct research and study prepare policy and guidelines;
- Follow-up the implementation; collaborate with organization's working on women Youth issues and perform capacity building activities to ensure equal participation and benefit of women in political, economical and social spheres

**Vision**

To see the Ethiopian women and Youth Equal participation and to benefit from economic, social and political spheres and protect children's rights and security.

The Ministry of Women, Children and Youth Affairs shall have the power and duties to:

1. Create awareness and movement on the question of women, children and youth;
2. Collect, compile and disseminate to all stakeholders information on the objective realities faced by women, children and Youth;

3. Ensure that opportunities are created for women and the Youth to actively participate in political, economic and social affairs of the country;
4. Encourage and support women and the youth to be organized, based on their free will and needs, with a view to defending their rights and solving their problems;
5. Design strategies to follow up and evaluate the preparation of policies, legislations, development programs and projects by federal government organs to ensure that they give due considerations to women and youth issues;
6. Undertake studies to identify discriminatory practices, and follow up their implementation;
7. Device means for the proper application of women's right to affirmative actions guaranteed at the national level and follow the implementation of same;
8. Ensure that due attention is given to select women for decision-making positions in various government organs;
9. Coordinate all stakeholders to project the rights and well-being of children;
10. Follow up the implementation of treaties relating to women and children and submit reports to the concerned bodies.

## 3.2. Introduction

This Handbook describes some of the protection challenges faced by women and girls of concern to the Office of the United Nations High Commissioner for Refugees (UNHCR) and outlines various strategies we should adopt with our partners to tackle these challenges. It sets out the legal standards and principles that guide our work to protect women and girls and outlines the different roles and responsibilities of States and other actors. UNHCR's own responsibilities in this respect are explained, both as part of its mandate to secure international protection and durable solutions and as a United Nations (UN) agency. Suggestions for actions by UNHCR and partners to support women's and girls' enjoyment of their rights are also included. Examples of innovative practices from the field illustrate how these principles can be applied. This Handbook refers to the protection of women and girls with the understanding that we are referring to all women and girls of concern to UNHCR, namely women and girls who are:

- asylum-seekers,
- refugees,
- internally displaced,
- returnees,

- ❖ stateless, or
- ❖ who have integrated into new communities.

## 3.3 Skills for Ensuring Security of Women

**General safety Skills**

- ❖ The best way for a women to feel secured is to use common sense and to take self precautionary steps.
- ❖ The wisest thing for a woman to do is to avoid trouble by adjusting ones behaviour and to assess the prevailing environment and the associated risks involved.
- ❖ The woman must follow her own instinct.
- ❖ One must leave as soon as the place looks uncomfortabfe.
- ❖ The woman must keep her eyes, ears and instincts open *to* notice details about people so that it can be described if needed later on.
- ❖ The woman must always show self confidence and never display the feeling that she is unaware about that place or the place she is going.
- ❖ The woman must always get prior information about the area , such as the location of the nearest Police Station, nearby shops, restaurants and business centres and the location of the nearest telephone booth.
- ❖ A woman must always dress and behave conservatively.
- ❖ A woman must never wear jewellery or carry cash , keys etc. in order to attract robbers.
- ❖ A woman must always know about alternate routes to reach her destination
- ❖ Routine times for picking up children from school, going io office or time for shopping must be altered sometimes.
- ❖ The woman must avoid interfering during threatening situations such as pohticai rallies
- ❖ Woman must keep an eye on strangers who might assess a place before carrying out their actions.
- ❖ A woman must never feel shy to scream if the situation demands.
- ❖ The woman security must know how to operate the walkie-talkie system
- ❖ The woman security must know the local customs and the local language and signal for seeking help.

**While alone at home**

- While alone at home a woman must keep all the entry doors iocked.The entrance area shouid never be dark.
- Identify a place inside the house which can be considered most safe.
- There should be a fire exit if possible.
- A woman must never open a door to strangers.
- A woman must never allow a stranger to make a telephone call from the premises.
- While using a lift, a lone woman should avoid travel with a stranger and instead get off as soon as she feels uncomfortable
- A woman must never engage a servant without checking their precedents or without Police verification.
- Neighbours must be intimated about ail servants who have been dismissed from service.
- The woman must train her servants to never open door carelessly, never to give out phone number to strangers, never to discuss or tell family affairs that they may know with any outsider.
- A woman must intimate the security station officer about any suspicious activity she might sense.

**While away from home or while travelling**

- A woman must always keep her contact numbers with some confident person while she is away from home.
- A woman must always be alert while travelling.
- A photocopy of her tidcet, passport, driving licence, credit card must be kept back with someone before a woman leaves home.

**While walking alone**

- A woman must wear shoes that will not snap if she has to run.
- A woman must not walk alone at night.
- A woman must not take a dark, vacant or a road close to bushy surroundings where others can hide and attack.
- A woman must avoid talking to strangers.
- If a woman is followed by a stranger she must never hesitate to take such actions that she feels proper.

- A woman must never halt if a car approaches her with baa intentions. She must not hesitate to shout and scream.
- Women must never'hitch-hike or accept a ride from a stranger.
- A woman should never jiggle her keys while walking to teii others that she is preparing to use the keys, if a woman finds her residence door open or broken she s'nouid never enter but should summon heip from the neighbours or the police.
- A woman must carry her handbag in a secured manner to prevent snatching.

**While using a Public transport**

- A woman must wait at a designated area to catch a train or bus.
- A Woman must not travel in a deserted compartment A woman must preferably occupy a train compartment where the train conductor is present A woman should avoid standing in a deserted platform A woman should avoid catching the last train or the last bus.
- A woman should always stay alert and see if she is being followed *after* she slights from the tram or bus.
- A woman should try to have someone to meet her at the station or DUS stand if she returns late.

**While socializing**

- A woman should not socialize with any persons whom she does not know.
- A woman should try to go out with a group of persons.
- A woman snouid choose a place where mere are omer persons if she has to meet a unknown person.
- A woman snouid speak out her mind without ietong others to guess and approach her to have intimate relations.
- A woman must insist on being treated with respect.

***Types of sexual harassment***

- A man who is a stranger stares hard at a woman.
- A man may intentionally brush past a woman.
- A man may utter obscene words and disappear into the crowd
- A man may keep following a woman etc.

**How to face such sexual harassment**

- The woman must simple ignore the advance

- If required, the woman must return a harsh comment after ensuring that she is outside striking distance
- The woman can stop and challenge the man outright to make him embarrassed and tell him that he is wrong The woman may keep a diary recording the incidents with dates, incidents, remarks, comments .actual conversation etc. that can serve as a record for filing a rormai complaint afterwards.
- The woman may even record the comments / conversation in her mobile phone or any other instrument.
- The woman may seek help from other female colleagues or sympathetic co-workers.

## 3.4 Operating Skills for Providing Security for Children

- Introduction
- In most locations there are children who are present.
- The security as well as ail others persons concerned must make special efforts to protect the children especially during crisis.
- The dutv of the security would be to assist parents in considering what to do in a crisis situation for protecting their children.
- Rules for Children to Follow During Crisis
- The children must be taught not to go out of sight of their parents when playing in public places
- A child should be told not go anywhere with a stranger without parent's permission
- A child should be told never to accept packages or letters from strangers
- The child must carry some identity proof giving out his/her name, address and contact number
- Rules for Parents
- A child should be taught never to get into a car or go into a house without permission from the parent or a guardian
- A child should never be left unattended in a public place even for a few moments
- The child should be made to remember his/her home address and contact number
- Children must know how to use public telephone and must be made to remember a few emergency phone numbers
- The parents must be asked to leave their contact numbers where they can be reached if required.

- The children must be trained to never leave their main doors open or unlocked and also never to open a door to allow a stranger inside.
- A parent should always listen to a child who protests about a perscr, or feels uncomfortable with a person. The reason must be asked and probed since there could be genuine factors.
- The children should be taught about the dangers posed by matches, gasoline, stoves, deep water, electric plug points, standing on roof edges, stooping down from fcaVconies , playing near a well or riverside or sea shore etc.
- Teach the Children how to cope with Crisis
- The children must be taught about the types of disaster a community can face.
- The children should not be allowed to witness events like fighting, killing, carry dead bodies' crimes being committed etc.
- After a crisis the children should be asked to go to school if H is open or be engaged in playing activities in order to divert attention and help them to overcome the trauma and mental stress.
- During crisis, the children should never be neglected and left alone. The parents, the teachers , the friends and family members must collectively help the child to overcome the crisis and for that play groups and support groups may be formed.
- The parents must never express feelings of fear and grief in front of the children as in that case those children will never mature to boldly face any other crisis in future when they grew up themselves.
- In case a child has witnessed a crisis or has fallen ill, he/she must never be left alone but should be attended to and given proper counseling in order to overcome the after effects of the incident.

## 3.5 Operating Skills for Handling Natural & Nuclear Disasters

- Introduction
- Every individual must know what steps should be taken before, during and after a Natural and / or Nuclear disaster
- Nobody can predict when a disaster can take place or how severe the impact can be.
- Therefore the only way out is to be prepared for disaster and know how to respond during and alter the disaster.
- What to do — in General

- ❖ Keep a stock of eatables which required little cooking and no refrigeration because during a disaster there may not be power supply.
- ❖ Keep a spare gas cylinder along with some emergency cooking equipment.
- ❖ Keep a first-aid kit handy
- ❖ Keep some blankets ready
- ❖ Keep emergency spare clothing handy
- ❖ Keep torch lights, flashlights handly with fresh batteries etc.
- ❖ Keep a portable radio with spare batteries in order to hear announcements

Most of today's conflicts take place within states. Their root causes often include poverty, the struggle for scarce resources, and violations of human rights. They have another tragic feature in common: women and girls suffer their impact disproportionately. While women and girls endure the same trauma as the rest of the population — bombings, famines, epidemics, mass executions, torture, arbitrary imprisonment, forced migration, ethnic cleansing, threats and intimidation — they are also targets of specific forms of violence and abuse, including sexual violence and exploitation.

Efforts to resolve these conflicts and address their root causes will not succeed unless we empower all those who have suffered from them — including and especially women. And only if women play a full and equal part can we build the foundations for enduring peace — development, good governance, human rights and justice.

In conflict areas across the world, women's movements have worked with the United Nations to rebuild the structures of peace and security, to rehabilitate and reconcile societies, to protect refugees and the internally displaced, to educate and raise awareness of human rights and the rule of law. Within the Organization itself, the integration of gender perspectives in peace and security areas has become a central strategy. An Inter-agency Task Force on Women, Peace and Security has been established to address the role of women in peacemaking, peacekeeping, humanitarian assistance and other activities.

This study, like the Inter-agency Task Force, is an initiative undertaken in response to Security Council resolution 1325 on women, peace and security adopted in October 2000 - in which the Council underlined the vital role of women in conflict solution, and mandated a review of the impact of armed conflict on women and girls, the role of women in peace-building, and the gender dimensions of peace processes and conflict resolution.

While the study shows that many positive steps have been taken to implement the resolution, women still form a minority of those who participate in peace and security negotiations, and receive less attention than men in post-conflict agreements, disarmament and reconstruction. Our challenge remains the full implementation of the landmark document that resolution 1325 represents. This study points the way to a more systematic way forward.

## 3.6 Standards and regulations

In order to ensure the effective and timely implementation of national or sub-national legislation and policies on shelters, relevant state ministers and departments should develop, in full collaboration with shelter workers and advocates, realistic guidelines, instructions and directives. Protocols and guidelines are important to outline the key service components provided by shelters and methods of service delivery, in order to promote women and girls' access to quality care and support.

Regulations for women's shelters can help to ensure that services to address the needs of women and their children are available, properly-resourced and appropriately aligned with core guiding principles.

Guidelines for shelter provision should be developed in collaboration with shelter staff as well as survivors, and may involve:

- The creation of a strategic plan for the shelter, which may answer the following questions: How will decisions be made? How will policies be developed? What is the state of the shelter and in what state should it be in the next three to five years? What is the process for achieving goals? (see developing a programme framework)
- A service delivery policy to include information such as the:
  - shelter's mandate, principles;
  - services offered to both women, and where relevant, children (including accommodation,/ provision of basic personal and household items, crisis intervention, risk assessment and safety planning, and counseling supports, referral and accompaniment to legal, health, security and social assistance, economic and employment activities);
  - staffing and structure
  - collection and storage of women's personal information (including rights related to access and confidentiality); and
  - residents' rights and responsibilities.

For example, the Ixora shelter for abused women and their children, established in 1999 by Help & Shelter in Guyana, has developed a comprehensive *Governance, Policies & Procedures Manual* that is reviewed every 18 months. The manual covers guidelines related to the governance and operational aspects of the shelter as follows:

- **Help & Shelter Governance Structure** (including accountability measures, membership, meetings, role and responsibilities of the Board, roles of coordinator and volunteers)
- Finance (including budget Process and Responsibilities, audit Arrangements, delegated of Authority, accounting Policies and Procedures, among other areas)
- **Human Resources** (including employment Policy, Grievance and Disciplinary Procedures, Contracts for Services, voluntewer stipends)
- **Operations Procedures** (related to child protection, guidelines for personnel/ volunteers, ethics and responsibilities, procedures for counseling, hotline support, sexual abuse cases. Monitoring and evaluation, physical and information security)
- The identification of minimum standards for what services will be available, how they will be distributed geographically and who will provide these services. These should include:
  - Confidentiality
  - Safety, security and respect for residents and staff
  - Accessibility (including child care services)
  - Availability
  - Free of charge and provision for residents to stay as long as required, regardless of their financial situation
  - Work within a gender analysis with the principles of empowerment and self-determination
  - Expertise recognized and developed through training
  - Qualified staff
  - Holistic services
  - Interagency coordination

Illustrative Example: **The Council of Europe's Combating Violence Against Women: Minimum Standards for Support Services includes the following set of minimum and asnirational standards for shelters.**

| Minimum standards | Aspirational standards |
|---|---|
| Services in shelters should be provided by female staff. | |

| Minimum standards | Aspirational standards |
|---|---|
| The security of residents should be addressed through confidential addresses and/or through appropriate security measures and monitoring. | There should be a written policy on visitors (where they are permitted). This should include ensuring that visitors understand confidentiality. |
| If there are insufficient places, or services are withdrawn - the shelter should assist in finding a suitable safe alternative accommodation. | Any alternative accommodation should be evaluated for compliance with the shelter's safety and confidentiality policies. |
| Refusal to provide or re-admit to services should only be undertaken where serious breaches of rules have taken place, or for safety of women and Children. | |
| Shelter support should be available for as long as the service user needs them. | |
| Staffing levels should be sufficient to meet the needs of current service users and children. | |
| Crisis support and safety planning for each service user. | Should provide information on the service user's rights and responsibilities (including confidentiality policies) within 24 hours of admission.<br>Rules should be presented in empowering language. |
| A written needs assessment should be completed within 3 to 7 days of admission. This should encompass:<br>health/medical needs;<br>children;<br>housing;<br>legal options; | Specialist shelter provision should be made for women who are substance abusers. |

| Minimum standards | Aspirational standards |
|---|---|
| financial assistance and options;<br>job training, employment, and education.<br>Should be able to provide (or make referral to) legal advice, advocacy, accompaniment and other support services. | |
| Should provide assistance to ensure that service users have independent economic means when they leave the shelter. | |
| Should have at least one qualified child care worker on the staff. | One child care worker per 10 children;<br>Safe play areas;<br>Outings and activities for children<br>Child protection policy |
| Shelters should model and promote respect and non-violence in all interactions including those between adults and children. | |
| Where a place is unavailable due to the age of an accompanying male child. The shelter should assist in providing or finding an alternative safe place for the family. | Any alternative accommodation should be evaluated for compliance with the shelter's safety and confidentiality policies. |
| Should assist in maintaining the child's education. | Have protocol with local schools to address child residents' needs.<br>Have space and facilities for adolescents to do homework. |
| **Training for shelter volunteers and staff should be a minimum of 30 hours and cover:**<br>A gendered analysis of violence against women;<br>Communication and intervention techniques; | There should be staff trained/able to communicate in sign language.<br>Information and counseling should be available in several languages reflecting the communities the shelter provides services to. |

| Minimum standards | Aspirational standards |
|---|---|
| Confidentiality;<br>Child protection;<br>Accessing translation and disability services;<br>How to make appropriate referrals;<br>Information on trauma, coping and survival;<br>Assessing risk;<br>Non-discrimination and diversity;<br>Empowerment. | [Staff should receive some basic training on immigration status/law. |
| Resettlement and follow-up services should be available to ex-residents and their children. | |
| Excerpt: Council of Europe. 2008 Combating Violence Against Women: Minimum Standards for Support Services. CoE. Vienna. | |

Illustrative example: Establishing Service Standards in Scotland

From 2009-2011. Scottish Women's Aid, a network of 38 shelters, developed domestic violence servicestandards in response to the need for benchmarks and a framework for measuring the value of shelter specialist services. Using a collaborative assessment process, the standards aim to assist shelters to document their practices to create evidence and demonstrate their contributions to women. The Standards focus on 5 themes: staff skills; accessible services for children and young people; safety and security; effective partnerships; and representation of women's voices to other agencies. An assessment of 28 shelters in 2012 and an evaluation of the standards informed their finalization for use by members of the network.

Background

The assessment process began in 2009, with a draft set of standards shared with advocates at an annual shelter conference. This was followed by:

- The establishment of a working group with respresentatives from 11 shelters responsible for shaping the standards and developing criteria for each (completed in March 2011).
- Two trainings with shelter staff to: increase their skills and confidence as peer

assessors; outline the assessment process and approach, including asking questions and collating evidence; review challenges/fears and benefits of peer assessment; gather staff opinions on characteristics of an ideal assessor and willingness to receive assessors at their shelter.

- Piloting the Standards in 3 shelters and revision based on the assessment experience.
- Outreach by Scottish Women's Aid, through shelter newsletters with updates on the process; follow-up with individual facilities; and a formal event to launch the standards, involving the Working Group and related organizations. Communication messages promoted shelter buy-in for the standards, by reinforcing their purpose to: protect domestic violence services and increase state support; create evidence around shelter services and quality; and promote a comprehensive approach to ensure good practice across services.

**Assessment process**

The Standards are promoted through a peer-led and confidential assessment conducted over a 3-month period. The assessment can help shelters identify: innovative and promising practices; areas for improvement;'and supports needed from Scottish Women's Aid. The process involves:

- A shelter self-assessment based on evidence/ documentation available (2-3 weeks);
- Email submission of the form to the assessor (shelter staff with past assessment experience);
- Joint review of findings with the assessor, an explicitly supportive rather than advisory role; and Agreement of promising practices on the Scottish Women's Aid website.

**Recommendations for replication**

- *Allow sufficient time for the process to ensure shelters are fully engaged,* before expanding partnerships with other sectors and institutions (e.g. government bodies who may develop their own related criteria), considering staff turnover and other unexpected delays.
- *Employ and sustain participatory and inclusive processes* for the development of standards, as demonstrated in the multipronged approach used by Scottish Women's Aid.
- *Standards should integrate/ complement existing criteria* (e.g. the Scottish government's National Care Standards')

**Resources:**

Summary of Standards

Standards and Assessment Criteria

Guidance for shelters being assessed

Guidance for Assessors

**Source:** Ash Kuloo. 2012. Presentation at Second World Conference of Women's Shelters. Washington, D.C.

In addition to specific service requirements, directives may guide the development of effective partnerships between shelters and other service providers, as shelters in most jurisdictions are run at the local level. Partnerships between shelter advocates and workers and officials at different levels of state, as well as other community stakeholders, including police and child welfare agencies, are necessary.

For example, the Tasaru Ntomonok Initiative in Kenya, designed for women and girls fleeing female genital mutilation and forced marriages, demonstrates effective collaboration among partners. The shelter receives referrals from the local Department of Education, which also involves an intake process to clarify the details of each case. When girls access the belter, the Child Welfare Department is notified to help with family reconciliation if the girl's parents agree to not have their daughter undergo the practice. The shelter also assists with court processes for protection orders. The establishment of local networks and carefully fostered partnerships were key to implementing the national and sub-national laws and policies successfully. Read more about the Initiative.

Guidelines should also outline the training and capacity development needs for public officials responsible for funding and liaising with shelters and their workers, since they may not be familiar with issues of violence against women.

Examples of shelter protocols and guidelines to help standardize service provision mandated by legislation and supported by policy include:

- Australia: *Code of Practice for Specialist Family Violence Services for Women and Children 'Enhancing the safety of women and children in Victoria* (Domestic Violence Victoria, 2006). The guidance, supported by the Department of Human Services, aims to provide the basis for a shared understanding of the gendered nature and dynamics of family violence and establish a foundation for collaborative practice among services and across sectors responding to family violence. It is accompanied by standards for counselling and support groups.

- Bosnia and Herzegovina: *Book of Rules on the Implementation of the Protection Measure of Sheltering Victims of Domestic Violence* (2006).The regulation provides a framework for which institutions may provide shelter services for women, what those services should entail and how they should be provided, including guidelines on infrastructure, staff competencies and rights of residents.
- Canada: *"I Built My House of Hove": Best Practices to Safely House Abused and Homeless Women* (Human Resources and Social Development Canada, 2009) which offers shelter workers information about how to safely house women and their children who have experienced violence, the different options for housing women (i.e. women staying in their homes, emergency shelters, longer-term options, etc.) and how to increase women's overall security.
- Moldova: *Model Regulations for the Rehabilitation Center for Victims of Violence* (2010) and *Frame Regulation on the organization and operation of assistance and protection centers for victims of trafficking in human beings* (2006)
- Serbia and Montenegro: *Code of Conduct for Establishing a Confidential* A/K'/Ze/fOSCE/ODIHR, 2001)
- South Africa: *Minimum Standards on Shelters for Abused Women* (Task Team on Shelters, Department of Social Development, 2001) set out principles in the provision of services; provide a framework for services from prevention efforts, ongoing support for survivors to identifying integrated and second stage housing; and establish guidelines for the operation, security and management of shelters, safe spaces, crisis centres in South Africa.

**Illustrative Resources:**

Service Delivery Standards for Member Programs (Iowa Coalition against Domestic Violence, USA, 2012). This resource provides detailed guidance on residential and non-residential services for women, children and perpetrators. Available in English.

National Service Standards for Domestic and Sexual Violence Core Standards (Women's Aid, UK, 2009). Available in English Policies and Procedures: Guidelines for Shelters (National Aboriginal Circle Against Family Violence, Canada available in English and French; Part 11 available in English and French.

**Rights and responsibilities**

Information on the rights and responsibilities of shelter residents is important to make

available as part of the arrival process to clarify expectations related to women's safety, participation and other aspects related to her stay at the shelter (e.g. the information that can be shared with non-residents; visitors guidelines or contact with abusers in cases of domestic violence, etc.).

Framing guidelines as rights and responsibilities rather than 'rules and regulations' aligns with the core principles of empowerment and self-determination, which should be integrated across all components of shelter services to ensure women's rights are truly promoted by service providers.

Rights and responsibilities should be designed with flexibility and responsiveness to women's needs and may complement or be part of the shelter policy.

They should describe the environment to be maintained at the shelter and should be posted or made easily accessible to residents. Key issues to be considered include:

- Safety and security (e.g. physical security of the facility; confidentiality of names, addresses and other information; and visitation)
- Use of shared and private spaces (e.g. housekeeping; maintenance of play areas for children; hours; respect of privacy; regulation of noise; and other house rules.)
- Interpersonal communication and behaviour between and among residents, their children, and staff (e.g. use of violence; respectful communication)
- Health (e.g. medical assistance; testing and disclosure related to communicable diseases, such as HIV; alcohol, cigarette and other substance use.)
- Opportunities for participation (house assembly, shelter council, support groups, workshops, training, committees, shared childcare schemes and meetings.)
- Other (e.g. responsibility for children; financial contributions; transition out of the shelter and re-entry; complaints processes; etc.) (Melbin et al., 2003).

**Illustrative Example: Missouri Shelter Rules Project (United States)**

In 2007, the Missouri Coalition Against Domestic and Sexual Violence (MCADSV), a state-wide network of over 100 domestic and sexual violence programmes, began a project to review the approach to rules used by shelters in the Coalition. The intervention aimed to improve the effectiveness of services provided by shelters, and developed in response to recurring challenges experienced by advocates and shelter staff in implementing rules (for example, related to children, chores, confidentiality, conflict resolution, curfew, drug and alcohol use, kitchens and food, medications, mental illness, entering/exiting the shelter, and participation in support groups and house meetings). The project has also

addressed the ongoing debate related to the need for rules and their alignment with shelter principles of empowerment and autonomy for women. During the pilot, an initial seven shelters chose to: remove written rules altogether (2 programmes); reduce the number of written rules in place (4 programmes); or improve policies and procedures for staff in place of written rules for residents (1 programme). After a year and a half, six shelters continued and seven new shelters joined the initiative. The Missouri experience demonstrates that minimal- rule approaches am main tain shelter structure and safety for survivors, while creating a more welcoming environment and providing more individualized services for women residents. This responds to survivor feedback on problematic rules as well as staff perspectives raised in defense of maintaining more comprehensive regulations (see Lyon, E., Lane, S. & Menard, A. 2008. ***"Meeting Survivors' Needs: A Multi-State Study of Domestic Violence Shelter Experiences".*** University of Connecticut School of Social Work and Anne Menard, National Resource Center on Domestic Violence).

**Kev lessons from the intervention include:**

- Shelters should have the organizational capacity to support internal transformation when revisiting their approach to rules (e.g. strong leadership and commitment to fully engage staff, while managing disagreement and resistance to change that may occur during the process).
- An intervention to revise rules may not be appropriate in all settings, particularly if there is strong resistance throughout the team that cannot be changed through multiple dialogues and training.
- It is important to involve, from the beginning, both shelter administrators/ managers as well as advocates/staff in the process of change, as each group has a particular role and perspective on the function of rules, and buy-in from all groups is necessary to successfully implement change.
- Additional training and continuous opportunities for dialogue should be provided to all staff to reinforce the shelter's values, approach to advocacy and service provision, as well as facilitate the process of change. Managers should be prepared to respond to staff changes, for instance, if staff members are unable to overcome their resistance to the intervention.
- Shelters may be more successful in transforming their use of rules when collaborating with other shelters or a coalition of shelters, or drawing upon the experience and support of others who have implemented similar changes.
- The process of transforming the environment within a shelter takes time and may

not be easy for managers or staff. Evaluation of the process should be conducted well-after the intervention has begun, to provide sufficient time for staff to reflect on the process and its outcomes on their advocacy practices and women's experiences.

- ❖ Physical changes to the shelter may facilitate the reduction of rules (e.g. creating separate sleeping or bathing spaces for women and their families; locked spaces for women to keep their food and belongings; safe areas for children to play without constant, direct supervision; security features to enable women to freely exit and enter the shelter, etc.). Despite initial costs, strategic investment in improving the living environment has long-term benefits on the effectiveness of the shelter and services provided by advocates.
- ❖ There are various approaches to supporting a minimal-rule environment, and each shelter should determine the most appropriate practices which meet the needs of its residents and enable staff to provide the most effective services.

The Missouri project experience is captured in the manual *How the Eurth Didn't Fly Into the Sun: Missouri's Protect to Reduce Rules in Domestic Violence Shelters* (Missouri Coalition Against Domestic and Sexual Violence, 2011), which also provides detailed guidance and templates for integrating a minimal-rule approach within a shelter.

**Complaints Procedures:**

Women should have opportunities to communicate any grievance or complaint they have with the staff or services being provided at the shelter. In addition to ongoing monitoring of services and mechanisms for receiving feedback from residents, a complaints process is important to enable shelters to address concerns of residents and improve the quality of its support.

A complaints process should cover a range of options available to ensure that women can raise their concerns in a manner in which they feel comfortable, and that problems are resolved using the most effective and appropriate methods (which may vary depending on the specific grievance).

**Key considerations for establishing complaints procedures include:**

- ❖ Determining an appropriate and realistic time frame for the shelter to address complaints.
- ❖ Identifying the different mechanisms which may be pursued by women to communicate and seek resolution for their complaints. These may involve:

- ✪ direct dialogue with relevant staff or their supervisor if the woman is unable or uncomfortable to speak with the staff involved;
- ✪ participation in a facilitated discussion or mediation on the issue;
- ✪ raising the issue in fora for shelter residents to discuss concerns or via representatives of residents, if such mechanisms exist; or
- ✪ providing confidential and anonymous written feedback, for example, through a locked complaints or comment box which is reviewed by shelter managers or a joint group of shelter staff and residents.
- ✪ filing a written complaint with the staff member, their supervisor or higher-level managers.

❖ Clarifying the chain of authority or levels through which complaints will be processed (e.g. supervisors, followed by shelter managers, executive director, and if needed, to the shelter's board or governing body).

Women should be informed of the complaints procedures upon their arrival at the shelter as well as when a particular issue is raised. Written information should also be available to all residents in accessible formats (i.e. hard copies of material in communal areas, with specific versions in the different languages used by residents, and alternative formats designed for women with communication disabilities or limited literacy) (WSCADV;WAVE, 2004).

**Tools:**

***Training Manual for Improving Quality Services for Victims of Domestic Violence*** (Women Against Violence Europe, 2008) offers training modules for shelter workers on understanding the problem of violence against, the role of shelters, how to set up a shelter, how it should be funded, what services should be offered, how to maintain a safe and secure shelter and information about the management of shelters, community life in shelters, public relations, networking and evaluation.

***Away from Violence: Guidelines for Setting Up and Running a Women's Refuge*** {Women Against Violence Europe, 2004). This briefing kit, developed by, is a resource for professionals intending to set up a shelter and may be used to support advocacy for improved policies and government support for shelters. The manual seeks to improve standards that may be applied across the various country-contexts in Europe and provides practical guidance on how to establish, organize, operate and manage a refuge (including the development of policies and procedures).

***Model Rights and Responsibilities Model Rights and Responsibilities for Shelter Residents*** ( Washi ngton State Coalition against Domestic Violence). This model policy is for shelter managers and staff, based on the context in the United States.

The resource provides guidance on the contents of shelter policies; a sample policy template that can be adapted as relevant: and a checklist of questions for reviewing existing shelter rules.

***Model Grievance Form*** (Washington State Coalition against Domestic Violence). This model form is for shelter managers and staff, based on the context in the United States. It includes a brief overview of issues to be considered in the grievance process and a sample letter which may be used or adapted by shelters.

***Shelter Rules*** (WSCADV). This online toolkit features audio visual materials, case studies, templates and other guidance to help shelter managers and staff understand and develop empowering guidelines for shelters that minimize control and maximize women's autonomy.

***Combating violence against women: Minimum standards for support services*** (Alberta Council of Women's Shelters, 2008). This resource summarizes the state of service provision for survivors of violence against women across Europe and identifies minimum standards of service delivery, including include qualified staff, child care services and provision for residents to stay as long as required, regardless of their financial situation.

***How the Earth Didn't Fly Into the Sun: Missouri's Project to Reduce Rules in Domestic Violence Shelters*** (Missouri Coalition Against Domestic and Sexual Violence, 2011). This manual provides guidance for integrating a minimal-rule approach within a shelter, with details on the experience of the Missouri Coalition Against Domestic Violence in the United States. The tool includes an overview of the Missouri project, as well as guidance for implementing changes in shelter rules, responding to challenges, and templates for resident and staff handbooks as well as surveys.

## 3.7 Operating Skill for security of women & children

### Introduction :

Both women and children have been disproportionately affected by conflict as casualties of violence, as internally displaced persons and as refugees. Violence against women and children in conflict harms families, impoverishes communities and reinforces other forms of inequality. In addition, women and girls suffer direct violations of their physical integrity, for

example through reproductive violations and enforced pregnancy. Most recent conflicts have been rife with epidemic rates of sexual and gender-based violence, combined with high levels of gender-based human rights violations. The reality is that sexual violence has often been dismissed as an unfortunate consequence of conflict, resulting in widespread impunity for these crimes and general tolerance of gender based violence in post-conflict societies. It was in recognition of this pervasive problem that the African Union Peace and Security Department decided in 2010 to examine how best to develop targeted action to mitigate violence against women and children in armed conflict, building on the already existing normative frameworks.

## Existing Normative Framework :

In 2003 and 2004, African heads of state adopted the Protocol to the African Charter on Human and People's Rights on the Rights of Women in Africa ("the Women's Protocol") and the Solemn Declaration on Gender Equality in Africa (SDGEA) which endorse the provisions of UN Security Council Resolution 1325 of 2000 on Women Peace and Security, the two documents call for the presence of women in conflict prevention and peace building activities in order to reverse their marginalization and abuse of human rights.

These international commitments are bolstered by some of the guiding principles of the AU, including the promotion of gender equality for which the AU Commission (AUC) has mandated a 50 per cent representation of women in its institutions. In the context of peace and security, the Post Conflict Reconstruction and Development Policy (PCRD) 2006 also commit member states to that same principle.

Building on UN Security Council Resolution 1325, the Gender Policy of the African Union (2009) equally calls for the effective participation of women in peace support operations, conflict prevention, mitigation and post conflict reconstruction and development efforts, as well as for an increase in women participation in all processes aimed at maintaining peace and security and avoiding relapse into conflict.

## Going Beyond the Normative Framework :

As noted above, while significant progress has been made in outlining a comprehensive human rights architecture for the continent, and within this to provide mechanisms to both prevent and address violence against women and children in conflicts, gross violations including sexual violence, displacement, recruitment of children by armed forces or groups, loss of life and livelihoods remain widespread. Despite the adoption of various legal mechanisms and resolutions, impunity for violations remains widespread and this is

compounded by women's marginalisation in peace processes and post-conflict reconstruction programmes. As with all international and regional agreements, the central challenge is to affect the shift from ratification to domestication and implementation in order to realise the rights of all Africans.

Notwithstanding the existence of a strong normative framework conducive to the institutionalization of a gender sensitive culture within the AU, the effective implementation of key recommendations in the field of gender, peace and security has been weak at all levels.

As the Department tasked with implementing the Africa Peace and Security Architecture (APSA) and the decisions of the Peace and Security Council (PSC), as well as managing the AU's objectives in so far as promoting peace and responding to crisis situations is concerned, the Peace and Security Department represents the key entry point for gender mainstreaming into the continental peace and security agenda.

Fully cogniscent of the centrality of its mandate and of the need to include women in the peace and stabilization efforts in Africa, the Peace and Security Department (PSD) of the AU has taken concrete steps to mainstream gender into the work of its Department at the institutional, operational and programmatic level.

Concrete steps undertaken by the Peace and Security Department:

**1. PSD Roadmap for gender mainstreaming: 2011-2013:**

PSD understands that responsibility for the implementation of a gender policy must be diffused across the organization structure, rather than concentrated in a small central Unit, which prompted the Department's initiative, in June 2011, to develop a comprehensive roadmap and action plan for the period from 2011 to 2013, which seek to enhance the gender perspective into all aspects of the Department's work, especially within the African Peace and Security Architecture (APSA), various policies and activities, through building gender capacity and accountability.

The roadmap has given an entire section (XIII) to the topic of women, peace and security. It lists several activities that were taken up by the AU Commission to strengthen the normative basis for the protection of women in armed conflicts and their successful implementation is on the way. These include, on the one hand, the consideration of the introduction of a Special Representative on Sexual Violence in the context of armed conflict; on the other hand, regular training sessions for AU headquarters and field staff to strengthen their skills in gender mainstreaming in line with the UN Security Council Resolution 1325 (2000) and subsequent resolutions. These trainings are an important measure to

increase awareness of the AU personnel on gender issues in the context of conflict prevention and response.

**2. The Panel of the Wise Study:**

The Panel of the Wise, one of the important pillars of APSA, and a consultative body of the Peace and Security Council, mandated to provide opinions on issues relevant to conflict prevention, management, and resolution has undertaken a comprehensive study on "Womena dn Children in Armed Conflicts" with the view to recommend ways to step up the implementation of existing commitments made by the Heads of State and Government, and various stakeholders in eliminating forms of violence against civilians, particularly women, girls and boys in armed conflict. Recommendations are grouped under six main headings: (i) Commitment and ratification; (ii) Promoting AU institutional co-ordination; (iii) Monitoring and documentation; (iv) Promoting accountability mechanisms; (v) Prevention and early warning; and (vi) Supporting AU-REC relations. The extensive study is expected to be submitted to the Assembly of Heads of states and Government in January 2014.

The report outlines both the considerable developments in the African Union's human rights architecture, as well as the challenges faced in the implementation of mechanisms aimed specifically to address issues related to women and children in armed conflicts. The report includes a number of recommendations directed to the AU at large, as well as to the Commission, in order to strengthen African instruments for mitigating violence against women, girls and boys in conflict situations. It also identifies ways in which the Panel of the Wise can assist in devising measures to consolidate the efforts of the AU through ensuring the implementation of existing obligations. By so doing the AU can address, politically and substantially, the vulnerabilities of women, girls and boys in armed conflict situations.

**3. The Annual Open Sessions of the PSC on Women and children in Armed Conflicts: the Livingston Formula:**

In December 2008, the Peace and Security Council (PSC) of the African Union (AU) held a retreat in Livingstone, Zambia and agreed on a mechanism for interaction between the PSC and Civil Society Organisations (CSOs) in the promotion of peace, security and stability in Africa. This is mechanism is known as the **"Livingstone Formula".** The Livingstone Formula has provided an opportunity for CSOs to contribute to the efforts of the PSC of the AU to foster peaceful and stable societies and to protect civilians, especially women and children. This collaboration of the AU and civil society has helped bring to the

forefront, the personal stories of women and children during armed conflict and has further opened the door for civil society to impact AU processes to safeguard the livelihoods of women and children, and for the AU to support civil society in mobilizing national, community and continental efforts towards sustainable peace initiatives.

As AU and its Member States were demonstrating a firm commitment to address issues related to both women and children in armed conflicts through well-defined human rights mechanisms, and by declaring the year 2010 the beginning of the AU Decade for Women (2010-20) which is intended to accelerate the implementation of the AU's policy framework to promote the rights of women on the continent, the PSD took advantage of these opportunities to launch the Livingston Formula with a PSC open session on Women and Children in Africa in March 2010 in Addis Ababa. ***At the conclusion of its meeting, the AU PSC made a decision to devote an open session, every year, to the theme of women and children and other vulnerable groups in armed conflicts.*** In convening these open session meetings, the PSC recognizes that a focus on women and children brings into clear view the wider human security dimensions of the AU peace and security agenda. Moreover, the Panel of the Wise took adavatneg of the opportunity to present the initial findings of its above-mentioned report on "Women and Children in Armed Conflict" to frame the discussions.

During the second AU Peace and Security Council open session, in March 2011, the AU Panel of the Wise requested FAS in partnership with UN Women, Urgent Action Fund (UAF) Africa, Oxfam, Isis Women International Cross-Cultural Exchange (Isis WICCE) to mobilize women survivors of sexual violence from DRC, South Sudan, Uganda, Guinea, Zimbabwe, Kenya and Cote d'Ivoire to produce a statement consolidating their views and recommendations. The statement included testimonies and recommendations on interventions regarding prevention of sexual violence and the rehabilitation of survivors. One of the key recommendations the women made was for the need for a holistic postconflict rehabilitation and reconstruction programmes to provide psychological, medical, legal, and financial support to women and children affected by conflicts. Related to this, the women survivors made a recommendation for the provision of a recovery fund for them to get economic empowerment and develop targeted programmes to be financially independent and claim their rightful role in the post conflict reconstruction.

At the third Open session of the Peace and Security Council (PSC) held on 26 March 2013, Council took note of the statements made by the Commissioner for Peace and

Security, the Director of Women, Gender and Development Directorate (WGDD), as well as United Nations agencies (UN Women and UNICEF), which focused on the role of Women in the promotion of peace in Africa since in Africa 1963; the contemporary nature of the threats to women and children in conflict areas; progress made since the PSC's last meeting in 2011 as regard to the protection of women and children in armed conflicts; review of various innovative and successful initiatives by non state actors and propose ways to support them.

## 3.8 Skills in Handling Radio Communications

- Introduction
- The purpose of radio communication is to provide the security personnel, the required guidance for knowing basic communication procedures.
- Skills are also required for knowing physical principles of radio operations.
- General Rules:
- All radios within a network consist of two or more radios operating on the same frequency or electromagnetic wave.
- Radio networks may operate on High frequency (HF) or Very High Frequency (VHF).HF radios use waves along the ground or reflections of waves off portions of the atmosphere to bounce signals from one station to another. VHF Radio waves travel in a short range.
- Radio Security must be kept in mind. Regular radios are public but radios used by security personnel are private. Radios can be deliberately "jammed" so that messages can neither be sent nor be received.
- Transmitting massages
- The frequency selection switch must be properly set to the correct frequency.
- One must know that only one person can broadcast at a time.
- While talking the 'Talk switch" is to be pressed but after talking that switch must be pressed again and released or eise the other person's reply will not be heard.
- One must not hold the microphone too dose to the mouth and he /she must not shout while speaking.
- Long conversations must be avoided as that will prevent other carters from communicating.

- ❖ Whenever a Security personhel gets into a Serious Crisis or emergency situation he must be given priority to speak, in such a situation he must repeat “Emergency Emergency Emergency” three times and give out his identity code.
- ❖ In a, not-a-serious crisis , the called must say “Security Security Security” three times and identify himseif.
- ❖ The Security personnel must know that the radios must be maintained property.
- ❖ The radio and battery must not be kept continuously in the charger so that the battery does not get over-charged. There may be different kinds of chargers, for example chargers with no indicator light, chargers with Teiiow indicator lights to indicate that the charger is working, chargers with Red indicator lights to indicate that the battery is accepting the charge and Red and Green indicator lights where the red light indicate that the charger is working and the radio battery is accepting the charge, here the red light will go out as soon as the battery is fully charged and the green light will come on
- ❖ It must always be kept in mind that security personnel must keep their batteries recharged so that the radio can function. These HF or VHf Radios normally operate on 12 Volt battery and therefore, in worst situation, these batteries can be recharged by piacing those batteries in a vehicle and by running the vehicle engine till the battery is charged.
- ❖ The Radio is a vital equipment in the possession of a security personnel, therefore it must be taken care properly.
- ❖ The radio shouid never be carried along with its antenna .
- ❖ The radio should not be dropped on banged hard or else it might get damaged.

### 3.8.1 Radio Communication for Security

We all know that communication skills are amongst the most important skills that a security officer can posses. Often, we need to relay messages and information further than would otherwise be possible via verbal means, in order to achieve this, a security officer has a number of tools at his/her disposal, such as the mobile phone, short message service, Morse code (not so common these days) and of course, the radio.

In this article, we are going to look at some of the more basic, but all too often forgotten radio proccedures required for the quick, concise and accurate transmission of information via radio.

**Basic Procedure**

It is important to remember that strict radio procedures and disciplines need to be adhered to at all times when using a radio, whether it be a hand held, vehicle based or a base station set up. This is important for a number of reasons. First and foremost, we observe strict radio procedures to preserve the security of the information being transmitted. Regardless of how secure the equipment you are using may be, always operate on the basis that someone could be listening in on your transmissions. Therefore, names of operatives and locations involved in a particular operation should be disguised via the use of code words or call signs.

**Call Signs**

When used in radio communications, call signs can perform a number of functions. Their primary function is often to protect the identity of the parties involved in the radio transmission. However, they also serve to simplify matters when communicating between large groups of people. For example, can you imagine trying to communicate with someone on a first name basis when there are three people in the group all called David? Not to mention that it is unreasonable to expect that every person in a group remember everyone's name.

Instead, it is far easier and safer to assign call signs based either on the Phonetic alphabet or a person's area of responsibility. For example, C1, C2, C3, pronounced Charlie One, two and three, would be used in place of Ralph, Fred and Bill. This way each person knows who is being called and there is no risk of him or her being identified. Alternatively, if you had three members of your team assigned to the stage area at a rock concert, you could assign them the call signs: Stage one, two and three. Once again, the identity of the caller is preserved and everyone knows exactly who he or she is communicating with.

**Code words**

Code words and call signs are used for much the same reasons - to prevent the true nature of the subject being discussed from being overheard by uninvited listeners. Take for example a situation where a security officer receives a radio call informing him that the door to one of the venue's cash offices has a broken lock. The call also informs him that the staff member at that location will be leaving the area unattended for a period of time. He is therefor requested to get someone there to keep an eye on the money. If anyone were listening in on the conversation, it would be a simple matter of getting there first or worse,

taking the officer out of the picture and helping themselves to the contents of the cash office.

To avoid this situation, code words can be assigned to specific types of incidents or locations. For example, rather than saying the cash office on the third floor in the member's area, you could refer to its location as "Members 3". Incidents can also be assigned code words such as "Code Blue", which might refer to a non-crucial incident requiring assistance when possible. An incident that requires more immediate assistance but is not yet dangerous could be a "Code Yellow" and a serious incident that requires immediate assistance could be a "Code Red". Similarly, specific incidents can be assigned specific code words. For example, a violent situation could be "Cyclone". Back up needed could be "Tanto." There are no set rules for assigning code words. Some people like to use words that employ the same first letter as the area they are referring to and other people like to use words that reflect the nature or function of a particular area or incident. Use any code word you like as long as the team know it and can remember it.

By employing code words, you make it difficult for anyone with criminal intentions to interfere with your operations. Take our example of the cash office from earlier in the article. Someone wishing to take advantage of the opportunity knows after hearing the call, who is attending, where the cash is and the nature of the problem. However, by employing the system of code words and call sign as discussed the call might sound something like this:

" Cash office to security. We have a Code Blue at Members 3. Require assistance."

"OK cash office. Escort one en route to Members 3."

What we have just ascertained is that there is an incident at the cash office in the member's area on level three that requires attention when possible. This has been acknowledged and one of the cash escort security officers is on the way.

The following key words are used in order to covey certain messages.

- ROGER: means message understood
- OVER: Call sign has transmitted and awaiting reply
- OUT: Call sign is finished transmitting at this time

When transmitting messages, these words used in conjunction with correct procedures make a message far more concise and easier to understand. The correct procedure for transmitting a message is as follows:

1. Start the message with your call, Sign and then say the call sign of the person you wish to contact.

1. Any time you expect a response, finish you transmission with the word OVER. This will let the person you are talking to know you are waiting for their reply.
2. When you are responding to someone else's message, use the word ROGER to let them know you have understood their transmission. If you didn't understand the transmission for some reason ask them to repeat the message by saying, "Repeat last call".
1. When you have finished your transmission and wish to end the conversation use the word OUT. This lets the person you are talking to know that you are finished. It also lets anyone eise waiting to use the radio know that the channel is clear and they can go ahead.

When putting ail of the previous examples in practice, you should have a short exchange that is easily understood, accurate and concise. Let's look at the earlier example of the cash office incident again. A conversation between trained radio operators should "sound" something like this:

"Cash office to Security, OVER."

"Security, go ahead Cash Office, OVER."

"Security, we have a Code Blue at Members 3, Over."

"ROGER Cash Office, Escort 1 en route, OVER."

"ROGER Security, Cash office OUT."

You can see how much more efficient and secure this example is. Cutting out the call signs once communications in this relay are established, can shorten this example even further.

**Common Problems With Radio Procedure**

**Cutting short transmissions**

There are a number of common problems that can occur with officers who have either little or no time on a radio net. Probably the most common of these problems is accidentally cutting off the first few seconds of a transmission. This is especially annoying if you are the person they are trying to contact. By cutting off the first few seconds of their transmission, the caller effectively cuts off their own call sign.

As a result, all you here is your call sign with no idea of who is calling.

To prevent this problem from occurring, simply push the transmit button on the radio and count to two before you begin to relay your message. Do this every time you transmit

and you should get your message through loud and clear every time.

**Make Sure That You Pay Attention To Radio Cails:**

Another problem common to people who have little or no experience on a radio net is inattentiveness. Be aware of your call sign and be vigilant for its use. There are few things more annoying than someone who won't answer their radio either because they are not paying attention to transmissions or because they have turned their unit down or knocked the volume and can no longer hear it properly. The solutions to both these problems are simple - pay attention to radio calls and check your volume at regular intervals.

If for some reason you are going to be unavailable for any period of time, call your supervisor and let them know and then inform them when you are back on air. If you are tied up with a patron or in the middle of something, rather than just ignoring your radio, respond with your caller's call sign followed by your own and then say "stand by". When you are free to talk, open communications with the last caller using correct procedure and say "go ahead".

**Don't Babble!**

People who babble to hear their own voice and to express their importance can be extremely annoying. These people distract other staff, clog up radio channels and make it difficult for anyone else trying to use the radio.

**Training Sessions**

Here are a few basic guidelines for training in the correct use of radios:

- During training sessions, set up a program designed to get staff familiar with using call signs and code words. Simulate instances and responses to situations using the radio so that everyone gets experience using the correct procedures This is the best practice other than on the job experience.
- Try and use the best quality that you can afford. These will usually be more reliable and offer better clarity.
- Become familiar with the radio. Make sure you can operate all of its switches by feel in the dark.
- Make sure you have spare batteries available and suitable recharging equipment.
- Keep talk time to a bare minimum. No chit chat. Operational use only.
- An ear peace is recommended for added security and clarity, especially when in high noise areas. It also enables you to receive messages hands free.

- ❖ Remember, everything you say can be heard. Therefore, don't say anything you do not want anyone one else to here.
- ❖ Learn the Phonetic Alphabet. Any word can be spelled out with clarity using this internationally recognised protocol.
- ❖ Don't forget to do a radio check not only when you first receive your radio but again when you are in your area of operation.

### 3.8.2 Skills for better radio communication

- ❖ The portable radio is the single-most versatile piece of equipment that a firefighter or officer can carry into a hazardous situation.
- ❖ Why do I believe that? Because portable radios are the primary means for:
- ❖ All responders to begin becoming informed and educated about the incident once the first firefighter or officer arrives on the scene;
- ❖ The incident commander to execute command and control activities;
- ❖ Officers and firefighters deployed to tactical assignments in the hazard area to communicate their observations and progress to the IC and to receive updated orders; and
- ❖ Personnel in the hazard area back to talk to the IC should there be a Mayday event.

  For all of the above types of communication to work, however, it is imperative that all portable radios on the scene are in good working order and that all personnel are skilled and practiced in their operation.

**Know your hardware**

Your life may one day depend upon knowing which button or knob on your portable radio to use — and you might only have one chance to get it right. Using the incredible capabilities of today's portable radios is a critical skill, and like any other skill, if you don't use it, you lose it.

Practice often using your radio's different features while wearing firefighting gloves, especially with those features that you don't routinely use. If that day comes when you really need a particular feature of your radio, chances are you'll be in a firefight, so prepare.

Maintain the radio and its battery according to the manufacturer's recommendations. All of the major radio manufacturers have gone to great lengths to produce operating

manuals and supporting media. Take advantage of these to build your body of knowledge about your radio.

Follow the manufacturer's recommendations for charging the batteries. Label the batteries and keep a battery log; in the log, track each battery's life cycle. Replace a battery when it no longer holds a charge for the recommended length of time. Carbon particles from smoke, dirty water, sheetrock dust and other fireground goo can quickly compromise radio functions. Compressed air cleaners, like those used to clean computer keyboards and other electronic equipment, are great for keeping microphone and speaker ports clear of debris.

Pay particular attention to contact points for remote microphones and clean according to the manufacturer's recommendations. An ordinary pencil eraser is a good tool for removing corrosion safely, so keep those contacts shiny for maximum performance.

Remember Murphy's Law. If something can go wrong, it will go wrong and usually at the most inopportune time. Carefully review and practice troubleshooting guidance provided by the manufacturer. Your ability to work through a radio malfunction on scene may be critical to your safety and that of others.

**Basic radio practices**

Learn and master the following components of radio communication under non-stressful conditions. Doing so will greatly enhance your portable radio communication, especially when the heat is on.

- Before speaking, formulate what information is being communicated and put the information in a standardized reporting template. If your organization has a standardized format for radio communications, learn it and use it consistently. An example of such a format is: [Who are you calling?] "Command [Who are you?] from Engine 26. [Where are you?] My crew is on stairwell, advancing to second floor with attack line. [CPR (conditions, progress and resources)]. Heavy heat and smoke conditions. Holding our position. Need ventilation of second floor before we can continue."
- Often, ICs are overwhelmed by excess information on the radio. This is where consistent use of a standard radio-reporting format will help determine if information needs to be transmitted. Develop your radio discipline by asking yourself: Has anything changed from my last CPR report? If face-to-face communication is possible between members of a crew and the information is not needed by the IC, don't get on the radio.

- Emergency scenes are heavy with noise pollution from running apparatus and portable power equipment like saws, ventilation fans, etc. Your radio might also be exposed to rain, snow or water from firefighting operations. Minimize microphone exposure by practicing shield, move and talk — shield the microphone using your hand, the bill of your helmet or your turnout coat; move away from the source of exposure, even if you can only turn your back to the source; talk directly into the microphone as much as possible, and keep the microphone 1 to 2 inches away from your mouth. If you do not have a speaking diaphragm or voice port on your facepiece, position the microphone against your lower jawbone on the skirt of the face-piece.
- When speaking into a microphone use a loud, clear and controlled voice — avoid shouting. When excited, our speech is often both louder and faster. When this happens, our radio transmissions can be unintelligible and may require the IC to ask for a rebroadcast, and thus more radio traffic on the channel. If your intended receiver is consistently asking you to repeat radio communication, you probably need to work on this.

  These skills can improve your radio transmissions quality, but what about the communication that comes your way? All of that noise pollution can certainly diminish your ability to hear the information that others are trying to get to you via your radio.

**Hearing aid**

The introduction of the remote microphone for portable radios, or collar mic, has greatly helped to overcome this challenge, but we lose that advantage when we don't keep the remote mic in close proximity to our ear.

Another useful adjunct is a set of foam earplugs; these can reduce the level of high-frequency noise from engines, power saws, operating hose lines, etc., and enable radio communications to be more clearly understood.

I found this to be true as a command officer. After I'd declared the incident under control, I would leave the noise-controlled environment of my command vehicle to do some managing by walking around. My earplugs enabled me to clearly hear all radio traffic coming over my remote mic that was clipped to the collar of my turnout coat.

Yet, technical issues can arise. You need to recognize technical problems and take corrective action to improve communications. Do not tolerate an inoperable radio when you are in the hazard area. If you cannot communicate with the incident commander, it's an accountability and safety issue. Get it fixed or get out.

**Radio position**

The optimal position for a portable radio transmission is at head height with the antenna in a vertical position. Not exactly the position you may find yourself when involved in fire combat operations, right?

Place your radio in the radio pocket of your turnout coat while you're crawling along the floor and this is what you have. What's the problem? The radio's antenna is far from its optimal transmitting position and some of the transmitted energy is absorbed by your body.

The result is a poor radiation pattern and a reduction in range of the radio. One solution is to move to a position where you can sit up and get the radio closer to its optimal transmitting position.

Many users do not use a radio pocket or radio case. While this certainly puts the radio in a slightly better transmitting position, it also exposes the radio to heat, smoke, water and particulates. Left unprotected, the radio may fail to operate when you most need it.

Radio cases with shoulder straps provide little protection and are an entanglement hazard when worn on the exterior of turnouts.

Good radio communications are critical for safe, efficient and effective operations on the emergency scene. How many times has poor incident communications been cited as a significant factor in NIOSH investigations of firefighter fatalities on the fire-ground?

Follow the advice I've provided here and I firmly believe that you'll have taken significant steps to minimize poor communication, and in turn, set up you and your team for fire-ground success.

**Radio Networks**

Mingara has a comprehensive knowledge and background in radio communication technologies, with competencies including the following:

Mingara's expertise in the provision radio communications advice is highly sought after, including for:

- Public Safety radio/wireless networks
- Public transport radio communications
- Mobile phone network coverage
- Emergency warning systems

**Mingara's radio communications capabilities are as expansive as they are varied, with an example of our skill sets provided below:**

- RF surveys (indoor/outdoor & field measurements)
- Witness acceptance testing & radio site commissioning
- Frequency planning, selection & licensing
- Simulcast design
- Radio site/tower RF design
- Antenna and feeder system design
- Point-to-point path profiles
- Work packages development
- Radio site audits
- Mobile blackspot/coverage analysis
- Interference analysis
- RF coverage predictions (click for details)
- Construction logistics & project management

**RF coverage prediction**

Mingara has the latest RF coverage prediction software, with extensive terrain and land use datasets broad range of coverage prediction services. Mingara offers RF coverage prediction services for the communications systems, from single site land mobile services to nationwide 3G networks. Point to VHF, UHF and microwave can be modelled by Mingara using our specialist path profile tools.

Based on proven experience in RF design, Mingara can provide additional value for clients by recommending suitable coverage prediction models and design parameters.

Mingara can deliver RF coverage predictions as high quality plots, images or as a GIS layer suitable for clients to import directly into their own mapping tools.

Mingara also has extensive experience with radio technologies.

**Technology competencies:**

- Fixed and mobile satellite communications
- Paging systems (POCSAG, Flex)
- Mobile data networks (RDLAP, Mobitex, CDMA lxRTT, EDGE and WCDMA, HSDPA)

- Analogue trunked networks (MPT1327, ED ACS)
- Digital trunked networks (TETRA, ASTRO, P25)
- Mobile voice communications systems (PMR)
- Mobile telephony (GSM, GSM-R, CDMA, 3GPP, 3G, LTE, Mission Critical LTE)
- Wireless 802.11 a/b/g/n
- Indoor and outdoor radio transmission systems

**An emergency communication system (ECS)** is any system (typically, computer-based) that is organized for the primary purpose of supporting one-way and two-way communication of emergency messages between both individuals and groups of individuals. These systems are commonly designed to integrate the cross-communication of messages between varieties of communication technologies, forming a *unified* communication system intended to optimize communications during emergencies.

**Emergency communication vs. notification**

An emergency notification system refers to a collection of methods that facilitate the one-way dissemination or broadcast of messages to one or many groups of people with the details of an occurring or pending emergency situation. Mass automated dialing services such as Reverse 911, and common siren systems that are used to alert for tornadoes, tsunami, air-raid, etc., are examples of emergency notification systems.

Emergency communication systems often provide or integrate those same notification services but will also include two-way communications typically to facilitate communications between emergency communications staff, affected people and first responders in the field. Another distinguishing attribute of the term "communication" may be that it implies the ability to provide detailed and meaningful information about an evolving emergency and actions that might be taken; whereas "notification" denotes a relatively more simplistic one-time conveyance of the existence and general nature of an emergency (such as Emergency Rescue Location).

Alternate and related terms

**Being a collection of methods that are often incorporated in many diverse settings in varying ways, there are** numerous words, terms, phrases, **and** jargon that are used interchangeably among the entities that utilize or have a need for emergency communication systems; but in most instances, these are all used to refer to the same or

substantially similar concept. For example, use of the terms "emergency communications" and "disaster **communications" definitively refer** to the same concept, with the only potential difference lying in the connotation, or **emotional meaning.**

- Emergency Notification
- Emergency Notification System
- Emergency Notification Service
- Emergency Communications
- Emergency Communications System
- Emergency Communications Service
- Emergency Response Software
- Unified Emergency Communications
- Emergency Warning System
- Emergency Management System
- Emergency Management Software
- Alerting System
- Emergency Alert
- Emergency Alert
- System (not to be confused with EAS)
- Emergency Alerting System
- Notification System
- Unified Communication System
- Public Mass Notification
- Public Notification System
- Mass Notification
- Mass Notification System
- Network-centric emergency notification
- Network-Centric Emergency Communication
- Unified Emergency Communication System
- Disaster Communication System
- Emergency Public Warning System

### Need

Emergencies place demands on communication processes that are often significantly different from the demands of nonemergency circumstances. Emergencies often involve escalating and evolving events that demand high performance and flexibility from the systems that provide emergency communication services. Message prioritisation, automation of communication, fast message delivery, communication audit trails, and other capabilities are often required by each unique emergency situation. Inadequate emergency communications capabilities can have consequences that are inconvenient at best and disastrous at worst.

### Case studies, failures and successes

#### New York City World Trade Center attack

During the September 11 attack in 2001, traditional telecommunications were stretched and overloaded. Phone networks along the entire East Coast were congested into uselessness. 911 operators were overwhelmed with calls and could do little more than offer encouragement because of the confusing information they were receiving. Communications between emergency services personnel were limited by a lack of interoperability between departments. Many fire-fighters died when the towers collapsed because they couldn't receive the warning that the police officers received from the New York City Police Department (NYPD) helicopters. Amateur radio played a large role in facilitating communications between the various emergency departments, which operated on different frequencies and protocols.

#### London Underground bombings

On the day of the 7 July 2005 London bombings, mobile phone networks, including Vodafone, reached full capacity and were overloaded by 10:00 a.m., only an hour and ten minutes after the bombs went off. Because of an antiquated radio system, the damaged trains were unable to communicate with the Transport for London control center or emergency personnel, while senior emergency services managers, of the London Ambulance Service in particular, were forced to rely on the already overloaded mobile phone network because of the lack of digital radios. The Access Overload Control, implemented only in a 1 km area around Aldgate Tube Station, wasn't helpful because many officials didn't have ACCOLC- enabled mobile phones. In the aftermath, the London Assembly determined the need for a digital radio communications system in London that can operate underground.

#### 2011 Joplin, Missouri tornado

161 people were killed and at least 990 injured when an EF5 multiple-vortex tornado

hit Joplin, Missouri. Because Joplin is located in a tornado-heavy area of the country, many people considered the tornado sirens routine and ignored them. Instead, many residents waited until they received confirmation from another, non-routine, source, such as seeing the tornado, a radio or TV report, or hearing a second siren. In the aftermath, an assessment team recommended that emergency warnings take risk perception into account to convey a sense of urgency. NOAA Officials are considering ways to charge the warning system to distinguish smaller tornadoes from more deadly ones.

**Hurricane Katrina**

When Hurricane Katrina, a Category 5 hu: i , hitN Orlcan. the commu completely destroyed, including power stations, internet servers, mobile phone towers, and 9ii services, ine federal ie

workers' satellite phones weren't interoperable, even when they did work.™ A few AM radio stations were able to continue broadcasting throughout the storm, notably WWL Radio, which remained on the air by broadcasting from a closet. Amateur radio was instrumental in the rescue process and maintained signals when 911 communications were damaged or overloaded.

**Virginia Tech Massacre**

The Virginia Tech Massacre, which resulted in the death of 33 people, helped propel discourse for effective emergency communication systems in schools. Virginia Tech had systems already in place, including e-mail and text notifications, but lacked a cohesive plan for using them. No warnings were sent out until after the event, two and a half hours after the initial shootings. Virginia Tech has since updated its emergency communications systems, especially public ones, since students can't always check e-mail in a timely fashion and professors often request that wireless devices be turned off in class. Because the massacre occurred within a 10-minute period, other schools have also implemented new, improved emergency communications systems with an emphasis on speed of communication.

**2011 Tohoku Earthquake**

The Japan Meteorological Agency's (JMA) early warning system, which uses seismometers, was able to alert millions of people across Japan about the impending earthquake via radio, mobile phone networks, including Docomo, AU, and Soft Bank, and television, including both NHK channels and cable channels. The tsunami warning system alerted people shortly after, although the tsunami was larger than expected. In areas with infrastructure still intact, even though both landline and mobile phone lines were not functioning

as might be expected, the Internet was still accessible. In the hardest hit areas, particularly Sendai and other areas of Miyagi, Iwate, and Fukushima Prefectures, satellite phones were often the only form of communication that functioned reliably. The following nuclear disaster at the Fukushima Daiichi Plant was rife with communications problems. No communications plan was in place, internal communications were poor, external communications were slow, and the public quickly lost confidence in TEPCO and the nuclear industry. The primary criticism was a failure of the government to release accurate information about the disaster. Calls were made for more transparency and promptness with future events.

**2012 Aurora movie theater shooting**

During the 2012 Aurora shooting on July 20, 2012, the gunman, James Eagan Holmes, released tear gas before opening fire during a showing of ***The Dark Knight Rises,*** causing many of the moviegoers to mistake the attack for part of the film's special effects. According to preliminary reports, the suspect initially went into the theater as a patron. He then exited and propped open an emergency exit, while he went to his car to get his bulletproof vest and weapons. He then attacked after reentry through the propped-open door.™ In this type of situation, there could have been considerable warning. Technology exists that can warn about open doors (such as an emergency door that shouldn't normally be open), and can send clear warning and instructions to any number of devices, including a movie screen. There is also a significant opportunity to consider the use of the theater's fire alarm system. Shortly after the assailant began shooting, the building's fire alarms were sounded. The natural inclination, in response to a fire alarm, would be to evacuate the building, but in this case, the assailant was specifically targeting people who attempted to exit.

**Hurricane Sandy**

Hurricane Sandy hit New York City, New Jersey, and the surrounding area on October 29, 2012, destroying thousands of houses and leaving millions without electricity and thus without internet, mobile phones, or landline communications.™ To prepare for the hurricane, many areas provided additional emergency help lines in case 911 wasn't available, The Federal Emergency Management Agency has strengthened its ability to respond to a disaster since the communications problems during Hurricane Katrina and using Twitter in its rescue efforts, and amateur radio operators were on standby to provide emergency communications. In the aftermath, up to 25% of mobile phone towers, network providers, and television stations were powerless. Communications have been steadily improving, however, although the hardest hit reas are still experiencing serious power outages.

**Attributes**

**Timeliness and speed of delivery**

An emergency, as defined by Merriam-Webster, is an unforeseen combination of circumstances or the resulting state that calls for immediate action. As such, it should be considered critically important that any communication about an emergency be timely and quick to disseminate, in order to mitigate damage or loss of life. For example, during the Virginia Tech massacre, about two hours had passed before the first communication (an email) was sent to staff and students; and by

that time, the gunman had already entered and secured a building in which he was'shortly to begin his attack. In that case, it wasn't until about 20 minutes after the shootings began, that a loudspeaker announcement was made for people to take cover. In many cases, it's likely obvious that-mere seconds and minutes are absolutely critical.

**Ease of use**

During a crisis, the people who use an ECS need to quickly and easily launch their notifications and they need to be able to do so in a way that securely provides them with confidence and an intuitive, familiar and easy-to-use interface that can be accessed from any location. An emergency communication system that's designed for non-technical users will ensure successful administration and usage; and during some life-threatening emergency situations, campus administrators must be able to react quickly and trigger the alert system swiftly. Yet emergency alert is probably among the least used and least familiar processes. Ease-of-use therefore is critical to the effectiveness of an emergency communication system.

However, in order to support a robust and capable emergency communication ability, this ease of use should not preclude the utilization of a complex, technologically advanced system. A sufficiently advanced system is required to coordinate multiple components to act in concert, to initiate and propagate emergency communications in any manner of ways. A distinguishing factor is in such a system bearing these advanced capabilities, while still being easy for the user to operate for both emergency and everyday communications *(so users can feel comfortable with it)* — not only for effective emergency communication, but also for an organization to realize the most return on investment, as well as the user being familiar enough with its operation as to effectively operate it under stressful emergency situations, such as in earthquake, tsunami, etc.

**Affordability**

Overall, the more affordable the cost of procuring, installing, and maintaining an

emergency communication system is, the more prolific such systems may become; and the more prolific these systems are, the more likely it is that these systems will be available to aid in times of emergency in more locations. According to Federal Signal, beyond supporting emergency response, today's mass notification systems have proven to be a valuable asset for everyday, non-emergency, intra- and inter-plant communications. This has become particularly evident in the deployment of interoperable, multi-device communications technology that not only enhances overall plant communications, but provides a host of useful software-based management and administrative tools. Additionally, many of the more traditional approaches to mass notification, i.e., public address and intercom systems, e-mail, and voice and text messaging, provide everyday functionality for plant communications and process control that represents attractive potential for return on investment.

**Providing instructions**

A clearly needed attribute of any modem emergency communication system is the ability to not only provide notification an emergency, but to also provide clear and actionable instructions for how to respond to an emergency. In a study by the Rehabilitation Engineering Research Center for Wireless Technologies, it was revealed that regardless of the initial form of notification, a secondary form was necessary before action would be taken. This supports the important observation that providing clear and concise instructions may reduce dependency on such secondary verification; and thus, providing instructions may save lives in an urgent emergency situation.

**Specific audiences or recipients**

Emergencies often require delivery of different versions of the same communication at the same time. For example, in an armed hostage-taking incident, occupants of a building may need to receive instructions to lock and barricade the door until further notice, while first responders to the incident need to be aware of the lockdown instructions and be provided more specific details of the hostage-taking event to inform their actions.

Using the hostage-taking example, some of the more modem emergency communication systems such as Siemens Sygnal or Message Net Connections state the ability to deliver a single message that provides full details to first responders while filtering that same message to provide more limited instructions to lock doors to the general public. By utilizing a single message that segregates content between types of users fewer messages have to be created and sent, which may also save time.

**Multiple communication paths/redundancy**

There should be multiple means of delivering emergency information so that if one should fail, others may get through.

Also, according to the Partnership for Public Warning, research shows clearly that more than one channel of communication will be consulted by people at risk in order to confirm the need for action. The public expects to be contacted in a variety of ways. As evidenced by various historical and recent events, besides phone calls and emails, citizens also expect to be able to use and be reached via text messaging, and fax. In one exemplary incident, the 2012 Wisconsin Sikh temple shooting, barricaded victims relied on sending text messages for help, in addition to traditional phone calls. In addition, the public may look to social media as another vehicle to receive messages and check in on updates.

Additionally, the Partnership for Public Warning states, "A single warning is frequently insufficient to move people to action, especially if it cannot be confirmed by direct observation. For most people the first warning received captures their attention and triggers a search for corroboration, but cannot be relied on to elicit the desired behavior. Scientific research supports the common-sense observation that people are disinclined to risk being fooled by a single alarm that might prove false or accidental. Effective warning requires the coordinated use of multiple channels of communication."

**Interoperability**

To support these attributes, a "unified" emergency communication system should be able to connect to and communicate with other related systems, hence the term. According to the Partnership for Public Warning, a fundamental problem is the lack of technical and procedural interoperability among warning originators, system providers, delivery systems, and warning recipients. Originators of warnings must undertake expensive, redundant tasks using multiple, dissimilar tools and techniques to take full advantage of today's warning systems.

Also, there are multiple ways that an emergency communication system might obtain an original warning. One example of this might be the case of a building's fire control system dispatching a notice that a smoke detector has activated. A properly designed emergency communication system should be able to receive that notice and process it into a message that the building's occupants can understand and take action on in order to save life and property. Another example might be of the National Weather Service sending an EAS severe weather warning (e.g. via RSS feed or similar). In that case, the emergency communication system should be able to process and disseminate the warning in a similar way as the smoke detector example, and inform people of what actions to take.

The ability to interoperate should also consider the need to be both forward and backward compatible with older and yet-to-be-conceived technologies. Introduction of a system that cannot interoperate with previously deployed equipment create potentially serious barriers to effective operation.

**Product versus service**

An emergency communication system may be composed of a product and its associated hardware and software, as owned by the entity using it (e.g., an on-site paging network), or as a service owned and provided by a third-party (e.g., a cellular carrier's SMS network). Each have their own advantages and disadvantages; however, despite perception otherwise, services have some major inherent problems when it comes to effective emergency communications. For instance, using SMS as one example, due to the architecture of cellular networks, text messaging services would not be able to handle a large volume of communications in a short period of time, making this particular type of service a potentially ineffective emergency communication method.

**Premises based versus non-premises based**

Premises based emergency communication systems are those which primarily or wholly exist in the same geographical or structural area as it serves, while non-premises based emergency communication systems are those which exist in a different geographical or structural area. There are advantages and disadvantages of each. Often, non-premises based systems are slower than those that are premises-based, because at the very least, the different locations need to be connected via (usually public) data networks, which may be susceptible to disruption or delay.

**Early systems**

In America's formative years, common means of emergency communications may have mostly consisted of church bells being rung or messengers on horseback. Later, as technology developed, the telegraph became a nearly instant method of communicating. From there, radio communications, telephones and sirens became commonplace. After the surprise attack on Pearl Harbor, by the Japanese in 1941, Civil Defense sirens became popular and resulted in their widespread use in military bases and towns across America. A particular weakness of these systems is that they largely lack the ability to inform people what they should do.

Fire alarm systems were first developed around the late 1800s and other related life-safety detectors associated with those systems (e.g., duct detectors, heat detectors, etc.)

were developed around the early 1900s. These constitute the first automated systems used in public and private buildings that are in normal and widespread use today. These systems, although originally designed for fire, have also been used for many other types of emergencies, sometimes effectively and sometimes not. For instance, if a fire alarm has been activated (as a general warning device) during an active shooter incident, the typical reaction to evacuate may not be the safest course of action; instead, a shelter in place action may be better. As an example, during the 201,2 Aurora shooting, amass shooting event that happened at the Century 16 movie theater in Aurora, Colorado, the assailant began targeting victims as they attempted to exit the theater; in which case, it would have been unwise to heed the fire alarm, that was sounding, and evacuate.

**Modern systems**

Today, modem communication tools such as smart-phones, flat-panel digital signage, GPS, and text-to-speech (among many others) are changing the way in which people are notified about emergencies. Of added value, with these more modem tools, is the ability to provide more specific instructions; so that, instead of merely notifying people about an emergency, it is now possible to provide specific instructions on what to do in order to mitigate the effects of an emergency. Furthermore, those instructions might even be customized for those peoples' specific and unique circumstances. For example, smart-phones may have geo-location abilities that would allow a map to be shown of safe locations (and perhaps routing there-to), relative to those devices specific users—all with a singular alert being sent as the source of those warnings.

**Infrastructure-independent**

Broadcast technologies that do not depend on man-made infrastructure to convey communication may be least susceptible to disruption during disasters and emergencies. Some examples of infrastructure-independent technologies are:

❖ **Short-wave Radio**

Short-wave (or Amateur) radio is a relatively long range method of communicating using radio waves. Because of the nature of radio wave propagation, communications made via short-wave radio can be intercepted and heard by anyone with the proper equipment and knowledge. However, due to their reliance only on electrical power (which can be obtained via batteries, solar, and other alternative means) and Earth's ionosphere, they are ideal for some of the worst case emergency scenarios. One disadvantage may be that one requires training and licensing to transmit using a short-wave radio, in many countries.

❖ **Two-way Radio**

Two-way radio consists of at least two devices (typically portable and hand-held) that are capable of transmitting and receiving communications to each other, using radio waves. Similar to short-wave, this type of communication is also able to be intercepted and heard by anyone with the proper equipment. However, unlike short-wave, this communication equipment is restricted by range (usually several miles, at most), but is relatively simple to operate and the main power source is usually provided by batteries. Two-way radios are in-use by many emergency responders on a daily basis, so they require minimal concentration to operate in the stress of an emergency situation, since the person operating it is already familiar with it. Additionally, many non-professionals may use unlicensed two-way radios, as is common with CB radio, Family Radio Service or PMR446.

❖ **Weather Radio**

A weather radio is a device which receives normal and emergency weather broadcasts. It may automatically turn on whenever an emergency is eminent or occurring, providing an alarm as well as a description of the situation. Anyone with a weather radio device can receive these broadcasts.

❖ **Internet Based Communication**

There is increasingly an opportunity to use infrastructure-independent network connection, sometimes called *Network-centric emergency notification,* for emergency communication. The emergence of initiatives such as Google's Project Loon offer opportunities for networked communication when infrastructure-dependent communication is hindered in emergency situations.

Each device has its own pros and cons given the emergency situation.

**Limitations**

Depending on the location, time, and nature of the emergency, a large variety of limitations could present themselves when it comes to communicating details of an emergency and any resultant actions that may need to be taken to protect life and property. For example, an audio public address system might be rendered ineffective if the emergency happens to be an explosive event which renders most or all of those affected deaf. Another common example might be the limitation of a fire alarm's siren component in a deaf school. Yet another example of a limitation could be the overloading of public services (such as cellular phone networks), resulting in the delay of vital SMS messages until they are too late. An effective emergency communication system should arguably be able to overcome as many of these potential limitations, as possible.

## 3.9 Rules for Successful Threat Intelligence Teams

Threat intelligence is quickly becoming a core element of risk management for many enterprises.

To truly understand risk, though, the enterprise must grasp and have the capability to handle emerging information security threats to its environment. Other areas of risk — financial risk, operational risk, geopolitical risk, risk of natural disasters — have been part of organizations' risk management plans since time immemorial; it's only these last few years that information security has bubbled to the top, and now companies are starting to put weight behind security threat intelligence programs.

Putting a team in place to manage threat intelligence, however, isn't as easy as other, more established areas of information security. First, it's newer, and second, organizations might not yet have the right skills and tools in-house.

With that in mind, we've identified four simple rules that will help organizations build and maintain a successful threat intelligence team.

(N.B. The rules are simple, but we do realize that implementation is not!)

**Tailor Your Talent**

It goes without saying that any team — threat intelligence or otherwise — is run by people, so hiring the right people with the right skills is critical. In some cases organizations can groom threat intelligence staff from within, from security operation center (SOC) teams to incident responders. Central skills like log management, networking expertise, and technical research (scouring through blogs, pastes, code, and forums) often come after years of professional information security experience.

Certain parts of threat analysis, however, necessitate distinct and practiced skill sets. Intelligence analysis, correlating and making predictions about threats based on (sometimes seemingly disparate) data, requires highly developed research and analytical skills and pattern recognition.

When building or adding to your threat intelligence team, especially concerning external hires, personalities matter.

Existing teams might feel threatened by new staff who appear to be "taking over" roles and responsibilities. Disgruntled employees are not productive employees. Thus, when forming or adding to the threat intelligence team, pay close attention to the "soft skills" of candidates.

Make sure that teammates can not only all "play nicely in the sandbox," but that you, as a manager, are communicating frequently, clearly, and honestly about expectations. The

interaction and workflow between teams should be pre-planned, and data sharing should facilitate easy integration for the teams responsible for making security verdicts.

**Architect Your Infrastructure**

Threat intelligence vendors provide strategic intelligence, but organizations should consider building in-house proprietary capabilities that deliver consistent, relevant, and actionable threat data.

Proprietary threat intelligence platforms (TIPs) have the advantage of being tailored to the organization's specific needs, and often come with a smaller price tag than commercial, off-the-shelf solutions. These custom-engineered solutions should integrate with external vendor systems to automatically collect, store, process, and correlate external data with internal telemetry such as security logs, DNS logs, Web proxy logs, Net-flow, and IDS/IPS.

Of course, building powerful proprietary capabilities requires an experienced data architect.

This individual is responsible for designing fast and nimble data structures with which external tools integrate seamlessly and bi-directionally. The data architect should understand not only the technical needs of the organization, but he or she should be involved in a continuous two-way feedback loop with the SOC, vulnerability management, incident response, project management, customer-facing fraud (where applicable), and red teams. This collaborative process facilitates control changes and allows the architect to deliver threat data in a format and on a timeline appropriate for each group.

Notably, threat analysts should never spend time manually processing operational data, and the architect fills that important role of providing the data upon which the analyst draws conclusions that ultimately decrease strategic business risk.

**Enable Business Profitability**

The goal of every threat intelligence program should be to find emerging threats before they impact the business. Reducing the number of direct threats drives down risk, which in turn increases profitability. Threat intelligence teams must therefore know what the business identifies as levers of profitability in order to prioritize the identification and dissection of threat events and sources.

At the center of profitability are the business's strategic assets (customers, employees, infrastructure, applications, vendors). Protecting strategic assets is priority number one, and defensive controls need to be managed as threats emerge.

To ensure protection for key assets, threat analysts must be able to examine the larger threat picture and identify such things as general industry threats, trends, attacker TTPs (tactics, techniques, and procedures), and commodity malware. While an attack on one industry organization, for instance, might not result in a direct threat to your own organization, knowing that several enterprises have been victims of a similar type of attack could indicate the need for hardened internal controls.

The ability to see the larger trends and drill down to direct threats against strategic assets means the threat intelligence team must understand what data it has available internally and what data it needs to source. Information gathering for an unknown purpose other than vague future applicability is a waste of resources, so set your sights on the information directly tied to the business and its levers of profitability.

**Communicate Continuously**

Enabling business profitability requires an understanding of the business's goals and roadmap.

To effectively set the roadmap, the executive layer also needs insight into current and future threats. If, for example, the business wants to acquire a partner but the partner is currently being targeted by hacktivist groups for what they deem unfair business practices, the executive team should have that intelligence before determining a market valuation and extending an offer. During a vendor evaluation, as another example, it is important to know if industry-specific malware, like Black Energy or Zeus, is emerging. Aligning one's business with a risky proposition is not a decision to be taken lightly.

Executives need to hear from the threat intelligence team how and why some of those threats translate to risk, and then learn if and how the risk of those threats can be mitigated. Organizational threats will always exist, and it's up to the business to decide its risk tolerance. Threat teams can aid the process by keeping executives informed but not spreading FUD (fear, uncertainty, and doubt). Delivering the message should be approached in a thoughtful, practical manner; do not overwhelm executives with technical details they neither care about nor understand. Their eyes are on the bottom line, and threat intelligence should be provided that supports moving in an upwards trajectory.

## Conclusion

With these four pillars in mind, organizations can run an effective threat intelligence team which contributes to the success of the business. People and tools are important parts of the process, but equally important are cross-functional collaboration and communication.

## 3.10 Operating Skills for Dealing with Threats

- Introduction
- There can be different types of threats. Only a few are discussed in this chapter and those may be Threatening Telephone Calls , Bomb Threats etc.
- Threating Telephone Calls
- In most cases telephone calls are hoax calls but from the security point of view, such caiis should not be dismissed lightly.
- Irrespective of the nature of such calls, they should toe reported to the designated official.
- The designated official should intimate the Appropriate Authority so that the identity of the caller can be established.
- The contents of the call and all other details must be reported as accurately as possible so that those information and help in subsequent evaluation or the threat and correlated with incidental threats or related crimes.
- Efforts must be made to split the telephone call into bits such as—the point of threat—it is a family dispute, whether it is a personal matter, whether it is directed to an organization or group or class of people etc.
- Threating bomb Threats in a Building
- The Bomb threat can be to a Building .
- The Bomb threat can be in the form of a telephone call, or a written message, or a suspicious letter or a unclaimed package or parcel left behind in some premises of fne building
- There must be a designated official to act in case of such threats.s, decision must be taken promptly on issues such as - full or partial evacuation, search operations, intimation to respective authorities etc.
- Floor Wardens must be appointed who will ensure that, during evacuation, no one is left behind they must be trained to know what to look for during searches of the respective areas.The Floor Warden must quickly assess the type of each bomb and the threat they can pose.
- What to do during a bomb threat evacuation
- The building may have to be quickly searched before any evacuation

- A pre-notified Evacuation Signal may be announced to draw attention of inmates before evacuation
- A Evacuation route may be established and before that the area should be checked for any explosive device that may lie around
- The doors and windows are to be left open to aViow ventilation for possible fumes or gases after an explosion
- The iifts and elevators must be rendered un-operationai so that people do not get trapped.
- 'Ensure that orderly evacuation takes piace and people do not panic which moving away
- The sick, the disabled, the children, the femaies must be provided special assistance
- The Electric connection must be snapped and gas lines must be disconnected in order to eliminate possibility of fire hazard.
- The evacuated people must be sent at ieast 100 meters away in order to prevent injury from the impact *of the* blast due to flying glasses masonrv splinters etc.
- What to do after the evacuation
- A through search of the building should be conducted before aflowing peopie to re-enter. This should be done by a person from the Bomb Disposal Squad.
- In case a suspicious object is located, it must never be touched.
- Arrangements may be made to inspect the same by experienced personnel before the Bomb Disposal Squad finally arrives.
- During the search, oniy persons familiar with the area should be sent in.
- No object should be shaken or moved during the search
- If the intimated Bomb Threat gives out a possibi'e Time Target, the Bomb search operation should themselves evacuate 30 minutes before the given threat time and they should not resume search until 30 minutes after the specified time.
- What to look for during a search
- The threat call may specify the description of the threat and therefore the searchers must look for that type of object.
- Any object that is unusual for the area may be searched
- Any object which is of exceptional shape or size or which may emit some smeii or peculiar sound must be iocated.

- An object in which wires or batteries are noticed must be checked first
- Any object marked as ‘’Bomb”, “Fire”, “Danger” etc. must be checked seriously.
- Searches may be made for unidentified bags,, left behind baggages, boxes, luggage, iunch boxes, thermos bottles, wooden crates, furniture office equipments etc.
- False ceiis must be given special’ attention as those are easy spots *for* planting rime bombs.
- Rest Room, Wash Rooms. Store Rooms, Computer Rooms etc. are aiso places for planting bombs and those must be searched thoroughly
- How to eliminate threat from a car or vehicle bomb
- If it is a parked vehicle, look for loose wires or unusual objects near it
- If it is an approaching vehicle, look around and underneath the vehicie before allowing it an entry
- If it is an unidentified vehicie, it must not be touched
- Go around the vehicie first, and then look under each wheel arch and the bumper to see if there are any unusual objects or loose wires
- The underside of the vehicle must be examined thoroughly with the help of an under-car search mirror
- While searching a car, ihe driver and front passenger area, the trunk/boot/luggaee area, the exhaust area and the fuel tank area should be carefully examined.
- During search at night, a battery torch should be.used.
- Before touching the vehicle, the search personnel must see if the windows or doors are broken or if there are visible scratch marks around the door locks or the trunk/boot/hood area.
- The search personnel must see if there are unusual ohjects/things inside the car/ vehicle or if the inside tapestry is tamper with.
- After opening the vehicle door, check that there are no wires are attached to the inside or the door
- inside objects must not be touched.
- hereafter, the Hood Bonnet and trunk/boot may be opened and checked to ensure that there are no wires attached or there are no unexpected components, boxes or unusuai wiring.

- Precaution guidance for handling threat calls.
- The call recipient must listen closely, remain calm and should never interrupt the carter.
- The exact time and duration of the call must be recorded.
- Record the exact words of the caller.
- Keep the suspicious caller talking by asking questions like -piease identify yourself, why are you calling me, what am I supposed to do etc. before recording the call.
- If the carter gives a bomb threat, ask the carter at what time the bomb is expected to explode.
- Ask the caller the exact location of the planted bomb
- Ask the caller if be can tell about the kind of the bomb planted etc.
- After the conversation, the call recipient must write down the call report in details and immediate alert and intimate art concerned officials.

# Unit - 4 ❑ Operating Skill for handling Natural Disasters

**Structure**

**4.18 Planning**

**4.18.1 Steps in Planning Function**

**4.18.2 Characteristics of planning**

**4.18.3 Advantages of planning**

**4.18.4 Disadvantages of planning**

## 4.1 Objectives

The following is a list of general objectives departments should consider when creating an Information Disaster Prevention and Recovery Plan:

- Ensure the safety of all employees and visitors at the site/facility
- Protect vital information and records
- Secure business sites and facilities
- Safeguard and make available vital materials, supplies and equipment to ensure the safety and recovery of records from predictable disasters
- Reduce the risk of disasters caused by human error, deliberate destruction, and building or equipment failures
- Be better prepared to recover from a major natural catastrophe
- Ensure the organization's ability to continue operating after a disaster
- Recover lost or damaged records or information after a disaster

## 4.2 Introduction

The Wikipedia defines the term disaster quite nicely:

*"A disaster is a natural or man-made event that negatively affects life, property, livelihood or industry often resulting in permanent changes to human societies, ecosystems and environment."*

As the definition suggests, disasters are highly disruptive events that cause suffering, deprivation, hardship, injury and even death, as a result of direct injury, disease, the interruption of commerce and business, and the partial or total destruction of critical infrastructure such as homes, hospitals, and other buildings, roads, bridges, power lines, etc. Disasters can be caused by naturally occurring events, such as earthquakes, hurricanes, flooding, or tornadoes, or they can be due to man-made events, either accidental (such as an accidental toxic spill or nuclear power plant event), or deliberately caused (such as various terrorist bombings and poisonings).

The United Nations defines a disaster as a serious disruption of the functioning of a community or a society. Disasters involve widespread human, material, economic or environmental impacts, which exceed the ability of the affected community or society to cope using its own resources.

The Red Cross and Red Crescent societies define disaster management as the organisation and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

## 4.3 Operating Skill for natural and nuclear disasters

**Nuclear and radiation accidents and incidents**

A nuclear and radiation accident is defined by the International Atomic Energy Agency (IAEA) as "an event that has led to significant consequences to people, the environment or the facility." Examples include lethal effects to individuals, large radioactivity release to the environment, or reactor core melt." The prime example of a "major nuclear accident" is one in which a reactor core is damaged and significant amounts of radioactivity are released, such as in the Chernobyl disaster in 1986.

The impact of nuclear accidents has been a topic of debate practically since the first nuclear reactors were constructed in 1954. It has also been a key factor in public concern about nuclear facilities. Some technical measures to reduce the risk of accidents or to minimize the amount of radioactivity released to the environment have been adopted. Despite the use of such measures, human error remains, and "there have been many accidents with varying impacts as well near misses and incidents". As of 2014, there have been more than 100 serious nuclear accidents and incidents from the use of nuclear power. Fifty-seven accidents have occurred since the Chernobyl disaster, and about 60% of all nuclear-related accidents have occurred in the USA. Serious nuclear power plant accidents include the Fukushima Daiichi nuclear disaster (2011). Chernobyl disaster (1986), Three Mile Island accident (1979), and the SL-1 accident (1961). Nuclear power accidents can involve loss of life and very large monetary costs for remediation work.

Nuclear-powered submarine core meltdown and other mishaps include the K-19 (1961), K-l 1 (19651, K-27(1968). K- 140 (1968), K-42911970), K-222 (19801. and K-431 *(*1985). Serious radiation accidents include the Kyshtym disaster, Windscale fire, radiotherapy accident in Costa Rica, radiotherapy accident in Zaragoza, radiation accident in Morocco. Goiania accident, radiation accident in Mexico City, radiotherapy unit accident

in Thailand, and the Mavapuri radiological accident in India.

The IAEA maintains a website reporting recent accidents.

**Nuclear power plant accidents**

One of the worst nuclear accidents to date was the Chernobyl disaster which occurred in 1986 in Ukraine. The accident killed 31 people directly and damaged approximately $7 billion of property. A study published in 2005 estimates that there will eventually be up to 4,000 additional cancer deaths related to the accident among those exposed to significant radiation levels. Radioactive fallout from the accident was concentrated in areas of Belarus, Ukraine and Russia. Approximately 350,000 people were forcibly resettled away from these areas soon after the accident.

Benjamin K. Sovacool has reported that worldwide there have been 99 accidents at nuclear power plants from 1952 to 2009 (defined as incidents that either resulted in the loss of human life or more than US$50,000 of property damage, the amount the US federal government uses to define major energy accidents that must be reported), totaling US$20.5 billion in property damages. Fifty-seven accidents have occurred since the Chernobyl disaster and almost two-thirds (56 out of 99) of all nuclear- related accidents have occurred in the US. There have been comparatively few fatalities associated with nuclear power plant accidents.

**Nuclear power plant accidents and incidents with multiple fatalities and/or more than USS100 million in property damage, 1952-2011**

| Date | Location of accident | Description of accident or incident | Dead | Cost ($US millions 2006) | INES level |
|---|---|---|---|---|---|
| September 29, 1957 | Mavak.Kvshtvm. Russia | The Kyshtym disaster was a radiation contamination incident that occurred at Mayak, a Nuclear fuel reprocessing plant in the Soviet Union. | | | 6 |
| July 26, 1957 | Simi ValleY,Califomia, United States | Partial core meltdown at Santa Susana Field Laboratory's Sodium Reactor Experiment. | 0 | 32 | |

| Date | Location of accident | Description of accident or incident | Dead | Cost ($US millions 2006) | INES level |
|---|---|---|---|---|---|
| October 10, 1957 | Sellafield.Cumberland. United Kingdom | A fire at the British atomic bomb project destroyed the core and released an estimated 740 terabecquerels of iodine-131 into the environment. A rudimentary smoke filter constructed over the main outlet chimney successfully prevented a far worse radiation leak and ensured minimal damage. | 0 | | 5 |
| January 3, 1961 | Idaho Falls.Idaho United States | Explosion at SL-1 prototype at the National Reactor Testing Station. All 3 operators were killed when a control rod was removed too far. | 3 | 22 | 4 |
| October 5, 1966 | Frenchtown Charter Township.Michiean, United States | Partial core meltdown of the Fermi 1 Reactor at the Enrico Fermi Nuclear Generating Station. No radiation leakage into the environment. | 0 | 132 | |
| January 21, 1969 | Lucens reactor, Vaud. Switzerland | On January 21, 1969, it suffered a loss-of-coolant accident, leading to a partial core meltdown and massive radioactive contamination of the cavern, which was then sealed. | 0 | | 5 |

| Date | Location of accident | Description of accident or incident | Dead | Cost ($US millions 2006) | INES level |
|---|---|---|---|---|---|
| 1975 | Sosnovyi Bor, Leningrad Oblast, Russia | There was reportedly a partial nuclear meltdown in Leningrad nuclear power plant-reactor unit 1. | | | |
| December 7, 1975 | Greifswald.East Germany | Electrical error causes fire in the main trough that destroys control lines and five main coolant pumps | 0 | 443 | 3 |
| January 5, 1976 | Jaslovske Bohunice, Czechoslovakia | Malfunction during fuel replacement. Fuel rod ejected from reactor into the reactor hall by coolant ($C0_2$). | 2 | | 4 |
| February 22, 1977 | Jaslovske Bohunice. Czechoslovakia | Severe corrosion of reactor and release of radioactivity into the plant area, necessitating total decommission | 0 | 1,700 | 4 |
| March 28, 1979 | Three Mile Island,Pennsvlvania, United States | Loss of coolant and partial core meltdown due to operator errors. There is a small release of radioactive gases. See also Three Mile Island accident health effects. | 0 | 2,400 | 5 |
| September 15, 1984 | Athens.Alabama. United States | Safety violations, operator error, and design problems force a six-year outage at Browns Ferry Unit 2. | 0 | 110 | |

| Date | Location of accident | Description of accident or incident | Dead | Cost ($US millions 2006) | INES level |
|---|---|---|---|---|---|
| March 9, 1985 | Athens.Alabama. United States | Instrumentation systems malfunction during startup, which led to suspension of operations at all three Browns Ferry Units | 0 | 1,830 | |
| April 11, 1986 | Plvmouth. Massachusetts. United States | Recurring equipment problems force emergency shutdown of Boston Edison'sPilgrim Nuclear Power Plant | 0 | 1,001 | |
| April 26, 1986 | Chemobyl disaster. Ukrainian SSR | Overheating, steam explosion, fire, and meltdown, necessitating the evacuation of 300,000 people from Chernobyl and dispersing radioactive material across Europe | 30 direct, 19 not entirely related and 15 minors due to thyroid cancer, as of 2008. [3] | 6,700 | 7 |
| May 4, 1986 | Hamm-Uentron. West Germany | Experimental THTR-300 reactor releases small amounts of fission products (0.1 GBq Co-60, Cs-137, Pa-233) to surrounding area | 0 | 267 | |
| March 31, 1987 | Delta.Pennsvlvania. United States | Peach Bottom units 2 and 3 shutdown due to cooling malfunctions and unexplained equipment problems | 0 | 400 | |

| Date | Location of accident | Description of accident or incident | Dead | Cost ($US millions 2006) | INES level |
|---|---|---|---|---|---|
| December 19, 1987 | Lycoming, New York, United States | Malfunctions force Niagara Mohawk Power Corporation to shut down Nine Mile Point Unit | 0 | 150 | |
| March 17, 1989 | Lusbv.Marvland. United States | Inspections at Calvert Cliff Units 1 and 2 reveal cracks at pressurized heater sleeves, forcing extended shutdowns | 0 | 120 | |
| March 1992 | Sosnovyi Bor. Leningrad Oblast. Russia | An accident at the Sosnovy Bor nuclear plant leaked radioactive gases and iodine into the air through a ruptured fuel channel. | | | |
| February 20, 1996 | Waterford.Connecticut. United States | Leaking valve forces shutdown Millstone Nuclear Power Plant Units 1 and 2, multiple equipment failures found | 0 | 254 | |
| September 2, 1996 | Crystal River.Florida. United States | Balance-of-plant equipment malfunction forces shutdown and extensive repairs at Crystal River Unit 3 | 0 | 384 | |
| September 30, 1999 | Ibaraki Prefecture, Japan | Tokaimura nuclear accident killed two workers, and exposed one more to radiation levels above permissible limits. | 2 | 54 | 4 |
| February 16, 2002 | Oak Harbor, Ohio, United States | Severe corrosion of control rod forces 24-month outage of Davis-Besse reactor | 0 | 143 | 3 |

| Date | Location of accident | Description of accident or incident | Dead | Cost ($US millions 2006) | INES level |
|---|---|---|---|---|---|
| August 9, 2004 | Fukui Prefecture. Japan | Steam explosion at Mihama Nuclear Power Plant kills 4 workers and injures 7 more | 4 | 9 | 1 |
| July 25, 2006 | Forsmark.Sweden | An electrical fault at Forsmark Nuclear Power Plant caused one reactor to be shut down | 0 | 100 | 2 |
| March 12, 2011 | Fukushima.Japan | A tsunami flooded and damaged the 5 active reactor plants drowning two workers. Loss of backup electrical power led to overheating, meltdowns, and evacuations. 123 One man died suddenly while carrying equipment during the clean-up. | 2+ | | 7 |
| September 12, 2011 | Marcoule.France | One person was killed and four injured, one seriously, in a blast at the Marcoule Nuclear Site. The explosion took place in a furnace used to melt metallic waste. | 1 | | |

**Nuclear reactor attacks**

The vulnerability of nuclear plants to deliberate attack is of concern in the area of nuclear safety and security. Nuclear power plants, civilian research reactors, certain naval fuel facilities, uranium enrichment plants, fuel fabrication plants, and even potentially uranium mines are vulnerable to attacks which could lead to widespread radioactive contamination. The attack threat is of several general types: commando-like ground-based attacks on equipment which if disabled could lead to a reactor core meltdown or widespread dispersal

of radioactivity; and external attacks such as an aircraft crash into a reactor complex, or cyber attacks.

The United States 9/11 Commission has said that nuclear power plants were potential targets originally considered for the September 11, 2001 attacks. If terrorist groups could sufficiently damage safety systems to cause a core meltdown at a nuclear power plant, and/or sufficiently damage spent fuel pools, such an attack could lead to widespread radioactive contamination. The Federation of American Scientists have said that if nuclear power use is to expand significantly, nuclear facilities will have to be made extremely safe from attacks that could release massive quantities of radioactivity into the community. New reactor designs have features of passive nuclear safety, which may help. In the United States, the NRC carries out "Force on Force" (FOF) exercises at all Nuclear Power Plant (NPP) sites at least once every three years.

Nuclear reactors become preferred targets during military conflict and, over the past three decades, have been repeatedly attacked during military air strikes, occupations, invasions and campaigns. Various acts of civil disobedience since 1980 by the peace group Plowshares have shown how nuclear weapons facilities can be penetrated, and the group's actions represent extraordinary breaches of security at nuclear weapons plants in the United States. The National Nuclear Security Administration has acknowledged the seriousness of the 2012 Plowshares action. Non-proliferation policy experts have questioned "the use of private contractors to provide security at facilities that manufacture and store the government's most dangerous military material". Nuclear weapons materials on the black market are a global concern, and there is concern about the possible detonation of a small, crude nuclear weapon by a militant group in a major city, with significant loss of life and property.

The number and sophistication of cyber attacks is on the rise. *Stuxnet* is a computer worm discovered in June 2010 that is believed to have been created by the United States and Israel to attack Iran's nuclear facilities. It switched off safety devices, causing centrifuges to spin out of control. The computers of South Korea's nuclear plant operator (KHNP) were hacked in December 2014. The cyber attacks involved thousands of phishing emails containing malicious codes, and information was stolen.

**Radiation and other accidents and incidents**

Serious radiation and other accidents and incidents include:

**1940s**

May 1945: Albert Stevens was one of several subjects of a human radiation experiment,

and was injected with plutonium without his knowledge or informed consent. Although Stevens was the person who received the highest dose of radiation during the plutonium experiments, he was neither the first nor the last subject to be studied. Eighteen people aged 4 to 69 were injected with plutonium. Subjects who were chosen for the experiment had been diagnosed with a terminal disease. They lived from 6 days up to 44 years past the time of their injection.12^ Eight of the 18 died within two years of the injection. All died from their preexisting terminal illness, or cardiac illnesses. None died from the plutonium itself. Patients from Rochester, Chicago, and Oak Ridge were also injected with plutonium in the Manhattan Project human experiments.

6-9 August 1945: On the orders of President Harry S. Truman, a uranium-gun design bomb, Little Bov, was used against the city of Hiroshima, Japan. Fat Man, a plutonium implosion-design bomb was used against the city of Nagasaki. The two weapons killed approximately 120,000 to 140,000 civilians and military personnel instantly and thousands more have died over the years from radiation sickness and related cancers.

August 1945: Criticality accident at US Los Alamos National Laboratory. Harry Daghliandies.

May 1946: Criticality accident at Los Alamos National Laboratory. Louis Slotin dies.

**1950s**

February 13, 1950: a Convair B-36B crashed in northern British Columbia after jettisoning a Mark IV atomic bomb. This was the first such nuclear weapon loss in history.

December 12, 1952: NRX AECL Chalk River Laboratories, Chalk River, Ontario, Canada. Partial meltdown, about 10,000 Curies released. Approximately 1202 people were involved in the two year cleanup. Future president Jimmy Carterwas one of the many people that helped clean up the accident.

15/03/1953 - Mavak. Former Soviet Union. Criticality accident. Contamination of plant personnel occurred.

1954: The 15 Mt Castle Bravo shot of 1954 which spread considerable nuclear fallout on many Pacific islands, including several which were inhabited, and some that had not been evacuated.

March 1, 1954: Dai go Fukuryu Maru. 1 fatality.

September 1957: a plutonium fire occurred at the Rocky Flats Plant, which resulted in the contamination of Building 71 and the release of plutonium into the atmosphere, causing US $818,600 in damage.

21/04/1957 - Mavak, Former Soviet Union. Criticality accident in the factory number 20 in the collection oxalate decantate after filtering sediment oxalate enriched uranium. Six people received doses of 300 to 1,000 rem (four women and two men), one woman died.

September 1957: Kvshtvm disaster: Nuclear waste storage tank explosion at Chelyabinsk. Russia. 200+ fatalities, believed to be a conservative estimate; 270,000 people were exposed to dangerous radiation levels. Over thirty small communities were removed from Soviet maps between 1958 and 1991.

October 1957: Windscale fire. UK. Fire ignites plutonium piles and contaminates surrounding dairy farms. An estimated 33 cancer deaths.

1957-1964: Rocketdyne located at the Santa Susanna Field Lab, 30 miles north of Los Angeles, California operated ten experimental nuclear reactors. Numerous accidents occurred including a core meltdown. Experimental reactors of that era were not required to have the same type of containment structures that shield modem nuclear reactors. During the Cold War time in which the accidents that occurred at Rocketdyne, these events were not publicly reported by the Department of Energy.

1958: Fuel rupture and fire at the National Research Universal reactor CNRU'I, Chalk River, Canada.

10/02/1958 - Mavak. Former Soviet Union. Criticality accident in SCR plant. Conducted experiments to determine the critical mass of enriched uranium in a cylindrical container with different concentrations of uranium in solution. Staff broke the rules and instructions for working with YADM (nuclear fissile material). When SCR personnel received doses from 7600 to 13,000 rem. Three people died, one man got radiation sickness and went blind.

December 30, 1958: Cecil Kelley criticality accident at Los Alamos National Laboratory.

March 1959: Santa Susana Field Laboratory. Los Angeles. California. Fire in a fuel processing facility.

July 1959: Santa Susana Field Laboratory. Los Angeles. California. Partial meltdown.

**1960s**

7 June 1960: the 1960 Fort Dix IM-99 accident destroyed aCIM-10 Bomarcnuclear missile and shelter and contaminated the BOMARC Missile Accident Sitein New Jersey.

24 January 1961: the 1961 Goldsboro B-52 crash occurred near Goldsboro. North Carolina. A B-52 Stratofortress carrying two Mark 39 nuclear bombs broke up in mid-air, dropping its nuclear payload in the process.

July 1961: soviet submarine K-19 accident. Eight fatalities and more than 30 people were over-exposed to radiation.

March, 21 -August 1962: radiation accident in Mexico City, four fatalities.

May 1962: The Cuban Missile Crisis was a 13-day confrontation in October 1962 between the Soviet Union and Cuba on one side and the United States on the other side. The crisis is generally regarded as the moment in which the Cold War came closest to turning into a nuclear conflict and is also the first documented instance of mutual assured destruction (MAD) being discussed as a determining factor in a major international arms agreement.

23 July, 1964: Wood River Junction criticality accident. Resulted in 1 fatality

1964, 1969: Santa Susana Field Laboratory. Los Angeles. California. Partial meltdowns.

1965 Philippine Sea A-4 crash, where a Skvhawk attack aircraft with a nuclear weapon fell into the sea. The pilot, the aircraft, and the B43 nuclear bombwere never recovered. It was not until the 1980s that the Pentagon revealed the loss of the one-megaton bomb.

October 1965: US CIA-led expedition abandons a nuclear-powered telemetry relay listening device on Nanda Devi January 17, 1966: the 1966 Palomares B-52 crash occurred when aB-52G bomber of the USAF collided with a KC-135 tanker during mid-air re-fuelling off the coast of Spain. The KC-135 was completely destroyed when its fuel load ignited, killing all four crew members. The B-52G broke apart, killing three of the seven crew members aboard.1^1 Of the four Mk28 type hydrogen bombs the B-52G carried, three were found on land near Almeria. Spain. The non-nuclear explosives in two of the weapons detonated upon impact with the ground, resulting in the contamination of a 2-square-kilometer (490- acre) (0.78 square mile) area by radioactive plutonium. The fourth, which fell into the Mediterranean Sea, was recovered intact after a 2'/2-month-long search.

January 21, 1968: the 1968 Thule Air Base B-52 crash involved a United States Air Force (USAF) B-52 bomber. The aircraft was carrying four hydrogen bombswhen a cabin fire forced the crew to abandon the aircraft. Six crew members ejected safely, but one who did not have an ejection seat was killed while trying to bail out. The bomber crashed onto sea ice in Greenland. causing the nuclear payload to rupture and disperse, which resulted in widespread radioactive contamination.

May 1968: Soviet submarine K-27 reactor near meltdown. 9 people died, 83 people were injured.021 In August 1968, the Project 667 A - Yankee class nuclear submarine K-

140 was in the naval yard at Severodvinsk for repairs. On August 27, an uncontrolled increase of the reactor's power occurred following work to upgrade the vessel. One of the reactors started up automatically when the control rods were raised to a higher position. Power increased to 18 times its normal amount, while pressure and temperature levels in the reactor increased to four times the normal amount. The automatic start-up of the reactor was caused by the incorrect installation of the control rod electrical cables and by operator error. Radiation levels aboard the vessel deteriorated.

10/12/1968 - Mavak. Former Soviet Union. Criticality accident. Plutonium solution was poured into a cylindrical container with dangerous geometry. One person died, another took a high dose of radiation and radiation sickness, after which he had two legs and his right arm amputated.1421

January 1969: Lucens reactor in Switzerland undergoes partial core meltdown leading to massive radioactive contamination of a cavern.

**1970s**

1974-1976: Columbus radiotherapy accident, 10 fatalities, 88 injuries from cobalt-60 source.

July 1978: Anatoli Bugorski was working on U-70, the largest Soviet particle accelerator, when he accidentally exposed his head directly to the proton beam. He survived, despite suffering some long-term damage.

July 1979: Church Rock Uranium Mill Spill in New Mexico. USA, when United Nuclear Corporation's uranium mill tailings disposal pond breached its dam. Over 1,000 tons of radioactive mill waste and millions of gallons of mine effluent flowed into the Puerco River, and contaminants traveled downstream.

**1980s**

1980 to 1989: The Kramatorsk radiological accident happened in Kramatorsk, Ukrainian SSR. In 1989, a small capsule containing highly radioactive caesium-137 was found inside the concrete wall of an apartment building. 6 residents of the building died from leukemia and 17 more received varying radiation doses. The accident was detected only after the residents called in a health physicist.

1980: Houston radiotherapy accident, 7 fatalities.

October 5, 1982: Lost radiation source, Baku, Azerbaijan, USSR. 5 fatalities, 13 injuries.

March 1984: Radiation accident in Morocco, eight fatalities from overexposure to

radiation from a lost iridium-192 source.

1984: Femald Feed Materials Production Center gained notoriety when it was learned that the plant was releasing millions of pounds of uranium dust into the atmosphere, causing major radioactive contamination of the surrounding areas. That same year, employee Dave Bocks, a 39-year-old pipefitter, disappeared during the facility's graveyard shift and was later reported missing. Eventually, his remains were discovered inside a uranium processing furnace located in Plant 6.

August 1985: Soviet submarine K-431 accident. Ten fatalities and 49 other people suffered radiation injuries.

October 1986: Soviet submarine K-219 reactor almost had a meltdown. Sergei Preminin died after he manually lowered the control rods, and stopped the explosion. The submarine sank three days later.

September 1987: Goiania accident. Four fatalities, and following radiological screening of more than 100,000 people, it was ascertained that 249 people received serious radiation contamination from exposure to caesium-137. In the cleanup operation, topsoil had to be removed from several sites, and several houses were demolished. All the objects from within those houses were removed and examined. *Time* magazine has identified the accident as one of the world's "worst nuclear disasters" and the International Atomic Energy Agency called it "one of the world's worst radiological incidents".

1989: San Salvador, El Salvador; one fatality due to violation of safety rules at cobalt-60 irradiation facility.

**1990s**

1990: Soreq, Israel; one fatality due to violation of safety rules at cobalt-60 irradiation facility.

December 16 - 1990: radiotherapy accident in Zaragoza. Eleven fatalities and 27 other patients were injured.

1991: Neswizh, Belarus; one fatality due to violation of safety rules at cobalt-60 irradiation facility.

1992: Jilin, China; three fatalities at cobalt-60 irradiation facility.

1992: USA; one fatality.

April 1993: accident at the Tomsk-7 Reprocessing Complex, when a tank exploded while being cleaned with nitric acid. The explosion released a cloud of radioactive gas. (INES level 4).

1994: Tammiku, Estonia; one fatality from disposed caesium-137 source.

August— December 1996: Radiotherapy accident in Costa Rica. Thirteen fatalities and 114 other patients received an overdose of radiation.

1996: an accident at Pelindaba research facility in South Africa results in the exposure of workers to radiation. Harold Daniels and several others die from cancers and radiation bums related to the exposure.

June 1997: Sarov, Russia; one fatality due to violation of safety rules.

May 1998: The Acerinox accident was an incident of radioactive contamination in Southern Spain. A caesium-137 source managed to pass through the monitoring equipment in an Acerinox scrap metal reprocessing plant. When melted, the caesium- 137 caused the release of a radioactive cloud.

September 1999: two fatalities at criticality accident at Tokaimura nuclear accident (Japan)

**2000s**

January-February 2000: Samut Prakan radiation accident: three deaths and ten injuries resulted in Samut Prakan when a cobalt- 60 radiation-therapy unit was dismantled.

May 2000: Meet Haifa, Egypt; two fatalities due to radiography accident.

August 2000 - March 2001: Instituto Oncologico Nacional of Panama, 17 fatalities. Patients receiving treatment for prostate cancer and cancer of the cervix receive lethal doses of radiation.

August 9, 2004: Mihama Nuclear Power Plant accident, 4 fatalities. Hot water and steam leaked from a broken pipe (not actually a radiation accident).

9 May 2005: it was announced that Thermal Oxide Reprocessing Plant in the UK suffered a large leak of a highly radioactive solution, which first started in July 2004.

April 2010: Mayapuri radiological accident. India, one fatality after a cobalt-60 research irradiator was sold to a scrap metal dealer and dismantled.

**2010s**

March 2011: Fukushima I nuclear accidents, Japan and the radioactive discharge at the Fukushima Daiichi Power Station.

January 17, 2014: At the Rossing Uranium Mine. Namibia, a catastrophic structural failure of a leach tank resulted in a major spill. The France-based laboratory, CRIIRAD. reported elevated levels of radioactive materials in the area surrounding the mine. Workers

were not informed of the dangers of working with radioactive materials and the health effects thereof.

February 1, 2014: Designed to last ten thousand years, the Waste Isolation Pilot Plant (WIPP) site had its first leak of airborne radioactive materials. 140 employees working underground at the time were sheltered indoors. 13 of these tested positive for internal radioactive contamination. Internal exposure to radioactive isotopes is more serious than external exposure, as these particles lodge in the body for decades, irradiating the surrounding tissues, thus increasing the risk of future cancers and other health effects. A second leak at the plant occurred shortly after the first, releasing plutonium and other radiotoxins, causing concern for communities living near the repository.

**Worldwide nuclear testing summary**

Between 16 July 1945 and 23 September 1992, the United States maintained a program of vigorous nuclear testing, with the exception of a moratorium between November 1958 and September 1961. By official count, a total of 1,054 nuclear tests and two nuclear attacks were conducted, with over 100 of them taking place at sites in the Pacific Ocean, over 900 of them at the Nevada Test Site, and ten on miscellaneous sites in the United States (Alaska, Colorado, Mississippi, and New Mexico). Until November 1962, the vast majority of the U.S. tests were atmospheric (that is, above-ground); after the acceptance of the Partial Test Ban Treaty all testing was regulated underground, in order to prevent the dispersion of nuclear fallout.

The U.S. program of atmospheric nuclear testing exposed a number of the population to the hazards of fallout. Estimating exact numbers, and the exact consequences, of people exposed has been medically very difficult, with the exception of the high exposures of Marshall Islanders and Japanese fishers in the case of the Castle Bravo incident in 1954. A number of groups of U.S. citizens — especially farmers and inhabitants of cities downwind of the Nevada Test Site and U.S. military workers at various tests — have sued for compensation and recognition of their exposure, many successfully. The passage of the Radiation Exposure Compensation Act of 1990 allowed for a systematic filing of compensation claims in relation to testing as well as those employed at nuclear weapons facilities. As of June 2009 over $1.4 billion total has been given in compensation, with over $660 million going to “down winders”.

**Worldwide nuclear testing totals by country**

| Country | Tests | Detonations | Peaceful tests | Atmospheric tests | Yield range, kt | Total yield, kt | Percentage by test count | Percentage by yield |
|---|---|---|---|---|---|---|---|---|
| USA | 1032 | 1127 | 27 | 231 | O to 15,000 | 196,513 | 48.8% | 37.0% |
| USSR | 729 | 982 | 156 | 230 | 0 to 50,000 | 296,836 | 34.4% | 54.0% |
| Great Britain | 88 | 88 | 0 | 33 | 0 to 3,000 | 9,282 | 4.2% | 1.8% |
| France | 212 | 212 | 4 | 52 | 0 to 2,600 | 13,567 | 10.0% | 2.6% |
| China | 47 | 47 | 0 | 22 | 0 to 4,000 | 24,409 | 2.2% | 4.6% |
| India | 3 | 6 | 1 | 0 | 0 to 43 | 68 | 0.14% | 0.013% |
| Pakistan | 2 | 6 | 0 | 0 | 1 to 32 | 51 | 0.095% | 0.0096% |
| North Korea | 3 | 3 | 0 | 0 | 1 to 7 | 12 | 0.14% | 0.0023% |
| Totals | 2116 | 2471 | 188 | 542 | 0 to 50,000 | 540,738 | | |

1. Including salvo tests counted as a single test.
2. **Jump up —** Detonations include zero-yield detonations in safety tests and failed full yield tests, but not those in the accident category listed above.
3. **Jump up —** As declared so by the nation testing; some may have been dual use.
4. **Jump up —** Defined as these classes of tests: atmospheric, surface, barge, cratering, space, and underwater tests.
5. **Jump up —** Including five tests in which the devices were destroyed before detonation, and the combat bombs dropped on Japan in World War II
6. **Jump up —** Includes both application tests and research tests at NTS.
7. **Jump up —** When the yield reads "< 20 kt" this total assumes the yield was half the maximum, i.e., 10 kt.
8. **Jump up —** Includes the test left behind in Semipalatinsk and 13 apparent failures not in the official list.
9. **Jump up —** 124 applications tests and 32 research tests which helped design better PNE charges.
10. **Jump up —** Includes the 31 Vixen tests, which were safety tests.
11. **Jump up —** Including two possible safety tests in 1978, which don't appear on other lists.
12. **Jump up —** Four of the tests at In Ekker were the focus of attention by APEX

(Application pacifique des experimentations nucleates). They even gave them different names, causing confusion.

13. **Jump up —** Includes one bomb destroyed before detonation by a failed parachute.
14. **Jump up —** Indira Gandhi, in her capacity as India's Minister of Atomic Energy at the time, declared the ***Smiling Buddha*** test to have been a test for the peaceful uses of atomic power.
15. **Jump up —** There is some uncertainty as to exactly how many bombs were exploded in each of Pakistan's tests. It could be as low as three altogether or as high as six.

**Trafficking and thefts**

The International Atomic Energy Agency says there is "a persistent problem with the illicit trafficking in nuclear and other radioactive materials, thefts, losses and other unauthorized activities". The IAEA Illicit Nuclear Trafficking Database notes 1,266 incidents reported by 99 countries over the last 12 years, including 18 incidents involving HEU or plutonium trafficking:

- Security specialist Shaun Gregory argued in an article that terrorists have attacked Pakistani nuclear facilities three times in the recent past; twice in 2007 and once in 2008.
- In November 2007, burglars with unknown intentions infiltrated the Pelindaba nuclear research facility near Pretoria, South Africa. The burglars escaped without acquiring any of the uranium held at the facility.
- In June 2007, the Federal Bureau of Investigation released to the press the name of Adnan Gulshair el Shukrijumah, allegedly the operations leader for developing tactical plans for detonating nuclear bombs in several American cities simultaneously.
- In November 2006, MI5 warned that al-Oaida were planning on using nuclear weapons against cities in the United Kingdom by obtaining the bombs via clandestine means.
- In February 2006, Oleg Khinsagov of Russia was arrested in Georgia, along with three Georgian accomplices, with 79.5 grams of 89 percent enriched HEU.
- The Alexander Litvinenko poisoning with radioactive polonium "represents an ominous landmark: the beginning of an era of nuclear terrorism," according to Andrew J. Patterson.
- In June 2002, U.S. citizen Jose Padilla was arrested for allegedly planning a

radiological attack on the city of Chicago; however, he was never charged with such conduct. He was instead convicted of charges that he conspired to "murder, kidnap and maim" people overseas.

## 4.4 Accident Categories

**Nuclear meltdown**

A nuclear meltdown is a severe nuclear reactor accident that results in reactor core damage from overheating. It has been defined as the accidental melting of the core of a nuclear reactor, and refers to the core's either complete or partial collapse. A core melt accident occurs when the heat generated by a nuclear reactor exceeds the heat removed by the cooling systems to the point where at least one nuclear fuel element exceeds its melting point. This differs from a fuel element failure, which is not caused by high temperatures. A meltdown may be caused by a loss of coolant, loss of coolant pressure, or low coolant flow rate or be the result of a criticality excursion in which the reactor is operated at a power level that exceeds its design limits. Alternately, in a reactor plant such as the RBMK-1000, an external fire may endanger the core, leading to a meltdown. Large-scale nuclear meltdowns at civilian nuclear power plants include:

- the Lucens reactor. Switzerland, in 1969.
- the Three Mile Island accident in Pennsylvania. United States, in 1979.
- the Chernobyl disaster at Chernobyl Nuclear Power Plant, Ukraine, USSR, in 1986.
- the Fukushima Daiichi nuclear disaster following the earthquake and tsunami in Japan, March 2011.

Other core meltdowns have occurred at:

- NRX (military), Ontario. Canada, in 1952
- BORAX-I (experimental), Idaho, U.S.A., in 1954
- EBR-I. Idaho, U.S.A., in 1955
- Windscale (military), Sellafield, England, in 1957 (see Windscale fire)
- Sodium Reactor Experiment, (civilian), California, U.S.A., in 1959
- Fermi 1 (civilian), Michigan, U.S.A., in 1966
- Chapelcross nuclear power station (civilian), Scotland, in 1967
- Saint-Laurent Nuclear Power Plant (civilian), France, in 1969

- A1 plant, (civilian) at Jaslovske Bohunice, Czechoslovakia, in 1977
- Saint-Laurent Nuclear Power Plant (civilian), France, in 1980

Eight Soviet Navy nuclear submarines have had nuclear core meltdowns or radiation incidents: K-19 (1961), K-l 1(1965), K- 27 (1968), K-l40 (1968), K-429 (1970), K-222 (1980), K-314 (1985), and K-431 (1985).

**Criticality accidents**

A criticality accident (also sometimes referred to as an "excursion" or "power excursion") occurs when a nuclear chain reaction is accidentally allowed to occur in fissile material, such as enriched uranium or plutonium. The Chernobyl accident is an example of a criticality accident. This accident destroyed a reactor at the plant and left a large geographic area uninhabitable. In a smaller scale accident at Sarov a technician working with highly enriched uranium was irradiated while preparing an experiment involving a sphere of fissile material. The Sarov accident is interesting because the system remained critical for many days before it could be stopped, though safely located in a shielded experimental hall. This is an example of a limited scope accident where only a few people can be harmed, while no release of radioactivity into the environment occurred. A criticality accident with limited off site release of both radiation (gamma and neutron) and a very small release of radioactivity occurred at Tokaimura in 1999 during the production of enriched uranium fuel. Two workers died, a third was permanently injured, and 350 citizens were exposed to radiation.

**Decay heat**

Decay heat accidents are where the heat generated by the radioactive decay causes harm. In a large nuclear reactor, aloss of coolant accident can damage the core: for example, at Three Mile Island a recently shutdown (SCRAMed) PWRreactor was left for a length of time without cooling water. As a result, the nuclear fuel was damaged, and the core partially melted. The removal of the decay heat is a significant reactor safety concern, especially shortly after shutdown. Failure to remove decay heat may cause the reactor core temperature to rise to dangerous levels and has caused nuclear accidents. The heat removal is usually achieved through several redundant and diverse systems, and the heat is often dissipated to an 'ultimate heat sink' which has a large capacity and requires no active power, though this method is typically used after decay heat has reduced to a very small value. The main cause of release of radioactivity in the Three Mile Island accident was a pilot-operated relief valve on the primary loop which stuck in the open position. This caused the overflow tank into which it drained to rupture and release large amounts of radioactive cooling water into the containment building.

In 2011, an earthquake and tsunami caused a loss of power to two plants in Fukushima, Japan, crippling the reactor as decay heat caused 90% of the fuel rods in the core of the Daiichi Unit 3 reactor to become uncovered. As of May 30, 2011, the removal of decay heat is still a cause for concern.

**Transport**

Transport accidents can cause a release of radioactivity resulting in contamination or shielding to be damaged resulting in direct irradiation. In Cochabamba a defective gamma radiography set was transported in a passenger bus as cargo. The gamma source was outside the shielding, and it irradiated some bus passengers.

In the United Kingdom, it was revealed in a court case that in March 2002 a radiotherapy source was transported from Leedsto Sellafield with defective shielding. The shielding had a gap on the underside. It is thought that no human has been seriously harmed by the escaping radiation.

**Equipment failure**

Equipment failure is one possible type of accident. In Bialystok, Poland, in 2001 the electronics associated with a particle accelerator used for the treatment of cancer suffered a malfunction. This then led to the overexposure of at least one patient. While the initial failure was the simple failure of a semiconductor diode, it set in motion a series of events which led to a radiation injury.

A related cause of accidents is failure of control software, as in the cases involving the Therac-25 medical radiotherapy equipment: the elimination of a hardware safety interlock in a new design model exposed a previously undetected bug in the control software, which could have led to patients receiving massive overdoses under a specific set of conditions.

**Human error**

Many of the major nuclear accidents have been directly attributable to operator or human error. This was obviously the case in the analysis of both the Chernobyl and TMI-2 accidents. At Chernobyl, a test procedure was being conducted prior to the accident. The leaders of the test permitted operators to disable and ignore key protection circuits and warnings that would have normally shut the reactor down. At TMI-2, operators permitted thousands of gallons of water to escape from the reactor plant before observing that the coolant pumps were behaving abnormally. The coolant pumps were thus turned off to protect the pumps, which in turn led to the destruction of the reactor itself as cooling was completely lost within the core.

A detailed investigation into SL-1 determined that one operator (perhaps inadvertently) manually pulled the 84-pound (38 kg) central control rod out about 26 inches rather than the maintenance procedure's intention of about 4 inches.

An assessment conducted by the Commissariat a l'Energie Atomique (CEA) in France concluded that no amount of technical innovation can eliminate the risk of human-induced errors associated with the operation of nuclear power plants. Two types of mistakes were deemed most serious: errors committed during field operations, such as maintenance and testing, that can cause an accident; and human errors made during small accidents that cascade to complete failure.

In 1946 Canadian Manhattan Project physicist Louis Slotin performed a risky experiment known as "tickling the dragon's tail" which involved two hemispheres of neutron-reflective beryllium being brought together around a plutonium core to bring it to criticality. Against operating procedures, the hemispheres were separated only by a screwdriver. The screwdriver slipped and set off a chain reaction criticality accident filling the room with harmful radiation and a flash of blue light (caused by excited, ionized air particles returning to their unexcited states). Slotin reflexively separated the hemispheres in reaction to the heat flash and blue light, preventing further irradiation of several co-workers present in the room. However, Slotin absorbed a lethal dose of the radiation and died nine days later. The infamous plutonium mass used in the experiment was referred to as the demon core.

**Lost source**

Lost source accidents, also referred to as orphan sources, are incidents in which a radioactive source is lost, stolen or abandoned. The source then might cause harm to humans. One case occurred at Yanango where a radiography source was lost, also at Samut Prakam a phosphorus tele-therapy source was lost and at Gilan in Iran a radiography source harmed a welder. The best known example of this type of event is the Goiania accident in Brazil.

The International Atomic Energy Agency has provided guides for scrap metal collectors on what a sealed source might look like. The scrap metal industry is the one where lost sources are most likely to be found.

**Comparisons**

Comparing the historical safety record of civilian nuclear energy with other forms of electrical generation, Ball, Roberts, and Simpson, the IAEA, and the Paul Scherrer Institute found in separate studies that during the period from 1970 to 1992, there were just 39 on-the-job deaths of nuclear power plant workers worldwide, while during the same time

period, there were 6,400 on-the-job deaths of coal power plant workers, 1,200 on-the-job deaths of natural gas power plant workers and members of the general public caused by natural gas power plants, and 4,000 deaths of members of the general public caused by hydroelectric power plants. In particular, coal power plants are estimated to kill 24,000 Americans per year due to lung disease as well as causing 40,000 heart attacks per year in the United States. According to Scientific American, the average coal power plant emits 100 times more radiation per year than a comparatively sized nuclear power plant in the form of toxic coal waste known as fly ash.

Journalist Stephanie Cooke says that it is not very useful to make accident comparisons just in terms of number of immediate deaths, as the way people's lives are disrupted is also relevant, as in the case of the 2011 Japanese nuclear accidents, where 80,000 residents were forced to evacuate from neighborhoods around the Fukushima plant:

You have people in Japan right now that are facing either not returning to their homes forever, or if they do return to their homes, living in a contaminated area... And knowing that whatever food they eat, it might be contaminated and always living with this sort of shadow of fear over them that they will die early because of cancer... It doesn't just kill now, it kills later, and it could kill centuries later... I'm not a great fan of coal-burning. I don't think any of these great big massive plants that spew pollution into the air are good. But I don't think it's really helpful to make these comparisons just in terms of number of deaths. Physicist Amory Lovins has said: "Nuclear power is the only energy source where mishap or malice can destroy so much value or kill many faraway people; the only one whose materials, technologies, and skills can help make and hide nuclear weapons; the only proposed climate solution that substitutes proliferation, major accidents, and radioactive-waste dangers".

In terms of energy accidents, hydroelectric plants were responsible for the most fatalities, but nuclear power plant accidents rank first in terms of their economic cost, accounting for 41 percent of all property damage. Oil and hydroelectric follow at around 25 percent each, followed by natural gas at 9 percent and coal at 2 percent. Excluding Chernobyl and the Shimantan Dam, the three other most expensive accidents involved the Exxon Valdez oil spill (Alaska), the Prestige oil spill (Spain), and the Three Mile Island nuclear accident (Pennsylvania).

**Nuclear safety**

Nuclear safety covers the actions taken to prevent nuclear and radiation accidents or to limit their consequences. This covers nuclear power plants as well as all other nuclear

facilities, the transportation of nuclear materials, and the use and storage of nuclear materials for medical, power, industry, and military uses.

The nuclear power industry has improved the safety and performance of reactors, and has proposed new safer (but generally untested) reactor designs but there is no guarantee that the reactors will be designed, built and operated correctly. Mistakes do occur and the designers of reactors at Fukushima in Japan did not anticipate that a tsunami generated by an earthquake would disable the backup systems that were supposed to stabilize the reactor after the earthquake. According to UBS AG, the Fukushima I nuclear accidents have cast doubt on whether even an advanced economy like Japan can master nuclear safety. Catastrophic scenarios involving terrorist attacks are also conceivable.

In his book, ***Normal accidents,*** Charles Perrow says that multiple and unexpected failures are built into society's complex and tightly-coupled nuclear reactor systems. Nuclear power plants cannot be operated without some major accidents. Such accidents are unavoidable and cannot be designed around. An interdisciplinary team from MIT have estimated that given the expected growth of nuclear power from 2005 - 2055, at least four serious nuclear accidents would be expected in that period. To date, there have been five serious accidents (core damage) in the world since 1970 (one at Three Mile Island in 1979; one at Chernobyl in 1986; and three at Fukushima-Daiichi in 2011), corresponding to the beginning of the operation of generation II reactors. This leads to on average one serious accident happening every eight years worldwide.

In the 2003 book, ***Brittle Power,*** Amory Lovins talks about the need for a resilient, secure, energy system:

The foundation of a secure energy system is to need less energy in the first place, then to get it from sources that are inherently invulnerable because they're diverse, dispersed, renewable, and mainly local. They're secure not because they're American but because of their design. Any highly centralized energy system — pipelines, nuclear plants, refineries — invite devastating attack. But invulnerable alternatives don't, and can't, fail on a large scale.

## 4.5 Nuclear and radiation accidents and incidents

A **nuclear and radiation accident** is defined by the International Atomic Energy Agency (IAEA) as "an event that has led to significant consequences to people, the environment or the facility." Examples include lethal effects to individuals, large radioactivity release to theenvironment, or reactor core melt.'14-1 The prime example of a "major nuclear accident" is one in which a reactor core is damaged and significant amounts of

radioactivity are released, such as in theChernobvl disaster in 1986.13

The impact of nuclear accidents has been a topic of debate practically since the first nuclear reactors were constructed in 1954. It has also been a key factor in public concern about nuclear facilities.161 Some technical measures to reduce the risk of accidents or to minimize the amount of radioactivity released to the environment have been adopted. Despite the use of such measures, human error remains, and "there have been many accidents with varying impacts as well near misses and incidents".™ As of 2014, there have been more than 100 serious nuclear accidents and incidents from the use of nuclear power. Fifty-seven accidents have occurred since the Chernobyl disaster, and about 60% of all nuclear-related accidents have occurred in the USA.MSerious nuclear power plant accidents include the Fukushima Daiichi nuclear disaster (2011), Chernobyl disaster (1986), Three Mile Island accident (1979), and the SL-1 accident (1961).121 Nuclear power accidents can involve loss of life and very large monetary costs for remediation work.™

Nuclear-powered submarine core meltdown and other mishaps include the K-19 (1961), K-11 (1965), K; 27 (1968), K-140 (1968), K-429(1970), K-222 (1980), and K-431 (igSS)™1™ Serious radiation accidents include the Kvshtvm disaster. Windscale fire, radiotherapy accident in Costa Rica.™ radiotherapy accident in Zaragoza.|14lradiation accident in Morocco.™ Goiania accident,™ radiation accident in Mexico City, radiotherapy unit accident in Thailand,™ and the Mavapuri radiological accident in India.™

The IAEA maintains a website reporting recent accidents.

**Nuclear power plant accidents**

One of the worst nuclear accidents to date was the Chernobyl disaster which occurred in 1986 in Ukraine. The accident killed 31 people directly and damaged approximately $7 billion of property. A study published in 2005 estimates that there will eventually be up to 4,000 additional cancer deaths related to the accident among those exposed to significant radiation levels.™ Radioactive fallout from the accident was concentrated in areas of Belarus, Ukraine and Russia. Approximately 350,000 people were forcibly resettled away from these areas soon after the accident.™

Beniamin K. Sovacool has reported that worldwide there have been 99 accidents at nuclear power plants from 1952 to 2009 (defined as incidents that either resulted in the loss of human life or more than US$50,000 of property damage, the amount the US federal government uses to define major energy accidents that must be reported), totaling US$20.5 billion in property damages.181 Fifty-seven accidents have occurred since the Chernobyl disaster, and almost two-thirds (56 out of 99) of all nuclear-related accidents have occurred

in the US. There have been comparatively few fatalities associated with nuclear power plant accidents.

**Nuclear reactor attacks**

The vulnerability of nuclear plants to deliberate attack is of concern in the area of nuclear safety and security. Nuclear power plants, civilian research reactors, certain naval fuel facilities, uranium enrichment plants, fuel fabrication plants, and even potentially uranium mines are vulnerable to attacks which could lead to widespread radioactive contamination. The attack threat is of several general types: commandolike ground-based attacks on equipment which if disabled could lead to a reactor core meltdown or widespread dispersal of radioactivity; and external attacks such as an aircraft crash into a reactor complex, or cyber attacks.123

The United States 9/11 Commission has said that nuclear power plants were potential targets originally considered for theSeptember 11,2001 attacks. If terrorist groups could sufficiently damage safety systems to cause a core meltdown at a nuclear power plant, and/or sufficiently damage spent fuel pools, such an attack could lead to widespread radioactive contamination. The Federation of American Scientists have said that if nuclear power use is to expand significantly, nuclear facilities will have to be made extremely safe from attacks that could release massive quantities of radioactivity into the community. New reactor designs have features of passive nuclear safety, which may help. In the United States, the NRC carries out "Force on Force" (FOF) exercises at all Nuclear Power Plant (NPP) sites at least once every three years.123

Nuclear reactors become preferred targets during military conflict and, over the past three decades, have been repeatedly attacked during military air strikes, occupations, invasions and campaigns.1281 Various acts of civil disobedience since 1980 by the peace group Plowshares have shown how nuclear weapons facilities can be penetrated, and the group's actions represent extraordinary breaches of security at nuclear weapons plants in the United States. The National Nuclear Security Administration has acknowledged the seriousness of the 2012 Plowshares action. Non-proliferation policy experts have questioned "the use of private contractors to provide security at facilities that manufacture and store the government's most dangerous military material".1221 Nuclear weapons materials on the black market are a global concern,™211 and there is concern about the possible detonation of a small, crude nuclear weapon by a militant group in a major city, with significant loss of life and property.13211221

The number and sophistication of cyber attacks is on the rise. *Stuxnet* is a computer

worm discovered in June 2010 that is believed to have been created by the United States and Israel to attack Iran's nuclear facilities. It switched off safety devices, causing centrifuges to spin out of control.1241 The computers of South Korea's nuclear plant operator (KHNP) were hacked in December 2014. The cyber attacks involved thousands of phishing emails containing malicious codes, and information was stolen.

**Natural disaster**

A natural disaster is a major adverse event resulting from natural processes of the Earth; examples include floods, hurricanes, tornadoes, volcanic eruptions.earthquakes. tsunamis, and other geologic processes. A natural disaster can cause loss of life or property damage,31 and typically leaves some economic damage in its wake, the severity of which depends on the affected population's resilience, or ability to recover and also on the infrastructure available.

An adverse event will not rise to the level of a disaster if it occurs in an area without vulnerable population.™ In a vulnerable area, however, such as Nepal during the 2015 earthquake, an earthquake can have disastrous consequences and leave lasting damage, requiring years to repair.

## 4.6 Geological disasters

**Avalanches and landslides**

During World War I. an estimated 40,000 to 80,000 soldiers died as a result of avalanches during the mountain campaign in the Alps at the Austrian-ltalian front. Many of the avalanches were caused by artillery fire.

**Earthquakes**

An earthquake is the result of a sudden release of energy in the Earth's crust that creates seismic waves. At the Earth's surface, earthquakes manifest themselves by vibration, shaking and sometimes displacement of the ground. Earthquakes are caused by slippage within geological faults. The underground point of origin of the earthquake is called the *seismic focus.* The point directly above the focus on the surface is called the *epicenter.* Earthquakes by themselves rarely kill people or wildlife. It is usually the secondary events that they trigger, such as building collapse, fires, tsunamis (seismic sea waves) and volcanoes, which are actually the human disaster. Many of these could possibly be avoided by

better construction, safety systems, early warning and planning.

**Sinkholes**

When natural erosion or human mining makes the ground too weak to support the structures built on it, the ground can collapse and produce a sinkhole. For example, the 2010 Guatemala City sinkhole which killed fifteen people was caused when heavy rain from Tropical Storm Agatha, diverted by leaking pipes into a pumicebedrock, led to the sudden collapse of the ground beneath a factory building.

**Volcanic eruptions**

Volcanoes can cause widespread destruction and consequent disaster in several ways. The effects include thevolcanic eruption itself that may cause harm following the explosion of the volcano or the fall of rock. Second, lava may be produced during the eruption of a volcano. As it leaves the volcano, the lava destroys many buildings, plants and animals due to its extreme heat. Third, volcanic ash generally meaning the cooled ash - may form a cloud, and settle thickly in nearby locations. When mixed with water this forms a concretelike material. In sufficient quantity ash may cause roofs to collapse under its weight but even small quantities will harm humans if inhaled. Since the ash has the consistency of ground glass it causes abrasion damage to moving parts such as engines. The main killer of humans in the immediate surroundings of a volcanic eruption is the pyroclastic flows, which consist of a cloud of hot volcanic ash which builds up in the air above the volcano and rushes down the slopes when the eruption no longer supports the lifting of the gases. It is believed that Pompeii was destroyed by a pyroclastic flow. A lahar is a volcanic mudflow or landslide. The 1953Tanqiwai disaster was caused by a lahar, as was the 1985 Armero tragedy in which the town of Armero was buried and an estimated 23,000 people were killed.

A specific type of volcano is the supervolcano. According to the Toba catastrophe theory. 75,000 to 80,000 years ago a supervolcanic event at Lake Toba reduced the human population to 10,000 or even 1,000 breeding pairs, creating a bottleneck in human evolution.0 It also killed three-quarters of all plant life in the northern hemisphere. The main danger from a supervolcano is the immense cloud of ash, which has a disastrous global effect on climate and temperature for many years.

## 4.7 Operating Skills for handling Mines and other Explosive Devices

- In today's environment, security risks arise due to planting of mines, booby-traps and uriexpfoded improvised Explosive Devices (lED) in various areas.
- The security personnel must use their common sense and intuitive precautions as defence against such explosive devices.
- Another security measure is to remain alert and aware about the presence of such dangers.
- The security personnel must be properly dressed with long trousers, tong sieeved shirts, cotton or wooien if possible (not nylon or terylene), and wear socks and shoes.
- The security personnel driving in mine infested areas must follow the following rules :
  - Drive with windows open
  - Drive cautiously
  - Keep eye open for obvious hole on the road surface
  - Never to drive with worn out tyres
  - The vehicle door must be completely covered with sand bags or soil In plastic bags
- Mines may be either anti-personnel mines or anti-tank mines. Other explosive devices may include booby-traps, grenades, and IED all of which are dangerous.
- Mines may be of different shapes and size .The Security personnel must be taught to NEVER DISTURB THOSE . Antitank mines do not explode even if those are trampled by pedestrian traffic.
- Personnel must be given Mine Awareness training and told where those could be found in that location such as :
  - Places of unrest
  - Around police or military caps
  - Sides of unused footpaths or tracks
  - On the verges of roads or rail tracks

- In and around culverts and bridges
- Near or inside abandoned or dilapidated housed
- In or around water bodies or water tanks
- In areas where people might hide
- At crossing point of small streams

- Security personnel may be trained to use mine-sweepers in order to trace mines planted near :
  - Dead animals
  - Near Small potholes
  - On the ground where small wire may peep out
  - On barbed wire fences
  - Near small serviceable roads or tracks
  - On uncultivated fields around cultivated fields
  - Small plastic bags or flags hanging from trees
  - Sticks inserted into the barks of trees etc.
- What to do if a mine is located
- The security personnel must report immediately to the iocai controlling office.
- The security personnel must never panic
- The security personnel must ask ask everybody to STOP
- The security personnel must try to find more mines The security personnel must retreat from the area and return with reinforcements
- The security personnel must stay alert and inform ail the community memoers

## 4.8 Operating Skills for handing hijacking situation (other than an airline hijacking

- Vehicle hijacking is becoming very common in areas infested by terrorists and areas where there is civil unrest.
- The vehicle hijackers are normally armed hut they are generally nervous because they are aware about the risks that they face. Therefore, thev resort to quick violence in order to steal the vehicle.

- The following precautions must be taken by security personnel to reduce the chances of victimization:
- Vehicle travel in identified hijacking areas must be minimized.
- The Security personnel must know what method the hijackers resort to in the area such as :
  - Road blocks
  - Stop sign and attack
  - vehicle cutoffs
  - Fake accidents
  - Decoy emergency vehicles : etc.
- Avoid travelling during the evening or in darkness
- The security personnel must remain alert
- Security personnel must avoid travelling alone, if possible they may travel with another vehicle
- Security personnel must lock the vehicle door and keep windows closed when driving through crowded area
- Security personnel must keep the vehicle in good mechanical road worthy condition
- Security personnel must try to use steel belted tyres
- Security personnel must use interior and exterior rear view mirrors
- Security personnel must install a “Bush Bar” in the vehicle to protect the radiator
- What to do If Vehicle Is hijacked
- Security personnel must never resist.
- Security personnel must explain their duties properly
- Security personnel must part with their belongings such as jewellery, purses, wallets, brief cases on demand.
- Security personnel must try to remember the features of the hijackers
- Security personnel must never provoke the hijackers with any rude remarks or any violent attack
- Security personnel must report the incident at the earliest
- Security personnel must be prepared to crash his own vehicie as a iast resort or crush the attackers and remember to put on the seat belt before crushing down his own vehicle

## 4.9 Operating skills for antivehicle theft operations

- The Security personnel should be trained to prevent theft of vehicles inside residential areas or parking lots or otherwise from roads inside residential or industrial areas by guarding the vehicles and ensuring their protection by controlling access into the parking area.

**Measures suggested**

- The area should be fenced
- The area should be preferably illuminated at night
- The ignition keys of parked vehicles should be kept in safe custody
- Duplicate keys should be kept in a secured piace
- Vehicles should be released only to authorized drivers who must identify themselves
- If vehicles are sent for maintenance, there should be a person accompanying the vehicle in order to eliminate the possibility of duplicate keys being made from the vehicle keys left behind at the garage.
- Vehicle alarm systems may be installed
- The owner of the vehicle may be advised to install an ignition and/or fuel cut-off system which prevents the thieves from starting the vehicle or travelling far as the fuel supply is disrupted
- The drivers or owners may be advised to remove the Distributor Cap or the battery of the vehicle when it is left behind for a iong duration or parked overnight in order to prevent the thieves from starting the vehicle .
- The owners may be advised to instaii locking devices such as :
  - Locking the steering wheel with a steel bar: or
  - By simply locking the steering wheel with a chain attached to a bolt fixed on the floor of the driver's cabin

## 4.10 Operating skills for facing a kidnapping or hostage situation

- When person or persons are detained or seized with the intention to kill or injure in order to force a third party to do something for the release of the hostage such a procedure may be denned as hostage taking.
- There are many options available but the following techniques can be suggested

for the security person:

- ❖ They should not fight back particularly if the hostage seekers are armed
- ❖ They must remain calm and patient and should try to explain everything and obey the captors because survival strategy is most important.
- ❖ They must keep a low profile and kill time so that the best possible strategy can be thought During such time, the security personnel must try to remember characteristic features of the captors so that those can be narrated later to help the police trace them later
- ❖ They must be cautious of their body language, speech and thev should never do anything to agitate the captors
- ❖ The security person must not give suggestions to the captors because any wrong suggestion resulting in an untoward situation later may *hoid the* person sofefy responsible
- ❖ The security person must ask for their requirement of water, food or medicines from the captors and try to build rapport with the captors by starting topics like family and children
- ❖ The security person must speak in the local dialect so as to build a local affinity and weakness for the hostage
- ❖ The security person must remember to drink iot of water and to eat enough food even if he/she is not hungry , if those are offered as maintaining physical strength is very important.
- ❖ The security person must try to convince the captors that they may even volunteer to help in negotiating with the authorities on behalf of the captors.
- ❖ The security person must make sure that the messages are conveyed accurately over radio or a telephone on behalf of the captors
- ❖ The security person must never beg, plead or cry.
- ❖ The security person must remember to quickly drop on the floor and to keep the hands on the floor If thev suspect that the captors might pin them down.
- ❖ The security person must respect the captors The hostage must attempt to escape only ir he/she is sure to do without danger or else if caught, the captors generally become aggressive and may resort to violence in order to teach ail a lesson.
- ❖ In the event of a hostage situation, the Security Leader must immediately review

the situation with the Security Management Team and decide what arrangements *should be* enhanced. A joint strategy must *be* planned on how to handle the situation.

- If required, the members of the hostage's family may have to be shifted and relocated in case they too are at risk
- As such situations are very sensitive, the security staff members must be trained to abstain from disclosing information relating to hostage taking incident to outsiders.

## 4.11 Operating Skill for handling coal mines and other explosive devices

**Introduction**

Blasting is an essential part of the mining cycle. In virtually all forms of mining, rock is broken by drilling and blasting the rock. Blasting technology is the process of fracturing material by the use of a calculated amount of explosive so that a predetermined volume of material is broken. From the earliest days of blasting with black powder, there have been steady developments in explosives, detonating and delaying techniques and in the understanding of the mechanics of rock breakage by explosives. Good blast design and execution are essential to successful mining operations. Improper or poor practices in blasting can have a severely negative impact on the economics of a mine. The use of excessive explosives at a mine site can result in damages to the rock structures and cause unwanted caving and large increases in support costs.

Blasting is used in both open pit and underground mining operations. While traditional blasting utilized black powder and dynamite, there are many different types of explosives used today. Common explosives used in industry now are ANFO (ammonium nitrate/fuel oil), slurries, and emulsions. Many factors are taken into account when determining what type of blast design or explosive will be used. Rock type, density, and strength are all important factors, as well as fracture condition of the rock, and water conditions.

Blasting is one of the more hazardous aspects of mining. As reported on the website of the National Institute for Occupational Safety and Health:

Between 1978 and 2000, 106 miners were killed and 1,050 were injured by explosives and breaking agents. In 2001, there were 7 blasting-related injuries and fatalities in the mining industry, compared to 140 in 1978. For the past two decades, most explosives-related injuries and fatalities in surface mines occurred when workers were struck by rock,

either because they were too close to the blast or rock was thrown much farther than expected. The second leading cause was blasts that shoot prematurely. In underground mines, most explosive-related fatalities were caused by miners being too close to the blast, followed by explosive fumes poisoning, misfires, and premature blasts. Misfires lead to injuries and fatalities as miners try to shoot explosives that failed to detonate in the original blast. Premature blasts occur without warning while blasters are near the explosive-loaded boreholes; the explosive may be initiated by lightning, the impact of explosives being dropped down a dry borehole, or careless handling of the initiating system (blasting caps).

**Blasting in surface mines**

Most rocks require blasting prior to excavation in surface mines. Usually four types of explosives are used in surface mining: slurries, dry mixes, emulsions and the hybrid heavy ANFO. Selection of explosives depends on many factors, which primarily includes critical diameter, hydrostatic pressure, temperature, minimum primer weight, density weight strength, bulk strength, gap sensitivity, water resistance, loading procedures, coupling or decoupled properties, shelf life, reliability for bulk operations and overall drilling and blasting economics.

Blasting Practices in Mines, a paper by P. Sharma provide a quick overview on blast design and pattern in surface mines. Here are two pictures which I have taken from his paper:

**Blasting in underground mines**

Most of the mining methods underground uses blasting as the primary method of rock excavation. Underground Blasting provides a good overview for a wide variety underground blast designs. A typical arrangement for blasting in VCR methods of mining is shown below:

**Controlled blasting**

Controlled blasting is a technique of blasting for the purpose to reduce the amount of overbreak and to control the ground vibrations. Following are the different types of controlled blasting techniques:

Pre-Splitting - this is an old but highly recognized technique with the purpose to form a fracture plane beyond which the radial cracks from blasting cannot travel. Other methods include Trim (Cushion) Blasting, Smooth blasting (contour or perimeter blasting) for underground mines and muffle blasting as a solution to prevent fly-rock from damaging human habitants and structures.

**Secondary blasting**

As stated in Webref. "Irrespective of the method of primary blasting employed, it may be necessary to reblast a proportion of the rock on the quarry floor so as to reduce it to a size suitable for handling by the excavators and crushers available. Two methods of secondary blasting of rock are available. The first, called the plaster or mudcap method, is to fire a charge of explosive placed on the rock and covered with clay, the shock of the detonating explosive breaking the block. The second technique, known as pop-shooting, is to drill a hole into the block and fire a small charge in this hole, which is usually stemmed with quarry fines."

**Non-explosives rock breaking**

Non-explosives are used in areas very closed to sensitive structures. These are mostly used in construction industry for breaking oversize rocks, concrete etc. Rockfrac and Dexpan produce expansion chemicals which are used to break rocks. Most of these are used in limestone and sandstone quarrying. Expansion chemicals require huge amount of drilling.

NonexTM and Magnum BusterTM are another two types of non-explosives which uses non-detonating chemicals to break rocks.

There are also hydraulic rock splitters that can be used where blasting is not permitted, or where it is not suitable. STM Construction Equipment is one of the companies that does this type of rock breaking. Also take a look at this video.

**Blasting Institutions**

Here are some journals and institutions that specialize in blasting:

(1) Journal of Explosives Engineering issued by the International Society of Explosive Engineers.

(2) Institute of Explosive Engineers. This site is mainly for explosives engineers in the UK, but also in other countries. They have lots of news about blasting and demolition, although a lot of it is for their members only. The institute's membership consists of engineers, scientists, logisticians, academics and legislators in disciplines such as excavation, quarrying, construction, demolition, and tunneling.

(3) Office of Surface Mining (OSM) Appalachian Regional Office offers an excellent Blasting Download page with a comprehensive list of U.S. Rules, Regulations, Research and Resources. The site also includes many reports, such as OSM reports, State reports, and US Bureau of Mines reports, as well as training aids, presentations and movies.

**Legal**

Before you blast you generally need a state Blaster's License. For example, California regulations state:

In order to obtain a Blaster's License, the applicant shall pass a written or an oral qualifying examination given at such times and places as determined by the Division. The examination shall include questions related to the license classification requested. Field tests may also be required as deemed necessary to determine the candidate's qualifications to perform the duties of a blaster. Every person requesting a Blaster's License shall:

(a) Be at least 21 years of age.

(b) Be able to understand and give understandable orders.

(c) Furnish satisfactory proof that he is proficient in the use and handling of explosive materials; the equipment and protective devices necessary for blasting operations; the safety precautions necessary in conducting blasting operations or furnish proof that he has had at least 3 years experience at blasting as an assistant to a person having a valid Blaster's License in various phases of the use and handling of explosives.

(d) Be of such moral character and physical condition that would not interfere with the proper performance of his duties and have the ability to direct and/or conduct blasting operations.

In Canada, each province has its own regulations regarding requirements for a blaster's permit. In each of the provinces, someone looking to obtain a permit must write a blasting exam and be knowledgeable about all health and safety requirements. In BC, the Worksafe BC site lists the certification requirements and examinations, as well as providing a link to the Ministry of Energy and Mines site that specifically deals with blasting permits for mine sites. This review does not cover each province or states license requirements but suffice to say that throughout North America, a permit is required before any blasting may done.

**Books**

One of the best books available that covers open pit blasting principles and techniques is William Hustruid's, *"Blasting principles for Oven Pit Mining"*.

Then there is *The Blasting Primer* by Jim Ludwiczak. The author is a professional geologist, a certified and licensed blaster, and a blasting instructor. Visit his company's website, Blasting & Mining Consultants. Inc if you cannot get the answer from his book.

**Some Blast Designs**

Bench blasting is a common blast technique most often used for open pit mines. By

definition, bench blasting is blasting in a vertical or sub-vertical hole or a row of holes towards a free vertical surface. More than one row of holes can be blasted in the same round. A time delay in the detonation between the rows creates new free surfaces for each row.

One type of bench blast design is short-hole blasting which is usually limited to drilling rounds of 1.2 m to 5.0m length and hole diameters of up to 43 mm. Cut and fill and room and pillar underground mining methods commonly employ short-hole blasting. Both ANFO and water gels can be used for this type of blasting. Holes are generally drilled in a square pattern.

Longhole bench blasting is similar to bench blasting in open pits, using long holes drilled downward either parallel to each other or in slight rings to cover the stope area. Initiation of the blast is with a booster down the hole.

Ring drilling and blasting is done from a series of sub level drill drifts developed in the ore body. The drill pattern is designed to cover off the extent of the ore in the stope. This type of blasting will cause the ore to swell by 30%, and this must be allowed for when blasting otherwise the blast may freeze.

Crater or VCR blasting was developed by INCO in the mid-1970's for primary stoping, pillar recovery and raising. This type of blasting is made possible by using much larger diameter holes underground. Accuracy of drilling is essential for this type of blasting.

There are many different types of blast design and this review does not attempt to cover them all. Along with the importance of selecting the proper blast design other important factors that influence blast results are:

- properties of explosives being used
- the initiation systems,
- the distribution of the explosive in the blast,
- rock structure,
- the overall geometry

**Courses**

The EduMine course on blasting is one of the most comprehensive treatments of the theory of blasting that is currently available online. If you want to know how the gel moves into the pores spaces and then generates gas pushing the rock out of the way during the explosion, this is the course for you. This course provides "a review of blasting theory and blasting products, and emphasizes the design, assessment and optimization of blasting

practices. The course focuses on drilling and blasting as it is applied in surface mines and quarries. Design methodology for safe and efficient blasting is provided. Monitoring and assessment to improve blast performance and reduce blast vibrations are discussed and examples of optimization programs are provided to illustrate the process.

**Suppliers**

The best pictures on the web of equipment to transport, store, and load blasting supplies is from AAMCOR LLC in Utah and they smell and sound like the rugged place it is.

In South Africa there is African Explosives Limited (AEL). They are also "well established in East, West, Central and Southern Africa, with production facilities and offices in Ghana, Mali, Nigeria, Tanzania, Ethiopia, Zambia, Zimbabwe and Botswana." AEL provides a wide range of products ranging from explosives, and initiating systems to blasting accessories and industrial products. AEL has developed the S200Eco range of emulsion - an Ammonium Nitrate/Calcium Nitrate (AN/CN) formulation, which they state is more environmentally friendly than other products available, and will help companies reduce their carbon footprint.

The Dvno Nobel website is the world's leading commercial explosives company with over 5,200 employees in 36 countries, research and technology facilities on four continents and sales of over US$ 1.2 billion per year. Dyno Nobel claims to have developed every major explosives innovation starting with the Safety Fuse in 1831. Other blasting advances include the development of slurry and water based explosives, and emulsion technology.

ORICA Mining Services maintains one of the best sites about blasting I have come across. If you need to blast or are simply interested in the technology, I can do no more than urge you to go to their sites. It will reward you.

**Consultants**

Here are a couple of the big companies that offer blasting services:

Orica Mining Services is the world's leading supplier of commercial explosives and blasting systems. They offer a number of what they call "Blast Based Services". The most recent and advanced services they offer are the Electronic Blasting Systems: i- kon, Uni tronic, and eDev. These systems are all about greater accuracy and flexibility, significant productivity gains, greater security and more safety features.

PMC Mining Services One of their specialities is mine shaft sinking. Here's what they say on their website: "DMC's expertise in mine shaft sinking is based on more than 100 years of combined manpower experience. During this time DMC has continuously worked

to develop technical improvements, the most significant of which is the patented Long Round Jumbo technology which involves a process for blasting 5 metre long shaft benches and which has materially increased the speed at which shafts can be sunk."

Here is the rest of the InfoMine list of blasting consultants:

- Aimone-Martin Associates. LLC
- Beresford Blake Thomas
- Blast Consulting Services
- Blasting and Mining Consultants, Inc.
- Blasting Damage Specialists
- BlastQuest
- Compaia Isdamar S. A. De C. V.
- Dinacon Indstria Comrcioe Servios Ltda.
- Dyno Nobel Inc.
- Eloranta & Associates. Inc.
- Erfurt Blasting Co Inc
- Findlay Blasting Inc
- Limpress Ltda
- Mattson Intertool GmbH
- R.H Borr Sprang
- Robertson Consulting (not to be confused with Robertson GeoConsultants)
- Sequncia Engenharia Proietose Meio Ambiente Ltda
- Technoblast - Sismografia e Detonaes
- Texcel
- The Saros Group
- Topex Inc.
- Western States Drilling And Blasting. Inc.

**Contractors**

There is sure to be somebody near you willing to be your blasting contractor. In South Africa. Rhino Blasting Contractors promises to do everything from swimming pools to mines.

In Western Canada, Westrail Construction Ltd, has been providing drill and blast services for over 30 years to some of the largest drilling and blasting projects in Canada. Some of the mines that Westrail has been employed at include Gibralter Mines, Endako Mines, Rabbit Lake Mine, and Green Hills Operation. Westrail works closely with northern communities in training and employing local people and services whenever possible.

**Software**

Master Blaster is an inventory and blast management software system that dramatically improves documentation accuracy, minimizes paperwork, and allows for rapid search and retrieval of inventory and blast documentation. This innovative web- based software product enables blasters, support staff, and managers to have secure access to the most up-to-date information regarding customers, inventory, billing, seismograph and other blast data from anywhere in the world via the Internet.

Your staff accesses Master Blaster via a user name and password from their laptops or from the host system (internal server). A secure login page directs blasters to the appropriate data entry forms and directs managers, executives and support staff to the appropriate content management and report areas of the Master Blaster system.

WipWare Inc, supplies WipFrag. Here is their description of it: *"Blast models, formulas, expected results, we all know that this approach to predicting blast results is useless without the tool to quantify what really matters; fragmentation. Our technologies root deep in the explosives industry, we understand the steps required to improve blast fragmentation, and the infinite number of variables which effect the results. Our technology empowers you with the tools you need to collect historical data, establish a statistical baseline and track subtle changes throughout the optimization process so you can make decisions based on fact, instead of theory*."

Soft-Blast is a software system for blast design, analysis, and management. This software can be utilized for "surface, underground, or tunnel blasting applications, explosives supply, consultation, contracting and education". The software is available in packages or as stand-alone modules. Some of the applications of this software include extended blast and/or timing analysis, and a program to analyse digital images acquired in the field and determine the size distribution of your fragmented rock at any stage in the comminution process.

**Introduction**

The Government has recently made changes to the laws concerning health and safety in the mining industry. This is in response to the recommendations of the Royal Commission

on the Pike River Coal Mine Tragedy and will bring New Zealand's approach to mining health and safety into line with international best practice. The changes affect open cast and underground coal and metalliferous mines and some tunnelling operations. Quarries, clay pits, alluvial gold and ironsand operations are only covered to a limited extent. The new legal requirements have been developed with help from an expert reference group of mining, health and safety and regulatory experts from New Zealand and abroad. The Government has also worked closely with people in the industry and would like to thank MinEx, the health and safety council for the New Zealand mining industry, for its commitment to the process. This is a guide for mine operators and others interested in mining health and safety. We outline the new requirements and explain who is affected and when. We also provide more detailed information (with links to the new legislation) for the five key areas: health and safety management systems; minimum standards; safety critical roles, training and competencies; worker participation; and emergency management. The guide is not a substitute for reading the legislation itself. We recommend that operators familiarise themselves with the new mining regulations and the changes to the Health and Safety in Employment Act 1992. If you would like to talk to someone about the new regime for mining health and safety please contact WorkSafe New Zealand on 0800 030 040. You can also contact MinEx on 0800 464 396.

**New requirements for mining health and safety**

New Zealand's new mining health and safety regime is set out in:

- **new mining regulations:** the Health and Safety in Employment (Mining Operations and
- Quarrying Operations) Regulations 2013 (the mining regulations)
- **revised electrical regulations:** the Electricity (Safety) Regulations 2010 as amended by the
- Electricity (Safety) Amendment Regulations 2013
- **the Health and Safety in Employment Act 1992:** as amended by the Health and Safety in
- Employment Amendment Act 2013
- **the *Health and Safety in Employment (Tunnelling Operations - Excluded Operations) Order***
- ***2013,***

- ***the new Mines Rescue Act 2013,*** and
- **codes of practice and guidance documents.**

The diagram in appendix one shows the different parts of the regime in a diagram. The new mining regulations replace the Health and Safety in Employment (Mining Administration) Regulations 1996 and the Health and Safety in Employment (Mining-Underground) Regulations 1999. They require mining operators to:

- put in place health and safety management systems
- appoint people to new safety critical roles
- make sure their workers meet new competency requirements
- comply with strengthened minimum standards
- meet new requirements for emergency preparedness and management, and
- meet notification and reporting requirements.

The amendments to the Electricity (Safety) Regulations 2010 complement the new mining regulations by:

- ensuring the competency of those carrying out electrical work at a mining operation
- improving design requirements, periodic assessment and verification of safety requirements of electrical equipment in mining operations, and
- regulating technical requirements for underground mining operations and prescribing equipment, testing and maintenance obligations.

The Government has also made some changes to the Health and Safety in Employment Act 1992 (the HSE Act) that affect mining. These include:

- Placing new health and safety obligations under the regulations on 'mine operators' and 'mine workers' rather than on 'employees' and 'employers'. Mine operators will be responsible for the health and safety of everyone who works at the operation and is exposed to hazards, regardless of whether they are employees, contractors or labour hire workers. The definition of mine workers includes those people who work in mines and tunnelling operations.
- Increasing the opportunities for workers to participate in health and safety at mining operations. Again, the new requirements apply to mine operators and mine workers.
- Empowering mines inspectors to take preventative action by issuing prohibition

notices if they reasonably believe that to continue operations would give rise to the risk of serious harm.

- Creating a New Zealand Mining Board of Examiners (the Board of Examiners) to help the new health and safety regulator, WorkSafe New Zealand (WorkSafe), to set and assess the competencies of people working in the mining industry.

These new requirements apply in addition to the more general obligations already in the HSE Act. The Government is currently undertaking a more general review of health and safety law, in response to the recommendations of the Independent Taskforce on Workplace Health and Safety, which will also affect the mining industry. The Health and Safety at Work Bill, which will replace the HSE Act, is expected to be introduced to Parliament early next year.

**Who is affected**

The new mining health and safety regime applies to:

- underground and surface coal mines
- underground and surface metalliferous mines (except alluvial gold and ironsand operations)
- tunnelling operations, except those that meet all the following criteria:
  - not more than two workers ordinarily work below ground at any one time, and
  - explosives are not used below ground at the operation, and
  - the operation relates to a tunnel or shaft that is, or is intended to be, no more than 15 metres long, and
  - the concentration of methane is not likely to be more than 0.25 per cent of the general body of air in the working area at the operation.

These mines and tunnelling operations are referred collectively to as 'mining operations' in both the regulations and the HSE Act. Some of the new requirements apply to all mining operations, while others only apply to certain types of operation. The diagram in appendix two shows which parts of the new mining regulations apply to which types of mining operations. Some requirements also apply to quarries, clay pits, alluvial gold and ironsand operations:

- the regulations set out the competency requirements for the managers of quarries and alluvial gold and ironsand operations

- people obtaining these competencies are subject to the new Board of Examiners' process, and
- quarries, clay pits and alluvial and ironsand operations must also comply with aspects of the revised electrical safety regulations.

We are currently working on specific health and safety guidelines for the quarry industry. These will be supplemented by quarry-specific regulations in the longer term.

**When the new laws come into force**

The new mining regulations and amended HSE Act come into force on 16 December 2013.

Mining operations that start on or after this date must comply with the new laws right away (except for the competency requirements, as explained below). Existing mining operations have a bit longer and there are other transition times as follows:

- Existing mining operations have an extra year to comply (i.e. until 31December 2014) but can do so earlier. We expect that most operations will adopt the new regime progressively over the next 12 months.
- Existing mining operations can also apply to WorkSafe for more time to meet specific requirements (a maximum of 36 months, on top of the initial one year transition period).
- The new competency requirements will be introduced in stages (refer to safety critical roles, training and competencies for details).

For underground coal mines, there are some additional transitional provisions:

- All seals and ventilation control devices installed in existing mining operations from 16 December 2013 must comply with the new requirements from 1 January 2015. Seals installed before 16 December 2013 are exempt, subject to risk assessment and management (under the hazard management processes set out in the regulations).
- Existing underground coal mines have a further 10 years (i.e. until December 2024) to meet the new requirement for a second intake.

Unions or other groups of mine workers can appoint industry health and safety representatives, who will have functions and powers in relation to underground coal mines, from 16 December 2013.

**Work Safe's support for the changes**

The new mining health and safety regime will be promoted and enforced by the

Extractives Inspectorate Team of WorkSafe's High Hazards Unit.

These inspectors will make every effort to discuss the new requirements with you and provide support as you put them into practice.

WorkSafe will also work with the mining industry to update existing codes of practice and guidance documents and produce new ones, to help you better understand how to comply with the new regime.

- Guidance produced in 2013 relating to hazard management systems for mines and developing safety management systems for the extractives industry will be updated to reflect the new regime.
- Codes of practice for fire and explosion and ventilation have already been developed. Over the next couple of years, these will be joined by new codes of practice relating to:
  - strata management
  - emergency response
  - spontaneous combustion
  - inundation and inrush
  - air quality
  - occupational health
  - roadways
  - gas outbursts
  - mechanical engineering
  - explosives,
  - surveying, and
  - quarries.

A mining sector advisory group will also be established by Work Safe, to provide advice on the effectiveness of the new mining health and safety regime.

You can expect more support from the regulator than in the past. In return, the regulator will expect more from the mining industry. Operators and WorkSafe will need to work closely together to improve health and safety performance in the New Zealand mining industry.

# 4.12 Hostage Rights: Law and Practice in Throes of Evolution

*We should look at what people do as well as what people say, because people often grumble about changing the rules without actually doing so.*[1]

Hostage-taking and hostage-holding have a long and convoluted history. While no one has given extensive treatment to the historical development of hostage-taking and hostage-holding, several modem commentators have noted their antiquity. These commentators have also discussed some of the changes they have undergone.[2] These changes have altered both the character of the activity itself and the purposes for which hostage-taking and hostage-holding are employed. Yet some of their earlier characteristics remain in a shadowy, though influential fashion.

The use of hostages is, undeniably, a device of great practical utility. Its renaissance in the 20th century is due in no small measure to an astute appreciation of that utility. In recent times,[3] hostage-taking has been rediscovered and put to new and highly dramatic uses. It is the consequences of these metamorphoric uses of hostage-taking that is the

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1. D. Yankelovxch, New Rules 39 (1981).
2. The best of these is a note by Mattson, 54 Nonas DAME LAW. 131,148 (1978).
3. Hostage-taking really came to prominence as an international phenomenon in the late 1960's. A great many kidnappings of diplomats in Latin America, and a systematic interference with air transport by Arab nationalists seeking the liberation of Palestine quickly generated imitation that focussed the attention of the world community upon

primary concern of this article. This article takes a necessary look at the progress that has been made to date. The subject of hostage-taking is one that will need constant monitoring and a more penetrating view of some of its aspects than is possible here. What can be said, at this stage, is that the world is seeing an intriguing new area of international law in the making. The direction of this new area of international law is by no means clear. Nonetheless, it is interesting and exciting to be present at its birth.

Hostage-taking has become essentially a relatively new form of criminal activity, international in scope and dimensions. The use of the word "criminal" is deliberate and pointed; it is intended to reflect the changing attitudes towards hostage-taking that are crystalling today. Formerly, the taking of hostages was almost inevitable under certain circumstances and therefore, it acquired at least quasi-recognition as an institution in the Law of Nations, and it became an accepted and disagreeable part of the Law of War.[4] Today, however, there is almost universal condemnation[5] of hostage-taking as a barbarous,

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the problem. The catalytic event that gave impetus to law enforcement responses in an organized, systematic way was the seizure by Arab nationalists, believed to have been of the Black September Group, of the Israeli athletes at the Munich Olympic Games on September 5, 1972. Seventeen persons were killed during the 23-hour drama, including five of the hostage-taken. This was truly a landmark event in this history of this subject, and has been appropriately recognized. "In front of Connollystrasse 31 there is a granite plaque, decorated with flowers, commemorating the murder of the Israeli athletes there in September 1972." Gay, *Musings in Munich, Am.* Scholar 48 (Winter 1974-75). Most of the relevant literature on hostagetaking dates from the early 1970's.

4. "The practice of taking or exchanging hostages is an ancient one and was originally 'a means of insuring the execution of treaties, armistices, and other agreements' or a punishment or reprisal" Mattson, *supra* note 2, at 133, citing J.W. Gamer & Georg Schwatzenber. This usage persists in our times. Following the cessation of hostilities in the Falkland Islands in 1982, a number of Argentinean servicemen continued to be held by the British to guarantee the armistice. The continued holding of lech Walesa by the Polish authorities may properly be construed as analogous to a hostage situation designed to ensure compliance of the Solidarity Movement with the law. Presumably, in the view of those authorities, Walesa is not an "innocent" hostage.

5. The reservation expressed here must be regarded as well-founded by reference to the U.N. debates on the General Assembly Resolution 31/103 of December 15,1976

uncivilized, criminal act.

The legal and practical solutions to the problems raised by hostage-taking are uncertain. There have been many brave words, but few really resolute actions in the world of law to match them.[6] If the beneficiary of this indecisiveness has been the hostage-taker, then certainly the loser has been the hostage. There has been, however, a continuing juristic movement towards the legal regulation of war as a means of protecting civilians from some of the horrors of war.[7] The world human rights movement is a vivid example of the recognition by advanced thinkers of the need to reduce, in legal and practical fashion, a little of man's inhumanity towards man.[8] Similarly, the plight of the hostage is now beginning to catch up with these better established trends; there has been a lag of many centuries between the recognition of the human rights of prisoners taken and held as trophies or items

for Drafting of an International Convention Against the Taking of Hostages. On this, see Verwey, *The International Hostages Convention & National Liberation Movements,* 75 Am. J. Int'l. L. 69, 92 (1981). While "recognizing that the taking of hostages is an act which endangers human lives and violates human dignity," and that "international law prohibited the taking of hostages," a number of delegates Bought to introduce the concept of the "innocent" hostage, presumably by contrast with those who deserved to have their lives endangered and their dignity violated because they were "guilty." For the pertinent documentation, *see* Control or Terrorism: International Documents (Y. Alexander, M. Brownz, and A. Na- res eds. 1979).

6. The distinction is neatly pointed up by the following observation: "But the limitations of international law alone are sadly reflected in the fact that the U.N. General Assembly, at the very height of the Iranian hostage crisis, was engaged in approving a new International Convention against the Taking of Hostages, with the full participation of the delegation of Iran." Legault, *Hostage-Taking and Diplomatic Immunity,* 11 MANITOBA L. J. 359, 365 (1981).

7. The position of the prisoner of war was, at one time, at least as precarious and unregulated as that of today's hostage. "Historically, law bad little influence on the treatment of prisoners of war. For centuries, prisoners not sold into slavery or held for ransom were killed." Zillman, *Political Uses of Prisoners of War,* Awz. ST. I*J. 237, 238-9 (1975).

8. *See* McDougal, Lasswell & Chen, *Human Rights & World Public Order: Human Rights in Comprehensive Context,* 72 Nw. UX. REV. 227-307 (1977). *See also* Narnia, *Progress Report on the United Nations Attempt to Draft an International Convention Against the Taking of Hostages,* 6 OHIO N.UX. REV. 89-98 (1979).

of war and the recognition of the same rights to hostages taken in the 20th century for other reasons.[9]

### 4.12.1 Terminology

Before discussing the various issues addressed in this article it is necessary to take a hard look at some of the semantic implications raised by hostage-taking. The term hostage-taking has recently acquired some concrete, legal significance. However, it is far from being a legal term of art This has remained curiously unremarked; almost as though a definition were quite unimportant since both the conventional and legal meanings of the term are notorious and therefore require no statement There is, however, much room for linguistic confusion here, and what progress there has been towards clarification has been made in the area of international law rather than domestic law.[10]

The term hostage-taking did not originate in a legal context, but was adopted somewhat uncritically from its lay usage. The elements of hostage-taking have rarely been given any critical definition and the term continues to be used indifferently to describe a number of highly disparate states of affairs.[11] In short, the lay meaning of hostage-taking has never

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9. It has been acutely observed: "Even in time of War, when power struggle marks its greatest intensify, it has long been a basic expectation of Man that there are limits to allowable death and suffering and that certain normative protections are peremptory." Faust, A *Survey of Possible Legal Responses to International Terrorism: Prevention, Punishment, & Cooperative Action,* 5 Ga. J. Int'l & Comp. L. 431-435 n.17 (1976).

10. The pertinent international documents are remarkably free from ambiguity when they speak of "hostages." *See,* e.g., U.N. Doc. A/AC 188/L3. It is dear, however, that the "act of taking hostages" is capable of embracing the crime of kidnapping. That latter term is sensibly omitted.

11. *See* Mickolua, *Negotiating for Hostages: A Policy Dilemma,* 19 Orbis 1309, 1310 (Winter 1976). "Kidnapping is by far the most prevalent hostage incident. . .". Clarence J. Mann points out: "By stark contrast, only 118 hostage cases were reported to the FBI during the entire first six months of 1976." For statistical purposes, these hostage incidents indude not only conventional kidnappings but also cases in which, for instance, a bank teller is abducted by robbers to support their escape. *Personal & Property of Transnational Operations,* in Legal Aspects op International Terrorism 42 (A. Evans *& J.* Murphy eds. 1978).

acquired any real degree of precision and the vagaries in its application have been carried over, almost unconsciously, into legal usage.

The principal problem is in the interchangeable employment of the words hostage-taking and kidnapping.[12] Indeed, especially in the domestic law of the United States, the two terms are in danger of becoming dangerously and inextricably intertwined. From the point of view of criminal policy, separation is clearly desirable. There is a tendency, to treat the act of hostage-taking as a mere element of the crime of kidnapping rather than a distinct genus of offense with its own constituent, characteristic components.[13] This tends to broaden and diffuse the essential notion of kidnapping; a term having its own long and traceable history in our jurisprudence.[14] This uncritical incorporation of the term hostagetaking has not only altered the criminal concept of kidnapping, but it has also crippled attempts to erect the act of hostage-taking into an autonomous crime under U.S. law. This has occurred at a time when such a distinction is achieving a measure of recognition in international law. It may already be too late to arrest this development, but it is one that should not escape the attention of the careful commentator. For the purposes of this article, *a hostage is any victim of a hostage-taking, skyjacking, or kidnapping.* It is unimportant for the purposes of this article whether or not the hostage is technically accorded that status by reference

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12. It has been correctly pointed out that: "In the United States, several state courts require that in order for there to be a kidnapping, there must be movement of the victim that has significance independent of the original assault. A barricade and hostage inddent in which the hostage is not moved an appreciable distance therefore might not qualify as a kidnapping." Kaye, *The United Nations Effort to Draft a Convention on the Taking of Hostages,* 27 Am. UJj. Rev. 433,444 (1978). *See also* Caplan, *Some Other Faces of Kidnapping,* 11 U. Mt>. L.F. 109,112 (1972), dting the Chessman case where the victim was dragged twenty-two feet from her car to the roadside and the kidnapping conviction was upheld.

13. *See* Slaughter, *Criminal Law—Kidnapping in North Carolina - A Statutory Definition for the Offense,* 12 Wake Forest L. Rev. 434, 447 (1976). Note in particular the wording of the North Carolina definition at page 437 and the intertwining of the concepts of kidnapping and hostage-taking. This definition is the product of relatively recent learning and concerns.

14. *See* Gooch v. United States, 82 F.2d 534, 637 (10th Cir. 1936), citing State v. Harrison, 145 N.C. 408: "The word 'kidnap' has a technical meaning. It is derived from the common law, and must be interpreted according to its technical meaning at common law."

to some country's domestic law or whether the status of the victim, and accordingly, the rights that flow from that status, may be more precisely defined. The present work is based, therefore, on a *de facto,* stylized definition of a hostage rather than its definition in either legal or common parlance. While the *de facto* definition is clearly unsatisfactory, it is probably the best definition, given the present state of the matter; refinement must be the work of others, who may have the advantage of more uniform descriptions and understanding of the nature of the problem. Presently, all that is necessary is a class of victims sharing a common plight.

Some attention to what is meant within this article by the term rights is necessary. Clearly, rights is another elastic term capable of different interpretations according to the context and sense in which it is used. Moreover, it is a word which legal scholars have given much consideration, both from the point of view of its meaning and of its application in different legal settings; like hostage-taking, rights is also a word capable of being invested with a broader lay meaning than its legal counterpart.

It is argued that under the civil law system, the meaning and extent of an individual's rights cannot be estimated from a mere reading of the law. A person's rights are shaped, extended-or contracted, and given meaning and value by those who have the authority to recognize a claim and provide its remedy.[15] The locus of that authority will vary from system to system and a concrete statement of an individual's rights in any particular instance will depend upon the specialized knowledge of the workings of that legal system.[16]

The international criminality of hostage-taking must be recognized. The failure to do so means that hostage-rights vary in substance and quantity depending upon the jurisdiction in which the drama is played out. Thus, a hostage's rights may be greater in London than in Beirut. Moreover, a hostage's rights may differ quite widely according to where he is victimised within the United States. This gives the subject its peculiar piquancy for the legal practitioner.

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15. It must be asked, realistically, what prospects of recovery there might have been if those held hostage in the U.S. Embassy in Tehran had brought suit in the Iranian courts, even if there had been no Agreement barring them from so doing. What rights might have been practically asserted in the courts of Idi Amen'3 Uganda by those forcibly detained at Entebbe as a result of having been skyjacked by a group of international terrorists to that country?

16. In the context of becoming a victim as a result of some unlawful interference with international aviation, these complex matters are well canvassed by Neil R. McGOchrist, *Aerial Hijacking,* 2 Lloyd Merc Comm. L.Q. 298-304 (1978).

Professor Henkin has stated, "By 'human rights' I mean simply those moral political claims which, by contemporary consensus, every human being has or is deemed to have upon his society and government."[17] The nature of a right as a claim upon somebody is the important concept. The substance and boundaries of that claim are determined by how effectively it can be upheld by those having the powers and authority to give it form and reality.

Hostage-rights must be viewed in a similar light. The claims arising under hostage-rights are for the most part as acceptable as the claims arising under human rights. Their translation into something of real value to those in whom they are deemed to inhere is a matter of more than mere statement; it demands an exercise of power and authority.[18] This article will demonstrate that a hostage's rights, in any given case, are what a hostage might realistically expect from an acknowledgement of his claims by the appropriate state organ in the particular circumstances and at a particular point in time.

The process by which a hostage's claims may be converted into rights may be regarded as having two stages. In the first stage, the claim is formally recognized as a right by a governmental body, usually a court, to which the task is entrusted. In the second stage, practical effect is given to that recognition by an executive organ of the state so that the right is invested with substance. In any particular case, the process can be subjected to examination to determine how far, if at all, the transformation from claim to right has progressed. In some instances, claims will be in the process of transformation since they have not yet reached the status of full-fledged rights. In others, the process is clearly complete, although the machinery for enforcement of the remedy may be ineffective. The recognition of rights is important, even where they cannot be effectively upheld or are consistently abused.[19] Rights are a yardstick against which human conduct can be measured.

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17. Henkin, *Rights: American & Human,* 79 COL. L. REV. 405 (1979).

18. A contemporary novelist, who has written s great deal on terrorism makes the distinction well "Power implies that we can accomplish what we plan. Authority signifies only that we may order it to be accomplished." M. West, The Clowns op Goo (1981). The distinction is far from academic, as witness the relative positions of a hijacked aircraft pilot and the ground authorities trying to manage the crisis.

19. A comparison may be made with the case of rape. The improvement, in recent years, of the treatment accorded the victims of rape, by those charged with administering the law in the United States is notable. There has not been a formal extension of the rights of the rape victim, so much as a growing awareness of the

## 4.13 Relative Value of Rights

All rights do not have the same value; some are more valuable than others, both to the system that recognizes and protects them and to the individual who is the beneficiary of that process. It follows then that rights are susceptible to the effects of competition both by reason of their rankings and priorities, and the fact that rights are deemed to attach to different subjects of the law. Accordingly, rights are sometimes in conflict and the system must then decide which right shall prevail However, neither recognition nor protection of rights is enough. Some rights will be upheld while others will be denied when the law cannot reconcile the clash of rights in a competitive situation.

There is no world-wide unanimity on the relative importance of rights. Rights receive their rankings and are upheld according to a variety of meta-legal and extra-legal considerations that differ from system to system and age to age. Currently, it is argued that the greatest human right is the right to life.

Taking the right to life as the apex of the system, a descending order of rights can be constructed. However this construction is done, it is certain that disagreements about ranking, and listing of rights will increase and grow sharper as the descent continues; there is more competition between rights at the bottom of the list than there is at the top. Nonetheless, whatever rights we assign to hostages, by reference to any particular legal system at any point in time, must be situated within this artificial, hierarchical construct.

This structure cannot deal with rights as mere abstractions; a tight that cannot be upheld in some practical fashion must be accounted as no right at all Likewise, no account of hostage-rights can fail to take into consideration that in both the legal and the practical sense, *all hostages are equal, but some are clearly more equal than others.* The political, professional or societal status of a person largely determines the extent and practical validity of his rights as a hostage.[20] Similarly, a person's status largely determines why he was taken as a hostage.

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obligations owed to the victim in the matter of just, rather than sympathetic, treatment

20. This may be a distressing point for those concerned with the establishment and maintenance of Equal Rights under the Law, but it must be realistically faced. Hostage- taking is a game of power. If the hostage seized is of sufficient importance to the power structure affected by the event, greater efforts will be made by the authorities to secure his release than might be expected were the victim of slight importance. This sensible premise orients hostage-taking by political extremists,

## 4.14 Conflict of Rights and Obligations

Central to the subject of this article is the concept of the collision or conflict of rights. A hostage's rights, at any particular place and time, are capable of being moved up or down the scale. This is no more capricious than what might befall anyone with a claim he is seeking to assert at law. However, the drama of the hostage's plight tends to accentuate the incongruities. It is, perhaps, better to view what is being examined here in terms of legally protected interests[21] rather than rights; at least until the conflict is resolved. Thus rather than assert that every person has a right not to be taken hostage, it is more expedient to state that every person has an expectation or an interest in remaining free from that harm.[22] If that expectation is not met, certain consequences flow from it. Essentially, the concern is the effect, from the hostage's perspective, of those consequences. It must be recognized that, given the state of the world today, almost anyone might be victimized by hostage-taking. Some people will, by reason of personal and circumstantial factors, run a much higher risk than others of being taken and held hostage. Having thus recognized that one's location determines the degree of risk to which one is exposed, it is useful to define in the most general of terms, the legitimate interests, expectations, or claims of a hostage. These interests may be divided into two parts by reference to the hostage-taking event itself. In the first instance, people have an interest in not being taken or held hostage. They have a claim upon society or government that appropriate measures be taken to prevent this traumatic experience from happening to them.[23] In addition, assuming that prevention fails and a hostage-taking occurs, the victim has an interest, expectation or claim to recover

prompting the seizure of prominent public figures such as Harms Martin Schleyer or Aldo Moro rather than some unknown, presumably, in theory, entitled to the same rights as a hostage. What those in authority actually *do* in these cases is much more revealing of the measure of hostage rights than what the law might say.

21. *Compare* Fletcher, *The Right to Life,* 13 GA. L. REV. 1371 (1979).

22. Special obligations may arise out of these expectations. The principle is most clearly spelled out in the airline cases. *See Terrorism in the Terminal: Airline Liability under Article 17 of the Warsaw Convention,* 52 N.Y.U.L.REV. 283, 305 (1977). "Hijacking and airplane sabotage are modem examples of inherent aviation risks, because aircraft operation is a 'prerequisite for these acts.' " *Id.* at 300-01.

23. Stated in such wide terms, the subject appears daunting. But any examination of hostage-rights must pose this as the first step, and then proceed to a minute and detailed exploration of the preventive measures. It is in this process that all the latent

his liberty as quickly as possible without suffering any physical, psychological, economical or other harm in the process. The potential conflict of other rights, endangered or interfered with by this disruptive event, is even more pressing and acute than in the pre-hostage-taking phase.

To state that an individual has rights necessarily involves a consideration of the obligations imposed upon others by any recognition and upholding of the rights. In other words, a right is a justified claim to stand in a certain relationship with some other person(s) such that that other has an obligation correlative to the right The claim is that a person has an obligation to do or not do some particular thing.[24] Therefore, hostage-rights may be equally expressed in terms of the obligations of others towards the hostage. Indeed, given the general utility of such an approach, it is better, perhaps, to seek precision in the matter of hostage-rights through an examination of the obligations and how well or poorly they are discharged.

Different obligations are owed to the hostage by different people; just as there is a hierarchy of rights, there is also a carefully graduated scale of obligations. This is the most interesting and controversial part of the exercise. For a curious, practical incongruity begins to emerge that, in a very real sense, distorts the whole picture of hostage-rights. Whatever the theoretical state of affairs might be, the recognition of rights does not match up with the discharge of the corresponding obligations. This is not due to a mechanical malfunctioning of the system. Rather is it due to a perception of rights and obligations not as correlates, or jural opposites in the Hohfeldian sense,[25] but as free-floating concepts, detached, or at best, connected to something other than one another. There is a certain sophistry, if not quite patent insincerity, about all this. It is as though there were a grudging recognition of values without acceptance of the obligation to protect them appropriately.

Consideration of the extreme case serves to highlight the incongruity. It is often asserted as a matter of policy, if not of strict law, that the life of the hostage is of the highest value

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conflicts and anomalies begin to surface for what is "appropriate" means much more than merely what is practical. Law is beginning to evolve, or is being made, around this question. If the term "rights" is to have any sensible meaning in the present context, the implications of what is involved have to be squarely faced.

24 Pilon, *Ordering Rights Consistently: Or What We Do & Do Not Have Rights To,* 13 GA. L. REV. 1171,1176 (1979).

25. Hohfield, *Some Fundamental Legal Conceptions as Applied to Legal Reasoning,* 23 YALE LJ. 16-59 (1913).

and thus, it is deserving of protection in a civilized society.[26] No other value is seen as superior to or commensurate with this one. Accordingly, in judging the place of the hostage's rights in any theoretical hierarchy, due weight must be placed upon the value of the hostage's life. All other values, in the construction of any system of rights and obligations ought therefore to accede to the process of giving effect to the supreme worth of the human life at stake in the hostage-taking drama. Certainly, property must be accorded a lesser value than human life; property, however valuable, can always be replaced or replenished in cash or in kind, while human life is irreplaceable.[27] Given this conflict of interests, it seems that there can be no doubt which ought to prevail. But the matter is far from being that simple. If it were that simple, no sum of money would be too high to ransom the life of a single hostage, however humble his station in society.[28] History and experience illustrate that this ideal does not fit the facts. This is easily demonstrated by pushing the matter to absurdity. What is an individual worth in monetary terms? One million, ten million, one hundred million, four hundred million?[29] How high need one go before the absurdity causes

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26. The *most* authoritative UA. expression of this is to be found in Disorders & Terrorism: Report op the Task Force on Disorders & Terrorism 29 (1976). "The standards and goals offered in this report are based firmly upon the primacy of the value of human life over all other values, concrete or abstract" *Id.* at 29.

27. A poignant expression of this sentiment comes from a speech of one who is no stranger to property values, Paul Mellon. "[Someone] quotes the sculptor Giacometti as having said, 'If a house were on fire and I could take out a Leonardo or a cat, I would rescue the cat. And then I would let it go'. It is life itself that counts." B. Hersh, The Mellon Family 532 (1979).

28. A study of monetary settlements actually made in hostage (especially kidnapping) cases quickly establishes that while all animals are equal, some animals are more equal than others. It is evident that a bank president is worth more, in terms of a ransom, than a bank teller. For some interesting insights into the human, as well as the financial aspects of assessing the worth of a kidnap victim, see C. Pepper, Kidnapped: 17 Days op Terror (1978).

29. This is close to the figure demanded for the release of each of the remaining 53 U.S. hostages in Iran. This event has spawned a great deal of literature deserving of the closest study by all interested in the subject of hostage rights. The legal aftermath of this event will be felt for years. It has been well said that, ''[I]t appears that the real trade was foreign Iranian assets for the hostages." Janis, *The Role of the International Court in the Hostages Crisis.* 13 Conn. L. Rev. 263, 276 (1981).

one to say "Stop!" Yet, it is accepted that human life is worth more than mere money. The source of the anomaly suggests itself when the enquiry whose money is made.[30]

## Whose Obligation?

Viewed in this light, the issue of hostage-rights is reduced to the question of who owes what to whom? Much of the uncertainty over the character and extent of hostage-rights is due to the lack of precise definition of the different obligations. Presently, we must stick to generalities, but the scheme for examination can be set out with some exactitude. Obligations towards the hostage, as well as those owed to potential hostages are owed in a *private* or an *official* capacity. Generally, a hostage's rights consist of certain claims against society, or against a government.

30. It is not always a matter of money at stake, even where non-governmental entities are concerned. An American bible translator, Chester Bitterman was kidnapped by M-19 terrorists in Bogota, Colombia on January 19,1981 in an attempt to force the U.S.-baaed Summer Institute of Linguistics to leave the country. Bitterman, aged 28, was killed by his captors 48 days after bis abduction when the missionary group refused to meet the demand. *See* The Dallas Morning News, March 8,1981, at 16A.

**Vehicle seizure**

- Aircraft hijacking
- Carjacking, a robbery in which the item stolen is a motor vehicle
- Maritime hijacking, or piracy
- Truck hijacking

**In computing and telecommunications**

- Hijack attack, in communication, a form of active wiretapping in which the attacker seizes control of a previously established communication association
- Blueiacking. the unsolicited transmission of data via Bluetooth
- Brandjacking
- Browser hijacking
- Clickjacking (including likejacking and cursorjacking)
- DNS hijacking
- Domain hijacking
- Homepage hijacking
- IP hijacking
- Page hijacking
- Reverse domain hijacking
- Session hijacking In entertainment
- A Hijacking. a 2012 Danish film
- Hijacking, in dance, a variation of lead and follow Other uses
- Credit card hijacking

**Indian Airlines Flight 814**

Indian Airlines Flight 814 commonly known as IC 814 was an Indian Airlines Airbus A3 00 en route from Tribhuvan International Airport in Kathmandu. Nepal to Indira Gandhi International Airport in Delhi. India on Friday, 24 December 1999, when it was hijacked. Harkat-ul-Mujahideen was accused of the hijacking.

The aircraft was hijacked by gunmen shortly after it entered Indian airspace at about 17:30 1ST. Hijackers ordered the aircraft to be flown to several locations. After touching down in Amritsar. Lahore and Dubai, the hijackers finally forced the aircraft to land in Kandahar. Afghanistan, which at the time was controlled by the Taliban. The hijackers

released 27 of 176 passengers in Dubai but fatally stabbed one and wounded several others.

At that time most of Afghanistan, including Kandahar where the plane landed, was under Taliban control, who resisted allowing the plane to land there. After eventually granting the plane landing rights, the Taliban still pressured the hijackers to release the hostages and give up on some of their demands.111 Taliban fighters surrounded the aircraft to prevent any Indian military intervention.

The motive for the hijacking appears to have been to secure the release of Islamist figures held in prison in India. The hostage crisis lasted for seven days and ended after India agreed to release three militants - Mushtaq Ahmed Zargar. Ahmed Omar Saeed Sheikh and Maulana Masood Azhar. These militants have since been implicated in other terrorist actions, such as the kidnap and murder of Daniel Pearl and Mumbai terror attacks.

**Hijacking**

Anil Sharma, the chief flight attendant on IC-814, later recalled that a masked, bespectacled man threatened to blow up the plane with a bomb and ordered Captain Devi Sharan to "fly west".111 Four other men wearing red masks then stood up and took positions throughout the aircraft. The hijackers wanted Captain Sharan to divert the aircraft over Lucknow and head towards Lahore. However, there was insufficient fuel. Captain Sharan told the hijackers that they had to land in Amritsar. India.121

**Landing in Amritsar, India.**

At Amritsar. Captain Sharan requested refuelling for the aircraft. However, the Crisis Management Group in Delhi directed Amritsar Airport authorities to ensure that the plane was immobilised. The armed personnel of the Punjab police were already in position to try and do this. They did not receive approval from New Delhi. Eventually, a fuel tanker was dispatched and instructed to block the approach of the aircraft. As the tanker sped towards the aircraft, air traffic control radioed the pilot to slow down, and the tanker immediately came to a stop. This sudden stop aroused the hijackers' suspicion and they forced the aircraft to take off immediately, without clearance from air traffic control. The aircraft missed the tanker by only a few feet.

**Landing in Lahore, Pakistan**

Due to extremely low fuel level, the aircraft requested an emergency landing in Lahore. Pakistan. Pakistan initially denied the request. Pakistan also shut down their air traffic services, thus effectively blackening the whole of Pakistan airspace for the Indian Airlines flight and switched off all lights at Lahore Airport. With no help from ATC, Captain Sharan

banked on his visual instincts and began descending on what he thought was a runway only to find out that it was a well-lit road and aborted landing the aircraft in time. On understanding that the only other option for the aircraft was to crash land, Lahore Airport switched on its lights and allowed the aircraft to land. Lahore 'airport officials refuelled the aircraft and allowed it to leave Lahore at 22:32 1ST. Pakistani officials rejected the pilot's request to offload some women and children passengers due to tense relations with India.

**Landing in Dubai, UAE**

The aircraft took off for Dubai where 27 passengers aboard the flight were released. The hijackers also released a critically injured 25-year-old male, Rupan Katyal, who was stabbed by the hijackers multiple times. Rupan had died before the aircraft landed in A1 Minhad Air Base, in Dubai. Indian authorities wanted to carry out a commando hijack specialist operation in Dubai involving Indian military officials, which was rejected by the UAE govemment. Landing in Kandahar, Afghanistan

After the aircraft landed in Kandahar. Taliban authorities, in an attempt to gain international recognition, agreed to cooperate with Indian authorities and took the role of mediators between the hijackers and the Indian government. Since India did not recognise the Taliban regime, it dispatched an official from its High Commission in Islamabad to Kandahar. India's lack of previous contact with the Taliban regime complicated the negotiating process. However, the intention of the Taliban was under doubt after its armed fighters surrounded the aircraft. The Taliban maintained that the forces were deployed in an attempt to dissuade the hijackers from killing or injuring the hostages but some analysts believe it was done to prevent an Indian military operation against the hijackers. Negotiations

- Maulana Masood Azhar - founded Jaish-e-Muhammed in 2000 which gained notoriety for its alleged role in the 2001 Indian Parliament attack.11211121
- Ahmed Omar Saeed Sheikh - arrested in 2002 by Pakistani authorities for the abduction and murder of Daniel Pearl.1™
- Mushtaq Ahmed Zargar - has played an active role since release in training Islamic militants in POK.

Ahmed Omar Saeed Sheikh, who had been imprisoned in connection with the 1994 Kidnappings of Western tourists in India, went on to murder Daniel Pearl and also allegedly played a significant role in planning the September 11 attacks in the United States.1181

After the three militants landed in Kandahar, the hostages aboard the flight were freed. On 31 December 1999, the freed hostages of the Indian Airlines Flight 814 were flown

back through special plane.

Meanwhile, the Taliban had given the hijackers ten hours to leave Afghanistan. The five hijackers departed with a Taliban hostage to ensure their safe passage and were reported to have left Afghanistan.

**Aftermath**

The case was investigated by Central Bureau of Investigation (CBI) which charged 10 people out of which seven including the five hijackers were still absconding and are in Pakistan.'On 5 Feb 2008, a special anti hijacking Patiala House Court sentenced all three convicts namely Abdul Latif, Yusuf Nepali and Dilip Kumar Bhujel to life imprisonment. They were charged for helping the hijackers in procuring fake passports and to take weapons on board. However, CBI moved Punjab and Haryana High Court demanding death penalty (instead of life imprisonment) to Abdul Latif. The case is set to come up for regular hearing in high court in September 2012. On 13 September 2012, the Jammu and Kashmir Police arrested terror suspect Mehrajuddin Dand, who allegedly provided logistical support for the hijacking of IC-814 in 1999. He allegedly provided travel papers to IC-814 hijackers.

Captain Devi Sharan (Commander of IC814) recounted the events in a book titled 'Flight into Fear - A Captain's Story' (2000). The book was written in collaboration with journalist Srinjoy Chowdhury.

Flight Engineer Anil K. Jaggia also wrote a book specifically depicting the events unfolded during the hijacking ordeal. His book is titled 'IC 814 Hijacked!'. The book was written in collaboration with Saurabh Shukla.

The CBI's application to convert the life imprisonment of Abdul Latif to a death sentence has been rejected. Also, Abdul Latif s application to decrease his sentence from life imprisonment has been rejected.

**Anti-hijack system**

An anti-hijack system is an electronic system fitted to motor vehicles to deter criminals from hijacking them. Although these types of systems are becoming more common on newer cars, they have not caused a decrease in insurance premiums as they are not as widely known about as other more common anti-theft systems such as alarms or steering locks. It can also be a part of an alarm or immobiliser system. An approved anti-hijacking system will achieve a safe, quick shutdown of the vehicle it is attached to.

**Technology**

There are three basic principles on which the systems work.

**Lockout**

A lockout system is armed when the driver turns the ignition key to the *on* position and carries out a specified action, usually flicking a hidden switch or depressing the brake pedal twice. It is activated when the vehicle drops below a certain speed or becomes stationary, and will cause all of the vehicles doors to automatically lock, to prevent against thieves stealing the vehicle when it is stopped, for example at a traffic light or pedestrian crossing.

**Transponder**

A transponder system is a system which is always armed until a device, usually a small RFID transponder, enters the vehicle's transmitter radius. Since the device is carried by the driver, usually in their wallet or pocket, if the driver leaves the immediate vicinity of the vehicle, so will the transponder, causing the system to assume the vehicle has been hijacked and disable it.

As the transponder itself is concealed, the thief would not be aware that such a system is active on a vehicle until they had ejected the driver and moved the vehicle out of range of the driver (usually only a couple of meters). This is probably the most common anti-hijack system, and a central locking system that uses the same concept was demonstrated by Jeremy Clarkson on an old episode of the BBC Top Gear program where he teased a butler by asking him to put his bags in a Mercedes-Benz S600 but didn't give him the RFID transponder. The butler was confused when the S600 doors wouldn't open when he tried, but when Jeremy approached with the transponder in his pocket, the system acknowledged this and unlocked the car, allowing Jeremy to simply pull the door handle to gain entry to the vehicle.

**Microswitch**

A microswitch system is always armed and is usually activated if one of the vehicle doors is opened and closed again while the vehicle's engine is running. Once the system has been activated, the driver will have a set time limit to disarm it by entering a code before the vehicle takes measures.

If the system is not disarmed in the time window, it will warn the driver by sounding the vehicle's horn once every 10 seconds for 30 seconds, at which point the system will start sounding the horn at much shorter intervals and will usually activate the vehicle's hazard lights.

At this point the immobiliser circuit will also start rapidly pulsing for 40 seconds, completely disabling the engine and eventually bringing the vehicle to a stop. If the thief switches the ignition to the *off* position and back to the *on* position again, the horn will restart and operate constantly and the hazard lights will flash for 60 seconds.

The immobiliser circuit will close for 15 seconds and will rapidly pulse for 15 seconds before re-opening the circuit, allowing the vehicle to be driven to a safe location before once again being immobilised. The hazard lights will continue to flash, and on every subsequent attempt to start the vehicle will cause the horn to operate for 30 seconds, but the immobilizer circuit will not open, so the vehicle will not start and the hazard lights will keep flashing until the vehicle's battery is drained or the system is disarmed.

## 4.15 Hong Kong mourns victims of bus hijacking in the Philippines

**Manila, Philippines (CNN)** — As the bodies of eight tourists killed in a bus hijacking in the Philippines arrived in Hong Kong, China, on Wednesday, the Hong Kong government urged citizens not to take their grief and anger out on Filipinos despite "the poor way" the hijacking was handled by authorities.

The Cathay Pacific flight, which also carried eight survivors and 19 relatives as well as dozens of officials, was greeted by a large crowd on its arrival at Hong Kong International Airport. In a somber ceremony, bagpipers played "Amazing Grace" as coffins were carried from the plane and wreaths laid upon them.

Several people were helped down a flight of stairs from the plane; one man's hand and arm were bandaged. Chief Secretary Henry Tang received the arrivals and then told reporters his government would urge its Philippine counterpart to conduct an "comprehensive, thorough, and impartial" investigation.

"The truth is the best consolation for the victims and their families," he said.

He added that Hong Kong is prepared to aid the Philippine authorities during the investigation.

"In order to facilitate a fair and thorough understanding of the incident, we believe it is imperative that the investigation report should at least cover a detailed account of the whole incident; and a detailed account of the causes of death and injuries," he said.

Two of three remaining hospitalized victims had been expected to be released from Philippine hospitals in time for the flight, but it was not known if they were on the plane that landed in Hong Kong. A third, more seriously injured tourist, remained in an intensive care unit in the Philippines.

Hong Kong's Chief Executive, Donald Tsang, was to lead a ceremony to raise the flag and lower it to half-staff on Thursday, and a three-minute period of silence was scheduled for 8 a.m., according to the Hong Kong government. Citizens were urged to join the ceremony or pay tribute in other ways during that time.

Meanwhile, residents in the Philippines observed a national day of mourning Wednesday in the aftermath of this week's bus hijacking in Manila.

Hong Kong's Equal Opportunities Commission said in a statement it "understands the strong feelings of Hong Kong people on the poor way that the crisis had been handled by the Philippine authorities."

"The EOC urges all members of the community to stay calm and, in line with our good tradition of tolerance and understanding, refrain from shifting our anger towards an innocent group, particularly the Filipinos who are living and traveling in Hong Kong," the statement said. "The people of Hong Kong have every reason to take pride in the racial harmony of this city, and we should guard against any action that may cause racial hatred or discord."

Former police officer Rolando Mendoza, who was apparently upset about having lost his job, took hostage a busload of tourists from Hong Kong on Monday. Witnesses said Mendoza was initially willing to cooperate, but he was shot dead by police after authorities say he became violent and started shooting hostages.

Rodolfo Matibay, district director of Manila police, took responsibility for how the incident was handled, saying he ordered the police assault on the bus, according to Gen. Leocaldo Santiago, regional director of Manila police.

He has been placed on administrative leave while the case is being investigated.

Four men and four women were killed in the standoff. One passenger was critically wounded and six others were hospitalized with less serious injuries.

The gunman had previously released nine of the hostages, including a mother and her three children, a man with diabetes and two photographers. The bus driver escaped.

Santiago said police killed none of the hostages, though a ballistics investigation has yet to be completed. Philippine President Benigno Aquino ordered all flags at public institutions in the Philippines, its embassies and consulates around the world lowered to half-staff.

In Hong Kong, flags also were lowered and traders at the Hong Kong Stock Exchange paused in silence.

The Chinese territory, meanwhile, issued a black travel alert for the Philippines, advising residents to avoid all travel there.

The government's Home Affairs Department has set up 18 condolence points around Hong Kong to allow people to mourn the victims and offer messages of sympathy. Tsang made an appearance at one of them on Tuesday to observe a minute of silence.

A Facebook page also honors the victims.

At the Hong Kong Management Association David Li Kwok Po College, students and faculty remembered Jessie Leung, 14,' who was killed along with her father and sister. Her brother remains in critical condition; her mother also survived the incident.

"Jessie was a helpful girl — cheerful, lovely, a good academic," said Catherine Chan, the school's development manager. "We hope her brother will recover soon."

In Manila, a makeshift shrine was erected in front of the bus, with flowers left for the victims.

The deadly standoff unfolded live on television, which the gunman was able to watch on a monitor on the bus. Santiago blamed the live broadcasts for contributing to the violence as the standoff quickly deteriorated while police surrounded the vehicle.

'We do not want to pass sweeping judgment or make early conclusions except to say that our intention to peacefully end this hostage drama was spoiled when the hostage-taker suddenly exhibited violent behavior and began shooting the hostages," Philippine National Police Chief Director Gen. Jesus A. Verzosa said Tuesday in a statement.

National police said officials noted "some observations and defects during their close monitoring of the unfolding events."

The statement did not provide details. However, it listed poor handling of the hostage negotiations; inadequate capability, skills, equipment and planning of the assault team; improper crowd control; inadequate training and competence of the assault team leader; and noncompliance to media relations procedures in hostage situations.

"The investigation has got to find out, what was the turning point? What happened?" said Richard Gordon, chairman of the Philippine National Red Cross.

Gordon said survivors said the situation inside the bus changed dramatically toward the end of the 10-hour standoff.

"Apparently the man went berserk. He was telling everybody he was not going to harm [them]. ... He said that nobody's going to get harmed. He said that he was probably

going to die, but not the hostages," he said. Santiago said that Mendoza's family members spoke with him early in the standoff and that he appeared "very reasonable and very psychologically stable."

Mendoza was a decorated police officer, winning several accolades. But his career spiraled downward when he was dismissed a year ago for extortion, Manila Vice Mayor Ikso Moreno said, and he wanted his motion for reconsideration to be heard.

Moreno said that Mendoza's brother was arrested during the standoff because he was "guilty of conspiring with his brother" and allegedly helped instigate the shooting.

Gordon said the brother's arrest may have pushed the gunman over the edge.

'When he saw his brother getting accosted by the policemen, he went berserk and he started firing," he said.

**Conditions:** In a field, military operations in urban terrain (MOUT) or garrison environment interact with news media when no public affairs practitioners are present.

**Standards:** Identified the principles of interacting with the media.

**Performance Steps**

1. Role of the individual when interacting with the media.
    a. Check identification or press credentials. If identification or press credentials are produced, continue with interview. If no identification or press credentials are produced, refer the individual to your chain of command or public affairs representative.
    b. Recognize your rights.
        (1) You don't have to speak to the media.
        (2) You don't have to answer ail the questions.
        (3) You control the length of the interview.
    c. Maintain operational security (OPSEC). Do not discuss classified information.
2. Guidelines for speaking with the media.
    a. Think before you answer.
    b. Tell the truth. You should not lie or intentionally mislead members of the media.
    c. Discuss only things that you have direct responsibility for or have personal knowledge about. Speak at your level. You should discuss only matters for which you have direct knowledge.

d. Don't answer speculative (what if) or hypothetical questions.
e. Avoid jargon, acronyms, slang and technical terms.
f. Answer the question with which you are most comfortable when asked multiple questions.
g. Keep remarks brief and concise.
h. Assume everything you say may be printed or broadcast.
i. Use "I" not "we" when stating your opinion.
j. If you don't know the answer to a question or cannot discuss it for any reason, say so. Avoid using "no comment".

3. Inform the chain of command of interaction with the media.

**Evaluation Preparation:**

***Setup:*** *Provide soldier with a realistic scenario of a simulated media interview situation. Use mock press credentials when necessary.*

***Brief Soldier:*** *Tell the soldier he is about to be interviewed by the media. No public affairs representatives are present. Evaluate soldier on his ability to interact with the media.*

| Performance Measures | GO | NO GO |
|---|---|---|
| 1. Checked media representative for identification or credentials. | — | — |
| 2. Stated three recognized rights. | — | — |
| 3. Maintained OPSEC throughout the interview. | — | — |
| 4. Discussed subject areas related to direct responsibility and personal knowledge. | — | — |
| 5. Stated answers while avoiding speculation. | — | — |
| 6. Performed interview without use of jargon, acronyms, slang or technical terms. | — | — |
| 7. Employed concise remarks. | — | — |
| 8. Ensured no "off-the-record" comments were made. | — | — |
| 9. Stated answers, avoiding "no comment" response. | — | — |
| 10. Informed chain of command of interaction with media. | — | — |

***Evaluation Guidance:*** *Score the soldier GO if 70 percent or more of the performance measures are passed. Score the soldier NO GO if less than 70 percent of the measures are passed. If the soldier scores NO GO on any performance measure, show or tell him what was wrong and how to perform the measure correctly.*

## 4.16 Rules for Successful Threat Intelligence Teams

Threat intelligence is quickly becoming a core element of risk management for many enterprises.

To truly understand risk, though, the enterprise must grasp and have the capability to handle emerging information security threats to its environment. Other areas of risk — financial risk, operational risk, geopolitical risk, risk of natural disasters — have been part of organizations' risk management plans since time immemorial; it's only these last few years that information security has bubbled to the top, and now companies are starting to put weight behind security threat intelligence programs.

Putting a team in place to manage threat intelligence, however, isn't as easy as other, more established areas of information security. First, it's newer, and second, organizations might not yet have the right skills and tools in-house.

With that in mind, we've identified four simple rules that will help organizations build and maintain a successful threat intelligence team.

(N.B. The rules are simple, but we do realize that implementation is not!)

### 4.16.1 Tailor Your Talent

It goes without saying that any team — threat intelligence or otherwise — is run by people, so hiring the right people with the right skills is critical. In some cases organizations can groom threat intelligence staff from within, from security operation center (SOC) teams to incident responders. Central skills like log management, networking expertise, and technical research (scouring through blogs, pastes, code, and forums) often come after years of professional information security experience.

Certain parts of threat analysis, however, necessitate distinct and practiced skill sets. Intelligence analysis, correlating and making predictions about threats based on (sometimes seemingly disparate) data, requires highly developed research and analytical skills and pattern recognition.

When building or adding to your threat intelligence team, especially concerning external hires, personalities matter.

Existing teams might feel threatened by new staff who appear to be "taking over" roles and responsibilities. Disgruntled employees are not productive employees. Thus, when forming

or adding to the threat intelligence team, pay close attention to the "soft skills" of candidates.

Make sure that teammates can not only all "play nicely in the sandbox," but that you, as a manager, are communicating frequently, clearly, and honestly about expectations. The interaction and workflow between teams should be pre-planned, and data sharing should facilitate easy integration for the teams responsible for making security verdicts.

### 4.16.2 Architect Your Infrastructure

Threat intelligence vendors provide strategic intelligence, but organizations should consider building in-house proprietary capabilities that deliver consistent, relevant, and actionable threat data.

Proprietary threat intelligence platforms (TIPs) have the advantage of being tailored to the organization's specific needs, and often come with a smaller price tag than commercial, off-the-shelf solutions. These custom-engineered solutions should integrate with external vendor systems to automatically collect, store, process, and correlate external data with internal telemetry such as security logs, DNS logs, Web proxy logs, Netflow, and IDS/IPS.

Of course, building powerful proprietary capabilities requires an experienced data architect.

This individual is responsible for designing fast and nimble data structures with which external tools integrate seamlessly and bi-directionally. The data architect should understand not only the technical needs of the organization, but he or she should be involved in a continuous two-way feedback loop with the SOC, vulnerability management, incident response, project management, customer-facing fraud (where applicable), and red teams. This collaborative process facilitates control changes and allows the architect to deliver threat data in a format and on a timeline appropriate for each group.

Notably, threat analysts should never spend time manually processing operational data, and the architect fills that important role of providing the data upon which the analyst draws conclusions that ultimately decrease strategic business risk.

### 4.16.3 Enable Business Profitability

The goal of every threat intelligence program should be to find emerging threats before they impact the business. Reducing the number of direct threats drives down risk, which in turn increases profitability. Threat intelligence teams must therefore know what the business identifies as levers of profitability in order to prioritize the identification and dissection of threat events and sources.

At the center of profitability are the business's strategic assets (customers, employees, infrastructure, applications, vendors). Protecting strategic assets is priority number one, and defensive controls need to be managed as threats emerge.

To ensure protection for key assets, threat analysts must be able to examine the larger threat picture and identify such things as general industry threats, trends, attacker TTPs (tactics, techniques, and procedures), and commodity malware. While an attack on one industry organization, for instance, might not result in a direct threat to your own organization, knowing that several enterprises have been been victims of a similar type of attack could indicate the need for hardened internal controls.

The ability to see the larger trends and drill down to direct threats against strategic assets means the threat intelligence team must understand what data it has available internally and what data it needs to source. Information gathering for an unknown purpose other than vague future applicability is a waste of resources, so set your sights on the information directly tied to the business and its levers of profitability.

### 4.16.4 Communicate Continuously

Enabling business profitability requires an understanding of the business's goals and roadmap.

To effectively set the roadmap, the executive layer also needs insight into current and future threats. If, for example, the business wants to acquire a partner but the partner is currently being targeted by hacktivist groups for what they deem unfair business practices, the executive team should have that intelligence before determining a market valuation and extending an offer. During a vendor evaluation, as another example, it is important to know if industry-specific malware, like BlackEnergy or Zeus, is emerging. Aligning one's business with a risky proposition is not a decision to be taken lightly.

Executives need to hear from the threat intelligence team how and why some of those threats translate to risk, and then learn if and how the risk of those threats can be mitigated. Organizational threats will always exist, and it's up to the business to decide its risk tolerance. Threat teams can aid the process by keeping executives informed but not spreading FUD (fear, uncertainty, and doubt). Delivering the message should be approached in a thoughtful, practical manner; do not overwhelm executives with technical details they neither care about nor understand. Their eyes are on the bottom line, and threat intelligence should be provided that supports moving in an upwards trajectory.

# 4.17 Construction Safety Practices

## 4.17.1 Excavation

***Fencing***

Where deep excavation is going on and there is likelihood of the public or cattle frequenting the area, suitable protective fencing should be erected and also sufficient number of notice boards and danger signals should be provided to prevent accidents by falling of persons in excavated trenches/pits. For excavated sites close to public roads/pathways, the area and the notice boards should have danger lights during darkness hours.

Barriers or coverings should be provided to excavations, shafts, pits and openings having a vertical fall distance of more than 2 ra, except during the period necessary for the access of persons and movement of plant equipment and materials. A structure made of timber or other suitable material should be erected for excavating and earthwork operations in order to prevent any fall of rock or displacement of earth or other material adjacent to or forming the sides of the excavations.

***Shoring***

1.2.1 Timber has been used traditionally for shoring. Aluminium shores using hydraulic jacks to hold them in place are also used these days. They are economical and lightweight, can be installed and dismantled easily and have a longer life. They are also more safe than timber to use.

***Installation***

As far as possible, the installation of shores should be done from the surface; that is, vertical shores should be placed from surface and the first horizontal brace should be installed just below the surface from above. The operator should go down in the trench with the help of a ladder which is long enough to install the next lower brace or trench jack, etc. Thus, the trench is made safe for him to descend to install additional horizontal braces. The trench jack or horizontal braces should never be used as a ladder for getting in or out of a trench as they are not designed to take vertical load.

***Removal***

When the removal of shoring is planned, the possible collapse of trench sides should be anticipated. The newly installed utility line will then be safeguarded in the normal course by being covered with loose or compact fill before shores are removed. If the trench is

likely to cave in on removal of the shores, it can be filled up to the bottom of the horizontal brace. It is a safe way for the worker to go down on the ladder and remove this brace, after which additional trench space can be filled up to the next horizontal brace or screw jack.

If the trench is to stay after the removal of shoring, the latter should not be removed till all work within the trench is completed and the newly installed utility line has been protected or covered.

A worker can then use a ladder to descend to the bottom of the horizontal trench jack and remove it The remaining horizontal jacks should be removed as he ascends the ladder. The removal of shoring is a hazardous work. A worker should never be permitted to engage in this work single handed.

***Loose Site Material***

The most serious safety problem associated with deep highway cut is that of landslides. This may occur during the work or any time after completion. Damages include loss of life or body injury, more often after heavy rains when the soil loosens and becomes heavy with water.

All loose stones, projecting lumps or earth should be removed from the trenches. The excavated sides of a trench should be adequately guarded.

***Minimum Check and Clear Edge of Trench***

There is a tendency to dump the excavated material just on the edge of the trench where excavation is done manually. The material may slide back into the trench or apply additional load on shoring. A provision of clear berm of a width not less than one-third of the final depth of excavations is recommended. In areas where this width of the berm is not feasible, the reduced berm width of not less than 1 m should be provided. It is always better to provide substantial toe board to prevent 'roll back' into the trench.

**Plant and Machinery**

The excavation may be done manually or with the help of equipment depending on the volume of work and site conditions. The risk of accidents in mechanical excavations are more due to the speed of excavation and dumping of the material. The following safety measures are recommended.

The excavating equipment should be parked at a distance of not less than the depth of the trench, or at least 6 m away from excavated sides for trenches deeper than 6 m.

With the use of power shovels and draglines, the banks of trenches become unstable

and thus dangerous for persons working nearby. These conditions should be watched and suitably remedied.

The vehicles should not be permitted to be driven too close to the pit. Care should be taken for locating roads leading to or from the pit. While loading manually, the vehicle should not be taken too near the wall of the pit. Use of spot logs will reduce risk of accidents where the vehicle is reversed for loading.

Workers should be provided with proper tools. Maximum hardness is the primary requirement for cutting edges and striking faces of tools. Overlooking the importance of providing the right tools for the job is perhaps the most serious risk to workers.

Workers using tools should guard against the danger arising out of the sudden movement of material which may throw them off balance. They should be adequately spaced to avoid being accidentally struck by tools of others working nearby.

**Access and Escape**

The workers should be able to escape fast in the event of any mishaps during excavation. It is recommended that one ladder should be provided for every length of 15 m or fraction thereof in the case of hazardous work, and 30 m of length or fraction thereof in the case of relatively less hazardous work.

Quite often the pathways become slippery due to accumulation of mud, sand or gravel. This should be avoided. Further, the pathways should be strong enough to withstand the intended use. Similarly, gangways should be of superior construction. The planks used should be strong, laid parallel to the length of the gangway and fastened together against displacement. They should be thick and have cleats for safe walking. Gangways should be kept clear of excavated material and other obstruction.

**Other Precautions**

Many accidents occur due to falls in unfenced trenches. Such accidents are more common during the rainy season. Fences, guards or barricades should be erected to prevent persons or livestock from falling into them. At night time, all public side walks and walkways should be adequately illuminated, and warning lights placed at proper sites to ensure safety of pedestrian and vehicular traffic. Sidewalks tend to become unstable during monsoons. They should be braced in the wet season. During excavation, the excavated sides should have the provision of steps or gradual slopes to ensure safety of men and machines in the area. It is possible that harmful gases and fumes are present in a trench. Gases, vapours and their metabolites absorbed by a human organ create morphological

abnormalities and the individual develops symptoms of poisoning. To prevent such mishaps, dilution and exhaust ventilation system should be used to reduce the concentration of gaseous matter to the recommended hygiene standards.

Explosive mixed gases may also be present in the trenches. Air containing more than 1.5 percent of flammable gases by volume is dangerous. Gases and fumes should be rendered harmless or discharged at points that are sufficiently remote from the trenches.

Internal combustion engines emit hydro-carbon, carbon monoxide and nitrogen oxides, which are dangerous to health. Hence no internal combustion engine should be operated in a trench unless adequate precautions are taken.

Burrowing or mining or what is known as 'gophering' should not be allowed. In any trench where such methods are being followed, the cavity belt should be eliminated by cutting it back to the bare slope before removing any further material from the section of the trench.

Workers normally take their lunch under the shade near their work sites. If shade is not available, they tend to sit in the shade or undercut of the trench. This practice should be prohibited. While excavating near or below the building foundations, the latter should be supported by shoring, bracing or underpinning as long as the trench remains open.

**Common Hazards**

Vibrations caused by the operation of machinery at sites adjacent to the excavated pits may cause collapse of walls unless they are properly braced. Further, quick sand is a dangerous phenomenon which necessitates the use of continuous steadying.

Damp sand is non-stable and for proper support it may need bracing *(see* Table 1).

**Responsibility of Supervisor**

***Safety Check***

Experienced and qualified supervisors should be put in charge of the excavation work. They should understand their responsibilities and the details of all safety rules. A supervisor should have the authority to enforce all safety rules at site, prevent the use of defective safety appliances, rigging of tools and materials and to disallow any worker to handle jobs for which he is not qualified. The supervisor should brief workers about the working plan before the start of the work and explain potential hazards to them. The excavation work should be inspected by a qualified engineer once a week and after every heavy spell of rain or storm. Defects, damage or dangers found should be reported immediately to the site incharge and corrective action taken. He should pay a special attention to water pipelines,

electric cables lying below the surface or during excavations of underground structures. The supervisors should ensure that all workers working under him are provided with safety appliances and protective equipment, and that they use it. The format of the Supervisor's Monthly Safety Report is given as Annex A. The worksheet for observation is attached as Annex B. General instructions for shoring and timbering of trenches is given in Table 1.

**Table 1A Hard Soil General Instructions for Shoring and Timbering of Trenches**
***(Clauses* 1.6 *and* 1.7.1)**

| Item No. | Depth of Trench | Sheathing | | Wales | | Struts | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Section | Horizontal Spacing, *Max* | Section | Vertical Spacing, *Max* | Section | | Spacing | |
| | | | | | | Width of trench not more than 2 m | Width of trench between 2 m and 4 m | Vertical | Horizontal |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | m | cm | m | cm | m | cm | cm | m | m |
| 1. | Over 2 but not over 3 | 5×20 | 2 | 15×15 | 1.5 | 10×10 | 10×15 | 1.5 | 3 |
| 2. | Over 3 but not over 5 | 5×20 | 1.5 | 15×15 | 1.5 | 10×15 | 15×15 | 1.5 | 3 |
| 3. | Over 5 but not over 6.5 | 5×20 | 1 | 20×20 | 1.5 | 15×15 | 15×15 | 1.5 | 3 |
| 4. | Over 6.5 but not over 8 | 5×20 | Width of member | 25×25 | 1.5 | 15×20 | 20×20 | 1.5 | 3 |
| 5. | Over 8 but not over 10 | 5×20 | Width of member | 20×30 | 1.5 | 20×20 | 20×25 | 1.5 | 3 |

**Table IB Soil which may Crack or Crumble**
***(Clauses* 1.6 *and* 1.7.1)**

| Item No. | Depth of Treach | Sheathing | | Wales | | Struts | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Section | Horizontal Spacing, Max | Section | Vertical Spacing, Max | Section | | Spacing | |
| | | | | | | Width of trench not more than 2m | Width of trench between 2m and 4m | Vertical | Horizontal |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | m | cm | m | cm | m | cm | cm | m | m |
| 1. | Over 1.5 but not over 2.5 | 5×20 | 1.5 | 10×15 | 1.5 | 10×10 | — | 1.5 | 3 |
| 2. | Over 2.5 but not over 3 | 5×20 | 1 | 15×15 | 1.5 | 10×10 | 15×15 | 1.5 | 3 |
| 3. | Over 3 but not over 5 | 5×20 | 0.5 | 15×20 | 1.5 | 10×15 | 15×15 | 1.5 | 3 |
| 4. | Over 5 but not over 6.5 | 5×15 | Width of member | 20×25 | 1.5 | 15×15 | 20×20 | 1.5 | 3 |
| 5. | Over 6.5 but not over 8 | 5×15 | Width of member | 25×25 | 1.5 | 15×20 | 20×20 | 1.5 | 3 |
| 6. | Over 8 but not over 10 | 8×20 | Width of member | 20×30 | 1.5 | 20×20 | 20×25 | 1.5 | 3 |

**Table 1C Loose Sandy or Soft Solid or Soil which has been Previously Excavated**
***(Clauses* 1.6 *and* 1.7.1)**

| Item No. | Depth of Treach | Sheathing | | Wales | | Struts | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Section | Horizontal Spacing, Max | Section | Vertical Spacing, Max | Section | | Spacing | |
| | | | | | | Width of trench not more than 2m | Width of trench between 2m and 4m | Vertical | Horizontal |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | m | cm | m | cm | m | cm | cm | m | m |
| 1. | Over 1.5 but not over 2.5 | 5×20 | 0.4 | 10×15 | 1.5 | 10×10 | 10×15 | 1.5 | 3 |
| 2. | Over 2.5 but not over 3 | 5×15 | Width of member | 15×20 | 1 | 10×15 | 15×15 | I | 3 |
| 3. | Over 3 but not over 5 | 5×15 | Width ofmember | 20×20 | 1.5 | 15×15 | 15×15 | 1.5 | 3 |
| 4. | Over 5 but not over 6.5 | 5×15 | Width of member | 20×25 | 1.5 | 15×15 | 15×20 | 1.5 | 3 |
| 5. | Over 6.5 but not ovfcr 8 | 8×20 | Width of member | 20×25 | 1.5 | 15×20 | 20×20 | 1.5 | 3 |
| 6. | Over 8 but not over 10 | 8×20 | Width of member | 25×25 | 1.5 | 20×20 | 20×20 | 1.5 | 3 |

**Table ID Soil Under Hydrostatic Pressure**
***(Clauses* 1.6 *and* 1.7.1)**

| Item No. | Depth of Treach | Sheathing | | Wales | | Struts | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Section | Horizontal Spacing, Max | Section | Vertical Spacing, Max | Section | | Spacing | |
| | | | | | | Width of trench not more than 2m | Width of trench between 2m and 4m | Vertical | Horizontal |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | m | cm | m | cm | m | cm | cm | m | m |
| 1. | Over 1.5 but not over 2.5 | 5×15 | Width of member | 15×20 | 1.5 | 10×10 | 15×15 | 1.5 | 3 |
| 2. | Over 2.5 but not over 3 | 5×15 | Width of member | 15×25 | 1 | 10×15 | 15×15 | 1.5 | 3 |
| 3. | Over 3 but not over 5 | 8×20 | Width of member | 25×25 | 1.25 | 15×15 | 15×15 | 1.25 | 3 |
| 4. | Over 5 but not over 6.5 | 8×20 | Width of member | 25×30 | 1.25 | 20×20 | 20×20 | 1.25 | 3 |
| 5. | Over 6.5 but not over 8 | 10×20 | Width of member | 25×35 | 1 | 20×20 | 20×25 | 1 | 3 |
| 6. | Over 8 but not over 10 | 10×20 | Width of member | 35×35 | 1 | 20×25 | 25×25 | 1 | 3 |

### *1.7.2 Record Keeping*

Certificates and reports received by a contractor in respect of any test, inspection or examination of any equipment, excavation, shores, earthwork, etc, should be kept at the relevant construction site. These certificates and reports should be readily available for inspections by senior officers and other concerned authorities.

### 4.17.2 Drilling and Blasting

Drilling and blasting is a major safety hazard on construction sites. Accidents generally happen due to the mishandling of explosives during transportation, carelessness in their storage, misfire, and not guarding the blasting area. The overconfidence on the part of workers/supervisors may also lead to accidents.

**Transportation of Explosives**

Three important items that need the consideration are:

a) Mode of transport,

b) Handling for transportation, and

c) Traffic on road and road conditions.

Explosives should always be transported in specially designed vehicles bearing special signs or inscription 'DANGER EXPLOSIVES'. Vehicles to be used for transporting explosives shall be in good working condition and shall have a light wooden or nonsparking metal like copper, brass, etc. Electrical wiring in vehicle shall be fully insulated so as to prevent danger of short circuiting and at least two fire extinguishers (of carbon tetrachloride type) shall be carried. No metal except approved metal truck bodies shall be allowed to come in contact with cases of explosives. Metal, flammable or corrosive substances shall not be transported with explosives. Smoking shall be prohibited in vehicles carrying explosives and no' unauthorised persons shall travel in vehicle carrying explosives. Loading and unloading of explosives shall be done carefully by trained staff and supervised by qualified personnel. If possible, the traffic on the road while carrying explosives should be regulated specially in ghat and city areas.

The speed of explosive van and distance between the vehicle shall be regulated as per safety rules depending on road conditions. Badly maintained roads or speed breaker may jolt the explosives in the van if not properly placed or packed.

**Handling Explosives**

Dynamite may cause severe headaches, more so when it is unwrapped and handled with bare hand. Different brands and strengths of the dynamite vary in their headache producing property. Persons handling explosives should not smoke and carry no match boxes.

A complete list of safety precautions recommended by the manufacturers will be found in each box of dynamite and the same should be followed.

**Indian Explosives Act, 1984**

Storage of explosives is regulated by *Indian Explosives Act,* 1984 and provisions thereunder should be strictly observed. Accidental detonation of explosives during storage may be caused due to the following reasons:

a) Use of unsuitable rooms for storing explosives;

b) Unsystematic control of wiring systems, fire- alarm systems, store closing devices and stray currents; and

c) Careless handling, unwrapping and distribution of explosives.

**Guidelines for Storage of Explosives**

a) Explosives shall be stored only in a magazine or an isolated building which is clean, dry, well ventilated, seasonally cool, correctly located, substantially constructed, bullet proof and fire resistant and securely locked.

b) Actual requirements of explosives shall be drawn from the magazine and transported to the site.

c) In case of work at scattered places and for a small duration portable magazines shall be used and kept within a fence in a safe place and properly guarded.

d) These shall not be carried in the pockets of any clothing on any person.

e) Blasting caps, electric blasting caps or primers shall not be stored in the same box container or room with other explosives.

f) Explosives, fuse or fuse lighters shall not be stored in a damp or wet place or near oil, gasoline, cleaning solutions or solvents or near radiant or steam pipes or other sources of heat.

g) Smoking shall not be permitted within the fencing around the explosive magazine. No matches, open lights, or other fire or flame shall be allowed near the magazine.

h) Persons entering the magazine shall not have shoes with iron nails or other sparking metal.

**Accidents while Using Explosives**

Most of the accidents during the use of explosives are caused due to the following reasons:

a) Faulty loading of blast holes,

b) Failure to withdraw fast enough from the blast area,

c) Returning to blasting points too soon after firing, and

d) Presence of strangers near the blasting point, and

e) Premature detonation or misfire.

**Precautions During Usage of Explosives**

Following precautions should be taken during usage of explosives:

a) Any package containing explosives shall not be dragged, dropped or handled roughly. They shall be opened only at a safe distance and properly shielded from the packages of explosives in bulk storage.

b) No person shall strike, tamper with, or attempt to remove or investigate the contents of a blasting cap or attempt to pull out the crimped safety fuse out of a blasting cap.

c) Children, unauthorised or unwanted persons shall not be present where explosives are being handled.

d) No person shall handle, use or be near explosives during the approach or progress of any electrical storm. All persons shall retire to a place of safety.

e) Deteriorated or damaged explosives shall not be used and should be disposed off. Further no attempt shall be made to soften hard set explosives by heating over a fire or by rolling the explosive on the ground.

***Guidelines for Supervision***

The supervisors should take the following basic precautions at the blasting sites:

a) Smoking or carrying match boxes should be prohibited.

b) The package containing explosives should not be dropped or opened with metal tools.

c) Explosives should not be carried on the body of a person.

d) Persons not required during blasting should stay away.

e) Explosives should not be handled during the approach or progress of electrical storms.

f) Heating of explosives should never be done.

g) Explosives that have aged, deteriorated or are damaged should never be used.

h) Explosives should be placed in a hole that is not wet, is away from shocks/ vibrations, and does not have rock splinters or sharp objects.

j) The fuse and the wire leads should be without top kinks.

k) Explosives should not be kept at places where they are exposed to flame, excessive heat or sparking.

**Drilling for Blasting**

A complete geologic and engineering evaluation is essential before drilling so as to avoid landslides after blasting. The face of the rock should be carefully examined to determine the possible presence ofunfired explosives.

**Guidelines for Loading Blasting Agent**

a) All duct holes shall be sufficiently large to admit freely the insertion of explosion cartridges of explosives.

b) Tamping shall be done only with wooden rods without any metal parts.

c) Primer shall never be tampered.

d) If the loaded holes did not actuate no drilling within 17 m of the hole shall be done.

e) While loading after enlarging the hole or drilling, it must be ascertained that it is cool and does not contain any metal or burning or smouldering material. The temperature in excess of 65°C are dangerous.

**Shot Firing**

***Electrical Circuit***

Three main systems commonly used in blasting are— Condenser-discharge blasting machines, mechanically operated blasting machines and power line circuits. Of these three, the condenser-discharge blasting machine system is the most widely used. It is simple to operate and assures adequate firing current for almost any size of shot.

**Guidelines for Firing**

a) Before firing, sufficient warning shall be given to enable the people working in the blasting area to get out of the danger zone.

b) Any power circuit used for firing electric blasting caps shall not be grounded.

c) After firing the leading wires shall be immediately disconnected from the machine and short circuited.

d) Safety fuse only shall be used where sources of extra means of electricity is present.

**Safety Fuse**

In most construction jobs, the cap and fuse are normally used for secondary blasting. The length of a fuse should not be less than 120 cm, and the burning rate not more than 60 cm per minute.

The fuse wire should be lighted with a fuse lighter designed for the purpose. It should be lighted until sufficient stemming has been placed over the explosives. Only the prescribed explosives in the required quantity should be used in underground work.

As the fumes caused by the explosives may take a long time to emit out of the underground structure, a foul air duct of the specified size may be used to clean the air. It is more effective than a blow or pressure line. The velocity of the air at the delivery end should not be less than 0.2 m/s.

**Precautions for Firing**

***Precautions Before and After Firing***

a) Blasting shall be carried out during the fixed hours everyday or fixed days in a week. This information shall be amply publicised.

b) Road closing barriers should be provided at least 400 m away when firing is to take place.

c) The beginning of the firing should be followed by loud sirens and similarly the completion of the firing should be succeeded by loud sirens.

d) The shot firer shall not return to the blasting site after firing until at least 5 min have elapsed.

e) In case of electric shot firing the shot holes shall be examined after firing and incase of misfire no person shall be allowed to approach the blasting site for at least 5 min.

f) In case of shot firing with safety fuse, utmost care shall be taken to count the number of loud reports to ensure that all the shots have fired and in the event of blasting site for at least 30 min.

g) In case of misfiring no person other than those fully authorized shall approach the holes until the following operations have been performed in respect of each of the misfired holes.

    1) If a misfire is due to faulty cable or faulty electrical connection the defect shall be resumed and the shot fired.

    2) The stemming shall be floated out by use of water or air jet from hole until the hole has been opened to within 60 cm of the charge upon which water will be siphoned then fresh charge placed and duly detonated or a new hole shall be drilled 60 cm away from the old bore, parallel to it, about 60 cm less in depth and the new hole charged and duly fired.

3) Careful search shall be made of unexploded material in the debris of the second charges.

The blasting operations shall be carried out scrupulously following the stipulations of the *Indian Explosives Act,* 1984 and Rules made thereunder and by agencies in possession of licensing authority.

The preparation of charges, the charging of holes and firing shots shall be carried out by or in the presence of a responsible person with experience of handling explosives.

No more than 8 holes shall be loaded and fired at any one time.

It should be ensured that projection of fragment stones by explosives is minimum. For this purpose, it is recommended that before exploding any blasting charge, a strong wooden lattice of sufficient weight be placed immediately over the drift

The blasting operation shall be carried out strictly in accordance with the stipulations under the license to carry out blasting operation.

**Disposal of Explosives**

a) Consult the manufacturers while disposing or destroying explosives and it should be done in strict accordance with the approved methods.

b) The materials used in the packing of explosives as empty cartridges, boxes, liners or other materials should not be left lying around.

c) The materials used in the packing of explosives as wood, paper, etc, should not be burnt in a stove, a fireplace or other conferred place, or to be used for any purpose.

d) The explosives should not be given on loan or parted or disposed off to anybody without the written permission of the competent authority.

In case of any theft, the matter should be reported to police and higher authority immediately.

### 4.17.3 Piling and deep foundations

**General**

A basic step in safety in piling is that one must know the elements of machinery and equipment, how they can cause accidents and what steps should be taken by the operator to avoid accidents. Machines and equipment differ widely, depending upon the process and

mode of piling, manufacturer's specialities, specification and allied factors. The safety requirements of each machine should be understood.

**Piling Rigs**

The legs of the tripod should be properly spiked in the ground. This will prevent accidents due slipping up of the tripod legs when rested on a paved ground or sleepers. The shear legs and bases become thin and fatigued with usage. They should be replaced frequently.

The failure of a pulley due to shearing of bolt or pin is quite common. Therefore, frequent check-ups of the pulley are essential. The wire rope forms the link between the main piling tools and the winch. Following regular checks are required in this respect.

a) Check for loose strands and wear, deformation, corrosion and breakage of wires.

b) Check whether the end of the rope has become loose or has slipped wire clips or wire sockets.

c) Check against slippage of rope from the sleeve during work.

d) Check if there is any occurrence of torsion while working and if so, rewind it normally at once.

e) Check if there are any adhesions like mud, earth, etc, on the rope. If so, clean with wire brush or compressed air.

f) Check if the grease applied on the rope is adequate.

g) Check for wear and cracks on the lining of the clutches and brake band; and the engine condition.

**Field Operations**

The common hazards in various field operations such as sheet piling, well foundation are mentioned below:

Sheet piling are normally used for construction of cassion or cofferdam to permit the de-watering of water for efficient under water working. They are handled manually, lifted by cranes and lowered by hammer or vibrostroker. The accidents due to drowning and injuries while handling are very common. These can be minimized by adopting the following precautions:

a) Hand ropes should be tied to control/prevent the movement of steel sheet sections that are transported.

b) Stirrups should be provided to workers engaged in interlocking the sheets.

c) Adequate pumping facilities shall be provided at cofferdam. Also adequate means of escape, such as ladders and boats shall be provided at cofferdams for protection of workers in case of flooding.

d) Adequate supplies of life saving equipment shall be provided for workers employed on cofferdams.

When sheet sections are being removed their movement shall be controlled by cables and other effective means.

***Well Foundation***

The progress and safety of well sinking depends on the knowledge of cutting edges provided by the

# 4.18 Planning

Planning means looking ahead and chalking out future courses of action to be followed. It is a preparatory step. It is a systematic activity which determines when, how and who is going to perform a specific job. Planning is a detailed programme regarding future courses of action. It is rightly said "Well plan is halftone". Therefore planning takes into consideration available & prospective human and physical resources of the organization so as to get effective co-ordination, contribution & perfect adjustment. It is the basic management function which includes formulation of one or more detailed plans to achieve optimum balance of needs or demands with the available resources.

According to Urwick, "Planning is a mental predisposition to do things in orderly way, to think before acting and to act in the light of facts rather than guesses". Planning is deciding best alternative among others to perform different managerial functions in order to achieve predetermined goals.

According to Koontz & O'Donell, "Planning is deciding in advance what to do, how to do and who is to do it. Planning bridges the gap between where we are to, where we want to go. It makes possible things to occur which would not otherwise occur".

## 4.18.1 Steps in Planning Function

***Planning function of management involves following steps:-***

**1. Establishment of objectives: -**

a. Planning requires a Systematic approach'.

b. Planning starts with the setting of goals and objectives to be achieved.

c. Objectives provide a rationale for undertaking various activities as well as indicate direction of efforts.

d. Moreover objectives focus the attention of managers on the end results to be achieved.

e. As a matter of fact, objectives provide nucleus to the planning process. Therefore, objectives should be stated in a clear, precise and unambiguous language. Otherwise the activities undertaken are bound to be ineffective.

f. As far as possible, objectives should be stated in quantitative terms. For example, Number of men working, wages given, units produced, etc. But such an objective cannot be stated in quantitative terms like performance of quality control manager, effectiveness of personnel manager.

g. Such goals should be specified in qualitative terms.

h. Hence objectives should be practical, acceptable, workable and achievable.

**2. Establishment of Planning Premises**

a. Planning premises are the assumptions about the lively shape of events in future.

b. They serve as a basis of planning.

c. Establishment of planning premises is concerned with determining where one tends to deviate from the actual plans and causes of such deviations.

d. It is to find out what obstacles are there in the way of business during the course of operations.

e. Establishment of planning premises is concerned to take such steps that avoids these obstacles to a great extent.

f. Planning premises may be internal or external. Internal includes capital investment policy, management labour relations, philosophy of management, etc. Whereas external includes socio economic, political and economical changes.

g. Internal premises are controllable whereas external are non- controllable.

**3. Choice of alternative course of action**

a. When forecast are available and premises are established, a number of alternative course of actions have to be considered.

b. For this purpose, each and every alternative will be evaluated by weighing its pros and cons in the light of resources available and requirements of the organization.

c. The merits, demerits as well as the consequences of each alternative must be examined before the choice is being made.

d. After objective and scientific evaluation, the best alternative is chosen.

e. The planners should take help of various quantitative techniques to judge the stability of an alternative.

**4. Formulation of derivative plans**

a. Derivative plans are the sub plans or secondary plans which help in the achievement of main plan.

b. Secondary plans will flow from the basic plan. These- are meant to support and expediate the achievement of basic plans.

c. These detail plans include policies, procedures, rules, programmes, budgets, schedules, etc. For example, if profit maximization is the main aim of the enterprise, derivative plans will include sales maximization, production maximization, and cost minimization.

d. Derivative plans indicate time schedule and sequence of accomplishing various tasks.

**5. Securing Co-operation**

a. After the plans have been determined, it js necessary rather advisable to take subordinates or those who have to implement these plans into confidence.

b. The purposes behind taking them into confidence are :-

c. Subordinates may feel motivated since they are involved in decision making process.

d. The organization may be able to get valuable suggestions and improvement in formulation as well as implementation of plans.

e. Also the employees will be more interested in the execution of these plans.

**6. Follow up/Appraisal of plans**

a. After deposing a particular cpurse of action-, it is put into action.

b. After the selected plan is implemented, it is important to appraise its effectiveness.

c. This is done on the basis of feedback or information received from departments or persons concerned.

d. This enables the management to correct deviations or modify the plan.

e. This step establishes a link between planning and controlling function.

f. The follow up must go side by side the implementation of plans so that in the light of observations made, future plans can be made more realistic.

### 4.18.2 Characteristics of planning

1. **Planning is goal-oriented.**
   a. Planning is made to achieve desired objective of business.
   b. The goals established should general acceptance otherwise individual efforts & energies will go misguided and misdirected.
   c. Planning identifies the action that would lead to desired goals quickly & economically.
   d. It provides sense of direction to various activities. E.g. Maruti Udhyog is trying to capture once again Indian Car Market by launching diesel models.
2. **Planning is looking ahead.**
   a. Planning is done for future.
   b. It requires peeping in future, analyzing it and predicting it.
   c. Thus planning is based on forecasting.
   d. A plan is a synthesis of forecast. .
   e. It is a mental predisposition for things to happen in future.
3. **Planning is an intellectual process.**
   a. Planning is a mental exercise involving creative thinking, sound judgement and imagination.
   b. It is not a mere guesswork but a rotational thinking.
   c. A manager can prepare sound plans only if he has sound judgement, foresight and imagination.
   d. Planning is always based on goals, facts and considered estimates.
4. **Planning involves choice & decision making.**
   a. Planning essentially involves choice among various alternatives.
   b. Therefore, if there is only one possible course of action, there is no need planning because there is no choice.
   c. Thus, decision making is an integral part of planning.
   d. A manager is surrounded by no. of alternatives; He has to pick the best depending upon requirements & resources of the enterprises.
5. **Planning is the primary function of management/Prirpacy of Planning.**
   a. Planning lays foundation for other functions of management.
   b. It serves as a guide for organizing, staffing, directing and controlling.

c. All the functions of management are performed within the framework of plans laid out.

d. Therefore planning is the basic or fundamental function of management.

**6. Planning is a Continuous Process.**

a. Planning is a never ending function due to the dyrfamic business environment.

b. Plans are also prepared for specific period f time and at the end of that period, plans are subjected to revaluation and review in the light of new requirements and changing conditions.

c. Planning never comes into end till the enterprise exists issues, problems may keep cropping up and they have to be tackled by planning effectively.

**7. Planning is all Pervasive.**

a. It is required at all levels of management and in all departments of enterprise.

b. Of course, the scope of planning may differ from one level to another.

c. The top level may be more concerned about planning the organization as a whole whereas the middle level rnay be more specific in departmental plans and the lower level plans implementation of the same.

**8. Planning is designed for efficiency.**

a. Planning leads to accomplishment of objectives at the minimum possible cost.

b. It avoids wastage of resources and ensures adequate and optimum utilization of resources.

c. A plan is worthless or useless if it does not value the cost incurred on it.

d. Therefore planning must lead to saving of time, effort and money.

e. Planning leads to proper utilization of men, money, materials, methods and machines.

**9. Planning is Flexible.**

a. Planning is done for the future.

b. Since future is unpredictable, planning must provide enough room to cope with the changes in customer's demand, competition, govt, policies etc.

c. Under changed circumstances, the original plan of action must be revised and updated to male it more practical.

## 4.18.3 Advantages of planning

**1. Planning facilitates management by objectives.**

a. Planning begins with determination of objectives.

b. It highlights the purposes for which various activities are to be undertaken.

c. In fact, it makes objectives more clear and specific.

d. Planning helps in focusing the attention of employees on the objectives or goals of enterprise

e. Without planning an organization has no guide.

f. Planning compels manager to prepare a Blue-print of the courses of action to be followed for accomplishment of objectives.

g. Therefore, planning brings order and rationality into the organization.

**2. Planning minimizes uncertainties.**

a. Business is full of uncertainties.

b. There are risks of various types due to uncertainties.

c. Planning helps in reducing uncertainties of future as it involves anticipation of future events.

d. Although future cannot be predicted with cent percent accuracy but planning helps management to anticipate future and prepare for risks by necessary provisions to meet unexpected turn of events.

e. Therefore with the help of planning, uncertainties can be forecasted which helps in preparing standbys as a result, uncertainties are minimized to a great extent.

**3. Planning facilitates co-ordination.**

a. Planning revolves around organizational goals.

b. All activities are directed towards common goals.

c. There is an integrated effort throughout:the.enterprise in various departments and groups.

d. It avoids duplication of efforts. In other words, it leads to better co-ordination.

e. It helps in finding out problems of work performance and aims at rectifying the same.

**4. Planning improves employee's moral.**

a. Planning creates an atmosphere of order and discipline in organization.

b. Employees know in advance what is expected,,of them and therefore conformity can be achieved easily.

c. This encourages employees to show their best and also earn reward for the same.

d. Planning creates a healthy attitude towards work environment which helps in boosting employees moral and efficiency.

**5. Planning helps in achieving economies.**

a. Effective planning secures economy since itieads to orderly allocation ofresources to various operations.

b. It also facilitates optimum utilization of resources which brings economy in operations.

c. It also avoids wastage of resources by selecting most appropriate use that will contribute to the objective of enterprise. For example; raw materials can be purchased in bulk and transportation cost can be minimized. At the same time it ensures regular supply for the production department, that is, overall efficiency.

**6. Planning facilitates controlling**

a. Planning facilitates existence of certain planned goals and standard of performance.

b. It provides basis of controlling.

c. We cannot think of an effective system of controlling without existence of well thought out plans.

d. Planning provides pre-determined goals against which actual performance is compared.

e. In fact, planning and controlling are the two sides of a same coin. If planning is root, controlling is the fruit.

**7. Planning provides competitive edge**

a. Planning provides competitive edge to the enterprise over the others which do not have effective planning. This is because of the fact that planning may involve changing in work methods, quality, quantity designs, extension of work, redefining of goals, etc.

b. With the help of forecasting not only the enterprise secures its future but at the same time it is able to estimate the future motives of it's competitor which helps in facing future challenges.

c. Therefore, planning leads to best utilization of possible resources, improves quality of production and thus the competitive strength of the enterprise is improved.

**8. Planning encourages innovations**

a. In the process of planning, managers have the opportunities of suggesting ways and means of improving performance.

b. Planning is basically a decision making function which involves creative thinking and imagination that ultimately leads to innovation of methods and operations for growth and prosperity of the enterprise.

### 4.18.4 Disadvantages of planning

***Internal Limitations***

There are several limitations of planning. Some of them are inherit in the process of planning like rigidity and other arise due to shortcoming of the techniques of planning and in the planners themselves.

**1. Rigidity**

a. Planning has tendency to make administration inflexible.

b. Planning implies prior determination of policies, procedures and programmes and a strict adherence to them in all circumstances.

c. There is no scope for individual freedom.

d. The development of employees is highly doubted because of which management might have faced lot of difficulties in future.

e. Planning therefore introduces inelasticity and discourages individual initiative and experimentation.

**2. Misdirected Planning**

a. Planning may be used to serve individual interestS rather than the interest of the enterprise.

b. Attempts can be made to influence setting of objectives, formulation of plans and programmes to suit ones own requirement rather than that of whole organization.

c. Machinery of planning can never be freed of'bias. Every planner has his own likes, dislikes, preferences, attitudes and interests which is reflected in planning.

**3. Time consuming**

a. Planning is a time consuming process because it involves collection of information, it's analysis and interpretation thereof. This entire process takes a lot of time specially where there are a number of alternatives available.

b. Therefore plannirig is not suitable during emergency or crisis when quick decisions are required.

**4. Probability in planning**

a. Planning is based on forecasts which are mere estimates about future.

b. These estimates may prove to be inexact due to the uncertainty of future.

c. Any change in the anticipated situation may render plans ineffective.

d. Plans do not always reflect real situations inspite of the sophisticated techniques of forecasting because future is unpredictable.

e. Thus, excessive reliance on plans may prove to be fatal.

**5. False sense of security**

a. Elaborate planning may create a false sense of security to the effect that everything is taken for granted.

b. Managers assume that as long as they work as per plans, it is satisfactory.

c. Therefore they fail to take up timely actions and an opportunity is lost.

d. Employees are more concerned about fulfillment of plan performance rather than any kind of change.

**6. Expensive**

a. Collection, analysis and evaluation of different information, facts and alternatives involves a lot of *;i* expense in terms of time, effort and money

b. According to Koontz and O'Donell, ' Expenses on planning should never exceed the estimated I benefits from planning.'

***External Limitations of Planning***

1. Political Climate- Change of government from Congress to some other political party, etc.
2. Labour Union- Strikes, lockouts, agitations.
3. Technological changes- Modern techniques and equipments, computerization.
4. Policies of competitors- Eg. Policies of Coca Cola and Pepsi.
5. Natural Calamities- Earthquakes and floods.
6. Changes in demand and prices- Change in fashion, change in tastes, change in income level, demand falls, price falls, etc.

## ANNEX F
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## Paper III

# Regulatory & Management Skill

# Unit - 1 ❑ Supervisory & Management Skill

**Structure**



## 1.1 Supervisor

Supervisor has got an important role to play in factory management. Supervision means overseeing the subordinates at work at the factory level. The supervisor is a part of the management team and he holds the designation of first line managers. He is a person who has to perform many functions which helps in achieving productivity. Therefore, supervisor can be called as the only manager who has an important role at execution level. There are certain philosophers who call supervisors as workers. There are yet some more philosophers who call them as managers. But actually he should be called as a manager or operative manager. His primary job is to manage the workers at operative level of management.

A supervisor plays multidisciplinary role at one time like —

**As a Planner -** A supervisor has to plan the daily work schedules in the factory. At the same time he has to divide the work to various workers according to their abilities.

**As a Manager -** It is rightly said that a supervisor is a part of the management team of an enterprise. He is, in fact, an operative manager.

**As a Guide and Leader -** A factory supervisor leads the workers by guiding them the way of perform their daily tasks. In fact, he plays a role of an inspirer by telling them.

**As a Mediator -** A Supervisor is called a linking pin between management and workers. He is the spokesperson of management as well as worker.

**As an Inspector -** An important role of supervisor is to enforce discipline in the factory. For this, the work includes checking progress of work against the time schedule, recording the work performances at regular intervals and reporting the deviations if any from those. He can also frame rules and regulations which have to be followed by workers during their work.

**As a Counselor -** A supervisor plays the role of a counselor to the worker's problem. He has to perform this role in order to build good relations and co-operation from workers. This can be done not only by listening to the grievances but also handling the grievances and satisfying the workers.

Therefore, we can say that effective and efficient supervision helps in serving better work performance, building good human relations, creating a congenial and co-operative environment. This all helps in increasing productivity.

**Functions of Supervisor**

Supervisor, being the manager in a direct contact with the operatives, has got multifarious function to perform. The objective behind performance of these functions is to bring stability and soundness in the organization which can be secured through increase in profits which is an end result of higher productivity. Therefore, a supervisor should be concerned with performing the following functions -

***1. Planning and Organizing -*** Supervisor's basic role is to plan the daily work schedule of the workers by guiding them the nature of their work and also dividing the work amongst the workers according to their interests, aptitudes, skills and interests.

***2. Provision of working conditions -*** A supervisor plays an important role in the physical setting of the factory and in arranging the physical resources at right place. This involves providing proper sitting place, ventilation, lighting, water facilities etc. to workers. His main responsibility is here to provide healthy and hygienic condition to the workers.

***3. Leadership and Guidance -*** A supervisor is the leader of workers under him. He leads the workers and influences them to work their best. He also guides the workers by fixing production targets and by providing them instruction and guidelines to achieve those targets.

***4. Motivation -*** A supervisor plays an important role by providing different incentives to workers to perform better. There are different monetary and non-monetary incentives which can inspire the workers to work better.

***5. Controlling -*** Controlling is an important function performed by supervisor. This will involve

- ❖ Recording the actual performance against the time schedule.
- ❖ Checking of progress of work.
- ❖ Finding out deviations if any and making solutions
- ❖ If not independently solved, reporting it to top management.

***6. Linking Pin -*** A supervisor proves to be a linking pin between management and workers. He communicates the policies of management to workers also passes instructions to them on behalf of management. On the other hand, he has a close contact with the workers and therefore can interact the problems, complaints, suggestions, etc to the management. In this way, he communicates workers problems and brings it to the notice of management.

***7. Conflict/Grievance Handling -*** The supervisor can handle the grievances of the workers effectively for this he has to do the following things :-

- ❖ He can be in direct touch with workers.
- ❖ By winning the confidence of the workers by solving their problems.
- ❖ By taking worker problems on humanitarian grounds.

If he cannot tackle it independently, he can take the help and advice of management to solve it.

***8. Reporting -*** A supervisor has got an important role to report about the cost, quality and any such output which can be responsible for increasing productivity. Factors like cost, output, performance, quality, etc can be reported continually to the management.

**Introducing new work methods -** The supervisor here has to be conscious about the environment of market and competition present. Therefore he can innovate the techniques of production. He can shift the workers into fresh schedules whenever possible. He can also try this best to keep on changing and improving to the physical environment around the workers. This will result in

- ❖ Higher productivity,
- ❖ High Morale of Workers,
- ❖ Satisfying working condition,
- ❖ Improving human relations,
- ❖ Higher Profits, and
- ❖ High Stability

**Enforcing Discipline -** A supervisor can undertake many steps to maintain discipline

in the concern by regulating checks and measures, strictness in orders and instructions, keeping an account of general discipline of factory, implementing penalties and punishments for the indiscipline workers. All these above steps help in improving the overall discipline of the factory.

**Levels of Management**

The term "Levels of Management' refers to a line of demarcation between various managerial positions in an organization. The number of levels in management increases when the size of the business and work force increases and vice versa. The level of management determines a chain of command, the amount of authority & status enjoyed by any managerial position. The levels of management can be classified in three broad categories:

1. Top level / Administrative level
2. Middle level / Executory
3. Low level / Supervisory / Operative / First-line managers

Managers at all these levels perform different functions. The role of managers at all the three levels is discussed below:

**Top Level of Management**

It consists of board of directors, chief executive or managing director. The top management is the ultimate source of authority and it manages goals and policies for an enterprise. It devotes more time on planning and coordinating functions.

1. The role of the top management can be summarized as follows -
2. Top management lays down the objectives and broad policies of the enterprise.
3. It issues necessary instructions for preparation of department budgets, procedures, schedules etc.
4. It prepares strategic plans & policies for the enterprise.
5. It appoints the executive for middle level i.e. departmental managers.
6. It controls & coordinates the activities of all the departments.
7. It is also responsible for maintaining a contact with the outside world.
8. It provides guidance and direction.
9. The top management is also responsible towards the shareholders for the performance of the enterprise.

**Middle Level of Management**

The branch managers and departmental managers constitute middle level. They are responsible to the top management for the functioning of their department. They devote more time to organizational and directional functions. In small organization, there is only one layer of middle level of management but in big enterprises, there may be senior and junior middle level management. Their role can be emphasized as -

1. They execute the plans of the organization in accordance with the policies and directives of the top management.
2. They make plans for the sub-units of the organization.
3. They participate in employment & training of lower level management.
4. They interpret and explain policies from top level management to lower level.
5. They are responsible for coordinating the activities within the division or department.
6. It also sends important reports and other important data to top level management.
7. They evaluate performance of junior managers.
8. They are also responsible for inspiring lower level managers towards better performance.

**Lower Level of Management**

Lower level is also known as supervisory / operative level of management. It consists of supervisors, foreman, section officers, superintendent etc. According to R.C. Davis, "Supervisory management refers to those executives whose work has to be largely with personal oversight and direction of operative employees". In other words, they are concerned with direction and controlling function of management. Their activities include -

1. Assigning of jobs and tasks to various workers.
2. They guide and instruct workers for day to day activities.
3. They are responsible for the quality as well as quantity of production.
4. They are also entrusted with the responsibility of maintaining good relation in the organization.
5. They communicate workers problems, suggestions, and recommendatory appeals etc to the higher level and higher level goals and objectives to the workers.
6. They help to solve the grievances of the workers.
7. They supervise & guide the sub-ordinates.

8. They are responsible for providing training to the workers.
9. They arrange necessary materials, machines, tools etc for getting the things done.
10. They prepare periodical reports about the performance of the workers.
11. They ensure discipline in the enterprise.
12. They motivate workers.
13. They are the image builders of the enterprise because they are in direct contact with the workers.

## 1.2 Planning Function of Management

Planning means looking ahead and chalking out future courses of action to be followed. It is a preparatory step. It is a systematic activity which determines when, how and who is going to perform a specific job. Planning is a detailed programme regarding future courses of action. It is rightly said "Well plan is half done". Therefore planning takes into consideration available & prospective human and physical resources of the organization so as to get effective co-ordination, contribution & perfect adjustment. It is the basic management function which includes formulation of one or more detailed plans to achieve optimum balance of needs or demands with the available resources.

According to Urwick, "Planning is a mental predisposition to do things in orderly way, to think before acting and to act in the light of facts rather than guesses". Planning is deciding best alternative among others to perform different managerial functions in order to achieve predetermined goals.

According to Koontz & O'Donell, "Planning is deciding in advance what to do, how to do and who is to do it. Planning bridges the gap between where we are to, where we want to go. It makes possible things to occur which would not otherwise occur".

Steps in Planning Function

Planning function of management involves following steps:-

**1. Establishment of objectives**

a. Planning requires a systematic approach.

b. Planning starts with the setting of goals and objectives to be achieved.

c. Objectives provide a rationale for undertaking various activities as well as indicate direction of efforts.

d. Moreover objectives focus the attention of managers on the end results to be achieved.

e. As a matter of fact, objectives provide nucleus to the planning process. Therefore, objectives should be stated in a clear, precise and unambiguous language. Otherwise the activities undertaken are bound to be ineffective.

f. As far as possible, objectives should be stated in quantitative terms. For example, Number of men working, wages given, units produced, etc. But such an objective cannot be stated in quantitative terms like performance of quality control manager, effectiveness of personnel manager.

g. Such goals should be specified in qualitative terms.

h. Hence objectives should be practical, acceptable, workable and achievable.

**2. Establishment of Planning Premises**

a. Planning premises are the assumptions about the lively shape of events in future.

b. They serve as a basis of planning.

c. Establishment of planning premises is concerned with determining where one tends to deviate from the actual plans and causes of such deviations.

d. It is to find out what obstacles are there in the way of business during the course of operations.

e. Establishment of planning premises is concerned to take such steps that avoids these obstacles to a great extent.

f. Planning premises may be internal or external. Internal includes capital investment policy, management labour relations, philosophy of management, etc. Whereas external includes socio- economic, political and economical changes.

g. Internal premises are controllable whereas external are non- controllable.

**3. Choice of alternative course of action**

a. When forecast are available and premises are established, a number of alternative course of actions have to be considered.

b. For this purpose, each and every alternative will be evaluated by weighing its pros and cons in the light of resources available and requirements of the organization.

c. The merits, demerits as well as the consequences of each alternative must be examined before the choice is being made.

d. After objective and scientific evaluation, the best alternative is chosen.

e. The planners should take help of various quantitative techniques to judge the stability of an alternative.

**4. Formulation of derivative plans**

a. Derivative plans are the sub plans or secondary plans which help in the achievement of main plan.

b. Secondary plans will flow from the basic plan. These are meant to support and expediate the achievement of basic plans.

c. These detail plans include policies, procedures, rules, programmes, budgets, schedules, etc. For example, if profit maximization is the main aim of the enterprise, derivative plans will include sales maximization, production maximization, and cost minimization.

d. Derivative plans indicate time schedule and sequence of accomplishing various tasks.

**5. Securing Co-operation**

a. After the plans have been determined, it is necessary rather advisable to take subordinates or those who have to implement these plans into confidence.

b. The purposes behind taking them into confidence are :-

c. Subordinates may feel motivated since they are involved in decision making process.

d. The organization may be able to get valuable suggestions and improvement in formulation as well as implementation of plans.

e. Also the employees will be more interested in the execution of these plans.

**6. Follow up/Appraisal of plans**

a. After choosing a particular course of action, it is put into action.

b. After the selected plan is implemented, it is important to appraise its effectiveness.

c. This is done on the basis of feedback or information received from departments or persons concerned.

d. This enables the management to correct deviations or modify the plan.

e. This step establishes a link between planning and controlling function.

f. The follow up must go side by side the implementation of plans so that in the light of observations made, future plans can be made more realistic.

**Characteristics of Planning**

1. **Planning is goal-oriented.**

a. Planning is made to achieve desired objective of business.

b. The goals established should general acceptance otherwise individual efforts & energies will go misguided and misdirected.

c. Planning identifies the action that would lead to desired goals quickly & economically.

d. It provides sense of direction to various activities. E.g. Maruti Udhyog is trying to capture once again Indian Car Market by launching diesel models.

2. **Planning is looking ahead.**

a. Planning is done for future.

b. It requires peeping in future, analyzing it and predicting it.

c. Thus planning is based on forecasting.

d. A plan is a synthesis of forecast.

e. It is a mental predisposition for things to happen in future.

3. **Planning is an intellectual process.**

a. Planning is a mental exercise involving creative thinking, sound judgement and imagination.

b. It is not a mere guesswork but a rotational thinking.

c. A manager can prepare sound plans only if he has sound judgement, foresight and imagination.

d. Planning is always based on goals, facts and considered estimates.

4. **Planning involves choice & decision making.**

a. Planning essentially involves choice among various alternatives.

b. Therefore, if there is only one possible course of action, there is no need planning because there is no choice.

c. Thus, decision making is an integral part of planning.

d. A manager is surrounded by no. of alternatives. He has to pick the best depending upon requirements & resources of the enterprises.

5. **Planning is the primary function of management / Primacy of Planning.**

a. Planning lays foundation for other functions of management.

b. It serves as a guide for organizing, staffing, directing and controlling.

c. All the functions of management are performed within the framework of plans laid out.

d. Therefore planning is the basic or fundamental function of management.

**6. Planning is a Continuous Process.**

a. Planning is a never ending function due to the dynamic business environment.

b. Plans are also prepared for specific period f time and at the end of that period, plans are subjected to revaluation and review in the light of new requirements and changing conditions.

c. Planning never comes into end till the enterprise exists issues, problems may keep cropping up and they have to be tackled by planning effectively.

**7. Planning is all Pervasive.**

a. It is required at all levels of management and in all departments of enterprise.

b. Of course, the scope of planning may differ from one level to another.

c. The top level may be more concerned about planning the organization as a whole whereas the middle level may be more specific in departmental plans and the lower level plans implementation of the same.

**8. Planning is designed for efficiency.**

a. Planning leads to accomplishment of objectives at the minimum possible cost.

b. It avoids wastage of resources and ensures adequate and optimum utilization of resources.

c. A plan is worthless or useless if it does not value the cost incurred on it.

d. Therefore planning must lead to saving of time, effort and money.

e. Planning leads to proper utilization of men, money, materials, methods and machines.

**9. Planning is Flexible.**

a. Planning is done for the future.

b. Since future is unpredictable, planning must provide enough room to cope with the changes in customer's demand, competition, govt. policies etc.

c. Under changed circumstances, the original plan of action must be revised and updated to male it more practical.

**Advantages of Planning**

**1. Planning facilitates management by objectives.**

a. Planning begins with determination of objectives.
b. It highlights the purposes for which various activities are to be undertaken.
c. In fact, it makes objectives more clear and specific.
d. Planning helps in focusing the attention of employees on the objectives or goals of enterprise.
e. Without planning an organization has no guide.
f. Planning compels manager to prepare a Blue-print of the courses of action to be followed for accomplishment of objectives.
g. Therefore, planning brings order and rationality into the organization.

**2. Planning minimizes uncertainties.**

a. Business is full of uncertainties.
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b. Employees know in advance what is expected of them and therefore conformity can be achieved easily.

c. This encourages employees to show their best and also earn reward for the same.

d. Planning creates a healthy attitude towards work environment which helps in boosting employees moral and efficiency.

**5. Planning helps in achieving economies.**

a. Effective planning secures economy since it leads to orderly allocation ofresources to various operations.

b. It also facilitates optimum utilization of resources which brings economy in operations.

c. It also avoids wastage of resources by selecting most appropriate use that will contribute to the objective of enterprise. For example, raw materials can be purchased in bulk and transportation cost can be minimized. At the same time it ensures regular supply for the production department, that is, overall efficiency.

**6. Planning facilitates controlling**

a. Planning facilitates existence of certain planned goals and standard of performance.

b. It provides basis of controlling.

c. We cannot think of an effective system of controlling without existence of well thought out plans.

d. Planning provides pre-determined goals against which actual performance is compared.

e. In fact, planning and controlling are the two sides of a same coin. If planning is root, controlling is the fruit.

**7. Planning provides competitive edge**

a. Planning provides competitive edge to the enterprise over the others which do not have effective planning. This is because of the fact that planning may involve changing in work methods, quality, quantity designs, extension of work, redefining of goals, etc.

b. With the help of forecasting not only the enterprise secures its future but at the same time it is able to estimate the future motives of it's competitor which helps in facing future challenges.

c. Therefore, planning leads to best utilization of possible resources, improves quality of production and thus the competitive strength of the enterprise is improved.

**8. Planning encourages innovations**

a. In the process of planning, managers have the opportunities of suggesting ways and means of improving performance.

b. Planning is basically a decision making function which involves creative thinking and imagination that ultimately leads to innovation of methods and operations for growth and prosperity of the enterprise.

**Disadvantages of Planning**

**Internal Limitations**

There are several limitations of planning. Some of them are inherit in the process of planning like rigidity and other arise due to shortcoming of the techniques of planning and in the planners themselves.

**1. Rigidity**

a. Planning has tendency to make administration inflexible.

b. Planning implies prior determination of policies, procedures and programmes and a strict adherence to them in all circumstances.

c. There is no scope for individual freedom.

d. The development of employees is highly doubted because of which management might have faced lot of difficulties in future.

e. Planning therefore introduces inelasticity and discourages individual initiative and experimentation.

**2. Misdirected Planning**

a. Planning may be used to serve individual interests rather than the interest of the enterprise.

b. Attempts can be made to influence setting of objectives, formulation of plans and programmes to suit ones own requirement rather than that of whole organization.

c. Machinery of planning can never be freed of bias. Every planner has his own likes, dislikes, preferences, attitudes and interests which is reflected in planning.

**3. Time consuming**

a. Planning is a time consuming process because it involves collection of information, it's analysis and interpretation thereof. This entire process takes a lot of time specially where there are a number of alternatives available.

b. Therefore planning is not suitable during emergency or crisis when quick decisions are required.

**4. Probability in planning**

a. Planning is based on forecasts which are mere estimates about future.
b. These estimates may prove to be inexact due to the uncertainty of future.
c. Any change in the anticipated situation may render plans ineffective.
d. Plans do not always reflect real situations inspite of the sophisticated techniques of forecasting because future is unpredictable.
e. Thus, excessive reliance on plans may prove to be fatal.

**5. False sense of security**

a. Elaborate planning may create a false sense of security to the effect that everything is taken for granted.
b. Managers assume that as long as they work as per plans, it is satisfactory.
c. Therefore they fail to take up timely actions and an opportunity is lost.
d. Employees are more concerned about fulfillment of plan performance rather than any kind of change.

**6. Expensive**

a. Collection, analysis and evaluation of different information, facts and alternatives involves a lot of expense in terms of time, effort and money
b. According to Koontz and O'Donell, ' Expenses on planning should never exceed the estimated benefits from planning. '

**External Limitations of Planning**

1. Political Climate- Change of government from Congress to some other political party, etc.
2. Labour Union- Strikes, lockouts, agitations.
3. Technological changes- Modern techniques and equipments, computerization.
4. Policies of competitors- Eg. Policies of Coca Cola and Pepsi.
5. Natural Calamities- Earthquakes and floods.
6. Changes in demand and prices- Change in fashion, change in tastes, change in income level, demand falls, price falls, etc.

## 1.3 Concept of Planning in Safety Management

Planning forms the backbone of any management activity including industrial safety management. Planning involves decisions making in advance taking due account of the

constraints and priorities, resource available and shape of things to come in future. Anticipation of goals choosing between alternatives, the possible pitfalls and lacuna during woking, any bottlenecks in the smooth functioning of various activities are some of the main concern of a systematic planning. Clarity of vision intellectual acumen and strong but conscious determination pave the way to success so far as planning is concerned.

**Basic Considerations for Planning Safety Management**

Basic considerations for planning safety management encompasses the following :

1. Participating of Workers. Workers must be exhorted to be safety conscious. The socio-economic background,attitudes towards safety of the workers may be assessed so that right type of training may be imparted to them.
2. Experience of Workers. The experience of workers play a pivotal role in containing hazards to a great extent. The novice among the workers should have interaction with the experienced worker so that adequate knowledge may be disseminated among the new entrants.
3. Age and Other Factor of Worker. The age of the workers as well as their salient traits have some bearing on safety. Hence the age as well as traits of the workers must have due consideration for building up strategy management.
4. Actual Working Procedures and the Working Conditions. A safe layout, a safe working procedure a safe working condition all contribute individually or collectively in the field of safety management. A poor layout, defective working procedure, wom out machines lack of repair and maintenance and last but not the least an uncongenial working environment have deleterious effect in the field of safety management.
5. Past Experience of Planning. Past experience of planning plays a very important role in chalking out future line of action in safety planning. The successful as well as the unsuccessful experiments of the past can help to formulate superior planning standard.
6. Role of Employee or Management. The role of employee or management in including the norms of safety among workers is a very important consideration for safety planning. Mutual cooperation and understanding between the management and the workers is the touchstone for a successful planning in safety management.

## Framing Safety Policies

While framing or formulating safety policies the following considerations need attention :

1. Meaning of Policies and Safety Policies. Policy forms the very foundation and core of any management activity. Policies are the basic guidelines which dictate the thinking style as well as the actions to achieve the desired goal or objectives. Policies restrict the arena within which decision are to be taken conformity with the objectives. Hence principles, rules and norms either explicit or implicit set up by the management and others along with the constraints therein fall under the ambit of policies. As a special case of policy making, the safety policy in itself has all the innate characteristics of policy making hitherto stated along with emphasis on the field of safety management.

2. Component or Content of Safety Management.

01. The Target. The target in the field of safety must be defined by the management.
02. The authority. The powers vested with the authority must be defined in unambiguous terms.
03. Norms and standards. The management must be clear regarding norms and standards to be followed.
04. Formation and Functioning of safety committee. Safety committee should be formed and should be vested with adequate powers. The safety committee must be functional and effective and not perfunctory by nature.
05. Safety personnel. The duties of the safety personnel must be well defined so that no confusion arises on this account.
06. Scope and responsibility. Specific person should shoulder and share responsibilities for each action taken in the matter of safety. Accountability is the prime need in all safety management activities. Scope of various personnel in respect of safety must be well- defined in order to have a foolproof safety management system.

## Importance of Safety Policy

Safety policy are very important and absolutely indispensable in order to :

I. Provide a suitable base for coordination of safety activities in the various levels of hierarchies.
II. Provide cogents,coherent and distinct objectives or goals in the field of safety management
III. Provide fruitful cooperation to translate safety activities into action at all levels.

IV. Provide an effect platform for initiations and motivation in the field of safety.

V. Provide a course of action which can ensure that accepted norms of safety are not deviated or violated.

**Effective Safety Policy**

An effective safety policy is characterised by the following:

**A. Flexibility :** The safety policy needs to be flexible and broad- based in the sense that they will provide guideline for the problems which vary in nature such that frequent changes in the policy are avoided.

**B. Explicitness :** The safety policy should be so formulated that explicitness is maintained. This implies that the policy should be in writing and ambiguous terms or statements should be absent in the formulation of the said policy.

**C. Coherence :** The safety policy should be coherent neither contradictory nor at variance with other policies thus maintaining the very essence of compatibility.

**D. Pragmatism :** The safety policies must reflect pragmatism. The viability and the success of the policy lie in the input- output assessment such that the benefits are commensurate with monetary involvements.

**E. Acceptability:** Any safety policy must have clear acceptability among the workers and should enough credibility and sincerity of purpose so that workers do not show a sense of aversion towards the policy.

The formulation of safety policy also includes ways and means to make safety policy positive or effectives. The ways and means to make safety policy positive or effective are contained in the Health and Safety at Work Act 1974. The main features of the said act are as follows:

1. Formulation of self- regulation safety policy by the employers shall be allowed.
2. Employee should be convinced regarding the need and usefulness of the safety policy. This goal can be achieved by ensuring that the workplace as well as the working environment are free from risks. It is to be further ensured that unprecedented risks have been contained through adequates and constant control/vigil.
3. Workers should be taken into confidence and their involvement in the framing of safety policy and decision-making should be welcomed.
4. The safety policy must not includes rules and regulation which are inflexible and compelling by nature.

5. The safety policy shall aim at rewarding persons who exhibit exemplary performance in containing accidents.
6. Safety policy shall be positive and optimistic in approach. The usefulness of safety norms should be highlighted through various information, data and other statements.
7. Safety policy should be specific through flexible in case of certain circumstance.
8. While reviewing the safety policy the workers should be taken into confidence.
9. No relaxation should be allowed in the enforcement of safety policy.

## 1.4 Directing Function of Management

Directing is said to be a process in which the managers instruct, guide and oversee the performance of the workers to achieve predetermined goals. Directing is said to be the heart of management process. Planning, organizing, staffing have got no importance if direction function does not take place.

Directing initiates action and it is from here actual work starts. Direction is said to be consisting of human factors. In simple words, it can be described as providing guidance to workers is doing work. In field of management, direction is said to be all those activities which are designed to encourage the subordinates to work effectively and efficiently. According to Human, "Directing consists of process or technique by which instruction can be issued and operations can be carried out as originally planned" Therefore, Directing is the function of guiding, inspiring, overseeing and instructing people towards accomplishment of organizational goals.

Direction has got following characteristics:

**1. Pervasive Function -** Directing is required at all levels of organization. Every manager provides guidance and inspiration to his subordinates.

**2. Continuous Activity -** Direction is a continuous activity as it continuous throughout the life of organization.

**3. Human Factor -** Directing function is related to subordinates and therefore it is related to human factor. Since human factor is complex and behaviour is unpredictable, direction function becomes important.

**4. Creative Activity -** Direction function helps in converting plans into performance. Without this function, people become inactive and physical resources are meaningless.

**5. Executive Function -** Direction function is carried out by all managers and executives

at all levels throughout the working of an enterprise, a subordinate receives instructions from his superior only.

**6. Delegate Function -** Direction is supposed to be a function dealing with human beings. Human behaviour is unpredictable by nature and conditioning the people's behaviour towards the goals of the enterprise is what the executive does in this function. Therefore, it is termed as having delicacy in it to tackle human behaviour.

**Importance of Directing Function**

Directing or Direction function is said to be the heart of management of process and therefore, is the central point around which accomplishment of goals take place. A few philosophers call Direction as "Life spark of an enterprise". It is also called as on actuating function of management because it is through direction that the operation of an enterprise actually starts. Being the central character of enterprise, it provides many benefits to a concern which are as follows:-

**1. It Initiates Actions -** Directions is the function which is the starting point of the work performance of subordinates. It is from this function the action takes place, subordinates understand their jobs and do according to the instructions laid. Whatever are plans laid, can be implemented only once the actual work starts. It is there that direction becomes beneficial.

**2. It Ingrates Efforts -** Through direction, the superiors are able to guide, inspire and instruct the subordinates to work. For this, efforts of every individual towards accomplishment of goals are required. It is through direction the efforts of every department can be related and integrated with others. This can be done through persuasive leadership and effective communication. Integration of efforts bring effectiveness and stability in a concern.

**3. Means of Motivation -** Direction function helps in achievement of goals. A manager makes use of the element of motivation here to improve the performances of subordinates. This can be done by providing incentives or compensation, whether monetary or non - monetary, which serves as a "Morale booster" to the subordinates Motivation is also helpful for the subordinates to give the best of their abilities which ultimately helps in growth.

**4. It Provides Stability -** Stability and balance in concern becomes very important for long term sun survival in the market. This can be brought upon by the managers with the help of four tools or elements of direction function - judicious blend of persuasive

leadership, effective communication, strict supervision and efficient motivation. Stability is very important since that is an index of growth of an enterprise. Therefore a manager can use of all the four traits in him so that performance standards can be maintained.

**5. Coping up with the changes -** It is a human behaviour that human beings show resistance to change. Adaptability with changing environment helps in sustaining planned growth and becoming a market leader. It is directing function which is of use to meet with changes in environment, both internal as external. Effective communication helps in coping up with the changes. It is the role of manager here to communicate the nature and contents of changes very clearly to the subordinates. This helps in clarifications, easy adaptions and smooth running of an enterprise. For example, if a concern shifts from handlooms to powerlooms, an important change in technique of production takes place. The resulting factors are less of manpower and more of machinery. This can be resisted by the subordinates. The manager here can explain that the change was in the benefit of the subordinates. Through more mechanization, production increases and thereby the profits. Indirectly, the subordinates are benefited out of that in form of higher remuneration.

**6. Efficient Utilization of Resources -** Direction finance helps in clarifying the role of every subordinate towards his work. The resources can be utilized properly only when less of wastages, duplication of efforts, overlapping of performances, etc. doesn't take place. Through direction, the role of subordinates become clear as manager makes use of his supervisory, the guidance, the instructions and motivation skill to inspire the subordinates. This helps in maximum possible utilization of resources of men, machine, materials and money which helps in reducing costs and increasing profits.

From the above discussion, one can justify that direction, surely, is the heart of management process. Heart plays an important role in a human body as it serves the function pumping blood to all parts of body which makes the parts function. In the similar manner, direction helps the subordinates to perform in best of their abilities and that too in a healthy environment. The manager makes use of the four elements of direction here so that work can be accomplished in a proper and right manner. According to Earnest Dale, "Directing is what has to be done and in what manner through dictating the procedures and policies for accomplishing performance standards". Therefore, it is rightly said that direction is essence of management process.

## 1.5 Supervisory Responsibility of Management in Safety

Responsibility of management in the field of safety includes responsibilities of various

line managers and staff specialists in a safety organisation/ department. It also includes the responsibilities of trade unions, government organisation/bodies, international organisation/ bodies in the field of safety. Line managers can be grouped into two sub-heads

1. Plant Manager and
2. Line Supervisor.

Similarly staff specialist specialists can be grouped into two sub-heads viz

1. Safety manager/specialists and
2. Part - Time safety specialist.

Responsibilities of line managers will includes responsibilities of plant managers as well as line supervisors.

**Responsibilities of Plant Manager**

The following are the prime responsibilities of plant manager :

1) Active participation in all safety management activities and programmes.
2) Enforcement of all safety norms.
3) Making adequate provisions against hazards of all types including those due to fire, chemicals etc.
4) Assignment of proper personnel to meet emergency and related rescue- work.
5) Shouldering the overall responsibility of safety management.
6) Delegation of powers to various department to carry out such measures which will ensure safety in each department thus upholding the proper safety standards in each and every department.
7) Submission of the annual safety report highlight the achievements, failures and improvements.
8) Active participation as the permanents chairman of the safety committee.
9) Advising the safety department in connection with special hazards and unforeseen situations.
10) Thorough checking of injury reports and to express views on the same.
11) Encouragement of research and development in the fields of safety including use of modern techniques of safety appraisal.
12) Modernisation of the safety department including inclusion of use of superior personal protective equipments and devices, alarm-systems etc.

**Responsibilities of Line Supervisors**

The following are the main responsibilities of line supervisors :

1. Imparting training and education to all categories of employees (experienced, novice or new entrants as well as transferred) in safety procedures and norms.
2. Assessment of need of safety procedures and their proper enforcement.
3. Regular testing and monitoring of the working environment, plants etc.
4. Actives participants in safety and housekeeping committees.
5. Regular and thorough safety inspections and to exhort the supervisors for proper repairs and maintenance.
6. Acceptance of direct responsibility in the matter of safety programmes.
7. Investigation of all accidents (fatal and non - fatal) and preparation of injury reports.
8. Assignments of special duty for certain experienced employees to help out new entrants or transferred employees not quite conversant with the plant and safety norms.
9. Carrying out of monthly safety meetings.
10. Assisting the personnel to cope with emergency situations as for example accidents due to fire gas leaks etc.
11. Arrangements of special training in case of new equipments or work procedures.
12. Improvements of the safety programme and to enhance the effectiveness of the same.

**Responsibilities of Safety Managers(Full Time)**

The prime responsibilities of full safety managers/specialists are as follows :

1. Assistance in the formation of full time safety committees and its smooth functioning.
2. Assistance to top managers to frame safety policies and continues follows- up actions regarding their enforcement. Attention of concerned managers to be draws in case of any infringement of the said policies so that corrective measures could be adopted in time.
3. Enforcement of all safety norms,rules, regulations,codes and laws relating to safety as envisaged by the central, state or local authorities along with proper maintenance of legal records and necessary reports pertaining to safety.
4. Controlling and monitoring of all activities which are hazardous in nature in order

to wards off accidents resulting into injury, damage to equipments and loss of material or property.

5. Coordination of all department of the organisation which could be involved in prevention of accidents directly or indirectly namely engineering department, medical, fire department and the plant proper.
6. Maintenance of safety information and monitoring of programmes related to detection and suitable rectification of hazardous conditions.
7. The dissemination of knowledge and relevant information regarding safety to all the departments of the organisation.
8. Awareness as to the latest research and development regarding safety equipments and hazardous materials, amendments in laws, regulations, rules,codes,new techniques of accident preventions in the field of safety management.
9. Approval or rejection of plant layouts including plants, ,machineries and equipments( including hazards monitoring, detection and warning equipments) in additions to personal protective equipments followed by recommendation of right type of plant layout and equipments.
10. Imparting training on safety to personnel at various levels.
11. Regular inspection and maintenance of the plant; at the same time, maintenance of all records related to safety.
12. Cooperation with the government agencies and insurance companies and consultants and to carry out the instructions or advice recommended by the relevant authorities.
13. Reviews and recommendation pertaining to all hazardous activities.
14. Incorporation of any revision or improvement in the working procedures and the working environment as deemed ft.
15. Investigations of accidents already occurred with due emphasis on the preventions of recurrence of such accidents.
16. Study and measurement of environmental hazards regarding radiations,noise pollutions, air pollution etc.
17. Complete planning for waste disposal of harmful or toxic wastes in full corroboration with the standards laid down by the pollution control boards.

**Responsibilities of Workers in the Field of Safety**

The following are the major responsibilities of workers :

1. Acquaintance with safety norms, rules,regulations,laws,codes etc.in connection with safety management.
2. Abiding by the instructions,rules and regulations regarding safety.
3. Abiding by the orders of the authorities in the matters of safety.
4. Alacrity on the part of workers while working.
5. Pointing out to the authorities any lacuna in the work procedures, defective tools and machineries,defective controls and lack of repairs and maintenance which may results in hazardous situations.
6. Check on personal habits,as for example alcoholism,drug addiction,untidy habits and manners and clumsy working etc.

**Responsibilities of Government, Social Organisation and Public Authorities**

The following responsibilities and functions are functions are vested upon government and public authorities as well as social organisations so far as industrial safety is concerned :

1. Framing of safety laws and regulations and their enforcement. Safety laws and regulations must be framed with due care taking due account of the prevailing conditions in the industries concerned. These laws and regulations becomes fruitless due to lack of enforcement. Enforcement of safety laws and regulations can be effected through various labours inspectorates,mines inspectorates, factory inspectorates and even other agencies.
2. Research,development and testing. The various state services including labour inspectorates should have adequate laboratory and other facilities in the directions of research, development and testing which should includes testing of materials and equipments, assessment of working conditions including noise pollutions and various other monitoring process like air- pollution control and monitoring . Even the manufacture of proper machine guards,equipments and their quality controls can be handled by various public authorities and social organisations.
3. Safety organisations and associations. Safety organisations and associations could be state sponsored or even manned by social organisations. The functions of these safety organisations and associations are to promote safety in industries as for example national safety council having its headquarters in Bombay is engaged in promotions of safety in industries in a number of ways. In other countries too like U.S.A.,U.K.,Australia etc. safety councils and safety associations are doing yeomen's service in the direction of safety management.

4. Cooperation among the inspectorates management and workers. Utmost cooperation is warranted among inspectorates, management and workers to create a congenial atmosphere where the provisions of safety norms could be maintained by proper interaction between the said constituent partners responsible for safety.
5. Advisory and educative role of state services. The state services have shoulder responsibility in disseminating the knowledge and norms of safety through its labours inspectorate in the forms of safety booklets, safety leaflets, safety posters, safety reports etc. for accidents preventions. In India this task is performed by government departments government sponsored organisations, national safety council etc.
6. Setting up of model state- owned industries. Certains state-owned industries could be set up as ideals so for industries safety management is concerned. These industries can be so perfectly development taking due consideration of industrial safety, that these can act as models to be followed by private industries entrepreneurs. These organisations can be even provide expertise to those private industrial establishment who seek help in safety management.
7. Audio visual aids in safety management. The government sponsored organisations, the private industrial establishment and other social activities can develop programmes to includes the safety management ethos among the workers and the public by arranging suitable exhibitions, establishing museums, advertising through media, holding safety workshops, observing safety weeks and through other safety related activities.

**Responsibilities of International Bodies/Organisation in the Field of Safety**

In the earlier days the following international bodies were responsible for the promoting and maintaining safety in undertakings:

1. International Industrial Accidents Congress. Its first meeting was held in 1889 at Paris.
2. International Association for Legal Protection of Workers. It started functioning in 1898. International bulletin on labour legislation was published in 1902. International industrial accident statistics was compiled in the early 20th century.
3. International Workers Conference. Its first meeting was held in 1916.
4. International Labour Organisation (I.LO). It started functioning in 1919.

However, in the recent years,International Labour Organisation (I.L.O) has played a very significant role in promoting safety in industries globally. Among the major activities of I.LO. the following are of interest.

**Safety Activities of the I.L.O.**

Industrial safety finds an insignificant and unimportant position in the early years of I.L.O. Industrial hygiene was discussed along with other topic in the first session held in 1919. The minimum age for working in an industry was prescribed which was a step towards safety. Prior to 1923, handling of poisonous chemicals was discussed and various conventions and recommendations were suggested in this regards. Further breakthrough occurred in 1923 with first international conference of labour statistics in which recommendations related to classification and rate of industrial accidents were framed. The first safety handbook was published in 1924. A journal on industrial safety survey first appeared in 1925 (later it was rechristened as journal of occupational safety and health in 1951). A correspondence committee on accident prevention was formed in 1925. Experts from several countries were drawn to advise the committee in the matters of safety. The safety convention had its inception in 1929 and was followed by several other conventions. In 1937 experts were drawn from different fields for drafting safety provision for coal mines. Industrial committees started meetings in 1945.

In 1949 another landmark decision in this direction was taken by incorporating the moral code of safety regulation for industrial establishments. International occupational safety and health information centre (also abbreviated as C.I.S.) a non- profit making body under the banner of I.L.O. started functioning in 1959 with the purpose of disseminating information etc. to further the cause of occupational safety and health on a global basis. Notably, with the adoption of the latest conventions and recommendations related to safety, health and working condition in 1981, new chapters were added to the various safety arenas. These conventions and recommendations have in its ambit the prevention of occupational hazards as well as improvement of the working environment. A tripartite approach encompassing formulation, implementation and periodical review of national policy regarding occupational safety, health and working environment has been suggested in the above conventions.

## 1.6 Organization and Management for Safety

**Concept of Safety Management**

The concept of safety management o more precisely speaking industrial safety management is concerned with the elimination of unsafe acts and unsafe condition through proper planning, directing , organising,motivating, communicating and controlling for the overall well-being of

the personnel engaged in industries. Proper managerial and operational activities are envisaged for the prevention of accidents as well as occupational diseases. The measures to be taken should take due account of preventing injuries and occupational diseases by adopting ways and means which should be appropriate less cumbersome and less costly.

**Objectives of Safety Management**

The main objectives of safety management are as follows :

1. To solve safety problems and to take up safety programmes in joint consultation and cooperation with all involved in the matter namely workers, management, consultants etc.
2. To rewards those persons who have shown their excellent performance in the field of safety. The rewards may be in the form of monetary incentives, in the form of certification etc.
3. To see that safety equipment and devices are not inconvenient and cumbersome and any lacuna in this respect must be removed forthwith.
4. To properly explain the safety rules and norms to the workers thus dispelling doubts from their minds.
5. To see that attitude of the safety officers or supervisors towards the workers is that of co- operation and not coercion.

All the above stipulations regarding safety come under the category of positives safety management. Positive safety management thus eliminates to a large extent the negative side of safety by suitably inculcating a positive attitude towards safety for all concerned with stress on rewards and minimise punishment as far as possible.

**Approaches to Safety Management**

These are three distinct schools of thoughts so far as the philosophy or the approach to safety management is concerned. These approaches are as follows :

1. Employee-centered approach.
2. Work-centered approach.
3. A combination of the above two approaches i.e work-cum-employee -centered approach.

I. Employee - centered approach. Mr. H.W. Heinrick, the pioneer in the field of safety management, propounded this concept or approach. This approach aims at creating safety consciousness among employee basically through the elimination of wrong psychological

attitudes. Control of unsafe behaviour and consequent development of safe behaviour among line managers and workers forms the main theme in this system of approach. The problem of safety is viewed from the point of view of the attitudes and behaviour of the people concerned with safety. In this approach it is the onus of the managers to make endeavours so that the people involved in safety can work in a democratic manner through mutual cooperation and joint consultation.

II. Work - centred approach. This basically aims at elimination of physical hazards and attaches only secondary importance to the psychological environment or conditions of the workers. This approach has an innate autocratic style of functioning. Manager's contributing to this approach put more emphasis on improving of poor performance of machines and their designs,rectifying the unsafe layouts, introduction of safe tools,restrictive rules and procedures.

III. Employee - cum- work-centered approach. This approach is an amalgamation of the two approaches hitherto described. This is a modern approach hitherto described. This is a modern approach to safety management in which the basic elements of the two approaches are found galvanised. The advancement of engineering and technology and the psychological perceptions of the workers in a democratic set up have been suitably mingled together to develop the concept of employee-cum-centred approach.

**Comparison of the Work-centered Approach and Employee- centered Approach**

The two approach are being compared with respect to certain salient features as follows:

| Point of Comparison | Employee- centered approach | Work - centered approach |
|---|---|---|
| Basic cause of accident | Unsafe act | Unsafe condition |
| Nature of safety problem | Human problem | Engineering problem |
| Style of Functioning | Democratic | Autocratic |
| Stress on condition of work | Psychological | Physical |
| Method of safety promotion | Educative and motivative | Legal |
| Emphasis on safety through | Altitude of workers and more obligations | Cost consciousness and economy |
| Main thrust areas | Job performance and job enrichment | Job specification experts and automation |

**Motivating Factors for Safe Behaviour**

The following factors constitute motivating factors for the safe behaviours :

1. Genetic factors/hereditary factors.
2. Skuational factors.
3. Environment factors.

Apart from these factors the present behaviour of an employee is the outcome of two parameters namely (i) Past factors and (ii) Current factors. Genetic factors, situational factors and environment factors are elaborated as follows:

I. Genetic factors/hereditary factors. A sound health, robust built,the colour of eyes etc. are greatly influenced by heredity. These genetic factors do influence the behaviour of the workers to a great extent. It may be mentioned that safe behaviour of a worker may be largely depends on sound health conditions.

II. Situational factors. Various situational factors like harsh and domineering behaviour of the management or supervisors towards workers, excessively long duration of work, the nature and type of motivation adopted by the management towards the workers etc.could be responsibility for unsafe behaviour by workers in workplaces. Unfavourable situational factors if any may inhibit the possibility of accidents.

III. Environment factors. Various environment factors can be summarised as follows:

A. Influence during embryonic stage. During the period, the child remains in the womb the behaviour and the lifestyles and other addiction(e.g. Narcotics, drugs etc) of a pregnant mother can causes individual difference in the behaviors of the offspring.

B. Childhood and family background. Childhood experience leave certain indelible imprints on the tenders mind of the child. The goals, the constraints,the rewards, the punishment, the motivations during childhood days exert a tremendous influence on the future behavioural patterns. In additions to this, the family background also shapes and influences individual behavioural patterns. Acquisition of skills, acumen,alertness etc. may be imbibed through a proper family background.

C. Early training and education. Interactions with fellow students, teachers and others in the schools do contribute to personality development, development of scientific outlook, elimination of superstitions and dogma. All these traits combined, help to eliminate unsafe behaviour.

D. Interaction with social groups and the prevailing working environment. Interaction

with social groups as well as the prevailing working environment have tremendous influence in shaping the personality and attitude of workers. The behaviour of an individual can be subjected to a restraining effect due to the presence of a dominant social group and a congenial working environment.

E. Predominant beliefs and cultural practices. Certain beliefs, dogma etc. can lend support to inevitability of accidents. This gives rise to fatalism, which must be dispelled from the minds of workers. Workers may have the notion that accidents are unavoidable and bound to happen even if proper safety measures are adopted. This sort of pessimism may compel the workers to reconcile with their fate and destiny without taking any recourse to precautionary measures.

**Personality Traits, Belief System and Safety**

L. Shaw and H. Sichel in their investigation and studies of accident proneness in 1971 have identified various personality traits/characteristics which account for safe behaviour of the individuals. Accounting to L. Shaw and H. Sichel the personality traits and their impact on safety are mentioned as follows :

1. Good personality from the point of view of safety, comprises of persons with such traits like peaceful,controlled,passive,careful,even tempered and calm.
2. Fair personality from the point view of safety comprises of persons with such traits like reserved,pessimistic,quite,lively and easy going.
3. Poor personality from the point of view of safety comprises of persons with such traits like rigid,anxious,talkative,responsive,moody,sober.
4. Bad personality from the point of view of safety, comprises of persons with such traits like aggressive, impulsive,optimistic,active,restless,excitable.

In the light of the above finding, the services of expert psychologists can be available to identity the personality types. The undesirable personality types i.e poor and the bad type can be easily weeded out at the time of selection of workers and, in case of employed workers these types i.e. poor and the bad types may be kept under strict watch and control to prevent any unsafe behavior on their part.

Another pioneer work in this direction of accident proneness studies has been camed out by O.J. Harvey on the basis of belief systems. This concept of belief system as system I, system II, system III, system IV.

**System I.** Individuals falling under system I are characterised by orthodoxy and rigidity in approach; as a result, these people stick to rules and norms, and their religious

and political beliefs are so firms that they are peeved at the slightest deviation from their avowed belief. They bank traditions, supernaturalism and are averse to changes. In this system father's positions in the family happens to be more dominant that the of the mother . These individuals view the world in a simplistic way. Such individuals bereft of scientific outlook and reasoning, Hence, these individuals bereft of esteem without any proper reasoning. Hence , these individuals bereft of scientific outlook and reasoning and with questionable safe behaviour find it difficult to accept safety rules and policy.

**System II.** Individuals falling under system II are characterised by less orthodoxy and rigidity as compared to individuals falling under system I.

Strong negative attitude towards tradition and institution is a salient feature of the individuals of system II. In this system the individuals are apprehensive of putting their trust and reliance upon persons of authority and power and deprecate the bossism of powerful persons where they are in a subservient(nominal) status. In this system the role of mother is more dominant as compared to father, as a result as result frequent conflicts prop up specially involving children. However,their partial attitude is demonstrated by their behaviour when they acquire power and misuse the same with impunity.

These negative beliefs often get them embroiled in controversies with subsequents alienation from others. Hence with these beliefs firm in their mind these individuals of system II are considered as employees having elements of risk so far as safety is concerned.

**System III.** Individuals falling under III are characterised by their acts and beliefs. Their dependence on persons of high status and power etc. is one of their salient features. The overprotection provided to them during their early upbringing by the mother as well as extreme dependence on persons of high status and power shape their attitudes and beliefs towards life. It is easy to deal with this type of individuals( having amiable nature) so far as safety is concerned.

**System IV.** Individuals falling under system IV are characterised by their open-minded,flexible and pragmatic beliefs and approaches. They are quite at variance with the people of system I as well as system II since they(i.e system IV individuals) possess no obsessions or bias for or against rules. The main thrust in this type is to attain the objectives in a smooth way with least of turmoil. This need as adjusting frame of mind coupled with beliefs and standards based on their reasoning and direct experience. However the family plays an important role in the sense that free thinking is encouraged and no beliefs is imposed upon these individuals. Out of the four systems individuals of system IV happen to be easiest to deals with so far safety management is concerned.

## 1.7 Safety Programme Formulation

Safety programme consists of a combination of such functions primarily intended to minimise the number of injuries and contain hazards so that the goal of industrial safety is achieved. Thus any safety programme basically deals with the identification of hazards coupled with the means to contain o minimise such hazards.

Safety programmes can be classified as preventive or maintenance safety programmes. Preventive safety programmes is basically a long-term tactics after a thorough and judicious planning and investigation. The basic theme is prevention of accidents through formation of safety organisations at various levels,rectification of flaws in the system of design and layout, maintenance of coordination between management and workers. This type of programs seeks improvements in the training and education system of the personnel and tries to locates defects in the analysis of cause of accidents.

The maintenance safety programme is a post-accidents programme of shorts duration. Nothing is pre planned in this system but emergency and temporary arrangement of ad hoc type are made to cater the needs of safety on the basis of priority and emergency.

**Contents of a Safety Programme**

Contents of safety programme may comprise of the following :

1. A typical organisational system. The system refers to an open type system where interactions between various departments,trade unions,government etc. are involved. Further the system is organic by nature in the sense that it contributes toward stability,growth and maturity.
2. The basis of the programme. The programme should be based on certain philosophy and policy. This philosophy and policy in general should be reflected in the execution of the programme itself.
3. Risk specification and hazards. All known process risk must be suitably defined and classified. Similarly all know hazards specially major hazards must be suitably defined and classified. The above exercise will be quite helpful in allocating particular tasks to suitable persons.
4. Allocation and controls of tasks. For all safety programmes allocation of specific task or jobs as well as their controls play a very important role in safety programmes. This includes not only controls including suitables maintenance procedures.
5. Performance control. Performance controls plays a very vital role in safety

programmes. This includes both in- sites and off- sites exercise, safety audits,hazard analysis (HAZAN),inspection methods, investigations on accidents, loss preventions schemes , risk evaluation and control,medical investigation and services etc. encompassing some of the areas of performance control. The authority and responsibility for the above exercise should be vested with experts whose names should also be clearly indicated in the content of safety programme.

6. Maintenance of norms and standards for various procedures and operations etc. The designs, layout, storage, handling, installation, repairs and maintenance, housekeeping etc come under the purview of maintenance of norms and standards for various procedures and operations. This includes machinery, electricals, illuminations, chemicals, protectives clothings and portable equipments. Protection against fire fighting improvement in working conditions, environmental controls and monitoring, maintenance of proper hygiene and welfare of the workers all are include in this context. Proper control is warranted both from the point of view of operations as well as design and selection of materials/equipment.
7. **Information system :** Authentic and pertinent information should be supplied at all levels. Necessary data and information pertaining to technical,medical,statistical etc. in connection with safety management must be readily available. The information services should be cooperative so that necessary informations are available to the concerned personnel with ease. Communication gap is extremely undesirable in connection with information system.

Information system have to be tackled at two stages namely that of problems analysis and decision making. The components of problems analysis are as follows :

**1. Identification of basic problems and priorities:** The basic problems have to be sorted out at the first instance . The problem arising out of the failure of a particular programme, any safety campaign etc. may point to some innate flaw somewhere in the information system. Hence problem analysis has to be taken up with due care and attention that is the problem must be identified and a comprehensive list of all such problem must be drawn up. Moreover, since all the problems may not be simultaneously taken up for solution , therefore, certain problems may need immediate attention whereas certain other problems may not be that of an urgent nature. Hence listing of the problem in order of their priorities has to done to ensure smooth and effectives functioning of any problem.

**2. Statements of the problems in the exact terms :** The problems must be describes in exact terms so the the objectives is crystal clear before the eyes of the analysers.

Collection of data and information is must in this direction. Both facts and opinions are to be collected and properly listed. The data and information should be collected judiciously and without any bias.

**3. Exploration of all possible causes :** On the basis of the informations collected the next step is to identify the possible causes. THe causes can range from lack of training and understanding to failure of working procedure and engineering mechanisms. Hence exploration of all possible causes should be judiciously done through elimination of such causes found to be redundant.

**4. Formulation of a testable hypothesis :** After all the possible causes of accidents have been sorted out, the next step of formulation of a testable hypothesis starts. This implies that the proposition should be exact such that the hypothesis suggested in unequivocal and verifiable. The hypothesis must pinpoint the specific causes and should not be vague in any way.

**5. Analysis of the exact problem :** The problems analysis is a difficult task and must be entrusted to experienced, unbiased and unprejudiced analysts. The testable hypothesis is based on certain assumptions as such in order to know the real causes a problem analysis has to be resorted to. The entire scenario including the chain of events; the history of the persons concerned as well as the working procedures must be assessed while testing a hypothesis involved in the problems analysis. If the whole gamut of things cannot be verified the method of random sampling has to be resorted to.

The decision-making stage should consider the following :

**1. Development of alternative proposals or approach:** This can be achieved through group discussions with initiations from the group leader. All alternatives or new ideas should be recorded. Participants in the group discussion should be encouraged to put forwards their ideas without criticizing the ideas of others. A suitable time slot for discussion on various alternatives solutions should be earmarked during group discussions. New alternatives and ideas can be developed by allocating some times(say an hour) to brainstorming activities during the sessions.

**2. Selection and implementation of action:** The selection of the appropriate action coupled with its proper implementation is a very important aspect of decision making. The best or the optimum solution can be found out only after complete screening of the various alternatives taking due account of the criteria, objectives and constraints. The implementation process must take into account the acceptability of the actions to be taken after proper discussions with the people to be affected by such actions.Unilateral actions can give rise

to grievances and lack of understanding among the workers and the management. In order to achieve a smooth implementation of actions all suggestions, criticisms,innovative ideas etc. must be sympathetically considered to avoid unnecessary confrontations. Some sections of the workers may be obsessed with imaginary and irrational approaches as regarding certain actions. Hence it is imperative on the part of the management to dispel doubts from the mind of all concerned.

## 1.8 Organising and Safety

### Concept of Organising

Organising is the process of identification and categorisation of the tasks to be performed by suitably delegation powers,responsibility etc. as well as establishing coordination between people so as to result in utmost efficiency and smooth functioning related to various activities. This implies that the coordination is sought at all levels in addition to building up of an efficient authority in the entire organisational set-up.

Organising demands a meticulous observance people to carry out or measures:

1. Employment of knowledgeable and experienced people to carry out important jobs or task.
2. Clearly defining the relationship between the various group or individuals at same or different levels.
3. Clear identification of the tasks so that the goal or the objectives may be attained without confusion.
4. To allocate functions with proper subdivisions as the jobs to be performed taking due account of responsibility and credibility of the persons concerned.
5. Proper facilities are to be provided so that people can discharge their duties quite faithfully.
6. Last but not the least the delegation of authority or power should be vested upon proper people specially those having proven track-record and an unblemished previous performance.

### Organisational Systems in Context to Safety

Generally speaking the line manager shoulders the main responsibility of safety management in an organisation. However, the safety department as well as the safety specialist have their definite roles in safety management as both of them advise and provide

due assistance to the line managers in the matters of safety. Since the line manager has to perform his duties and arduous tasks, it is not expected of him to shoulder the whole gamut of responsibility involved in the safety management. With the safety literatures growing in volume by leaps and bounds every year and the introduction of new safety techniques, the line manager becomes extremely burdened if he has to look after the whole arena of safety. Hence creation of separate safety department fortified with safety specialist is warranted under the changed circumstances in industries.

The safety specialist under special circumstances can be entrusted with line authority in a restricted sense in case of emergencies and special delegation powers can be vested to the specialist by the managers themselves. The safety specialist is expected to inculcate the value and importance of safety in the whole system through persuasion and timely advice.

**Role of Safety Department**

The role safety department in an organisation should be viewed in the light of the following:

1. Place of safety department in an organisation, and
2. Organisational structure of the safety department.

**1. Place of Safety Department in an Organisation :** The place or safety department in the organisation could be conceived in the following ways:

A. Direct channel of communication could be established between the safety director and the top management. This implies that the safety director may be directly placed under the managing director or the general manager.

B. The channel of communication between the safety director and the top management through the line manager having direct access to the top management.

C. The safety director may be placed under such persons (as for examples personnel manager etc.) who wields enough power and influence in the organisation itself. In this case the personnel manager should have be good rapport with the line officer.

D. The safety director may be placed under such a boss who has real interest in the safety matters as for example the production manager.

**2. Organisational Structure of the Safety Department :** This organisational structure of the safety department depends upon two factors namely the size of the organisation in the terms of small or large and the territorial location of the organisation. The territorial location may also be referred to as geographical location.

**Organisational Structure in Small Undertakings**

These undertaking being small do not engage a full-time safety expert. Sometimes the safety responsibility may be shouldered by a qualified,experienced and safety trained foreman to cater for the health and medical needs. A physician and a nurse assisted by para-medical staff can be engaged on a part-time basis. A few personnel may be trained to render first-aid services to cope with any minor injury and ailments.

**Organisational Structure in Large Undertakings**

In case of large undertaking where there is a single large plant, a centralised safety department is desirable where safety specialist have to be engaged on a full-time basis. In this case a director of safety may be installed under whom various safety managers dealing with safety may be installed under whom various safety managers dealing with safety planning,safety maintenance,safety inspection, safety research etc. have to perform their duties sincerely. However, in an organisation of the multi plant type characterised by scattered operations, a decentralised safety department may be the right choice. In this system the general manager may be installed under whom a personnel manager may be placed. The personnel manager may become the incharge of the safety department. Various safety managers of the safety department may operate under the personnel manager. A workshop superintendent may be placed under a safety manager. Finally a foreman and safety officer might operate under the workshop superintendent. Under the same general manager, a production manager may function. A number of workshop superintendent may operate under the production manager. Furthermore, a foreman and a safety officer might be placed under each workshop superintendents. Thus in the above context decentralisation is achieved since the safety activities are performed through separate and distinct streams.

**Territorial Organisational Structure**

In case of organisation characterised by scattered operation in farflung regions, aproper strategy to cope with such situations is warranted. In this arrangement the production manager and the personnel manager work under the same general manager. Different regional deputy general manager. Different regional deputy general managers are deputed under the production manager. The deputy managers may look after the work of different territories or regions as for example eastern regional deputy general manager are deputed under the production manager. The deputy managers may look after work of different territories or regions as for example eastern region,northern region, southern regions,western regions. Foremen and safety officers work under these regional deputy managers. In order

to synchronics all the activities of the various territorial regions, a safety department at the headquarters is necessary. The top management frames safety policies which should be followed by the various regional and local units. A regional manager assisted by foremen and safety officers should have to freedom to chalk out and implementation general safety plans. In is the onus of the chief safety personnel at the headquarters that the general safety policy is being followed at all locations. He should also provide assistance and necessary directions to uphold the safety policy.

Safety Responsibilities and Functions Of Various Functionaries task of and Departments in an Organisation

Functions and responsibilities of different functionaries regarding safety in an organisation are as follows:

**Head of the Safety Department Director**

The head of the safety department/safety director is vested with the onerous task of solving safety problems by offering judicious and sustainable solutions as well as promotions of safety at various levels. Basically the head of the safety department has to enforce safe practice and to remove or put check on hazards.

The major functions and responsibilities of the safety director can be summarised as follows:

1. Synchronizing all safety activities related to all departments as for example medical department,fire department,engineering department etc.
2. REgular inspection by himself or through the staff to ascertain and ensure that the safety practises and procedures are being followed in conformity with the relevant standards and acts. Necessary correcting or remedial measures are to be taken in case of any infringement safety procedures, standards,act etc.
3. The design of any new equipment (including safety equipment) has to be duly approved.
4. Controlling directing formulating in the administrative as well as advisory capacity for accident prevention policy and programmes.
5. Closely co-operating and monitoring the training programmes in safety.
6. Maintaining accident records system through staff and devices ways and means for non-recurrence of accidents.
7. Help to include the concept of safety through programmes, safety week, safety training, safety seminars etc.

8. Maintaining suitable liaison and rapport with the safety consultants or professional with exchange of information so as to keep abreast of the latest in safety. This may include research and development (R&D) effort.
9. Fixing up standards for personal protective equipment and other safety devices to be used by the working personnel.
10. To recommend safety measures in connection with new constructions,renovations or repairs.
11. Delegation of certain powers to officers under him to streamline the proper functioning of the safety department.
12. Submission of safety reports periodically to superior officers to make them aware of the status of safety in general.

## 1.9 Functions and Responsibilities of Safety Supervisors

The following are the major functions and responsibilities of safety officers/safety supervisors :

1. To comply with the safety laws,norms and standards.
2. To promptly investigate regarding the cause and the nature of accidents as well as to identify accident prone workers.
3. To inculcate the spirit of safety among workers by launching safety campaigns in the forms of observing safety weeks and through other audio-visual aids including arranging contests, talks and seminars on safety.
4. To coordinate and motivate the safety educational and training programmes among workers.
5. To collect and maintain data and information regarding frequency and severity of accidents.
6. To formulate suitable safety policies and programmes.
7. To identify hazardous tasks and processes as well as hazardous zones in the workplaces with suitable demarcation of such zones.
8. To keep in readiness fire fighting squads,medical support and first aid help for the personnel.
9. To inspect, supervise or investigate all new constructions,new procedures,installation of new equipment from the point of view of safety.

10. To adopt remedial or corrective measures to contain hazards.
11. To report regularly on safety performance as well as accident trends.
12. To ensure that personal protective equipments are in working condition and being used by workers in hazardous situations.
13. To help the safety committee normally as a secretary.
14. To formulate and select suitable remedial and corrective measures in order to contain or minimise unsafe procedures and practices and hazards of various nature.

The functions and responsibilities of different departments regarding safety in an organisation are as follows :

A) Fire Department. Separate fire department are found in large plants. The function and responsibilities of the fire department are as follows:

1. To inspect fire-fighting equipments and to see that they are in working condition.
2. To arrange mock fire-fighting drills from time to time in addition to fire protection surveys.
3. To abide by the latest fire- fighting codes and fire prevention norms.
4. To update review and enforce the fire detection and fire control system in addition to training and educational programmes on fire prevention and fighting.

B) Safety Department. The functions and responsibilities of the safety department are as Follows:

1. To arrange for education and training on safety for the personnel. This includes proper motivation to the workers coupled with inculcating the spirit of safety among them.
2. To maintain adequate safety standards conforming to safety laws as envisaged by central, state and local authorities.
3. To improve and promote the safety system and to advise on safety management. This includes safety campaigns,safety communication system, safety research and development programmes etc.
4. To assess review and grant approval to safety norms,procedures and policies related to plant safety and occupational safety.
5. To carry out safety inspections and surveys and accident inspections pertaining to safety.
6. To identify unsafe conditions and act and try to suggest suitable measures for the

amelioration of the condition of workers affected by these conditions or acts.

C) Maintenance Department. The functions and responsibilities of the maintenance department are as follows :

1. To arrange for medical check- ups at regular intervals for the personnel.
2. To assess the physical capabilities of the workers taking due account of the job requirements.
3. To conduct frequent medical examinations of employees and to assess work injuries, illness(both severe and chronic) so that the general health of the workers does not deteriorate and lead to serious health problems.
4. To start medical treatment with promptness in case of all injuries and to inculcate the spirit of personal hygiene among workers so that small injuries and wrong habits do not escalate the problem to uncontrollable dimensions.
5. To conduct occasional medical surveys in order to assess the working conditions and working environment under which the workers have to operate.

E) Engineering and Design Department. The following are the functions and responsibilities of the engineering and design department :

1. To design such equipment, tools and equipment which are safe enough to work with. This is physical requirement pertaining to workers.
2. To design such plants,tools and equipment which cater for psychological demands of the employees taking due account of convenience, easy workability etc. Ergonomics plays an important role in this case.
3. To take due precautions during actual working and operations involving hazardous machines and jobs thereby ensuring safety t workers to a great extent.

F) Transport Department. The following are the functions and responsibilities of the transport department:

1. To thoroughly inspect vehicles and garages at regular intervals. A report to this effect should be submitted to the safety department.
2. To replace or repair all defective vehicles so that accidents can be averted.
3. To keep the garages clean, free from dirt,oils and greases to avoid slipping and skidding.

G) Inspection Department. The following are the functions and responsibilities of the inspections department:

1. To report regularly to the safety department.
2. To list defective tools and machinery, their location and type in various department and send the information promptly to all concerned.

**Purchase Department**

The following are the functions and responsibilities of the purchase department :

1. To purchase such materials,tools,plants, equipment etc. which are not substandard or defective.
2. To ensure that the purchased goods,articles,machines etc. do not infringe safety norms. In any case the concept of safety should not be compromised with economic considerations or constraints.

# Unit - 2 ❑ Communication & Leadership in Safety Skill

**Structure**



## 2.1 Leadership and Safety

### Concept of Leadership

Leadership is one of the many sterling qualities which enables to attain certain well - defined common goal or objectives through persuasion and understanding. It is binding factor responsible for the development of cohesive groups imbued with the idea of forging ahead towards the common goal. Commanding as well as the initiation of vital steps among the groups are the two important ingredients of a successful leadership. The initiation of vital steps may include motivation proper communications, decision making and sorting out problems etc.

### Concept of Safety Leadership

Safety leadership connotes the ability of personnel related to safety to influence the top management, middle management and lower management in such a way that the spirit of safety is upheld in real forms., the norms and standards of safety are maintained and all the plans and actions related to safety are streamlined in such a way that the organisation remains practically free from accidents and injuries. In order to achieve this goal a particular style of leadership has to be evolved befitting the organisation by thoroughly studying the various leadership styles and then a practical shape has to be incorporated to the evolved style or model in such a way that the said style in effective as well as readily acceptable to all concerned.

The tasks before the safety managers and safety officers are manifold. These managers or officers should possess leadership qualities with the potential of motivating and influencing so that the safety functions and goals are achieved. Safety training to employees, providing incentives for safe performance, improvise methods to reduce hazards to take part in safety campaigns, to monitor safety programmes etc. are some of the tasks the safety manager or the safety officer has to performs.

**Qualities of a Safety Leader**

The following are a few sterling qualities expected of safety leader:

1. Alacrity.
2. Intelligence.
3. Knowledge (including professional knowledge)
4. Responsibility.
5. Originality.
6. Motivation.
7. Persuasiveness.
8. Communication Skill.
9. Adaptability.
10. Confidence.
11. Diligence.
12. Credibility.
13. Affability.
14. Sociability.
15. Tenacity.
16. Sensitivity.
17. Group- feeling.
18. Optimism.

Since the safety leader is expected to performs arduous and emergency rask it is built natural that he must possess such qualities as alacrity, tenacity, responsibility and confidence.

Lack of Knowledge (specially professional knowledge) or intelligence or adaptability will land him into troubles as he has to deal with a plethora of problems of varying nature.

All his actions must exude confidence optimism and right motivation. Since the safety leader has to work in group, he must have adequate knowledge of group processes and should have respect for others, along with a strong sense of social sensitivity. He should not be obsessed with a dictatorial style of functioning rather should possess persuasiveness and affability so as to congenial atmosphere in the whole gamut of safety.

**Leadership Style**

Leadership style also call leadership techniques have great influence on the inter-personal relations of managers as well as the relation between the managers and the managed i.e workers. LEadership styles connote the conspicuous behavioural pattern adopted by the leader to guide or the influence the behaviour of the followers or subordinates. A few common leadership styles are being explained as follows:

1. The autocratic style/authoritarian style.
2. The democratic style.
3. The free- rein style.
4. The bureaucratic style.
5. The charismatic style.
6. The manipulative style.

## 2.2 Communication Skills

No one would talk much in society if they knew how often they misunderstood others.

Communication is the exchange and flow of information and ideas from one person to another; it involves a sender transmitting an idea, information, or feeling to a receiver.

Effective communication occurs only if the receiver understands the exact information or idea that the sender intended to transmit.

**Communication**

**Thought:** First, information exists in the mind of the sender. This can be a concept, idea, information, or feelings.

**Encoding:** Next, a message is sent to a receiver in words or other symbols.

**Decoding:** Lastly, the receiver translates the words or symbols into a concept or information that he or she can understand.

During the transmitting of the message, two elements will be received:

Contentis the actual words or symbols of the message that is known as language - the spoken and written words combined into phrases that make grammatical and semantic sense. We all use and interpret the meanings of words differently, so even simple messages can be misunderstood. And many words have different meanings to confuse the issue even more.

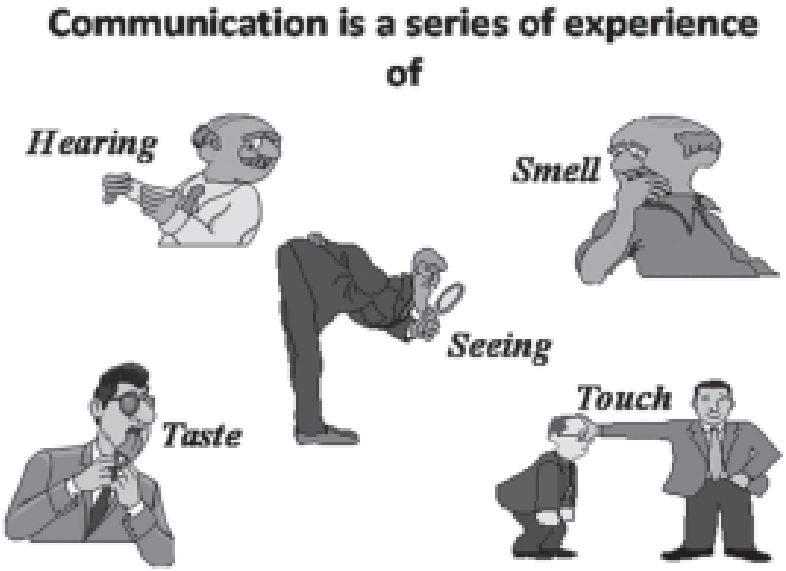
Contextis the way the message is delivered and is known as paralanguage - it is the nonverbal elements in speech such as the tone of voice, the look in the sender's eyes, body language, hand gestures, and state of emotions (anger, fear, uncertainty, confidence, etc.) that can be detected. Although paralanguage or context often cause messages to be misunderstood as we believe what we see more than what we hear; they are powerful communicators that help us to understand each other.

A message has NOT been communicated unless it is understood by the receiver (decoded).

Communication is an exchange, not just a give, as all parties must participate to complete the information exchange.

**Communication Skills**

Communication Skill is the ability to use language (receptive) and express (expressive) information. Effective communication skill is a critical element in career and personal lives.

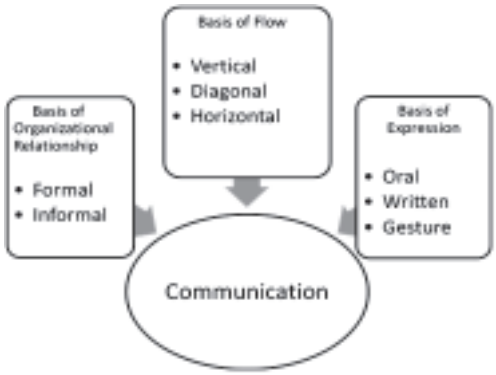



Now, let us have a look at what are the Goals of Effective Communication.


In our daily life, there are in fact four ways by which we communicate:

- Speaking.
- Writing
- Visual Image
- Body Language

Though these are the most common ways of Communication, a further introspection reveal Communication in a slightly different way. We can have following types of communication.



On the basis of Organizational Relationships, we may communicate formally, for example we may have a formal discussion with our colleagues & or we also have an informal gathering & talk. On the basis of Flow, we may communicate with the persons sitting in front of us (vertically),beside us (horizontal), & sitting diagonally to us (diagonal). On the basis of expressions we make, we may communicate orally or in writing. It is also equally important to note that our gestures & body language also play a significant role in communicating with others, a point which we often miss out.

**Components of Communication**

An effective Communication essentially has three components:

- Verbal Messages - the words we choose
- Para verbal Messages - how we say the words
- Nonverbal Messages - our body language ( eye contact. the pitch of tone we use, the gestures we make)

These components are used to send Clear, Concise Messages & receive and correctly understand Messages Sent to Us.

An Effective Verbal Message should be:

- Brief, organized
- Free of jargon
- Do not create resistance

**Para verbal Messages:** The messages that we transmit through the tone, pitch, and pacing of our voices. Here is an interesting example:

"I didn't **SAY** you were stupid."
"I didn't say **YOU** were stupid."
"I didn't say you were **STUPID**."

The sentence is same, but the thrust we are putting on the words are different.

In the first sentence, the thrust of our tone is on 'SAY' - indicates that I have not said this.

In the second sentence, the thrust of our tone is on 'YOU' - indicates that I have said Stupid, but I did not mean you.

In the third sentence, the thrust of our tone is on 'STUPID' - indicates that I have said

something to you but not Stupid.

This is a classic example of what we mean to say & how we say that to others while communicating. A slight modulation of our voice & the thrust we put in while saying the words can change the whole perspective of communication.

Nonverbal Messages:Primary way that we communicate emotionsare

Facial Expressions Postures and Gestures

The facial expressions like eye contact, smile, nodding, Postures & gestures are equally important means of communication. They reveal our true mood & attitude towards the person with whom we are communicating in spite of our best efforts to hide them.

If our body language does not match with our verbal communication, the entire communication instantly would fail, not only that it would also throw a not very desirable image of us in the eyes of the person who are being communicated.

Imagine that you say 'Good Morning' to a person with a stern & grim face. You may not be liking that person at that moment, and then it is better not wish him. Your facial expression is not matching your verbal expression & that would create a very undesirable & wrong image of yours which in turn may create confusion & misunderstanding. This is only a small example but, we should practice giving a perfectly matching verbal & non-verbal expressions to the person with whom we are communicating.

Remember, even a Zero communication is better than a wrongly matched verbal & non-verbal communication.

**Barriers to Communication**

The following factors may cause barriers to effective communication

❖ Semantic Barriers ❖ Emotional Or Psychological Barriers

❖ Organizational Barriers ❖ Personal Barriers

Let us take up the factors one by one:-

**Semantic Barriers**

Often language & symbols we use while communicating may pose barriers.

- ❖ Symbols with different meaning
- ❖ Badly expressed message
- ❖ Faulty translation
- ❖ Unclarifiedassumption, may fall in this category.

**Emotional Or Psychological Barriers**

Some time we may find that it is our emotion & deep routed psychology creating obstacles. We, as human beings often:

- ❖ Do premature evaluation
- ❖ Become inattentive
- ❖ Tend to lose transmission resulting in poor retention
- ❖ Keep undue reliance on the written word
- ❖ Distrust the communication we are getting
- ❖ Fail to communicate, which ultimately result in broken or mis-communication.

**Organization Barriers**

Again sometimes, the Organisation where we work, itself poses barriers to effective communication:

- ❖ Organizational policy
- ❖ Organization rules & regulation
- ❖ Status relation
- ❖ Complexity in organization

Though, in most of the cases we have hardly anything to do with the Organisational barriers, but it remains one of the major obstacles of effective communication in that Organisational framework.

**Personal Barriers**

In our job situation, we may face some obstacles that may prevent us from effectively

communicating with our superiors as well as with our subordinates. These barriers have been classified as Personal Barriers.

**Barriers in Superior**

- Attitude of Superior
- Fear of challenge of authority
- Lack of time
- Lack of awareness

**Barriers in Subordinates**

- Unwillingness to communicate
- Lack of proper incentive

It is important for us to know all the types of barriers discussed above since any one of them alone is sufficient to end all our sincere efforts of good communication. In order that we may become an effective communicator, we must try to eliminate the barriers that are standing in our way.

Here, it would be pertinent to discuss about the qualities which make us a good communicator.


At last, let us have some tips on good Communication Skills:

- Maintain eye contact with the audience
- Body awareness
- Gestures and expressions

- ❖ Convey one's thoughts
- ❖ Practice effective communicationskills

Remember


**Effective Communication**

" Two ways.
" Involves active listening.
" Reflects the accountability of speaker and listener.
" Utilizes feedback.
" Free of stress.
" Clear.

We will now discuss about one of the most important components of Communication :-

**The Listening Skill.**

**What is listening?**

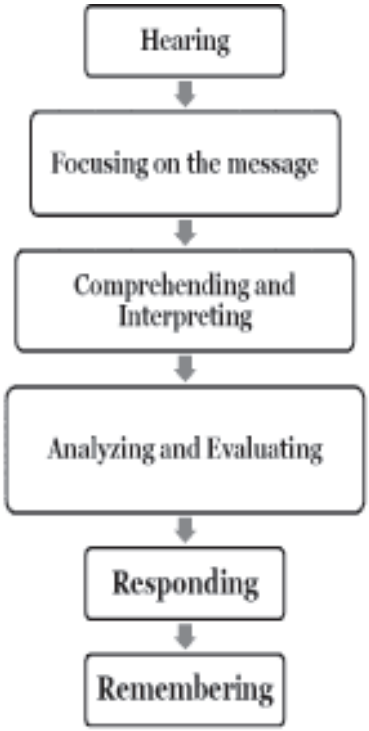
It is an active Process of eliciting information, ideas, attitudes and emotions of others. It is an interpersonal & oral exchange. It is conscious & essentially involves mind.

There are some common fallacies about Listening like:

- ❖ Listening is not my problem!
- ❖ Listening and hearing are the same
- ❖ Good readers are good listeners
- ❖ Smarter people are better listeners
- ❖ Listening improves with age
- ❖ Listening skills are difficult to learn

**How to Be an Effective Listener**

In order to become an effective listener, we must know the different stages of Listening Process. Here is a simple diagram which would help us to remember the stages easily.




In order that we become an effective listener, there are three questions we need to answer first & that would guide us in the path of becoming a good listener.

- What do we Think about Listening?
- What do we Feel about Listening?
- What do we Do about Listening?

Let us try to answer the questions one by one.

**What do we Think about Listening?**

- Understand the complexities of listening
- Prepare to listen
- Adjust to the situation
- Focus on ideas or key points

**What do we Feel about Listening?**

- Want to listen
- Delay judgment
- Admit bias
- Not to tune out "dry" subjects
- Accept responsibility for understanding
- Encourage others to talk

**What do we Do about Listening?**

- Establish eye contact with the speaker
- Take notes if required
- Be a physically involved listener
- Avoid negative mannerism
- Exercise listening muscles

A meticulous & sincere exercise on 'Think',' Feel' & 'Do' about Listening will eventually make us a good listener. But we must acknowledge that it is a time consuming process which we have to make time bound in order to get the desired result within the targeted Time Frame work.

Here are some Tips by Keith Davis on Effective Listening.

**The Un ccsvimanisvenrs- Keith Davis**

- StopTalkiug.
- Put 11 Talker At Ease.
- Express Willingness To Listen
- Remove Distractions.
- Enpatlrize.
- Be Patient.
- Hold Tender.
- Go Easy OnArgumentsAnd Criticism
- Ask Questions.
- StopTalkiug!

## 2.3 Time Management

**Why Time Management?**

Time is a great equalizer. Everyone has 24 hours in a day, 365 days in a year. The difference lies in how we utilize that time. This is where inequality begins. Some people respect time & make most of it, but many others do not attach any value to time & therefore waste it.

The fact that we talk about 'wasting time' or 'spending time' means that we do attach some value to it. In fact, one of the major sources of stress is the sense that we have too much to do & not enough time to do it. So, we need to plan our activities in accordance with the time available & how much time we want to allot for that. This is what is called basic Time Management.

**What is Time Management?**

Managing Time means to utilize the available time in optimum manner to achieve one's personal & professional goals. Each of us has our own need for socialising,sleeping, eating, working in office etc. Time Management gives us the recourse of how effectively & efficiently we manage all these works within the fixed limits of 24 hours in a Day.

It refers to a range of skills, tools, and techniques used to manage time when accomplishing specific tasks, projects and goals. This set encompasses a wide scope of activities, and these include planning, allocating, setting goals, delegation, analysis of time spent, monitoring, organizing, scheduling, and prioritizing. Initially, time management referred to just business or work activities, but eventually the term broadened to include personal activities as well.

A time management system is a designed combination of processes, tools, techniques, and methods.

**How to Manage Time EFFECTIVELY?**

For better Management of Time, we need to categorize our daily work. Steven Covey devised Time Management Matrix for categorizing the works we do.

**TIME MANAGEMENT**

Are you throwing your time away?

## Stephen Covey's Time Management Matrix

| | Urgent | Not Urgent |
|---|---|---|
| Important | **I** Do Now<br>- Crisis<br>- Pressing problems<br>- Deadline-driven projects, meetings | **II** Plan To Do<br>- Preparation<br>- Prevention<br>- Planning<br>- Relationship building<br>- True re-creation<br>- Empowerment |
| Not Important | **III** Reject & Explain<br>- Interruptions,<br>- some phone calls, mails<br>- Many proximate, pressing matters<br>- Many popular activities | **IV** Resist & Cease<br>- Trivial work<br>- Time wasters<br>- "Escape" activities |

**Explanation of the Quadrants:**

**Quadrant-I** It represents the work which are **'Urgent & Important'**. We need to spend time over here. Here we manage, produce & bring our experience, judgment in response to needs & challenges. Many important activities become urgent through procrastination (deferment), or because we don't do enough prevention & planning.

**Quadrant-II** (Quadrant of Quality): It represents works that are **'Important but not urgent'.** Here we do our long range planning, anticipate & prevent problems, empowers others, broaden our minds & increase our skills. Ignoring this Quadrant feeds & enlarges **Quadrant-I**, creates stress & deeper crisis.

**Quadrant-III** (Quadrant of Deception): It represents works which are **'Urgent but not important'**. The word urgency creates the illusion of importance. Actual activities, if

they are important at all, are important to someone else. Many phone calls, meetings & drop in visitors fall in this category.

**Quadrant-IV** (Quadrant of Waste): It represents the works which are **'Noturgent, not important'**. Reading addictive novels, watching mindless television shows or gossiping at office would qualify as **Quadrant- IV** time wasters.

We can categorise Time Wasting activities as:-

**Major & Minor Time Wasters.**

| **Major Time Wasters (Some example):** | **Minor Time Wasters (some examples):** |
|---|---|
| Procrastination | Being a slave on the Telephone. |
| Afraid to delegate | Unexpected/Unwanted visitors |
| Not wanting to say 'NO' | Needless reports/Junk mail |
| Low self-esteem. | Meeting without Agenda. |
| Problems with Objectives/Priorities. | |

Once we have categorised our work as per the above Matrix, the next step would be to devise a Road-way for Effective Time Management.

Andrew Berner developed:-

**The 'Three Ps' of Effective Time Management.**

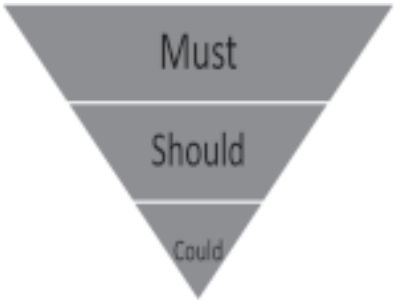
**Planning** **Prioritisation** **Procrastination.**

**Planning & Prioritise:**

In the context of Time Management, Planning is essentially organizing all necessary tasks that we can anticipate as required to be done. We must identify the objectives, priorities and expected results along with the resources needed to perform the task properly and in time. We have to realistically estimate the time it will take us to complete each objective and we should remember that our plans have to be implemented, they are not simple paper plans to be presented in an interview or examination.

Prioritise means the importance or rating which we are assigning to each task we

perform and plan to perform. While Prioritising our activities, one recourse may be to remember the Principle of COULD, SHOULD and MUST.




We have to take up the tasks that we 'must' do at first, they are the priority tasks & provide enough time if possible, to some extent buffer time for that. After then we take up the 'should' tasks & at last if time permits, then takeup the 'could' tasks. Priority activitiesfor every individual will be different. Theydepend on their Goals & personal value system. We should not go by what others are doing; instead we should be in line with our Professional and Personal Goal.

While Prioritising, we should also consider Pareto's Principle:

**80% of work gives 20% results and 20% of work gives 80% results.**

Effective Planning &Prioritisation aim at achieving 80% output from 20% effort.It is always better to have the Daily Planning &Prioritisation first, which would automatically lead to Long term planning.

| ***Tips on Planning the Day*** | ***Tips on Prioritisation*** |
|---|---|
| Prepare a list of priorities for the day based on urgency and importance. | Try to make the Best Use of Time. |
| Allocate time according to Priorities. | Decide that we don't have to please everyone. |
| "TO DO LIST" (Top 3 Priorities today) | Resist the temptation to do small, insignificant tasks too well. |
| Have a Follow through and get the Timing Right. | Outsource what we can. |
| Morning is the time for hard work. | We don't have to do everything everybody tells us to do. |
| Interesting work, meetings and social events can take place in off-peak time. | Follow the Principle of Must - Should - Could. |
| Have work-breaks to overcome fatigue. | Remember Pareto's Principle. |
| Living 100% in the present improves our work output. | |

**Procrastination:**

Are we affected?

Have we ever seen our most important tasks being put off until later and then later and later, while we are getting busy with many not so important activities? Did we hope that we may have more time and better mood in the future to start the task and do it properly? Does an approaching deadline mean a crisis for us? Do we keep hesitating every time we make a decision?

If we often see ourselves in such low productivity situations, then there is a big chance that our life got under control of the procrastination habit. And those situations are only the most explicit symptoms.

What is it?

A basic definition of procrastination is putting off the things that we should be doing now. This happens with all of us time after time. Yet, what makes a big difference for our success is our ability to recognize procrastination reasons and expressions in their different forms, and to promptly take them under control, before this bad habit steals our opportunities, damages our career and pride, or destroys our relationships. So why do not we do it now?

Causes of procrastination

What is the typical reason for procrastination? Here are a few of the most common situations to consider in our anti procrastination efforts.

It can be as simple as :-

- Waiting for the right mood
- Waiting for the right time

Then look at the way we organize our work. We may notice other reasons for procrastination like:

- Lack of clear goals
- Underestimating the difficulty of the tasks
- Underestimating the time required to complete the tasks
- Underdeveloped decision making skills
- Too ambiguous tasks and unclear standards for the task outcomes
- Feeling as the tasks are imposed on us from outside
- Fear of failure

- Perfectionism and over committed.
- Don't know where to start.
- To avoid an unpleasant task.
- Waiting for more information.
- We may think if we put it off, someone else will do it.

**Effects of Procrastination**

When we decide not to deal with things and put them off, all we are doing is making more work for ourselves in the long run. And the more work we have, the more stressed you will feel because of all the backlogged work you still have to do.

You know, just because we avoid completing a task today doesn't mean it will not needed to be done tomorrow. We wake up and we have an even heavier burden than the day before. This stress or anxiety we feel over long periods of time and can lead to more serious situations such as depression and other forms of mental illnesses.

The sooner we come out of these inhibitions & fear, the better result we can expect from our life. After all procrastination will lead us nowhere other than increasing our stress level in the long run.

**Avoiding Procrastination**

"You cannot escape the responsibility of Tomorrow by evading it today"—Abraham Lincoln


Remedial measures of Procrastination has more a psychological approach. A few guidelines and tips may be found useful to come out of procrastination.

Focus on the immediate task and project, on its details and use self-imposed deadlines and stick to a task till the deadline is met.

Tasks that are unpleasant can be made different by assigning time limits or deadlines.

People with low self-control, are easily distracted and impulsive and cannot be easily transformed but we can adjust our surroundings and put ourselves in the right environment.

It can be easily said that once you do get going on a task and successfully complete it, you're unlikely to procrastinate the same task in future.

Almost by definition procrastination is a failure to meet goals. So setting goals in the right way is crucial be it short-term or long-term goals.

**Setting goals**

Perhaps one of the most important things we will do to ensure our better Time Management is 'goal setting'. Many people, however, fail to recognize the importance of setting goals and tend to pass it over as unimportant. But nothing could be more vital to a successful Time Management than learning how to properly set goals.

One element that all successful people have in common is that they set specific goals and have devised a plan for achieving them. This means that they determine exactly what they want and know how they are going to get there.

**Three basic types of goals**

**Improvement goals:** Things that we want to change or make better, such as losing weight, quitting smoking, or having better relationships.


**Achievement goals:** Things that we want to accomplish, such as top sales person, greatest golfer, or best teacher.

**Financial goals:** Things that we want to acquire, like making a million dollars, being financially independent, owning cars, homes, etc. Ask a majority of people about their goals, and they will typically give some vague, general answer. If it's an improvement goal, they may tell us that they want to lose weight. While they may be able to lose weight without a clearly defined goal, their chances of really succeeding long-term are slim until they specify how much weight they want to lose and devise a plan for how they are going to do it.

If we don't know where we are going, how will we know when we get there?

**The seven keys to goal achievement:**

Once we have written down our goals and developed a clear Idea of what we want, we still have to get there. Here are the seven keys to achieving our goals.

They are the crucial elements from start, to implementation, and to achievement of our goals & to make our goals a reality.

**1. Desire**

It all starts with a dream, a desire to have or accomplish something. If we don't want it, then why bother going after it?

**2. Belief**

In order to accomplish or acquire something, we must possess the belief that it is achievable and worth pursuing. Reaching this goal must not conflict with our values, and no one will be harmed or adversely affected. We must possess the belief that we are capable of achieving it, and that we can learn whatever is necessary to accomplish it.

**3. Knowledge**

We need to acquire the knowledge and information that we will need to accomplish or achieve whatever it is we are attempting. This means learning the "how-to" of what we want to do. We will also need to read about, listen to, and model someone who has already done what we wish to accomplish in order to learn the mental strategies that are necessary to accomplish this goal.

**4. Opportunity**

The opportunity must exist for us to take action. Is this something that we can do now? If not, when? Are there external (or internal) factors that are getting in the way?

**5. Vision**

In order to accomplish the goal, we must have a clear idea of what it is that we want, and create a compelling internal representation in our mind that we can "see" vividly. We can also use external pictures of our goal that we review daily. The better we can visualize our goal and its achievement, the better our chances of getting it.

**6. Planning**

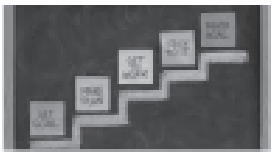
Let us devise a concise plan for the achievement of our goal setting long-term, short-term, as well as daily goals & implement the use of a day-planner system to help plan our time and to "track" our progress towards our achievement.

**7. Commitment**

Stick to it, no matter what. We must be prepared to do "whatever it takes" (without hurting anyone) to accomplish our goal & by using vision and planning to create such a great picture of our goal that we fall in love with the thought of its accomplishment.

Once we set our goal, we have to examine whether the goal filters through the Principle of 'SMART'. Only then our Goal would be fitting best with the time we have allotted for achieving that goal and will give best result.

## "SMART" GOALS



**S - Specific & Self**

Trying to "do our best" or "do better" is like trying to eat the hole in a donut. There's nothing there to chew on or digest. We need to fine some very specific, concrete, and measurable action-steps that would tell us what our goal looks like in real-life terms. Include how we will measure our results so that we can tell whether we are getting anywhere and within time .

**M - Measurable & Flexible**

Goals should be measurable in order that the pace may be reviewed. If we don't have any measurement yard stick we will never be able to periodically review to what extent we have achieved over stipulated time schedule and what is left to be achieved in the given time frame. Good strategies and goals are always flexible, because nothing in this world stays the same for very long, and staying alive and on course means being able to adapt to changing circumstances.

**Example:** We are always going to run into circumstances that make it difficult to stick to our diet or exercise plan, special occasions, unexpected schedule conflicts, even just a really hard day where we need a break from the routine for our mental health.

Our goals should include some contingency plans for dealing with these problems so that we don't fall into that all-or-nothing thinking that lets the difficult situation become an excuse for ditching our whole plan.

And remember, meeting our goals is 90% attitude. No one is perfect, and we're going to have days where we just don't do what we set out to. Make sure we build up some Time Management technique and tools to help us deal with those days without losing sight of our long-term goals, or losing our motivation.

**A - Achievable & Positive**

Let us not take the challenging characteristic (above) too far. Make sure we can actually achieve what we're setting out to do. Otherwise, we will get frustrated and quit the game.

**Example:** Sixty minutes of aerobic exercise may be better than 30 minutes, but two hours may not be especially if we're so worn out afterward that we have to stop exercising completely for a while.We can always build up the time and intensity of our workouts as our fitness level improves over time.

**R - Realistic & Rewarding**

Goals should always be framed in positive terms (realistic & rewarding). Humans are not designed to white-knuckle their way through life, always trying to not do things or to avoid certain thoughts, feelings, actions or circumstances. We are much better at approaching what we

**DO want than avoiding what we DON'T want.**

Example: If we want to reduce the amount of "junk" food we eat, frame that goal in positive & realistic words like increasing the amount of calories we eat from healthy foods, and identifying which healthy foods we want to eat more. Instead of trying to eliminate chocolate treats, for example, we can plan a low-fat yogurt with fruit for our sweet snack. If we do this for a few weeks, our brain will disconnect the habitual association between treat and chocolate and make a new one with the yogurt and fruit. And we'll be just as happy with this new treat!

But our goals should also push us to extend ourselves beyond where we already are. Otherwise we shall get bored and quit the game.

How often we reward ourselves? We desire to be rewarded by others. Let us go & reward ourselves with a piece of chocolate for the hard work we have put in. It will definitely make a word of difference.

**T - Time Bound**

Goals need to come with deadlines, due dates, and payoff schedules. Otherwise, they'll fade into the background with our daily hubbub, and we'll quit playing the game. If our long-term goal is going to take a while to reach, then we have to create some intermediate- and short-term goals. These will make our larger goal seem less daunting and keep us focused on what we can do here and now to help ourselves get there.

Finally, before we take up any Time Management planning, do question ourselves:

- What is the objective?
- How will I know if I'm successful?
- How will I be rewarded?
- Is this task something I want to do?
- Do I have the time to do it?
- What have I got to lose?
- Is there a better way to do it?

- ❖ Should it even be done at all?
- ❖ Will the world come to an end if I do not do this?

**REMEMBER**

- ❖ Set goals and work towards achieving them.
- ❖ Plan the day.
- ❖ When feasible, delegate.
- ❖ Don't let paperwork pile up.
- ❖ Do not procrastinate.
- ❖ Identify time waster and resolve to eliminate them.
- ❖ Add times for relaxation and recreation in the schedule.
- ❖ Learn to say "NO."

## ANNEXURE-A

**Pickle Jar Exercise on Prioritisation of Tasks.**

**Materials:**

1. A Medium size Jar with cover.
2. 10 Ping Pong Balls.
3. A few marbles.
4. A handful of Sand.
5. A Bottle of water (500 ml).

**Procedure:**

The participants are required to put & fit in all the materials into the Jar.

**Learning:**

The Jar representing 24 hours of a Day,

Balls are the top priority tasks (Quadrant-I,Tasks),

Marbles representing second category tasks (Quadrant-II,Tasks),

Sand representing third category tasks(Quadrant- III) &

Water is fourth category tasks(Quadrant- IV).

The exercise shows how we would prioritise different tasks we do within the given 24 hours framework.

## ANNEXURE- B

### Group Exercise on Effective Planning & Delegation.

**Procedure:** The participants are divided into four groups each with six members, with one observer in each Group. Each Group has to perform the following tasks within a time framework of 10 minutes. The marks were tallied after each group finishes.

**LIST OF TASK**

| Sr No | TASKS | POINTS |
|---|---|---|
| 1. | Do a lap around the room | 05 |
| 2. | Sing a song together (4 Lines) | 25 |
| 3. | Make a paper aero plane & throw it across the room | 15 |
| 4. | Take signature from each observer on a single piece of paper. | 05 |
| 5. | Assign a nick name to each member of your team and write a complete name card with HomeTown and the nickname | 10 |
| 6. | Make a tower out of the materials owned by you.(Minimum 5 items) | 10 |
| 7. | Name your Team and come up with a two word slogan | 20 |
| 8. | Make sounds (barking) of 3 different types of animals | 05 |
| 9. | Cover the magazine | 10 |
| 10 | Write " Betty Botter bought bitter butter" 05 times | 05 |

**Learning:** Each Group shares its experience regarding the causes of failure & success. Group will be able to understand & appreciate the importance of planning & delegation of work, distribution of work among the team members in order to finish off the job within the given time framework. Essentially they will also learn that effective Time Management involves proper delegation of work while working in a Group. They not only have to delegate but also chalk out proper preparation &prioritisation. They should also keep Pareto's Principle of 20:80 in mind while doing these activities, only then it would be possible to extract maximum output with optimum effort within fixed time hours?

## ANNEXURE- C

### Exercise on Effective Listening Skill

**Rumour Clinic Exercise**

**Acknowledgement:**

1. ThamesValleyUniversity, London, U.K.
2. Department of Personnel & Training, Govt. of India.

**Procedure:**

Six participants are selected to play the game, of whom; the last one plays the Role of Police Officer.

Six participants are selected as observer of the game.

The participants (players) will be seated in a closed door room & precaution to be taken that nothing is getting heard in that room.

The tutor calls out the first participant (rest five would be sitting in that closed door room) & reads out a report on a road accident happened nearby.

It will be read out aloud, clearly & only once.

No repetition & interruption can be made in between.

The participant will be given to synchronize & remember what he has heard. Then he will call out the second participant who will describe the accident he has heard from his memory.

The norms would remain same.

The exercise will be repeated till the sixth participant who is the Police Officer of the game hears the accident.

He has to write what he has heard about the accident on the Board. After the incident

is written, the original report would be displayed.

The six observers would eventually record ADDITION, DELETION & DISTORTION of the report in each six rounds.

**Learning:** The participants would share their experience & reasons for addition, deletion & distortion of the message they have heard.

They will be able to understand the difference between Listening & Effective listening & also identify the factors they have to take care of while listening to others.

## 2.4 Team Building


**TeamBuilding**

Team building is a philosophy of job design in which employees are viewed as members of interdependent teams instead of as individual workers.

Team building refers to a wide range of activities, presented to businesses, schools, sports teams, religious or nonprofit organizations designed for improving team performance.

Team building is pursued via a variety of practices, and can range from simple bondingexercises to complex simulations and multi-day team building designed to develop a team.

It generally sits within the theory and practice of organizational development, but can also be applied to sports teams, school groups, and other contexts. However it is not to be confused with **"Team Recreation"** that consists of activities for teams that are strictly recreational.

Team building can also be seen in day-to-day operations of an organization and team dynamics can be improved through successful leadership.

Team building is an important factor in any environment; its focus is to specialize in bringing out the best in a team, to ensure self development, positive communication, leadership skills and the ability to work closely together as a team to solve **Performance Problems**.

Team building can also refer to the process of selecting or creating a team from the beginning.

At the outset it will be interesting to differentiate between Team & Group.

As per Collins Dictionary:

Group is a number of persons BOUND together by common social standards, interests, etc, example Class - IX

**Team:** a group of people ORGANIZED to work together, example Foot Ball Team of Class - IX.

**Difference between Team & Group**

| Group | Team |
|---|---|
| Common characteristic | Common goal |
| May or may not involve action | Implies action or activity |
| Mainly individual work | Working together |

**Size of the Group & Team:**

Depending on the number of members,size of the Team/Group may be:

Dyad : A group of two

Triad : A group of three

“Small Group” : A group is generally considered small when it has 7 or fewer people.

“Large Group” : Members more than 7 in number.

**Why Should We Be a Team?**

- When staff use their skills and knowledge together, the result is a stronger organization that can fulfill its mission

  "To provide accurate information that would assist individuals in achieving a better quality of life."

- People working together can sustain the enthusiasm and lend support needed to complete the work of each program.

When assembling a team it is very important to consider the overall dynamics of the team. According to Frank La Fasto, when building a team, Five Dynamics are fundamental to team success:

1. The team member: Successful teams are made up of a collection of effective individuals. These are people who are experienced, have problem solving ability, openness to addressing the problem, action oriented.
2. Team relationships: For a team to be successful, the members of the team must be able to build up a strong interpersonal relationship.
3. Team problem solving: An effective team depends on how focused and clear the goal of the team is. A relaxed, comfortable and accepting environment coupled with open and honest communication would lead to better problem solving.
4. Team leadership: Effective team leadership depends on leadership competencies. A competent leader is: focused on the goal, ensures a collaborative climate, builds confidence of team members, sets priorities, demonstrates sufficient "know-how" and manages performance through feedback.
5. Organizational environment: The climate and culture of the organization must be conductive to team behavior.

**Teamwork & Team Building**

**Teamwork:** It is a concept of people working together with a definite Goal & with clearly set objectives to achieve the Goal.

**Team Building:** It is a Process of establishing and developing a greater sense of collaboration and trust between members.

For successful Team Building, the role of the Team Players are the most deciding &

crucial factor. It is the dynamics & harmony between them which ultimately drives the Team towards the Goal. So it is required that a team player is able to get along with their colleagues and work together in a group.

**Characteristics of a Team**

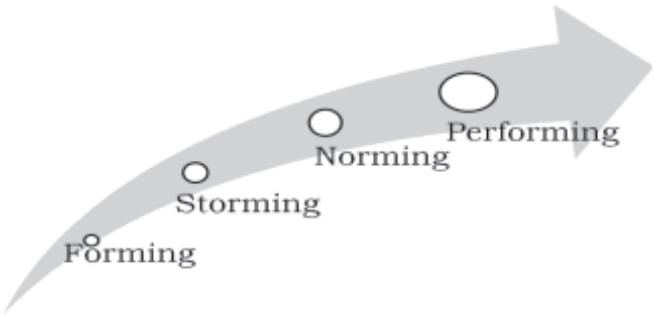
- o Teams set clear and important goals.
- o Team is result oriented.
- o Members are competent and committed.
- o Members collaborate freely.
- o Teams have leadership.
- o Team is collectively stronger than the individual.

**Teams work with other groups.**

Once we identify the characteristics of a Team, the next very pertinent question that strikes our mind, how to build a TEAM.

**There are Four stages of Team Building:**

**Stages in Team Building**




**Stage 1: FORMING**

During the Team Forming Stage the Team members:

* Defines the problem & agrees on goals
* Fomulates strategies for tackling the tasks.
* Determines the challenges and identifies information needed.
* Individuals take on certain roles.
* Develops trust and communication.

The Team members also sit together & select a Team Leader who will take up the

primary responsibility of leading the Team towards the Goal Achievement.

**Leadership roles**

Successful team leaders should possess Six Leadership Abilities:

1. A team leader is usually goal-oriented to keep the team on track.
2. They must promote a safe environment where members can openly discuss issues.
3. A leader must build confidence amongst members by building and maintaining trust and offering the members responsibilities.
4. A leader should be technically competent in matters relating to team tasks and goals.
5. It is important for a team leader to set a manageable list of priorities for the team to keep members focused.
6. Finally, leaders should offer clear performance expectations by recognizing and rewarding excellent performance, and provide feedback to others.

Carl Larson and Frank La Fasto conducted a three year study of over 75 diverse teams. By interviewing key members of each team, Larson & La Fasto identified Eight Effective strategies a leader should employ to enhance team building:

1. Establish clear and inspiring team goals
2. Maintain a results-oriented team structure
3. Assemble competent team members
4. Strive for unified commitment
5. Provide a collaborative climate
6. Encourage standards of excellence
7. Furnish external support and recognition
8. Apply principled leadership

The Team would suffer a set back if the Formation of the Team is not proper & the leadership is not adequate to handle all the conflicts that may arise at this nascent stage.

**Stage 2: STORMING**

During the Storming stage team members:

- ❖ Realize that the task is more difficult than they imagined.
- ❖ Have difference in attitude about chances of success.
- ❖ May be resistant to the task.

- Have poor collaboration.

In order that the Team has a successful Storming Stage, it is essential that they should have a proper diagnosis regarding, what has happened. The following questions may guide them to arrive at a consensus decision.

**Storming Diagnosis:**

- Do we have common goals and objectives?
- Do we agree on roles and responsibilities?
- Does our communication work?
- Do we have adequate interpersonal skills?

After diagnosis, the problems would be on the table, it is now the role of the Team Leader how ably he negotiates the conflict by:

- Separating problem issues from people issues.
- Being soft on people, hard on problem.
- Looking for underlying needs.

After sorting out the problems & deciding over an agreed frame work, the Team should now sit & decide the NORMS which would berigorously followed by each Team member.

Every member should understand, appreciate & acknowledge that flouting of norms would put all the efforts given in vein & they have to again start from Zero,

For example, if the norm is to assemble at 9.30 a.m. in the morning, then everyone has to arrive at 9.30 a.m. sharp, may what come. If any one member is late by 10 minutes in a Four Member Team then the Team is actually late by 40 minutes.

**Stage 3: NORMING**

During this stage members accept:

- Their team
- Team rules and procedures
- Their roles in the team

Team members also realize that they are not going to crash-and-burn instead start helping each other. Team begins to show the sign of oneness.Relationships become more cooperative. There is willingness to confront issues and solve problems.

Teams develop the ability to give & receive Feedback. There is a sense of team

spirit. Much success of this stage essentially depends on an Effective Feedback Mechanism. The more transparent the mechanism, the more is the chance of having high rate of success.

**Feedback**

Feedback provides the basis for helping members to improve their performance. It helps identifying what aspects of performance need change and which should be maintained. While speaking of Feedback we must bear in our mind that, the Feedback is a two-way process; Giving & Receiving. There is a definite art of giving & receiving Feedback.

**Giving Feedback**

While giving Feedback the following points should be borne in our mind:

- Concentrate on behaviour rather than personality
- Specific rather than general
- Timely
- Provide constructive, supportive and non threatening suggestions.

**Receiving Feedback**

While Receiving Feedback, the following may e borne in our mind also:

- Listen - don't react.
- Clarify and check your understanding
- Compare with feedback from others
- Ask for detail not given
- Decide action you will take
- Thank the Feedback giver

An effective Feedback would lead the Team to a greater Performance level.

**Stage 4: PERFORMING**

This is the final stage where the Team is all set to perform.

Effective performance also requires,

- Gaining of better understanding of each other's strengths and weaknesses.
- The ability to prevent group conflict and work to resolve differences.

❖ Developing a close attachment with the team.

In order that a Team performs successfully, it should have a clearcommunication among its members, beneficial team behaviors and ground rules, balanced participation & good personal relationship.

However, a Team works best, when its members have:

❖ A commitment to common objectives
❖ Defined roles and responsibilities
❖ Effective communication and work procedures
❖ Good personal relationships

We should always remember that EACH MEMBEROF THE TEAM HAS HIS OWN CONTRIBUTION & WE SHOULD ACKNOWLEDGE IT.

It is often seen that the result of the Team work is not up to the satisfactory level, & there are in fact times when Teams fail. Let us try to analyse why a Team may fail while performing.

Probably, the following may be the underlying causes of Team failure:

o Confusion about defining the true goal of the team.
o Hidden Agendas.
o Interpersonal resentment.
o Resentment about giving up individual territory.
o Disagreement over procedures.
o Strong competitive feelings between members.
o Climate where people are afraid to voice their feelings, ideas and opinions.
o Lack of skills of team members
o Abstract thinking
o Lack of energy.
o Lack of clear focus.
o Unclear, overloaded roles.
o Lack of timely feedback.

Last but not the least; Team Members should also possess certain qualities while working in a Team.

What is desired from an individual member is:

❖ Keep an open mind.
❖ Pursue new ideas.

- ❖ Treat ideas equally.
- ❖ Look for the most interesting aspect of each idea.
- ❖ Ask "good" questions.
- ❖ Listen with interest and respect

**Risks of Team Building in an Organisation**

The major risk of team building is that a team member may become cynical of the organization. This could happen as a result of the organization holding team building events outside of the normal context in which the organization usually functions under.

For example, if an organization hosts team building events when individual goals and efforts are the norm with the organizational culture, the team building event will have no lasting impact.

It is crucial to follow up a team building event with meaningful workplace practice. If the team members do not see an improvement within an organization as a result of team building events, members may view such events as a waste of time. This may lead to loss of trust in the organization, harm motivation, as well as decrease employee morale and production.

But it is to be always remembered that a successfully formed Team definitely increases the output level over the performance of an individual employee of the organization.

## ANNEXURE- D

Exercise 'Create a Story' on Team Building

**Create A Story**

**Procedure:** The participants were divided into groups & each group was required to create a story using each of the above symbols & giving a name of the story.

Every Team Member is to be given to work with Two symbols & then the Team finally synchronizes & give a name of the story. All the four stages of Team Formation to be followed & examined by one Observer designated for each team.

After completion, each Teams share the success or reasons for failure of accomplishing the task within time.

**Time Allotted:** 07 Minutes each group.

**Learning:** Exercise on how to work in a Team,

## ANNEXURE - E

Exercise: Lost at Sea

**Acknowledgement:**

1. ThamesValleyUniversity, London, U.K.
2. Department of Personnel & Training, Govt. of India.

**The Game:**

Imagine being lost at sea due to a fire in the ship. You are left with only the following items with you & you are traveling in a life boat. You only have an idea that the nearest land is around 1000 miles away.

Here is a list of items you are left with.

01) Sextant (a navigation instrument for measuring angular distance)
02) Shaving Mirror
03) Five-Gallon can of water
04) Mosquito netting
05) One case of army ration
06) Maps of the Pacific Ocean
07) Seat Cushion (flotation device approved by the Coast Guard)
08) Two-gallon can of oil gas mixtures
09) Small Transistor radio
10) Shark Repellent

11) Twenty Square feet of opaque plastic
12) One quart of 160-proof Puerto Rican rum
13) Fifteen feet of nylon rope
14) Two boxes of chocolate bars
15) Fishing Kit

List these articles according to their importance with respect to your survival.

**Procedure:** Participants are divided into four groups with six members each & one observer for each Team. First the listing is done by each member of the Team

**Time:** 10minutes,

Then discuss with the Team & form one single agreed listing(consensus about the rating of each item according to its importance with respect to the survival). Then the correct order is shown:

**Correct Order**

01) Shaving Mirror
02) Two gallon can of oil-gas mixture
03) Five gallon can of water
04) One case of army ration
05) 20 square feet of opaque plastic
06) 2 boxes of Chocolate bars
07) Fishing kit
08) 15 feet of Nylon Rope
09) Floating seat Cushion
10) Shark Repellent
11) One quart of Rum
12) Small transistor radio
13) Maps of the Pacific Ocean
14) Mosquito netting
15) Sextant

**Scoring Pattern:** Score is calculated on the basis of deviation of ranking with respect to the correct ranking. First individual score is done after that, Team scoring is done &

tallied. If the Team Score is less than the average Individual Score then we can say synergy is reached & overall Team performance is better than the individual performance of the Team.

## 2.5 Employability Skills

In today's world with such tremendous competition in the job market, it is extremely important that we should develop specific skills for getting suitable employment as per our choice.

Employability Skills, a concept devised by J. Hillage& E. Pollard, 1998 refers to:

- Capability of gaining initial employment.
- Maintaining the existing employment.
- Getting a new one, if required.

One may ponder about the factors on which employability depends on: They depend mainly on -

- Our Personal Assets- Knowledge, Skill, Attitude.( Key Competencies, Generic skills, Life skills)
- The way we use & deploy these assets.
- The way we present them to employers.

Knowledge ⟶ Confidence

Skill ⟶ Competence

Attitude ⟶ Commitment

The most pertinent question that may arise in our mind -Why are Employability Skills so important? The answer obviously is in affirmative & has two dimensions as follows:

**In Jobs:**

- Employers look for these skills because they want 'work-ready' employees.
- Proving we have these skills will help us get and keep a job.

**Life in general:**

- These skills help us perform effectively in all areas of life.

**The Key factors of Employability Skills:**

Let us now analyse these key components:-

Learning, Initiative & Enterprise and Technology are classified as Hard Skills in the sense that they can be acquired from the materials available to us. We may build up knowledge of the subject, initiatives & enterprises which would maximize our profits & returns from the books, journals, articles from the internet & so on. In the modern world, when people are carrying gigabytes & terabytes in their pockets, we need to have the knowledge of upcoming technologies as well. Technology would also include the thorough knowledge of process & products if we are essentially technical persons.

**Rest of the skills:** Planning & Organization, Communication, Self Management, Problem Solving, Team Work are termed as Soft Skills because we need to develop these skills from within us. These inner qualities would essentially come from ourselves & no amount of external injections would trigger these qualities unless we want to develop them.

All these skills as stated above require: tact, patience, empathy, application of reasoning, rational thinking, auto suggestions for self-improvement, convincing capacity, listening, good gesture, sharing, self respect inculcating in respect for others.

Development of theses skills require time & prolonged practice. We should recognize & believe that they are as important as hard skills.

In today's world what counts at the end of the day is how we communicate with others & present ourselves before them. Communication we shouldn't forget has two aspects- Verbal & Non- Verbal Communication & both of them are equally important.

Imagine ourselves greeting GOOD-MORNING with a grim face; the morning may be good to us but what about others? What is meant to be said is, the verbal communication & body language should be perfectly matching when we are interacting with others.

It all depends on us, how we interact with the outer world, & a successful communication, an effective relationship building essentially requires perfect Self Management.

**Self Management**

Enables an individual to:

- Analyze, Assess, Motivate one self
- Develop a positive attitude towards life & work
- Achieve the goal

For a successful Self Management it is required that

we assess ourselves sincerely, our strength, weak points & get them weighted with respect to the opportunities & threats existing in the outer world.

Here is an interesting Tool for Self Assessment which has a widespread use:

**SWOT Analysis**

SWOT Analysis means how we asses our Strength (S), Weakness (W) Opportunity(O) & Threats(T).

Let us explain this with a simple diagram:

| **INTERNAL FACTORS WE POSSESS** | **EXTERNAL FACTORS WE FACE** |
|---|---|
| Strength<br>We need to:<br>***Maintain.**<br>***Build** | Opportunity<br>We think of:<br>***Prioritize.**<br>***Optimize.** |
| Weakness<br>We have to chalk out:<br>***Remedy.** | Threat<br>Ooops we:<br>***Counter.** |

Strength & Weakness are the results of our internal (Self) scan.

Strength are the qualities we naturally possess or develop for example, we may possess good listening skill, communication ability etc.

Weakness refer to the areas we need to work hard or where we are lacking, like, we may be impatient, can not apply logic, think rationally, lacking computer knowledge & so on.

If we can sharpen our strength & overcome our weakness, then we will be able to scan the external environment in a better way.

Opportunity & Threats are existing externally, for example, wide range of job availability may be one opportunity existing & presence of competitors may be one Threat existing in the outside world on which we don't have any control. All we can do probably is by improving strength & overcoming weakness we can fight the fierce competition in the job market & outweigh the competitors.

So, it is WE who ultimately assess the Employability Skills.

WE take control of our assessment and WE benefit directly…

WE SELF ASSESS our performance, so

WE UNDERSTAND our skills, so

WE KNOW HOW to improve them, so

WE can PROVE & EXPLAIN them at a job interview, so

WE GET THE JOB! … Plus many other benefits.

In the present global economy, which is highly dynamic, volatile & essentially changing & challenging here is a list of skills which may be helpful to us.

| New Context | Skills Required |
|---|---|
| Global Competition: | · Global Awareness<br>· Self-Direction |
| Global Cooperation: | · Global Awareness<br>· Collaboration<br>· Information & Communication Technology<br>· (ICT) Literacy |
| Information Growth:<br><br>More Jobs & Careers: | · Information Literacy<br>· Critical Thinking<br>· Problem Solving<br>· Critical Thinking & Problem Solving<br>· Innovation & Improvement<br>· Flexibility & Adaptability |
| Growing Service Economy: | · Communication Skills<br>· Life and Career Awareness Skills |

Out of the Skills stated above, one skill deserves special mention & that is Presentation Skill, it is all about out how we present ourselves in the potential job market.

It essentially involves many sub skills like,Negotiating Skill, Communication Skills,

Problem solving Skills, Conflict Resolution Skills. All of these skills can be categiorised under the Broad Heading Social Skills or Interpersonal Skills.The skills which are required for judging, understanding & working with others.

So, to meet the challenges of rapidly changing & dynamic economy of the 21st Century, new skills, regardless of what they are called, will essentially help us to sale our personal skills in the job market in a more presentable manner & will be needed for every man, woman and child to address the economic, social, political and citizenship challenges that await them. Business success & growth of the economy will demand a workforce whose skills adapt to the changing needs of the future.

## ANNEXURE-F

### Exercise on SWOT Analysis

**Procedure:** Participants are divided in four Groups with six members. Each Group selects an Issue like opening of a small entrepreneurship on Food Processing etc. & analyses out the Strength they have, the weaknesses they have to overcome, the probable opportunities in the market & what are the probable threats.

**Time Allotted:** 20 minutes to discuss & 05 minute each Group to present.

The Presentation is to be made as per the following Matrix:

| INTERNAL FACTORS WE POSSESS | EXTERNAL FACTORS WE FACE |
|---|---|
| Strength | Opportunity |
| Weakness | Threat |

## Annexure- G

### Exercise on Presentation Skills

**Procedure:** The participants are divided into two Groups with six members. Three member client Team for each Group & two observers for each Group.

One group is assigned with the task of making a product out of the things they have of their own choice. They have to give a name of the Product they have made, prepare one Slogan for the campaign of the product. Then finally they have to convince & sell the product to the client Team.

The other group has been assigned with the task of securing loan from a Bank for opening up a Hotel at sea side. They have to present their scheme & convince the Bank Team of their project & secure loan.

**Time:** Discussion & preparation 15 minutes, presentation 10 minutes each.

**Method:** Role Play.

**Learning:** The participants will learn by doing. They will learn how to manage conflict, negotiate & also apply other Inter-personal Skills.

## 2.6 Stress Management

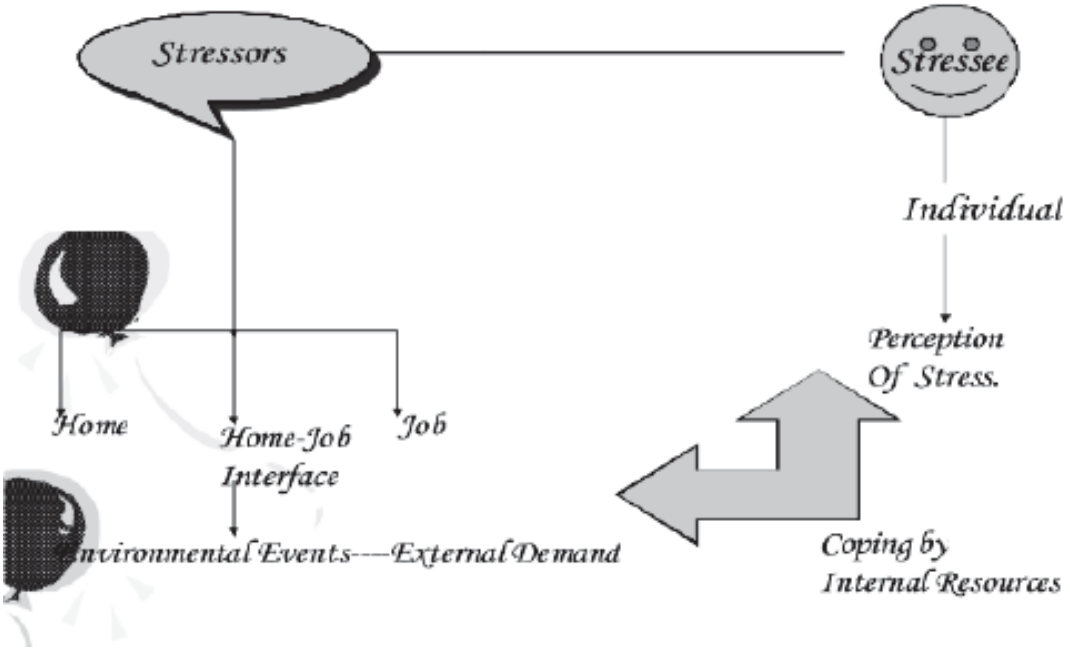
**What is Stress?**

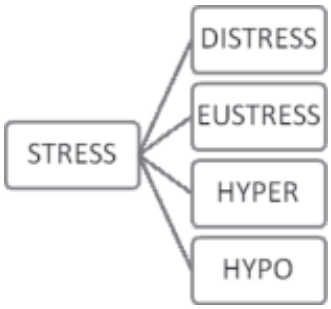
The concept of Stress was first devised by Prof.HansSelye in 1936.Stress can be defined as non-specific response of the body against any external demand/stimuli which threatens body equilibrium.

Stress means Stringere→ To draw tight.

In other words, Stress is our response to any situation: we find Challenging, frightening, or difficult.

The following diagram would help us to explain the source of our Stress.






It is clear from the diagram that if our Resources are more than or equal to External Demand, then we generally get stressed, but problem arises when we does not have adequate internal resources to cope with the outer challenges. We tend to get stressed & often try to fly away from the situation that eventually brings more stress in our life.

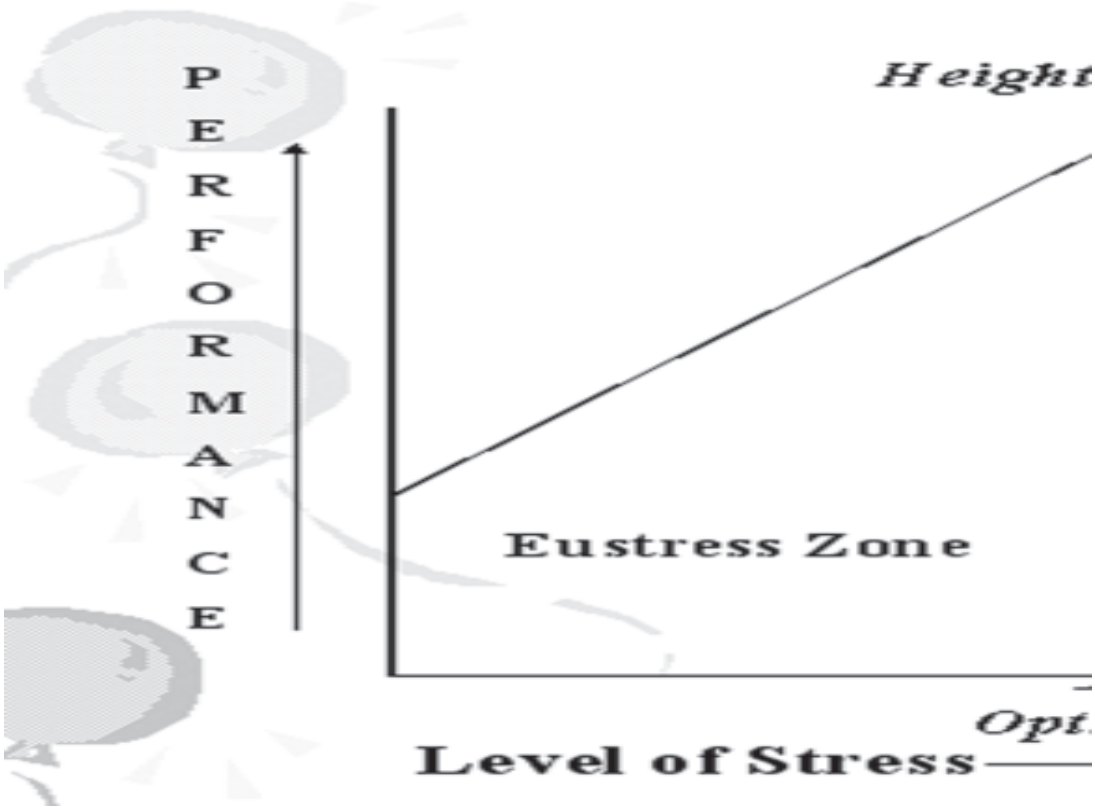
**Types of Stress:** There are usually four types of Stress.

**Hypo Stress:** Means usually a very low level stress.

**Hyper Stress:** Means generally high-level stress.

**Eustress:** Good stress acting as boost for giving out the best within us.

**Distress:** Bad stress that slowly kills us.




This is an interesting diagram showing the relationship between Performance & Stress. It clearly indicates that Eustress is the Zone where our performance constantly increases

until it reaches a height with Optimum Stress Level.

After that knowingly or unknowingly we enter into Distress Zone. It starts good with Stress being the Honey Moon Stage but if we do not take adequate & proper measures to cope with the stress level then very soon we will land up with Fuel Shortage, Chronic, Crisis Stages & end up with a Big CRASH which eventually results in depression, frustration & unfortunate cases of suicides.

A very pertinent question would be, how shall we identify that we are in Distress Stages? Here are some tips :

**Symptoms of Excessive Stress**

| Emotional Disturbance | Disruption of Thought Process | Physical Discomfort | Behavioral Changes |
|---|---|---|---|
| Anxiety | Lack of concentration | Increased breathing | Hostility |
| Forgetfulness | Forgetfulness | Heart rate increase | Restlessness |
| Depression | Constant worrying | Muscles tighten | Irritability |
| Apathy | Taking More time to do things | Cold clammy hands | Under/over eating |
| Anger | | Hands shake | Increase In Smoking /Alcohol |
| Excessive | | Immune system less efficient | Ridiculing Others. |
| Shame | | GI tract disorders | |
| Irritability | | Fatigue | |
| | | Sleeplessness | |
| | | Longer recovery from injury | |
| | | Endocrine system problems | |

**Signs of Job Stress**

o Resist going to work o Tired all day o Excessive absenteeism

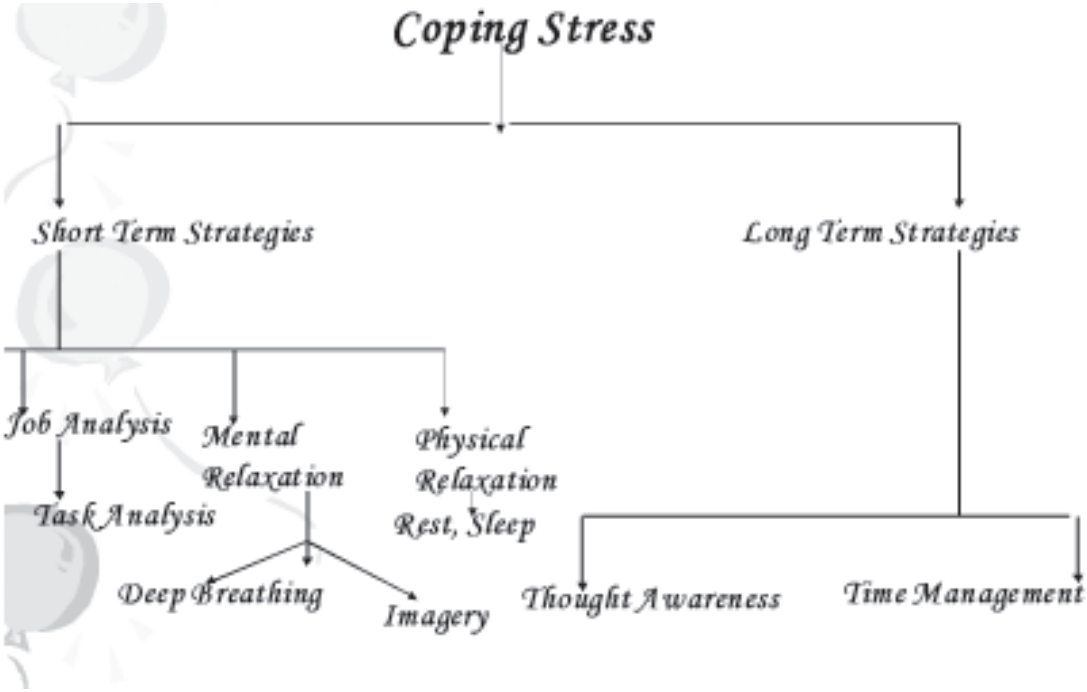
o Watch the clock o Loss of concentration o Not open to change

If we are alert with the symptoms from the beginning then we will be able to cope distress properly & perhaps will be able to extract the good effects of Stress also.

**Effects of Stress : Good & Bad**

| Positive Stress Results | Negative Stress Results |
|---|---|
| Enables concentration | Loss of motivation |
| Increases performance | Reduces effectiveness |
| Energizes you into motion | Physical, mental, and behavioral problems |

We should understand & appreciate that it is not possible to eliminate Stress from our life, instead we should try to chalk out some coping Strategies to handle with stressful situation of our life. The following diagram would help us to list out the possible strategies of coping with the Stress.




Before going to the techniques of coping stress, let us have some common beliefs that contribute stress.

- We must be loved by every one& everyone must approve every thing we do.
- We must be thoroughly competent, achieving in all aspects.
- It is easier to avoid difficulties & responsibilities in life than to face them.

- ❖ There is one perfect solution to every problem & if it is not found the results will be terrible.

We can cope stress of our every day life by:

a) Eliminate — which we will probably can not& need not.

b) Reduce — which we can for a short period of time, that is what we call ' Flight or avoidance technique'

c) Manage — which we will have to do so long we live, that is what is called 'Fight Technique'.

We shall now discuss about different Stress Management Technique:

**Short Term Strategies: (gives us momentary relief)**

**Job Analysis:** This is a technique by which we divide the Job we do into specific tasks & then subtasks. Let us give one example, suppose our job is teaching, and then the tasks would be- taking a session, checking of answer scripts, setting questions, invigilating during exam etc. Now, once we identify the tasks, we would be able to list them out according to priorities & then assign time .We can also prepare a Task List or To-Do list o the priority basis. This would reduce our tension & would control our stress level.

**Mental Relaxation or Mental Imagery:** We can practice deep breathing. A few long breaths taken slowly would pacify our irritation & tension. But, we have to take breathe in a relaxed posture, best would be by lying down or sitting in a comfortable manner.

**Physical relaxation:** A small work break would often do wonder in our work place. It rejuvenates our energy level & puts us into motion again. It is desirable that we should sleep at least eight hours a day & take ample rest. This would reduce both physical & mental stress & the body & mind gets necessary time to put us in to action again.

**Long Term Strategies:** (help us in managing stress so long we live).

There are two unique techniques which would help us in building up a positive attitude towards life which ultimately helps to manage stress.

**Thought Awareness Technique:** It has three steps :-

First Step is Self Analysis, where we try to analyse our Strength, Weakness, against the Opportunity& threats we face from the outer world. This will raise our self confidence.

Next, we observe our thought process while thinking of a stressful situation. It is quite normal that negative thoughts would come. Let all the negative thoughts jam our mind.

The third step would be how we cope with these negative thoughts.

**Rational Thinking:** In this stage, we try to weigh the negative thoughts rationally. Here we do a lot of questioning to ourselves.

Are we becoming too frightful? Preconceived? Skeptic? Here is the time to sit back & think rationally based on the strength & weakness we are having & the actual reality of the outer world. We have to eliminate the unnecessary negative thoughts which may bar us from doing & acting.

**Positive Thinking:** After we have rationalized our thought process, it is now time to think positively - note that:

1) Almost all negative experiences have positive elements in it.
2) List down all the negative points & challenge each of them. We may find that many of them are wrong. In case of serious points, we have to set measurable personal goals.
3) Accept that there are events which we can not control.
4) Focus on positive part of our personality & be assertive.

**Time Management Technique:** This tool already has been discussed in a separate module.

**Remember**

- ❖ We Learn from our failures.
- ❖ We all experience stress.
- ❖ Stress level will rise & fall.
- ❖ We can take control of many events that cause stress.
- ❖ Not everyone is perfect, we all make mistakes or give up at times & we all learn.
- ❖ It is never shameful to seek help.
- ❖ We have right to say a two letter word 'NO'.

**ANNEXURE- H**

**Exercise on 'understanding the Stress Level'**

**Stress Susceptibility Chart.**

| | | | | |
|---|---|---|---|---|
| 1. | Do you do most things as quickly as you can | YES | OFTEN | NO |
| 2. | Do you have a short temper | YES | OFTEN | NO |
| 3. | Do you take work home at weekends or on holidays | YES | OFTEN | NO |
| 4. | Do you try to do more than one thing at a time | YES | OFTEN | NO |
| 5. | Do you find it hard to tolerate delays | YES | OFTEN | NO |
| 6. | Do you always prefer competitive games & sports | YES | OFTEN | NO |
| 7. | Do you get impatient when you see some one doing something slower than you could do it. | YES | OFTEN | NO |
| 8. | Do you always rise to a challenge | YES | OFTEN | NO |
| 9. | Do you feel guilty when you relax & do nothing? | YES | OFTEN | NO |
| 10. | Do you believe that you yourself only can do job well | YES | OFTEN | NO |

**Interpretation of Scores :** Higher number of 'YES' Marks indicate greater level of Stress.

## 2.7 Conflict Management

**Understanding Conflict—Meaning and Phases of Conflict**

Whenever two individuals opine in different ways, a conflict arises. In a layman's language conflict is nothing but a fight either between two individuals or among group members. No two individuals can think alike and there is definitely a difference in their thought process as well as their understanding. Disagreements among individuals lead to conflicts and fights. Conflict arises whenever individuals have different values, opinions,

needs, interests and are unable to find a middle way.

**Let us understand conflict in a better way**

Tim and Joe were working in the same team and were best of friends. One fine day, they were asked to give their inputs on a particular project assigned to them by their superior. There was a major clash in their understanding of the project and both could not agree to each other's opinions. Tim wanted to execute the project in a particular way which did not go well with Joe. The outcome of the difference in their opinions was a conflict between the two and now both of them just can't stand each other.

The dissimilarity in the interest, thought process, nature and attitude of Tim and Joe gave rise to a conflict between the two.

Conflict is defined as a clash between individuals arising out of a difference in thought process, attitudes, understanding, interests, requirements and even sometimes perceptions. A conflict results in heated arguments, physical abuses and definitely loss of peace and harmony. A conflict can actually change relationships. Friends can become foes as a result of conflict just as in the case of Tim and Joe.

A Conflict not only can arise between individuals but also among countries, political parties and states as well. A small conflict not controlled at the correct time may lead to a large war and rifts among countries leading to major unrest and disharmony.

It is a well known fact that neighbours are our biggest assets as they always stand by us whenever we need them. Let us take the example of India and China or for that matter India and Pakistan. India and Pakistan are twin sisters as there is hardly any difference in the culture, religion, climatic conditions, eating habits of the people staying in both the countries, but still the two countries are always at loggerheads and the reason is actually unknown. Small issues between the two countries have triggered a conflict between them which has now become a major concern for both the countries.

Misunderstandings as well as ego clashes also lead to conflicts. Every individual has a different way to look at things and react to various situations.

Rajkumar wanted to meet Gautam at the church. He called up Gautam and following was the conversation between them.

Rajkumar - "Gautam, I want to meet you tomorrow at 9"

Gautam tried Rajkumar's number a several times but could not speak to him. Rajkumar waited the whole day for Gautam and finally there was a major fight between them. For Rajkumar 9 meant 9 in the morning whereas Gautam misunderstood it for 9 in the evening

and hence a major conflict between the two. It is always advisable to be very clear and very specific to avoid misunderstandings and conflicts. Any feedback or suggestion by an individual might not go very well with other individual leading to severe displeasure. It might hurt the ego of the other person resulting in a fight and major disagreement.

**Phases of conflict**

**A conflict has five phases.**

1. **Prelude to conflict —** It involves all the factors which possibly arise a conflict among individuals. Lack of coordination, differences in interests, dissimilarity in cultural, religion, educational background all are instrumental in arising a conflict.
2. **Triggering Event —** No conflict can arise on its own. There has to be an event which triggers the conflict. Jenny and Ali never got along very well with each other. They were from different cultural backgrounds, a very strong factor for possibility of a conflict.Ali was in the mid of a presentation when Jenny stood up and criticized him for the lack of relevant content in his presentation, thus triggering the conflict between them.
3. **Initiation Phase —** Initiation phase is actually the phase when the conflict has already begun. Heated arguments, abuses, verbal disagreements are all warning alarms which indicate that the fight is already on.
4. **Differentiation Phase —** It is the phase when the individuals voice out their differences against each other. The reasons for the conflict are raised in the differentiation phase.
5. **Resolution Phase —** A Conflict leads to nowhere. Individuals must try to compromise to some extent and resolve the conflict soon. The resolution phase explores the various options to resolve the conflict.

Conflicts can be of many types like verbal conflict, religious conflict, emotional conflict, social conflict, personal conflict, organizational conflict, community conflict and so on.

Conflicts and fighting with each other never lead to a conclusion. If you are not on the same line as the other individual, never fight, instead try your level best to sort out your differences. Discussion is always a better and wiser way to adopt rather than conflicts.

**Conflict Management Skills**

Conflict management plays a very important role in preventing conflicts among individuals. How does a conflict arise? When individuals strongly oppose each other's opinions and ideas, the probability of a conflict arises. A conflict starts when individuals

think on different lines and find it very difficult to accept each other's ideas. Conflict must be avoided as it destroys the peace, lowers the productivity as well as demotivates the individuals. All the factors leading to a fight must be explored and efforts must be made to prevent a conflict. A conflict is not very easy to control; an individual needs certain skills for the same.

**Let us study the skills in detail.**

**1. Effective communication Skills**

Effective communication skills are of utmost importance to prevent conflicts. While interacting with others, you have to take special care of your speech and the way you speak. Never ever shout on anyone, even if you do not agree with him. Always speak in a polite but convincing manner. Greet others with a warm smile. It works. Be very specific and precise in your speech. Do not use complicated words and confuse others. Keep a control on your tongue and do not use words which might hurt the sentiments of others. Avoid using abusive languages.

**2. Listening Skills**

An individual must not give his expert comments unless and until he is very clear what the other person wants. Always be a good listener. Don't just jump to conclusions and assume things on your own. Always listen to the other side of the story as well.

**3. Discussion**

Don't just follow the rumor mills blindly, do discuss with others as well. Differences can crop up anytime but fighting would provide no solution. It is always better to sit and discuss the issues on an open forum. All the participants must give their inputs and efforts must be made to find out an alternative. Invite all the members involved and never ignore anyone as it would never solve the problem. Everyone has a right to express his views and a middle way has to be found.

**4. Patience**

One needs to be very patient to avoid conflicts. There would be people at your workplace and even home who would try to provoke you to fight. Never ever get influenced. Always follow your instincts and support what is right. Be very sensible and patient. Learn to keep a control on your emotions. Do not ever lose your temper as it would only make the situation worse.

**5. Impartial**

An individual has to be impartial to avoid conflicts. Do not always support your friend.

Stand by what is correct and never support what is wrong. Any individual, even if he is your friend must be corrected if you feel he is wrong. Listen to everyone and never ignore anyone just because you don't know him.

**6. Never Criticize**

Make the other person understand if he is wrong. Don't criticize him as it would definitely hurt his sentiments. The other person might not be as intelligent as you are, but you have no right to make fun of him. Others will look up to you if you guide the other person well and make him realize his mistakes.

**7. Positive Attitude**

Positive attitude is essential to avoid fights and conflicts. In offices, never ever play the Blame game. No one is perfect and if you have done anything wrong, have the courage to accept it. Human Beings are bound to make mistakes but never try to put the blame on anyone else's shoulders. Avoid backbiting as it only spoils the relationships. If you don't agree with anyone's views, discuss with him on his face, he will like it. Don't always find faults in others and be a little more adjusting as life is all about adjustments.

**8. Ignore others**

Individuals must try to adopt the middle path approach which considers the interests of one and all. Don't unnecessarily waste your energy for a person who is too adamant and is not willing to compromise at all. Ignore the person who is too demanding as it would solve half of your problems.

**Strategies to Avoid Conflicts at the Workplace**

It is rightly said that organizations are individual's first home as one spends the maximum time here. Employees must treat their fellow workers as a part of one big family and must work together to achieve the goals of the organization. Conflicts must be avoided at the workplace to ensure that the employees give their best for maximum productivity.

**Let us understand the strategies to avoid conflicts at the workplace.**

- Every individual has his own style of working and reacting to any particular situation. Problems are bound to come when individuals work together. Never leave any problem unattended as a small problem can eventually become a major reason to worry later on. The problems must be addressed on an open platform and all related employees must be invited. Never discuss any problem separately with individuals as the other person might feel neglected. Prefer a conference room or

the board room to discuss the problems and find a solution to it. Never always depend on verbal communications. Official communications must be preferably through emails marking a CC to all the participants as it is more reliable and transparent.

- Transparency must be maintained at all levels and superiors must be easily available to the subordinates to avoid confusions. Gossips and backbiting must be avoided at workplace as it is considered seriously unprofessional and lead to conflicts among individuals. Be straight forward and learn to express your views in a convincing way. Never be partial at workplaces. Do not support anyone just because he is a friend. Support him if he is right and do correct him if he is wrong. Understand the other individual as well. Don't just impose your ideas on others, instead consider their views also. The superior must know the strengths of his team members and should assign the responsibilities keeping in mind their interests and specialties.
- Communication also plays a very important role in avoiding conflicts at work places. Be very clear and precise in your communication. Never adopt a casual attitude at work as it would strictly go against you. Never deliver any speech or presentation at a noisy place as no one will be able to understand what the other person intends to communicate resulting in misunderstandings.
- Develop the habit of using planners to avoid forgetting important dates and tasks. Do not criticize or make fun of your colleagues. If he is not wearing the tie in the desired way, let him know the correct way. He will feel happy and look up to you in the future. Never ever rely on politics in the office as it spoils the environment completely. Blame game must be avoided strictly as it just adds on to the problems and doesn't provide any solution. You will not become unimportant if you accept your faults. Don't always expect the other person to come to you and discuss things. Be the first one to take the initiative. Learn to own your responsibilities and never pass on the blame to your colleagues. An individual must keep his personal and professional life separate.
- Never carry your problems to work as it never allows you to concentrate in your work. For an employee, office must come first and he must keep his personal interests on the backburner. Learn to trust your colleagues. Always approach the right person and don't spread rumors unnecessarily. One should not be too adamant at workplaces. Be a little more adjusting and flexible. Every employee must try to compromise to the best possible extent and try to find out an alternative. Create

a healthy and a professional environment at office.

- Differences, problems are bound to arise at workplaces, but steps must be taken at the right time to avoid unnecessary fights and disagreements. Conflict not only spoils the ambience but also reduces the productivity of the employees. They feel highly demotivated and don't feel like going to offices. Employees waste all their time and energy and nothing productive can be expected out of them and ultimately the organization is at loss.

**Role of Communication in Conflict Management**

The dissimilarity in the ideas and opinions of individuals result in a conflict. One needs to adjust with each other to some extent to avoid conflicts and better relations. Conflicts and fights must be prevented to avoid its adverse consequences like stress, anxiety and unnecessary tensions. Communication has a big role to play in conflict management. It has been observed that poor communication always results in misunderstandings and eventually conflicts. Our communication has to be clear and precise to avoid conflicts. First yourself be very clear what you intend to convey to the other individual. The thoughts must be carefully put into sensible and relevant words for the others to understand well. Never use words which might hurt the sentiments of others and avoid using derogatory sentences. Don't use too complicated terminologies as the other person might not understand it well.

- Be very clear and straightforward what you expect from the other person. Don't always expect the other person to understand everything on his own. Haphazard thoughts only add on to confusions and result in displeasure and disagreements. If you want to meet your team member at 9 in the morning at the conference hall, please remember to mention the correct timings along with the venue as well as the agenda so that the participants come thoroughly prepared. Don't just communicate for the sake of it.
- Don't merely depend on verbal communication, instead prefer communication through email keeping each and every member in the loop. Never ignore anyone just because you do not like him. It is generally observed that conflict among individuals arises when they feel neglected or left out. Transparency is essential at all levels for better understanding and avoiding conflicts.
- Communication must not be done with members separately but must be on a common platform so that every one gets the same picture. Master the art of writing emails. Select the correct font, style and be careful about the content such that the

mail is self explanatory. Disagreements can arise anytime so make sure that the superiors are always available to the subordinates. At workplaces, the hierarchy must not be too complicated as it only adds to the confusions. People do not understand whom to contact and start fighting among themselves only. At workplaces, employees must be de-motivated to interfere in each other's works and criticize others.

- Never be loud and always be very careful about your pitch and tone. Be polite and convincing. Make your point very clear but do not shout on others as he might feel bad and it might go against you. Presentations, seminars, speeches must be delivered at a noise free zone so that the information hits the eardrums of the recipients instantly and creates the desired impact. Question answer round must be kept at the end in the presentations and people must not jump in between with their questions. It seriously offends the speaker and might result in a fight. Be a little patient and wait for your turn to speak. Be a good listener.
- An individual must not assume things on his own and overreact on petty issues. Every individual has the right to express his views and one must first listen to what the other person has to say.
- When two individuals are interacting with each other, try not to speak in between unless and until required. Always meet the other person with a warm smile. Avoid being rude and harsh. Don't just start shouting even if you do not agree to the other person, sit with him face to face and make him understand his mistakes. Once you are through with your communication, do cross check with the other person whether he has received the correct message or not. Wrong messages lead to confusions and people lose their trust on each other. Make sure you are very clear and transparent with your communication. Think twice before you speak and never offend others.

Always learn to keep a control on your emotions and make sure your communication is impressive and relevant for effective conflict management.

**Tips for Conflict Management for Professionals**

Conflict arises when individuals opine in dissimilar ways or have varied interests, attitudes and even perceptions. Misunderstandings among individuals and ego clashes also result in a conflict. Conflict can arise any time and at any place when individuals are not willing to adjust with each other and are adamant on their views and thought processes. One must understand that a conflict never benefits anyone and it only leads to disagreements

and displeasures. Conflicts must be strictly avoided at workplaces as it hampers the productivity of the workers and they are unable to concentrate on their work. It wastes one's time and energy and the employee is restless and anxious always and doesn't enjoy his work.

Steps must be taken to prevent conflict at the right time in offices to avoid unnecessary tensions and disharmony. Employees must ensure that more focus is on productive output rather than unnecessary fighting with each other. A professional must try his level best to avoid conflicts and its negative consequences.

Let us go through some handy tips for conflict management for professionals.

- Make sure your communication is effective and impressive: Never play with words or share haphazard thoughts with others, instead use corporate jargons and professional terminologies for better understanding. If you yourself are not clear what you expect from your fellow worker, the other person will never be able to understand what you intend to communicate. Be very precise but convincing. The content has to be relevant and sensible. Avoid using derogatory sentences and lewd remarks as it is considered strictly unprofessional. Don't adopt a casual approach at work.
- Be a good and a patient listener: Never jump with your question in between any presentation or seminar, as it seriously offends the speaker and results in displeasure. Wait for your turn to speak. Don't poke your nose into other's conversation. Never interfere in each other's work. Let your colleagues have some space. Always listen to the other person as well and then decide what is right and wrong.
- Don't always depend on verbal communication at workplace: Professionals must communicate through emails as it is more reliable and transparent. Make sure the e-mail is marked to all the related members so that everyone is on the same lines and get a common picture. Take care of your mail body, style and font. Be transparent in your communication. Never communicate with individuals separately as people feel left out and start fighting with each other. Business Communication must be on an open forum inviting all the participants.
- Professionals must develop the habit of using planners, organizers and desk calendars at work: You cannot remember each and every thing, so it is always advisable to jot down the points to avoid forgetting important things. Encircle the dates on the desktop calendar when you have to submit an important report to your boss or have to go for a meeting and place it right in front of you. It would prevent

unnecessary stress and conflicts. Never attend any meeting without a pen and a paper. It will bother you later on.

- The pitch and the tone have to be taken great care of: Don't be too low as others will not be able to understand you properly. Never ever shout or be rude to your colleagues. Shouting solves no problems and it seriously goes against you. Soften your pitch but be convincing. Professionals must take care of their accent, correct pronunciation, punctuations, pauses etc to make the speech impressive and for others to listen attentively.
- Adopt a positive attitude: Don't always find faults in the other person and assume that he is always wrong. Listen to his side of the story as well and never underestimate your fellow worker. If you do not agree with the other person, don't start arguing, instead sit with him face to face, discuss and make him understand your point. He will feel glad. Leave your personal problems out before stepping in the office and always keep your personal interests on the back burner. Find reasons to be happy as negative thoughts always lead to conflicts and disagreements. You can't misbehave with your colleagues just because you are in a fowl mood.
- Never criticize anyone or make him feel small: If he has done anything wrong, make him realize his mistakes instead of making fun of him. Correct him, wherever he is wrong but in a polite way. He will respect you and look up to you in the future. Everyone is equal and one must respect his fellow worker to earn respect in return.
- Prefer the conference room, board room or any suitable place for presentations, seminars and discussions: Avoid communicating at places like workstations, cafeteria, playgrounds or other noisy places as noise acts as a hindrance and creates misunderstandings and confusions. Don't just speak for the sake of speaking.
- A professional must avoid blame games at work: Learn to own your responsibilities and do not always blame others for your mistakes. Never drag issues and be a little more forgiving. Don't always expect the others to come up to you and admit their mistakes. Take the initiative and be the first one to say sorry. It works and solves major conflict and also improves relations among individuals. Kill your ego at workplaces.
- The superiors must ensure that the team members are assigned responsibilities according to their key responsibility areas and specializations: Never impose your decisions or views on others. Things must be discussed with everyone before implementation. An individual has to be a little more flexible and adjusting at

workplaces. Never be too demanding or rigid. Things can't always be just like the way you want.

- ❖ Be impartial at work: Do not favour anyone just because he is your friend. Stand by what is right and do oppose someone who is wrong. Do not blame anyone just because you do not like him. An individual must be judged by the hard work he puts in and not by his physical appearance or relations with you.
- ❖ Never discuss your work and responsibilities with others and learn to keep things a little confidential: Never spread unnecessary and baseless rumors about anyone. Gossips and backbitings must be strictly avoided at work. Encourage healthy competition at work and stay away from controversies. Too much of a friendship at work is bad and must be avoided. Avoid doing personal favours at work.

Conflicts must be avoided at workplace so that employees do not carry tensions back home and are able to give their best to benefit themselves as well as the organization.

**Employee Grievance**

**Effective Ways of Handling Grievance**

Grievance may be any genuine or imaginary feeling of dissatisfaction or injustice which an employee experiences about his job and it's nature, about the management policies and procedures. It must be expressed by the employee and brought to the notice of the management and the organization. Grievances take the form of collective disputes when they are not resolved. Also they will then lower the morale and efficiency of the employees. Unattended grievances result in frustration, dissatisfaction, low productivity, lack of interest in work, absenteeism, etc. In short, grievance arises when employees' expectations are not fulfilled from the organization as a result of which a feeling of discontentment and dissatisfaction arises. This dissatisfaction must crop up from employment issues and not from personal issues.

Grievance may result from the following factors-

a) Improper working conditions such as strict production standards, unsafe workplace, bad relation with managers, etc.

b) Irrational management policies such as overtime, transfers, demotions, inappropriate salary structure, etc.

c) Violation of organizational rules and practices

The manager should immediately identify all grievances and must take appropriate

steps to eliminate the causes of such grievances so that the employees remain loyal and committed to their work. Effective grievance management is an essential part of personnel management. The managers should adopt the following approach to manage grievance effectively-

1. Quick action- As soon as the grievance arises, it should be identified and resolved. Training must be given to the managers to effectively and timely manage a grievance. This will lower the detrimental effects of grievance on the employees and their performance.
2. Acknowledging grievance- The manager must acknowledge the grievance put forward by the employee as manifestation of true and real feelings of the employees. Acknowledgement by the manager implies that the manager is eager to look into the complaint impartially and without any bias. This will create a conducive work environment with instances of grievance reduced.
3. Gathering facts- The managers should gather appropriate and sufficient facts explaining the grievance's nature. A record of such facts must be maintained so that these can be used in later stage of grievance redressal.
4. Examining the causes of grievance- The actual cause of grievance should be identified. Accordingly remedial actions should be taken to prevent repetition of the grievance.
5. Decision- After identifying the causes of grievance, alternative course of actions should be thought of to manage the grievance. The effect of each course of action on the existing and future management policies and procedure should be analyzed and accordingly decision should be taken by the manager.
6. Execution and review- The manager should execute the decision quickly, ignoring the fact, that it may or may not hurt the employees concerned. After implementing the decision, a follow-up must be there to ensure that the grievance has been resolved completely and adequately.

An effective grievance procedure ensures an amiable work environment because it redresses the grievance to mutual satisfaction of both the employees and the managers. It also helps the management to frame policies and procedures acceptable to the employees. It becomes an effective medium for the employees to express t feelings, discontent and dissatisfaction openly and formally.

## 2.8 Document Writing/Report Writing

**What is a Report?**

A report is a structured written document in which a specific issue is examined for the purpose of conveying information, in order to report findings, to answer a request, to put forward ideas and make recommendations or offer solutions.

An effective report is one that is written appropriate to its purpose and audience, accurate, logical; clear and concise; and is well organised into clear section headings. These sections enable readers to find and focus on specific pieces of information.

Purpose, audience and types of Reports Keep in mind what your audience needs to know, this will dictate what type of report you will need to write and the amount of detail to be contained therein. Some questions you need to keep in mind include:

1. Who is the report written for?
2. How is it relevant to them?
3. Why has the report been written?
4. Why should they read the report?
5. What will the audience do with the information?
6. What are the topics covered?
7. What are the recommendations or outcomes?

It is most important to think about your reader(s) in terms of heir wants, needs and expectations. The level of knowledge they have on the topic and their individual areas of expertise could impact greatly on how your report is received.

**Key Points to Writing a Document :**

**Use of language**

- Appropriate
- Jargon
- Plain English

**Content**

- Simple sentences and or statements
- Use of dot points
- Everything to the point

- This is job specific - use experts in the area, as a trainer I have no idea.

**Living Documents**

- Must be written to be changed
- Open mind required
- What triggers change?
- Every time the document is used it is tested.
- Constant continuous improvement

**What triggers change**

- Change in procedure
- Change in equipment
- Better way to do the same job
- Organisational change
- Wanting to deliver Best practice

**Writing the documents**

- What to write
- How long to write
- Start point and finish point
- Answer the who what when questions

**What to do with the finished draft**

- Test the document using someone else to red pen it - don?t be "precious" -
- open mind
- Discuss the suggested changes and include the agreed changes
- Final quality check

**Implement the document**

- Sign off - Who? How? Where?
- Document control - how where - electronic or hard copy?
- Storage and use
- Archiving of old documents - using S drive?

**Review documents**

- Who? When? How?

- ❖ What triggers review?
- ❖ Is there a set time or ongoing?

**Cross Campus use of Documents**

- ❖ Are your systems the same as other campuses?

**The 5W-H Plan for Writing**

The template below can be useful to help you start initial preparation or peer discussions for outlining your writing plan.

| **Topic : XXXXXXXXXXXXXXX** | |
|---|---|
| **Question** | **Answer** |
| Who?<br>What?<br>Where?<br>When?<br>Why? | |

**Steps in Writing Workplace Documents**

**Preparation**

- ◆ **Purpose**
  - ❀ Why are you writing? For example, the purpose may be to:
    - o inform
    - o persuade
    - o present a point of view
    - o propose ideas
    - o report findings
    - o recommend a course of action
  - ❀ What action or outcome are you hoping for?
- ◆ **Reader's requirements**
  - ❀ To whom are you writing?
  - ❀ What does the reader want to know?
  - ❀ What does the reader know about the topic already?

- ❀ What is the reader?s attitude to the topic?
- ❀ What specific requirements or limitations are there?
- ❀ How much detail is required?
- ❀ When is the document required?

❖ **Content**

- ❀ What information do you need to include?
- ❀ Brainstorm and record all ideas that come to mind about the topic. Brainstorming methods include:
  - o Who? What? Where? When? Why? and How? questions;
  - o A mind map of the main concepts, sub-concepts and minor concepts.

❖ **Method**

- ❀ What type of document will be the most appropriate? (e.g. memo, letter or report)
- ❀ What is the most effective way of sending the message? (e.g. personal delivery, mail, e-mail or fax)

**Research**

- ❀ You may need to research the topic.
- ❀ Record the main points and relevant details.
- ❀ Record the source details (i.e. author, title and publishing details) of your research.

**Organisation**

- ❀ Evaluate each point against the topic and purpose of your document.
- ❀ Only retain relevant information.
- ❀ Group like points and arrange them under appropriate headings, sub-headings and minor
- ❀ headings.
- ❀ Arrange the headings, sub-headings and key points into a logical order. This creates a
- ❀ content outline.

**Writing the First Draft**

- ❀ Talk your ideas through with someone else before you start writing. This helps you

to express your thoughts clearly.

- ❀ Type your first draft quickly. Write what you can, then fill in the missing information later.
- ❀ Follow the appropriate document structure.
- ❀ Follow your content outline, and use headings, sub-headings and minor headings.
- ❀ If desired, use decimal numbering and indentation for the headings, sub-headings and minor headings. For example:

**1. HEADING**

**1.1 Sub-heading**

**1.1.1 Minor heading**

- ❀ Add tables and/or illustrations, if applicable.
- ❀ Add layout and formatting features.

**Editing the Draft**

- ❀ When you have completed the draft, lay it aside for a day or two if possible. You can then criticise it objectively, keeping in mind the desirable qualities it should have.
- ❀ Evaluate, correct and improve the draft. Read every word, sentence and paragraph with a view to making constructive changes.
  - ❖ Make sentences clearer, tighter, unambiguous and more polished.
  - ❖ Remove unnecessary details or words.
  - ❖ Add any necessary details that have been omitted.
  - ❖ Check that the tense is consistent.
  - ❖ Use active voice and first person where possible.
  - ❖ Correct the spelling, grammar and punctuation.
  - ❖ If the flow needs to be improved, re-arrange the sequence of sentences or paragraphs.
- ❀ Check that the writing style is appropriate.

**Re-Drafting**

- ❀ Several drafts are usually required in the editing stage.
- ❀ An editing checklist is useful for reviewing the final draft.

- ❀ It may also be helpful to ask actual or potential members of your audience to provide feedback about the final draft. It should be tested by two groups:
  - ❖ people who have been chosen because of their expertise; and
  - ❖ people who have been chosen because of their lack of expertise.
- ❀ Revise the final draft in line with the feedback.

**Writing the Final Copy**

- ❀ Type the final copy of the document.
- ❀ Proofread word by word, and figure by figure.
- ❀ Sign and/or type your name or initials at the end of the document.
- ❀ Keep a copy of the final version for your own records.

Send the document to the reader.

**Important Things to Remember when Editing :**

**Complete**

1. Does the message say all I want it to say?
2. Does it answer all the questions the reader may ask?

**Concise**

3. Has unnecessary information been removed?
4. Is it expressed in the fewest words necessary for completeness,

**Clear**

5. Will the reader understand the wording?
6. Is the intended meaning clear?
7. Is each paragraph one complete thought?
8. Are the ideas presented in the most effective order?
9. Do sentences and paragraphs flow logically?
10. Is the desired reader action specific?

**Correct**

11. Are the statements true and accurate?
12. Have I distorted any of the facts?
13. Is the information (e.g. data, statistics) accurate?

14. Is the grammar correct?

15. Is the spelling correct?

16. Is the punctuation correct?

**Appropriate in tone**

17. Will the tone get the desired response?

18. Is it free from antagonistic words or phrases?

19. Is it free from hackneyed or stilted phrases which will amuse or irritate the reader?

20. Is the language positive?

21. Is the language gender-neutral?

22. Is the tone conversational?

23. Is the correct approach (direct, indirect) being used?

24. Is the tone varied and readable, or flat and monotonous?

**Neat**

25. Is the layout correct?

26. Is the layout pleasing to the eye?

27. Are there noticeable corrections?

**Seven Layout Mistakes to Avoid**

Seven common layout mistakes in documents, web pages and PowerPoint slides. Avoid these mistakes and you'll produce more professional documents.

**1.Don't just fill up :** Space just like you need darkness to appreciate light, you need white space to make your documents more legible. You don?t have to fill up every square centimetre with text or images: less IS more. Increasing the margins of your typical A4 document by 2cm will often improve the layout greatly. Being aware of white space takes practice. The next time you come across a nice layout, make a point to notice just how much white space is used.

**2. Beware of stuff overload :**Volume does not equal quality. So edit ferociously to keep your content tight. Refrain from gratuitous decorations. As a general rule, use at most two typefaces and no more than three different heading sizes. Avoid colours and images unless they are pertinent to your material. Remember, your intention is not to show off the weirdest typefaces you have, or the vastness of your clipart collection.

**3. Don't overuse symmetry :**Using centering and symmetrically arranged elements

tends to create boring layouts. If you have a column of text and a column of images, make their widths obviously different. Left-justified headings are neater and easier to read than centred headings. On some web pages, centred headings can become disconnected from their body copy. Unless you are working in a right-to-left language, don?t right-justify any body copy. On web pages, right-justified text can be invisible on smaller screens.

**4. Pay attention to detail :** Many documents are marred by unintended changes in typeface or type sizes. Use document styles, instead of manual spot formatting, to reduce the likelihood of this. Other layout mistakes to watch are: heading sizes, margins and "orphans and widows" (single lines of text at the top or bottom of a new page). Also, use your spell checker!

**5. Avoid unclear hierarchy :** Documents are generally consumed in a linear fashion, so set up a clear hierarchy of reading. Put the most important information first. Use different heading sizes to differentiate between sections and subsections. Not everything is equally important. Many ineffective websites are filled edge to edge with minimally prioritised material. Do not put your logo on every page or every slide. Your logo should not be a space filler. If your message is useful or interesting, people will remember you.

**6. A word processor is not a typewriter :** Unless you work in a mono spaced typewriter font like Courier, hitting space twice after punctuation creates ugly gaps in your paragraphs. It also screws up the Full Justification algorithm. Use Paragraph Styles to specify the gap between your paragraphs, instead of hitting Enter twice. Each stroke of the Enter key adds an unnecessary Paragraph Mark to your document. Don?t use spaces to line up bits of text that should be in a table. A space is used to separate words and nothing else.

**7. Multimedia is annoying! :** Just because you can, does not mean you should. When used inappropriately, animations, videos and sound all scream "Amateur". And they are usually poor quality, to boot. Common examples are websites that unexpectedly play sound, PowerPoint presentations with a spinning logo on every page and Word documents that use those blinking fairy-sprinkles Text Effects. Keep it simple. When in doubt, don?t format anything! The styles in the various default MS Office templates do tend to produce good results. The result will be documents that are easier to read, transfer between computers, share, upload to information systems and integrate into workflows.

### Quick Tips for Report Writing

Use this checklist to ensure your report is complete and includes all relevant sections:

| | |
|---|---|
| Title page | The title of the report |
| | The author's name and title |
| | The date the report was written |
| Contents page | A contents heading |
| | All headings and sub-headings and their page numbers correspond with the actual contents |
| | A list of tables and their page numbers |
| | A list of figures and their page numbers |
| | A list of graphs and their page numbers |
| | References and appendices sections and their page numbers. |
| Executive summary/Abstract | A separate page |
| | A heading |
| | A summary of the main points in the report |
| Introduction/Executive Summary | A definition of the topic and key terms |
| | Set out the scope and focus of the topic |
| | Present a plan of the argument |
| | Show the writer's stance |
| Body of the report | Stick to the scope and focus of the topic |
| | Flow in a logical manner |
| | Expand on the argument set out in the report |
| | Back up all claims with facts and evidence. |
| Conclusion | Restate the main ideas |
| | Give the writers stance on the topic |
| | State any implications |
| | Make the necessary recommendations: interpret, analyse and evaluate |
| Layout | Headings and subheadings should be consistent in size, number, font and colour |
| Quotations | Enclosed in quotation marks |
| | Less than three lines long |
| | Sourced with the author's name, page number and date in brackets |
| | Relevant |
| | Correct (they must be verbatim) |
| | Sourced accurately. |

| | |
|---|---|
| Tables & figures | Be referenced in the body of the text |
| | Be framed |
| | Have a heading |
| | Be numbered correctly |
| References | Be on a separate page |
| | Under the appropriate heading |
| | Listed alphabetically by surnames |
| Always | Edit for jargon, avoid personal pronouns and contractions and Lead with your most convincing or most important material |
| | Have I fulfilled the purpose of the report? |
| | Are the facts correct? |
| | Is the report comprehensive and relevant? Lead with your most convincing material. |
| | Are the layout and presentation well thought out, is the style clear, concise and professional |
| | Proofread and check spelling, grammar and punctuation |

# Unit - 3 ❑ Regulatory Affairs & Legal Provision

**Structure**



## 3.1 The Private Security Agencies (Regulation) Act, 2005

[With effect from 15th March, 2006]

An Act to provide for the regulation of private security agencies and for matters connected there with or incidental there to.

Be it enacted by Parliament in the Fifty-sixth Year of the Republic of /India as follows:

**1. Short title, extent and commencement. -**

(i) This Act may be called the Private Security Agencies (Regulation) Act, 2005.

(ii) It extends to the whole of India except the State of Jammu and Kashmir.

(iii) It shall come into force on such date as the Central Government may, by notification in the official Gazette, appoint.

**2. Definitions. - In this Act, unless the context otherwise requires, -**

(a) "armoured car service" means the service provided by deployment of armed guards along with armoured car and such other related services which may be notified by the Central Government or as the case may be, the State Government from time to time;

(b) "Controlling Authority "means the Controlling Authority appointed under sub-section (1) of section 3;

(c) "License" means a license granted under sub-section (5) of section 7;

(d) "Notification" means a notification published in the Official Gazette;

(e) "Prescribed" means prescribed by rules made under this Act;

(f) "Private security" means security provided by a person, other than a public servant, to protect or guard any person or property or both and includes provision of armoured car service;

(g) "Private security agency" means a person or body of persons other than a Government agency, department or organisation engaged in the business of providing private security service including training to private security guards or their supervisor or providing private security guards to any industrial or business undertaking or a company or any other person or property:

(h) "Private security guard" means a person providing private security with or without arm to another person or property or both and includes a supervisor;

(i) "State Government", in relation to a Union territory, includes the Administrator of that Union territory appointed by the President under Article 239 of the Constitution.

**3. Appointment of Controlling Authority.-**

(A) The State Government shall by notification, designate an officer not below the rank of a Joint Secretary in the Home Department of the State or an equivalent

officer to be the Controlling Authority, for the purposes of this Act.

(B) The State Government may, for efficient discharge of functions by the Controlling Authority, provide it with such other officers and staff as that Government considers necessary.

**4. Persons or Private Security Agency not to engage or provide private security guard without license —** No person shall carry on or commence the business of private security agency, unless he holds a license issued under this Act :

Provided that the person carrying on the business of private security agency, immediately before the commencement of this Act, may continue to do so for a period of one year from the date of such commencement and if he has made an application for such license within the said period of one year, till the disposal of such application:

Provided further that no private security agency shall provide private security abroad without obtaining permission of the Controlling Authority, which shall consult the Central Government before according such permission.

**5. Eligibility for license.—** An application for issue of a license under this Act shall only be considered from a person after due verification of his antecedents.

**6. Persons not eligible for license. -**

(1) A person shall not be considered for issue of a license under this Act, if he has been—

(a) Convicted of an offence in connection with promotion, formation or management of a company (any fraud or misfeasance committed by him in relation to the company), including, an undischarged insolvent; or

(b) Convicted by a competent court for an offence, the prescribed punishment for which is imprisonment of not less than two years; or

(c) Keeping links with any organisation or association which is banned under any law on account of their activities which pose threat to national security or public order or there is information about such a person indulging in activities which are prejudicial to national security or public order; or

(d) Dismissed or removed from Government service on grounds of misconduct or moral turpitude.

(2) A company, firm or an association of persons shall not be considered for issue of a license under this Act, it is not registered in India, or having a proprietor or a majority shareholder, partner or director, who is not a citizen of India.

**7. Application for grant of license.-**

a) An application for grant of license to a private security agency shall be made to the Controlling Authority in such form as may be prescribed.

b) The applicant shall submit an affidavit incorporating the details in relation to provisions contained in section 6, ensure the availability of the training for its private security guards and supervisors required under sub-section (2) of section 9, fulfillment of conditions under section 11 and of cases registered with police or pending in a court of law involving the applicant.

c) Every application under sub-section (1) shall be accompanied by a fee of-

   a. Rupees five thousand if the private security agency is operating in one district of a state;

   b. Rupees ten thousand if the agency is operating in more than one but up to five districts of a State; and

   c. Rupees twenty-five thousand if it is operating in the whole State.

d) On receipt of an application under sub-section (1), the Controlling Authority may, after making such inquiries as it considers necessary and obtaining no objection certificate from the concerned police authority, by order in writing, either grant a license or refuse to grant the same within a period of sixty days from the date of receipt of application with complete particulars and the prescribed fee :

**Provided that no order of refusal shall be made unless -**

   a. The applicant has been given a reasonable opportunity of being heard; and

   b. The ground on which licence is refused is mentioned in the order.

e) A license granted under this section -

   a. Shall be valid for a period of five years unless the same is cancelled under sub-section (1) of section 13;

   b. May be renewed from time to time after the expiry of five years, for a further period of five years on payment of such fee as may prescribed; and

   c. Shall be subject to such conditions as may be prescribed.

**8. Renewal of licence.-**

(1) An application for renewal of licence shall be made to the Controlling Authority, not less than forty-five days before the date of expiry of the period of validity thereof, in such form as may be prescribed and shall be accompanied by the

requisite fee and other documents required under sections 6, 7 and 11 of this Act.

(2) The Controlling Authority shall pass an order on application for renewal of licence within thirty days from the date of receipt of application complete in all respects.

(3) On receipt of an application under sub-section (1), the Controlling Authority may, after making such inquiries as he considers necessary and by order in writing, renew the licence or refuse to renew the same:

Provided that no order of refusal shall be made except after giving the applicant a reasonable opportunity of being heard.

**9. Conditions for commencement of operation and engagement of supervisors.-**

(A) Every private security agency shall, within six months of obtaining the licence, commence its activities.

(B) Every private security agency shall ensure imparting of such training and skills to its private security guards and supervisors as may be prescribed:

Provided that the person carrying on the business of private security agency, before the commencement of this Act, shall ensure the required training to its security guards and supervisors within a period of one year from the date of such commencement.

(C) Every private security agency shall, within sixty days from the date of issue of the licence, employ such number of supervisors, as may be prescribed.

(D) A private security agency shall not employ or engage a person as a supervisor unless he fulfills the conditions specified in sub- section (1) of section 10.

(E) While engaging a supervisor of private security guards, every private security agency shall give preference to a person who has experience of serving in the Army, Navy, Air Force, any other Armed forces of the Union or State Police including armed constabularies and Home Guards for a period of not less than three years.

**10. Eligibility to be a private security guard.-**

1. A private security agency shall not employ or engage any person as a private security guard unless he -

   a. Is a citizen of India or a citizen of such other country the Central Government may, by notification in the official Gazette, specify;

   b. Has completed eighteen years of age but has not attained the age of sixty-five years;

c. Satisfies the agency about his character and antecedents in such manner as may be prescribed;

d. Has completed the prescribed security training successfully;

e. Fulfils such physical standards as may be prescribed; and

f. Satisfies such other conditions as may be prescribed.

2. No person who has been convicted by a competent court or who has been dismissed or removed on grounds of misconduct or moral turpitude while serving in any of the armed forces of the Union, State Police Organisations, Central or State Governments or in any private security agency shall be employed or engaged as a private security guard or a supervisor.

3. Every private security agency may, while employing a person as a private security guard, give preference to a person who has served as a member in one or more of the following, namely :-

a. Army;

b. Navy;

c. Air Force;

d. Any other armed forces of the Union;

e. Police, including armed constabularies of States; and

f. Home Guards.

**11. Conditions of licence. -**

1. The State Government may frame rules to prescribe the conditions on which licence shall be granted under this Act and such conditions shall include requirements as to the training which the licensee is to undergo, details of the person or persons forming the agency, obligation as to the information to be provided from time to time to the Controlling Authority regarding any change in their address, change of management and also about any criminal charge made against them in the course of their performance of duties of the private security agency or as the case may be, a private security guard employed or engaged by them.

2. The State Government may make provision in the rules to verify about imparting of required training by the private security agency under sub-section (2) of section 9 and to review continuation or otherwise of licence of such private security agency which may not have adhered to the condition of ensuring the required training.

**12. Licence to be exhibited.-**

Every private security agency shall exhibit its licence or copy thereof in a conspicuous place of its business.

**13. Cancellation and suspension of licence.-**

1. The Controlling Authority may cancel any licence on any one or more of the following grounds, namely:-
   a. That the licence has been obtained on misrepresentation or suppression of material fact;
   b. That the licence holder has used false document or photographs;
   c. That the licence holder has violated provisions of the Act or the rules made there under or any of the conditions of the licence;
   d. That the licence holder has misused information obtained by him during the discharge of his duties as the private security agency to any industrial or business undertaker or a company or any other person;
   e. That the licence holder by using any letter-head, advertisement or any other printed matter or in any other manner represented that the private security agency is an instrumentality of the Government or such agency is or has been using a name different from that for which licence has been granted;
   f. That the licence holder is or has been impersonating or permitting or aiding or abetting anybody to impersonate as a public servant;
   g. That the private security agency had failed to commence its activities or to engage a supervisor within had failed to commence its activities or engage a supervisor within the specified time period;
   h. That the licence holder is o has willfully failed refused to render services agreed to any person;
   i. That the licence holder has done act is in of a court order or order of a awful authority or is or been advising, encouraging assisting any person to violate any such order;
   j. That the licence holder has violated the provisions of the Acts given in the Schedule which may be modified by the Central Government, by notification in the Official Gazette;
   k. That there have been repeated instances when the private security guard or

guards provided by the private security agency-

i. Failed to provide private security or were guilty of gross negligence in not providing stich security;

ii. Committed a breach of trust or misappropriated the property or a part thereof which they were supposed to protect;

iii. Were found habitually drunk or indiscipline;

iv. Were found to be involved in committing crimes; or

v. had connived or abetted a crime against the person or property placed under their change; or

l. That the licence holder has done any act which poses a threat to national security, or did not provide assistance to the police or other authority in the discharge of its duties or acted in a manner prejudicial to national security or public order or law and order.

2. Where the Controlling Authority, for reasons to be recorded in writing, is satisfied that pending the question of canceling of licence on any of the grounds mentioned in sub-section

3. Above, it is necessary to do so, that Controlling Authority may, by order in writing, suspend the operation of the licence for such period not exceeding thirty days as may be specified in the order and require the licence holder to show cause, within fifteen days from the date of issue of such order, as to why the suspension of the licence should not be extended till the determination of the question of cancellation.

4. Every order of suspending or cancelling of a licence shall be in writing and shall specify the reasons for such suspension or cancellation and a copy thereof shall be communicated to the person affected.

5. No order of cancellation of licence under sub-section (1) shall be made unless the person concerned has been given a reasonable opportunity of being heard.

**14. Appeals.-**

1. Any person aggrieved by an order of the Controlling Authority refusing the licence under sub-section (4) of section 7 or renewal under sub-section (3) of section 8 or order of suspension of licence under sub-section (2) of section 13 or cancellation of licence under sub-section (1) of that section, may prefer an appeal against that order to the Home Secretary of the State Government within a period of sixty days of the date of such order:

Provided that an appeal may be admitted after the expiry of the said period of sixty days if the appellant satisfies the State Government that he has sufficient cause for preferring the appeal within that period.

2. Every appeal under sub-section (1) shall be made in such form as may be prescribed and shall be accompanied by a copy of the order appealed against.
3. Before disposing of an appeal, the State Government shall give the appellant a reasonable opportunity of being heard.

**15. Register to be maintained by a private security agency.-**

1. Every private security agency shall maintain a register containing-
   a. the names and addresses of the persons managing the private security agency;
   b. the names, addresses, photographs and salaries of the private security guards and supervisors under its control;
   c. the names and addresses of the persons whom it had provided private security guards or services; and
   d. such other particulars as may be prescribed.
2. The Controlling Authority may call for such information as it considers necessary from any private security agency, supervisor or private security guard to ensure due compliance of the Act.

**16. Inspection of licence, etc.-**

The Controlling Authority or any other officer authorized by it in this behalf may at any reasonable time, enter the premises of the private security agency and inspect and examine the place of business, the records, accounts and other documents connected with the licence and may take copy of any document.

**17. Issue of photo identity card.-**

1. Every private security guard shall be issued a photo identity card, by the private security agency employing or engaging the guard.
2. The photo identity card under sub-section (1) shall be issued in such form as may be prescribed.
3. Every private security guard or supervisor shall carry on his person the photo identity card issued under sub-section (1) and shall produce it on demand for inspection by the Controlling Authority or any other officer authorized by it in this behalf.

**18. Disclosure of information to unauthorized person.-**

1. Any person who may be or has been employed or engaged as a private security guard by the private security agency shall not divulge to anyone other than the employer, or in such manner and to such person as the employer directs, any information acquired by him during such employment with respect to the work which he has been assigned by such employer, except such disclosure as may be required under this Act or in connection with any inquiry or investigation by the police or as may be required by an authority or process of law.
2. All private security guards of a private security agency shall render necessary assistance to the police or to such authority in the process of any investigation pertaining to the activities of that agency.
3. If violation of any law is noticed by any private security guard during the course of discharge of his duties, he shall bring it to the notice of his superior, who in turn shall inform the police either through his employer or agency or on his own.

**19. Delegation.-**

The State Government may, by notification, direct that any power or function (except the powers to make rules under section 25)

1. Which may be exercised or performed by it, or
2. Which may be exercised or performed by the Controlling Authority, under this Act, may, in relation to such matter and subject to such conditions, if any, as may be specified in the notification, be also exercised or performed by such officer or authority subordinate to the Government or officer subordinate to the Controlling Authority, as may be specified in such notification.

**20. Punishment for contravention of certain provisions.-**

1. Any person who contravenes the provisions of section 4 shall be punishable with imprisonment for a term which may extend to one year, or with fine which may extend to twenty-five thousand rupees, or with both.
2. Any person or private security agency who contravenes, the provisions of sections 9, 10 and 12 of the Act, shall be punishable with a fine which may extend to twenty-five thousand rupees, in addition to suspension or cancellation of the licence.

**21. Penalty for unauthorized use of certain uniforms.-**

If any private security guard or supervisor wears the uniform of the Army, Air force, Navy or any other armed forces of the Union or Police or any dress having the appearance

or bearing any the distinctive marks or that uniform, he and the proprietor of the private security agency shall be punishable with imprisonment for a term which may extend to one year or with fine which may extend to five thousand rupees, or with both.

**22. Offences by companies.-**

1. Where an offence under this Act has been committed by a company, every person who at the time the offence was committed was in charge of, and was responsible to, the company for the conduct of the business of the company as well as the company, shall be deemed to be guilty of the offence and shall be liable to be proceeded against and punished accordingly:

   Provided that nothing contained in this sub-section shall render any such person liable to any punishment, if he proves that the offence was committed without his knowledge or that he had exercised all due diligence to prevent the commission of such offence.

2. Notwithstanding anything contained in sub-section (1), where any offence under this Act has been committed by a company and it is proved that the offence has been committed with the consent or connivance of or is attributable to, any neglect on the part of any director, manager, secretary or other officer of the company, such director, manager, secretary or other officer shall be deemed to be guilty of that offence and shall be liable to be proceeded against and punished accordingly.

   Explanation. - For the purposes of this section-

   a. "company" means anybody corporate and includes a firm or other association of individuals; and

   b. "Director", in relation to a firm, means a partner in the firm.

**23. Indemnity**

No suit, prosecution or other legal proceeding shall lie against the Controlling authority or any other officer authorized by it in respect of anything in good faith done intended to be done under this Act.

**24. Framing of model rules for adoption by States.**

The Central Government may, frame model rules in respect of all or any of the matters with respect to which the State Government may make rules under this Act, and where any such model rules have been framed the State Government shall, while making any rules in respect of that matter under section 25, so far as is practicable, conform to such model rules.

**25. Power of State Government to make rules.-**

1. The State Government may, by notification, make rules for carrying out the provisions of this Act.
2. In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:-
   a. the procedure for verification of character and antecedents under clause (c) of sub-section (1) of section 10; the type of training under clause (d) of sub-section (1) of section 10; the physical standard under clause (e) of sub-section (1) of section 10; and other conditions under clause (f) of sub-section (1) of section 10;
   b. the number of supervisors to be employed under sub-section (3) of section9;
   c. the form of an application for grant of licence under sub-section (1) of section 7;
   d. the form in which the licence to be granted under sub-section (4) of section 7 and conditions subject to which such licence to be granted under section 11;
   e. the form of an application for renewal of licence under sub-section (1) of section 8;
   f. the form under sub-section (2) of section 14 for preferring an appeal;
   g. particulars to be maintained in a register under sub-section (1) of section 15;
   h. the form in which photo identity card under sub-section (2) of section 17 be issued;
   i. any other matter which is required to be, or may be, prescribed.
3. Every rule made by State Government under this section shall be laid, as soon as may after it is made, before each House of the State Legislature where it consists of two Houses, or where such Legislature consists of one Houses, before that House.
4. In respect of Union territories, every rule made to carry out the provisions of the Act shall be laid before each House of Parliament and where there exists a legislative Assembly, before that Assembly.

**THE SCHEDULE**

**[See section 13(1) (i)]**

1. The payment of Wages Act, 1936 (4 of 1936(4 of 1936).

2. The Industrial Disputer act, 1947 (14 of 1947).
3. The Minimum Wages Act, 1948 (11 of 1948).
4. The Employees Provident Fund and Miscellaneous Provision Act, 1952 (19 of 1952).
5. State Government of Bonus Act, 1965 (21 of 1965).
6. The Contract labour (Regulation and Abolition) Acts, 1970 (37 of 1970)
7. The payment of Gratuity Act, 1972 (39 of 1972)
8. The Equal Remuneration Act, 1976 (25 of 1976).
9. The Inter-State Migrant Workmen (regulation of Employment and conditions of Service) Act, 1979 (30 of 1979)

## 3.2 The Private Security Agencies Central

[With effect from 26th April, 2006]

In exercise of the powers conferred by section 24 of the Private Security Agencies (Regulation) Act, 2005 (29 of 2005), the Central Government hereby makes the following rules, namely:-

**Rules**

**1. Short title and commencement.-**

a. These rules may be called the Private Security Agencies Central Model Rules, 2006.

b. They shall come into force from the date of their publication in the Official Gazette.

**2. Definitions.-**

In these rules unless, the context otherwise requires,-

a. "Act" means the Private Security Agencies (Regulation) Act, 2005;

b. "Agency" means the Private Security Agency;

c. "Controlling Authority" means, the Controlling Authority so declared under the Act;

d. "From" means, a Form appended to these rules;

e. "License" means a license granted under the Act;

f. Words and expressions not defined in these regulations but defined in the Act, shall have the same meaning respectively assigned to them in the Act.

**3. Verification of the antecedents of the applicants.-**

1. Every applicant while making an application to the Controlling Authority for the issue of a fresh license or renewal shall enclose the From I for verification of his antecedents. If the application is a company, a firm or an association of persons, the application shall be accompanied by From I for every proprietor or majority shareholder, partner or director of the company, as if they were also the applicants.
2. On receipt of such application the Controlling Authority shall make such inquiries, as it considers necessary to verify the contents of the application and the particulars of the applicant.
3. The Controlling Authority shall obtain a no- objection certificate from the District Superintendent of Police of the concerned District where the Agency intends to commence its activities. For this purpose it will send to him a copy of the application for license and its attachments for verification and report.
4. The District Superintendent of Police in addition to the causing of verification of antecedents of every individual in whose name the antecedent form is filled up, shall also furnish the following information:
    a. Whether the applicant or the company earlier operated any Private Security Agency, either individually or in partnership of others and if so, the details thereof; and
    b. Whether the applicant possesses any special qualification or skill, which may facilitate his operations of Private Security Agency.

**4. Verification of character and antecedents of the private security guard and supervisor.-**

1. Before any person is employed or engaged as a security guard or supervisor, the Agency shall satisfy itself about the character and antecedents of such person in any one or more of the following manner:-
    a. by verifying the character and antecedents of the person by itself;
    b. by relying upon the character and antecedent verification certificate produced by the person:

    Provided that the character and antecedent certificate shall be valid and the Agency does not have any adverse report regarding the person's character and antecedents from any other source; as prescribed herein under, produce by the person provided it is valid and the Agency does not have any adverse report

regarding the person's character and antecedents from any other source;

c. by relying on the report received from the police authorities signed under the authority of the District Superintendent of police or an officer of the equivalent or higher rank.

2. The person desirous of getting employed or engaged as security guard or supervisor shall submit From II to the Agency. If the person has stayed in more than one District during the last five years, the number of forms will be as many as Districts.
3. The Agency shall cause an inquiry into the correctness of the particulars filled in either by itself or by sending the form to the respective District Superintendent of Police.
4. The State Government may prescribe the form and the manner in which the fee is to be deposited for the service of character and antecedent verification by police.
5. The police will establish identity of the individual and verify the character and antecedents of the person by making a visit to the locality where the person claims to have resided or residing and ascertain his identity and reputation from the respectable residents of the locality. They will also consult the police station record of the concerned police station and other records at the District Police Headquarter before preparing the character and antecedents verification report. This report will contain the comments of the police on every claim of the person in character and antecedents From and also a general report about his activities including means of livelihood in the period of verification. The police will specifically state if there is a criminal case registered against the person at any point of time or if he has ever been convicted of criminal offence punishable with imprisonment.
6. The police will specifically comment if the engaging or employing the person under verification by the Private Security Agency will pose a threat to National Security.
7. The police authorities shall ensure that character and antecedent verification report is issued within ninety days of the receipt of the character and antecedent form.
8. The report of the police regarding character and antecedents of a person will be graded as confidential. It is addressed in named cover to a designated officer of the Security Agency requesting for character and antecedents.
9. Character and antecedent's verification report once issued will remain valid for three years.
10. On the basis of police verification and the basis of their own verification, the

Agency shall issue in From III a Character certificate and this certificate will not be taken back by such Agency even if the person ceases to be the employee of that Agency.

**5. Security training.-**

1. The Controlling Authority shall frame the detailed training syllabus required for training the security guards. This training shall be for a minimum period of hundred hours of classroom instruction and sixty hours of field training, spread over at least twenty working days. The ex-servicemen and former police personnel shall however be required to attend a condensed course only, of minimum forty hours of classroom instructions and sixteen hours of field training spread over at least seven working days.
2. The training will include the following subjects, namely:-
   a. Conduct in public and correct wearing of uniform;
   b. Physical fitness training;
   c. Physical security, security of the assets, security of the building or apartment, personnel security, household security;
   d. Fire fighting;
   e. Crowd control;
   f. Examining identification papers including identity cards, passports and smart cards;
   g. Should be able to read and understand English alphabets and Arabic numerals as normally encountered in the identification documents, arms licence, travel documents and security inspection sheet;
   h. Identification of improvised explosive devices;
   i. First-aid;
   j. Crisis response and disasters management;
   k. Defensive driving
   l. Handling and operation of non-prohibited weapons and firearms (optional);
   m. Rudimentary knowledge of Indian Penal Code, right to private defence, procedure for lodging first information report in the police station, Arms Act(only operative sections); Explosives Act (operative sections);
   n. Badges of rank in police and military forces;

o. Identification of different types of arms in use in public and Police;

p. Use of security equipments and devices (for example: security alarms and screening equipments); and

q. Leadership and management (for supervisors only).

3. The security guard will have to successfully undergo the training prescribed by the competent Authority. On completion of the training each successful trainee will be awarded a certificate in From IV by the training institute or organization.

4. The competent Authority will inspect the functioning of training facility from time to time either by itself or through its own officers. Normally such inspection will be conducted at least two times every year.

5. All the Agencies shall submit a list of successful trainees to the Controlling Authority in the manner prescribed by it.

6. Standard of physical fitness for security guards.-

1. A person shall be eligible for being engaged or employed as security guard if he fulfills the standards of physical fitness as specified below:-

    1. Height, 160 cms (for Female 150 cms), weight according to standard table of height and weight, chest 80 cms with an expansion of 4 cms (for females no minimum requirement for chest measurement).

    2. Eye sight: Far sight vision 6/6, near vision 0.6/0.6 with or without correction, free from colour blindness should be able to identify and distinguish colour display in security equipment and read and understand display in English alphabets and Arabic numerals.

    3. Free from knock knee and flat foot and should be able to run one kilometer in six minutes.

    4. Hearing: Free from defect; should be able to hear and respond to the spoken voice and the alarms generated by security equipments.

    5. The candidate should have dexterity and strength to perform searches, handle objects and use force for restraining the individuals in case of need.

2. A candidate should be free from evidence of any contagious or infectious disease. He should not be suffering from any disease which is likely to be aggravated by service or is likely to render him unfit for service or endanger the health of the public.

3. Agency shall ensure that every security guard working for it undergoes a medical examination after every twelve months from his last such examination so as to ensure his continued maintenance of physical standard as prescribed for the entry level.

**7. Provision for supervisors.-**

1. There shall be one supervisor to supervise the work of not more than fifteen private security guards.
2. In case the private security guards are on security duty in different premises and it is not practical to supervise their work by one supervisor, the Agency shall depute more number of supervisors so that at least for every six private security guards there is one supervisor available for assistance, advice and supervision.

**8. Manner of Making Application For Grant Of Licence.-**

1. Every application by an Agency for the grant of a licence under clause (1) of section 7 of the Act, shall be made to the Controlling Authority in the format prescribed in Form V.
2. Every application referred to in sub-rule (1) shall be accompanied by a demand draft or banker's cheque showing the payment of fees as prescribed under clause (3) of section 7, payable to the Controlling Authority of the State concerned where the application is being made.
3. Every application referred to in sub-rule (1) shall be either personally delivered to the Controlling Authority or sent to him by registered post. On receipt of the application referred to in sub-rule (1), the Controlling Authority shall after nothing there on the date of receipt by him of the application, grant an acknowledgment to the applicant.

**9. Grant of licence.-**

1. The Controlling Authority, after receiving an application under sub-rule (1) of rule 8 shall grant a licence to the private security agency in From VI after completing all the formalities and satisfying itself about the suitability of the applicant and also the need for granting the licence for the area of operation applied for.
2. The Controlling Authority either by itself or through its officers may verify the training and skills imparted to the private security guards and supervisors of any private security agency.
3. The Controlling Authority may review the continuation or otherwise of licence of

such security agencies which may not adhered to the conditions of ensuring the required training.

**10. Conditions for grant of licence.-**

1. The licence shall successfully undergo a training relating to the private security as prescribed by the Controlling Authority within the time frame fixed by it.
2. The licence shall intimate the name, parentage, date of birth, permanent address, and address for correspondence and the principle profession of each person forming the Agency within fifteen days of receipt of the license to the Controlling Authority.
3. The license shall inform the Controlling Authority regarding any change in the address of persons forming the Agency, change of management within seven days of such change.
4. The license shall immediately intimate to the Controlling Authority about any criminal charge framed against the persons forming the Agency or against private security guard or supervisor engaged or employed by the Agency, in the course of their performance of duties as private security agency. A copy of such communication shall also be sent to the officer in charge of the police station where the person charged against resides.
5. Every license shall abide by the requirements of physical standards for the private security guards and their training as prescribed in these rules as the condition on which the licence is granted.
6. Save as provided in these rules, the fees paid for the grant of licence shall be non-refundable.

**11. Renewal of licence.-**

1. Every Agency shall apply to the Controlling Authority for renewal of the licence.
2. The fees chargeable for renewal of the licence shall be the same as for the grant thereof.

**12. Conditions for renewal of licence.-**

The renewal of the licence will be granted subject to the following conditions:-

I. The applicant continues to maintain his principle place of business in the jurisdiction of the Controlling Authority.

II. The applicant continues to ensure the availability of the training for its private security guards and superiors required under sub-section (2) of section 5 of the Act.

III. The applicant continues to adhere to the license conditions.

IV. The police have no objection to the renewal of the license to the applicant.

The form for application of renewal of licence will be same as the form for the application for original licence.

**13. Appeals and procedure.-**

1. Every appeal under sub-section (1) of section 14 of the Act shall be preferred in From VII signed by the aggrieved person or his authorized advocate and presented to the appellate officer in person or sent to him by registered post.
2. The Controlling Authority may prescribe a fee for the appeal to be filed under section 14 of the Act and the manner in which such fee will be paid.

**14. Register to be maintained by the Agency.-**

The register required to be maintained under the Act by the Agency shall be in From VIII.

**15. Photo identity card.-**

1. Every photo-identity card issued by the Agency under sub-section (2) of section 17 shall be in From IX.
2. The photo-identity card shall convey a full-face image in colour, full name of the private security guard, name of the Agency and the identification number of the individual to whom the photo identity card is issued.
3. The photo-identity card shall clearly indicate the individual's position in the Agency and the date up to which the photo-identity card is valid.
4. The photo-identity card shall be maintained up to date and any change in the particulars shall be entered therein.
5. The photo-identity card issued to the private security guard will be returned to the Agency issuing it, once the private security guard is no longer engaged or employed by it.
6. Any loss or theft of photo-identity card will be immediately brought to the notice of the Agency that issued it.

**16. Other conditions.-**

1. Notwithstanding whether the Agency mandates its private security guards to put on uniform while on duty or not, every private security agency will issue and make it obligatory for its security guards to put on:
   a. an arm badge distinguishing the Agency;

b. shoulder or chest badge to indicate his position in the organization;

c. whistle attached to the whistle cord and to be kept in the left pocket;

d. shoes with eyelet and laces;

e. a headgear which may also carry the distinguishing mark of the Agency.

2. The clothes worn by the private security guard while on active duty shall be such that they do not hamper in his efficient performance. In particular they will neither be too tight nor too loose as to obstruct movement or bending of limbs.

3. Every private security guard will carry a notebook and a writing instrument with him.

4. Every private security guard while on active security duty will wear and display photo-identity card issued under section 17 of the Act, on the outer most garment above waist level on his person in a conspicuous manner.

## 3.3 The Private Security Agencies

(Regulation) Act, 2005

**Statement of Objects and Reasons**

1. Due to increase in the number of business establishments and increasing demands for security, there has been a proliferation of private security agencies in the recent years. The growing tendency to hire security guards from private sources by industrial or business undertakings has led to coming up of large number of private security agencies all over the country. Though these private security agencies have helped in meeting the security needs of business establishment, there has been a growing concern about the manner of functioning of these agencies, many of which seem to conduct their operations without due care for verifying the antecedents of the personnel employed as private security guards and supervisors.

2. Private multi- national security agencies have also established their branches in the country, which unless properly regulated, may have serious security implications. Unless suitable safeguards are devised, these developments are likely to have wide ranging security implications, which may not be in national interest. There is also a danger of the employees of the private security agencies encroaching upon the duties of the police, using weapons in an illegal manner and wearing uniforms which resemble those of the police. In many instances, personnel employed by these agencies have also been involved in criminal activities.

3. For all these reasons, Union Government has been considering to regulate the functioning of these private security agencies, so that they are run within legal parameters and are accountable to a regulatory mechanism. In view of above, it is proposed to regulate the private security agencies through an Act which provides for a Controlling Authority to be appointed by the State Governments for the purpose of granting licences and also to make holding of licences mandatory for the carrying on of business of security agencies and other related matters.
4. The Bill to achieve the above objects.

## 3.4 The West Bengal Private Security Agencies (Regulation) Rules, 2007

[With effect from 8th May, 2007]

In exercise of the power conferred by section 25 of the Private Security Agencies (Regulation) Act, 2005 (29 of 2005), the Governor is pleased hereby to make following rules, namely:-

**Rules**

**1. Short title and commencement.-**

1. These rules may be called the West Bengal Private Security Agencies (Regulation) Rules, 2007
2. They shall come into force on the date of their publication in the Official Gazette.

**2. Definitions.-**

1. In these rules, unless there is anything repugnant in the subject or context.-
   a. "The Act" means the Private Security Agencies (Regulation) Act, 2005;
   b. "Agency" means the Private Security Agencies;
   c. "Form" means a Form appended to these rules.
2. Words and expressions not defined in these rules but defined in the Act, shall have the same meaning respectively assigned to them in the Act.
3. Verification of the antecedents of the applicants.-
   1. Every applicant while making an application to the Controlling Authority for the issue of a fresh licence or renewal shall enclose From I for verification of his antecedents. If the applicant is a company, a firm or an association of persons, the application shall be accompanied by From I for every proprietor, majority

shareholder, partner and director of the company, as if they were also the applicants.

2. On receipt of application under sub-rule (1) of this rule, the Controlling Authority shall make such inquiries, as it considers necessary to verify the contents of the application and the particulars of the applicant.
3. The Controlling Authority shall obtain a no objection certificate from the Superintendent of Police of the concerned District, or in case of Kolkata from the Commissioner of Police, Kolkata or an officer authorized by him not below the rank of Deputy Commissioner of Police, as the case may be, where the applicant intends to commence its activities. For the purpose, the Controlling Authority shall send to him a copy of the application for licence and its attachments for verification and report.
4. The Superintendent of Police, or Commissioner of Police, Kolkata or an officer authorized by him not below the rank of Deputy commissioner of Police, as the case may be, in addition to the causing of verification of antecedents of every individual in whose name the antecedent form is filled up, shall also furnish the following information:-
   a. whether the applicant under sub-rule (1) of this rule earlier operated any Agency, either individually or in partnership of others and if so, the details thereof; and
   b. whether the applicant possesses any special qualification or skill, which may facilitate his operations of Agency.

**4. Verification of character and antecedents of the private security guard and supervisor.-**

1. Before any person is employed or engaged as a security guard or supervisor, the Agency shall satisfy itself about the character and antecedents of such person in any one or more of the following manners:-
   a. by verifying the character and antecedent of the person by itself;
   b. by relying upon the character and antecedent verification certificate produced by the person:

   Provided that the character and antecedent certificate shall be valid if the Agency does not have any adverse report regarding the person's character and antecedents from any other source as prescribed here in under;

c. by relying on the report received from the police authorities signed under the authority of the Superintendent of Police or an officer of the equivalent or higher rank of the concerned district or the commissioner of Police, Kolkata or an officer not below the rank of Deputy Commissioner of Police, as the case may be.

2. The person desirous of getting employed or engaged as security guard or supervisor shall submit From II to the Agency. If the person has stayed in more than one district during the last five years, the number of Forms will be as many as districts.
3. The police will establish identity of the individual and verify the character and antecedents of the person by making a visit to the locality where the person claims to have resided or residing and ascertain his identity and reputation from the respectable residents of the locality. They will also consult the police station record of the concerned police station and other records at the Police Headquarter before preparing the character and antecedents verification report. This report will contain the comments of the police on every claim of the person in character and antecedent from and also a general report about his activities including means of livelihood in the period of verification. The police will specifically state if there is a criminal case registered against the person at any point of time or if he has been convicted of criminal offence punishable with imprisonment.
4. The police will specifically comment if the engaging or employing the person under verification by the Agency will pose a threat to National Security.
5. The police authorities shall ensure that character and antecedent verification report is issued within ninety day of the receipt of the character and antecedent Form.
6. The report of the police regarding character and antecedents of a person will be graded as confidential. It will be addressed in named cover to a designated officer of the Agency requesting for character and antecedents.
7. Character and antecedents verification report once issued will remain valid for three years.
8. On the basis of verification, the Agency shall issue in Form III a character and antecedent certificate and this certificate will not be taken back by such Agency even if the person ceases to be the employee of that Agency.

**5. Security training.**

1. The Controlling Authority shall frame the detailed training syllabus required for

training the security guard and Supervisor. This training shall be for a minimum period of hundred hours of classroom instruction and sixty hours of field training, spread over at least twenty working days. The ex-servicemen and former police personnel shall be required to attend a condensed course only, of minimum forty hours of class-room instructions and sixteen hours of field training spread over at least seven working days.

2. The training shall include the following subjects, namely:-
   a. Conduct in public and correct wearing of uniform;
   b. Physical fitness training;
   c. Physical security, security of the assets, security of the building or apartment, personnel security, household security;
   d. Fire fighting;
   e. Crowd control;
   f. Examining identification papers including identity cards, passports and smart cards;
   g. Should be able to read and understand English alphabets and Arabic numerals as normally encountered in the identification documents, arms licence, travel documents and security inspection sheet;
   h. Identification of improvised explosive devices and knowledge of preliminary step to handle the situation;
   i. First-aid
   j. Crisis response and disasters management;
   k. Defensive driving (compulsory for the driver of Armoured vehicle and optional for others);
   l. Rudimentary knowledge of the Indian Penal Code, 1860, the Code of Criminal Procedure, 1973 including knowledge of sections 37 and 39 of the Code of Criminal Procedure, 1973 regarding aid Magistrate and police, right to private defence, procedure for lodging first information report in the police station, the Arms Act, 1959 (only operative sections), Explosives Act (operative sections);
   m. Badge of rank in police and military forces;
   n. Preliminary knowledge to protect the scene of crime till the arrival of police and collecting of evidence in the scene of crime;

o. Knowledge regarding possible modes of collection of intelligence by foreign nationals;

p. Knowledge of Article 51A of Constitution of India regarding Fundamental duties;

q. Identification of different types of arms in use in public and police;

r. Use of security equipment and devices (for example; security alarms and screening equipment);and

s. Leadership and management (for supervisors).

3. The private Security guard and supervisor will have to successfully undergo the training prescribed under sub-rule (2). On completion of the training each successful trainee shall be awarded a certificate in Form IV by the training institute or organization.

4. The private security guard and supervisor will have to undertaken refresher course training for fifty hours biennially.

5. The Controlling Authority shall inspect the functioning of training facility from time to time either by himself or through the officers authorized by him in this behalf.

**6. Standard of physical fitness for security guards and supervisor.-**

1. A person shall be eligible for being engaged or employed as security guard or Supervisor if he fulfils the standards of physical fitness as specified below:-

a. Height, 160 cms. (for female 150 cms), weight according to standard table of height and weight, Cheat 80 cms. With an expansion of 4 cms. (for females no requirement of chest measurement) :

b. Provided that a person belonging to the Gorkhas or Nepalies or Sikkimese or Scheduled Castes or Scheduled Tribes is eligible for relaxation of height by 5 cms.

c. Eye sight: Far sight vision 6/6, near vision 0.6/0.6 with or without correction, free from colour blindness, shall be able to identity and distinguish colour display in security equipment and read and understand display in English alphabets and Arabic numerals,

d. Free from knock knee and flat feet and shall be able to run one kilometer in six minutes,

e. Hearing: Free from defect; shall be able to hear and respond to the spoken voice and the alarms generated by security equipment,

f. The candidate shall have dexterity and strength to perform searches, handle objects and use force for restraining the individuals in case of need.

2. A candidate shall be free from contagious or infectious disease. He shall not be suffering from any disease which is likely to be aggravated by service or is likely to render him unfit for service or endanger the health of the public.

**7. Provision for supervisors.**

1. There shall be one supervisor to supervise the work of not more than fifteen private security guards.

2. In case the private security guards are on security duty in different premises and it is not practical to supervise their work by one supervisor, the Agency shall depute more number of supervisors so that at least for every six private security guards there is one supervisor if available for assistance, advice and supervision.

**8. Manner of making application for grant of licence.-**

1. Every application under sub-section (1) of section 7 of the Act shall be made to the Controlling Authority in the format prescribed in Form V.

2. Every application referred to in sub-rule (1) shall be accompanied by receipted challan in T.R. Form under head of Account "018-Fees under the Private Security Agencies (Regulation) Act, 2005, for regulating the functioning of Security Agencies" with detailed heads "13-Licence Fees" and "16-Other Fees" sub-ordinate to the Receipt Head of Account "0070-Other Administrative Services-60-Other Services-800-Other Receipts Including Census" showing the payment of fees as prescribed under sub-section (3) of section 7 of the Act.

3. Every application refered sub0rule (1) shall be either personally delivered to the Controlling Authority shall after noting thereon the date of receipt by him of the application, grant an acknowledgement to the applicant.

4. On receipt of the application referred to in sub-rule (1), the Controlling Authority shall after nothing there on the date of receipt by him of the application, grant an acknowledgement to the applicant.

**9. Grant of licence.-**

1. The Controlling Authority, after receiving an application under sub-rule (1) of rule 8 of these rules shall grant a licence in From VI after completing all the formalities

and satisfying himself about the suitability of the applicant under the provisions of the Act and also the need for granting the licence for the area of operation applied for.

2. The Controlling Authority either by himself or through the officers authorized by him in this behalf may verify the training and skills imparted to the private security guards and supervisors of any Agency.
3. The Controlling Authority may review the continuation or otherwise of licence of such security agencies which may not have adhered to the conditions of ensuring the required training.

**Note:** In the name of the Private Security Agency, no words like, "Indian", "National" or any other such words which give the impression of any Government patronage can be used.

**10. Conditions for grant of licence.-**

1. The licence shall undergo training to get themselves acquainted with the knowledge and the Indian Penal Code, 1860, Code of Criminal Procedure, 1973, within the time frame fixed by the Controlling Authority.
2. The licence shall intimate the name, parentage, date of birth, permanent address, address for correspondence and the principal profession of each person forming the Agency within fifteen days of receipt of the licence to the Controlling Authority.
3. The licence shall inform the Controlling Authority regarding any change in the address of persons forming the Agency, change of management within seven days of such change.
4. The licence shall immediately intimate to the Controlling Authority about any criminal charge framed against the persons forming the Agency or against the Private Security guard or Supervisor engaged or employed by the Agency, in the course of their performance of duties. A copy of such communication shall also be sent to the officer in charge of the police station where the person charged against resides.
5. Every licence shall abide by the requirements of physical standards for the private security guards and supervisor and their training as prescribed in these rules as the condition on which the licence is granted.

**11. Conditions for the renewal of licence.-**

The renewal of the licence under section 8 of the Act will be granted subject to the following conditions:-

I. The applicant continues to maintain his principal place of business in the jurisdiction of the Controlling Authority;

II. The applicant continues to ensure the availability of the training for its private security guards and supervisors required under sub-section (2) of section 9 of the Act;

III. The applicant continues to adhere to the conditions of the licence;

IV. The police have no objection to the renewal of the licence to the applicant.

V. The Form for application of renewal of licence shall be in the format prescribed in Form V.

**12. Appeals and procedure.-**

Every appeal under sub-section (1) of section 14 of the Act shall be preferred in Form VII signed by the aggrieved person and presented to the Home Secretary of the State Government being the appellate authority in person or sent to him by registered post.

**13. Register to be maintained by the Agency.-**

The register required to be maintained under the Act by the Agency shall be in Form VIII.

**14. Photo identity card.**

1. Every photo identity card issued by the Agency under sub-section (2) of section17 of the Act shall be in Form IX.
2. The photo identity card shall convey a full-face image in colour, full name of the private security guard or Supervisor, name of the Agency and the identification number of the individual to whom the photo identity card is issued.
3. (c)The photo identity card shall clearly indicate the individual's position in the Agency and the date up to which the photo identity card is valid.
4. The photo identity card shall be maintained up to date and any change in the particulars shall be entered therein.
5. The photo identity card issued to the private security guard and the Supervisor will be returned to the Agency issuing it, once the private security guard or the Supervisor is no longer engaged or employed by it.
6. Any loss or theft of photo identity card will be immediately brought to the notice of the Agency that issues it.

**15. Other conditions.-**

1. Every Agency shall issue and make it obligatory for its security guards to put on:-
   a. An arm badge distinguishing the Agency;
   b. Shoulder or chest badge to indicate his position in the organization;
   c. Whistle attached to the whistle cord and to be kept in the left pocket;
   d. Shoes with eyelet and laces;
   e. A headgear which may also carry the distinguishing mark of the Agency.
2. The clothes worn by the private security guard and Supervisor while on duty shall be such that they do not hamper in his efficient performance. In particular they will neither be too tight nor too loose as to obstruct movement or bending of limbs.
3. Every private security guard and Supervisor will carry a notebook and a writing instrument with him.
4. Every private security guard and Supervisor while on security duty will wear and display photo identity card issued under section 17 of the Act, on the outermost garment above waist level on his person in a conspicuous manner.

## 3.5 Employees' Provident Funds & Misc. Provisions Act, 1952

**Object of the Act**

To provide wider terminal benefits to the Workers on completion of their employment.

**Applicability**

Every specified factory OR establishment in which 20 or more persons are employed.

Any factory or Establishment can also voluntarily cover under the Act, even if the number of employees are less than 20.

**Eligibility**

- ❖ Any person who is employed for work of an establishment or employed through contractor in or in connection with the work of an establishment and drawing salary upto Rs.6,500/- p.m. (Basic + DA).
- ❖ Any disabled employee appointed after 1.4.2008 drawing salary upto Rs.25,000/-
- ❖ Any international worker (irrespective of salary limit)

**Payment of Contribution**

The employer shall pay the contribution payable to the EPF, DLI and Employees'

Pension Fund in respect of the member of the Employees' Pension Fund employed by him directly by or through a contractor.

- It shall be the responsibility of the principal employer to pay the contributions payable to the EPF, DLI and Employees' Pension Fund by himself in respect of the employees directly employed by him and also in respect of the employees directly employed by him and also in respect of the employees employed by or through a contractor.

**Rates of Contribution**

- Employer - 12%
- Employee - 12%
- Govt. - 1.16%

| SCHEME | EMPLOYEE'S | EMPLOYER'S | CENTRAL GOVT'S |
|---|---|---|---|
| Provident Fund Scheme | 12% | Amount > 8.33% (in case where contribution is 12% of 10%) 10% (in case of Certain Establishments as per details given earlier) | NIL |
| Insurance Scheme | NIL | 0.5 | NIL |
| Pension Scheme | NIL | 8.33% (Diverted out of Provident Fund (12) | 1.16% |

- The employer also will pay administrative charges @ 1.11% on maximum limit of Rs.6500 whereas an exempted establishment will pay inspection charges @ 0.005% on the total wages paid.

**Benefits**

- Withdrawal of accumulated amount with interest on exit from employment.
- Advances in severely restricted circumstances like buying house, marriage/education, etc.
- Pension to the employees under Employees' Pension Scheme a
- Insurance under Employees' Deposit Linked Insurance Scheme.

**Damages on Delayed Payment**

- Less than 2 months ….@ 5% per annum
- Two months and above but less than upto four months …. @10% per annum
- Four months and above but less than upto six months …. @ 15% per annum
- Six months and above ….@ 25% per annum
- Simple Interest @12% p.a. on delayed payment of contribution.

**Penal Provision**

- For contraventions of Provisions of the Act, imprisonment upto 3 years and fine upto Rs.10,000/-.
- For repeated contraventions of the Act, imprisonment upto 5 years and fine upto Rs.25,000/-.

## 3.6 Employees' State Insurance Act, 1948 & Scheme

**Object of the Act**

To provide social insurance for the employees.

**Applicability of the Act & Scheme**

Is extended in area-wise to factories employing 10 or more persons and establishments employing 20 or more person.

**Coverage of employees**

Employees drawing gross wages upto Rs.15000/- per month, engaged either directly or thrugh contractor

**Rate of Contribution of the wages**

Employers' 4.75%

Employees' 1.75%

**Manner and Time Limit for making Payment of contribution**

The total amount of contribution (employee's share and employer's share) is to be deposited with the authorised bank through a challan in the prescribed form in quadruplicate on or before 21ST of month following the calendar month in which the wages fall due.

**Benefits to the employees under the Act**

Medical, sickness, extended sickness for certain diseases, enhanced sickness, dependents maternity, besides funeral expenses, rehabilitation allowance, medical benefit to insured person and his or her spouse.

**Wages for ESI Contributions**

To be deemed as wages

- Basic pay
- Dearness allowance
- House rent allowance
- City compensatory allowance
- Overtime wages (but not to be taken into account for determining the coverage of an employee)
- Payment for day of rest
- Production incentive
- Bonus other than statutory bonus
- Night shift allowance
- Heat, Gas & Dust allowance
- Payment for unsubstituted holidays
- Meal/food allowance
- Suspension allowance
- Lay off compensation
- Children education allowance (not being reimbursement for actual tuition fee)

**NOT to be deemed as wages**

- Contribution paid by kthe employer to any pension/provident fund or under ESI Act.
- Sum paid to defray special expenses entailed by the nature of employment -
- Daily allowance paid for the period spent on tour.
- Gratuity payable on discharge.
- Pay in lieu of notice of retrenchment compensation
- Benefits paid under the ESI Scheme.

- Encashment of leave
- Payment of Inam which does not form part of the terms of employment.
- Washing allowance
- Conveyance Amount towards reimbursement for duty related journey

**Contribution period**

1ST April to 30TH September.

1ST October to 31ST March

**Contribution period**

If the person joined insurance employment for the first time, say on 5TH January, his first contribution period will be from 5TH January to 31ST March and his corresponding first benefit will be from 5TH October to 31ST December.

**Penal Provision**

- For contraventions of Provisions of the Act, imprisonment upto 2 years and fine upto Rs.5,000/-.
- For repeated contraventions of the Act, imprisonment upto 5 years and fine upto Rs.25,000/-.

## 3.7 Factories Act, 1948

**Applicability of the Act**

To any premises where manufacturing activities are carried out with the aid of power and where 10 or more workers are/were working OR where manufacturing activities are carried out without the aid of power and where 20 or more workers are/were working.

**Employer to ensure health of workers pertaining to**

- Cleanliness Disposal of wastes and effluents
- Ventilation and temperature dust and fume
- Overcrowding Artificial humidification Lighting
- Drinking water Spittoons.

**Safety Measures**

- Facing of machinery

- Work on near machinery in motion.
- Employment prohibition of young persons on dangerous machines.
- Striking gear and devices for cutting off power.
- Self-acting machines.
- Casing of new machinery.
- Prohibition of employment of women and children near cotton-openers.
- Hoists and lifts.

**Working Hours, Spread Over & Overtime of Adults**

- Weekly hours not more than 48 hours.
- Daily hours, not more than 9 hours.
- Intervals for rest at least ½ hour on working for 5 hours.
- Spreadover not more than 10½ hours.
- Overlapping shifts prohibited.
- Extra wages for overtime double than normal rate of wages.
- Restrictions on employment of women before 6AM and beyond 7 PM.

**Welfare Measures**

- Washing facilities
- Facilities for storing and drying clothing
- Facilities for sitting
- First-aid appliances - one first aid box not less than one for every 150 workers.
- Canteens when there are 250 or more workers.
- Shelters, rest rooms and lunch rooms when there are 150 or more workers.
- Creches when there are 30 or more women workers.
- Welfare office when there are 500 or more workers.

**Employment of Young Persons**

- Prohibition of employment of young children i.e. below 14 years.
- Adolescent workers (15 to 18 years of age) are permitted with less working hours and special conditions.

**Annual Leave with Wages**

A worker having worked for 240 days @ one day for every 20 days of working.

**Penal Provision**

- For contraventions of Provisions of the Act, imprisonment upto 7 years or fine upto Rs.2,00,000/-.
- For continuous contraventions of the Act, imprisonment upto 10 year and/or fine upto Rs.5,000/- per day

## 3.8 Industrial Disputes Act, 1947

**Object of the Act**

Provisions for investigation and settlement of industrial disputes and for certain other purposes.

**Important Definition**

**Industry —** has attained wider meaning than defined except for domestic employment, covers from shops with nominal employees to big industrial units.

**Workman —** Includes almost all category of employees, except person doing

Managerial and Administrative work, and also Supervisors earning wages more than Rs.10,000/- p.m.

**Machinery to deal with Disputes**

**Works Committee—**Joint Committee with equal number of employers and employees' representatives for discussion of certain common problems.

**Conciliation-**is an attempt by Govt. Official in helping to settle the disputes.

**Adjudication -** Labour Court, Industrial Tribunal or National Tribunal to hear and decide the dispute.

**Persons Bound by Settlement**

- When in the course of conciliation proceedings etc., all persons working or joining subsequently.
- Otherwise than in course of conciliation, upon the parties to the settlement.

**Period of Operation of Settlements and Awards**

- A settlement for a period as agreed by the parties, or
- Period of six months on signing of settlement.
- An award for one year after its enforcement.

**Conditions for Laying off**

Failure, refusal or inability of an employer to provide work due to

- Shortage of coal, power or raw material.
- Accumulation of stocks.
- Breakdown of machinery.
- Natural calamity.

**Lay off Compensation**

Payment of wages except for intervening weekly holiday compensation 50% of total or basic wages and DA for a period of lay off upto maximum 45 days in a year.

**Notice of Change**

21 days notice to be given by an employer to workmen about changing the conditions of service as provided in IVth Schedule.

**Prohibition of strikes & lock out**

- Without giving to the employer notice of strike, as hereinafter provided, within six weeks before striking.
- Within fourteen days of giving such notice.
- Before the expiry of the date of strike specified in any such notice as aforesaid.
- During the pendency of any conciliation proceedings before a conciliation officer and seven days after the conclusion of such proceedings.
- During the pendency of conciliation proceedings before a Board and seven days after the conclusion of such proceedings.
- During the pendency of proceedings before a Labour Court, Tribunal or National
- Tribunal and two months, after the conclusion of such proceedings.
- During the pendency of arbitration proceedings before an arbitrator and two months after the conclusion of such proceedings, where a notification has been issued under Sub-Section(3A) of section 10A

- ❖ During any period in which a settlement or award is in operation, in respect of any of the matters covered by the settlement or award.

**Prior Permission from the Govt.**

When there are more than 100 workmen (in UP 300 or more) during proceeding 12 months, prior permission to be obtained by the Employer for Lay Off, Retrenchment or Closure.

**Retrenchment of Workmen Compensation & Conditions**

No employees who has worked for 240 days in a year shall not be retrenched unless paid/given:

- ❖ Retrenchment compensation @ 15 days' wages for every completed year of service.
- ❖ Given One month's notice or wages in lieu thereof.
- ❖ Reasons for retrenchment
- ❖ Complying with principle of 'last come first go'.

**Notice for Closure of an Undertaking**

- ❖ 60 days' notice to the authorities for intended closure in prescribed form, when there are minimum 50 workers and less than 100 workers.
- ❖ To apply for Prior permission from Govt. atleast 90 days before the intended closure, when there are 100 or more workmen during preceding 12 months (in UP 300 or more workmen)

**Penal Provision**

- ❖ For breach of provisions of the Act, the employer shall be punishable with imprisonment upto 6 months and/or fine not exceeding Rs.5,000/-.
- ❖ On continuity of offence fine upto Rs.200/- per day.

## 3.9 Payment of Bonus Act, 1965

**Object of the Act**

To provide certain statutory right to the employees to share the profit of the employer.

**Applicability of Act**

Every factory where in 10 or more persons are employed and Other establishments in which 20 or more persons are employed on any day during an accounting year.

Certain States like Maharashtra has made this Act applicable to all the Establishments employing minimum 10 employees.

**Exemption for newly set up Establishments**

Newly set up establishment is exempted from paying bonus for the initial 5 years, provided no profit is made during these years. If the employer derives profit in any of the first five years, he has to pay bonus for that year.

**Eligibility for Bonus**

- Employees (other than Apprentice) drawing salary (basic + DA) upto Rs.10,000/- p.m.
- An employee will be entitled only when he has worked for 30 working days in that financial year.

**Benefits**

- Minimum Bonus is 8.33% of total salary earnings (basic + DA) for the financial year. (Calculation to be done as if the maximum salary were Rs.3,500/- p.m.)
- Maximum bonus is 20%

**Disqualification & Deduction of Bonus**

On dismissal of an employee for

- Fraud; or
- riotous or violent behaviour while on the premises of the establishment; or
- theft, misappropriation or sabotage of any property of the establishment or
- Misconduct of causing financial loss to the Employer to the extent that bonus can be deducted for that year.

**Time Limit for Payment of Bonus**

Within 8 months from the close of accounting year.

**Set-off and Set-on**

As per Schedule IV. Sec. 15

**Maintenance of Registers and Records**

- A register showing the computation of the allocable surplus , in Form 'A'.
- A register showing the set-on and set-off of the allocable surplus, in form 'B'.
- A register showing the details of the amount of bonus paid, in Form 'C'

**Filing of Retun.**

Annual Return to be filed in form 'D' to the concerned Authority.

**Penal Provision**

For breach of provisions of the Act, the employer shall be punishable with imprisonment upto 6 months and/or fine not exceeding Rs.1,000.

## 3.10 Payment of Gratuity Act, 1972

**Object of the Act**

To provide certain reward to the employees for a long meritorious service, at the end of their services.

**Applicability**

Every factory, mine, oil field, plantation, port, railways, shop or establishment employing 10 or more employees

Once Act applies, it continues to apply even if employment strength falls below 10.

**Eligibility**

- Any person employed on wages/salary (irrespective of designation) and completed 5 years of continuous service (except in case of death), shall be eligible for gratuity at the end of their services.

**Benefits**

- 15 days wages (basic + DA) for every completed year of service.
- Maximum gratuity payable is Rs.10,00,000/-

**Calculation Method**

Gratuity = (Monthly salary /26) X 15 days X No. of year of service

**Forfeiture of Gratuity**

Gratuity can be forefeited on termination of an employee

- for moral turpitude or riotous or disorderly behaviour.
- Wholly or partially for wilfully causing loss, destruction of property etc.

**Display of Notice**

Certain notices & abstract of Act are to be displayed at conspicuous place at the main

entrance in English language or the language understood by majority of employees of the factory/establishment.

**Nomination**

To be obtained by employer after expiry of one year's service, in Form 'F'

**Penal Provision**

- Imprisonment upto 2 years or fine upto Rs.20,000 for avoiding to make payment by making false statement or representation.
- For other contraventions of the Act, imprisonment upto one year and/or fine upto Rs.10,000/-

## 3.11 Payment of Wages Act, 1936

**Object of the Act**

The main object of the Act is to regulate the payment of wages of certain classes of employed persons, avoid unnecessary delay in the payment of wages and to prevent unauthorised deductions from the wages.

**Applicability of Act**

- Factories, industrial Establishments, Tramway service or motor transport service, Air transport service, Dock, Wharf or Jetty, Inland vessel, Mine, quarry or oil-field Plantation, Workshop, construction activities or other establishment etc.
- In the state of Maharashtra the Act is extended to Shops & commercial establishments.

**Coverage of Employees**

The employees drawing average wage upto Rs.10,000/- p.m.

**Time of payment of wages**

The wages of every person employed be paid:

- When less than 1000 persons are employed shall be paid before the expiry of the 7th day of the following month.
- When more than 1000 workers, before the expiry of the 10 day of the following month.

**Mode of Payment of Wages**

- ❖ All wages shall be paid in current coins or currency notes or in both.
- ❖ After obtaining the authorization, either by cheque or by crediting the wages in employee's bank Account
- ❖ Wages exceeding Rs.3000/- to be paid by cheque/through bank (Applicable in Maharashtra only)

**Fines as prescribed by**

- ❖ Not to imposed unless the employer is given an opportunity to show cause To record in the register (Sec.8)

**Deduction from wages**

Deductions such as, fine, deduction for amenities and services supplied by the employer, advances paid, over payment of wages, loan, granted for house building or other purposes, income tax payable, in pursuance of the order of the Court, PF contributions, cooperative societies, premium for Life Insurance, contribution to any fund constituted by employer or a trade union, recovery of losses, ESI contributions etc. can be made from the wages, in accordance with Section 7.

**Maximum Deductions**

- ❖ The maximum permissible deductions is 50% of the wages
- ❖ In the event of deduction include payment to co-operative societies, the maximum permissible deduction is 75% of the wages.

**Penal Provision**

- ❖ Penalties for breach of provisions are from Rs.200/- to Rs.1000/-.
- ❖ Repeat offences attract 1 month to 6 months imprisonment and fine from Rs.500/ - to Rs.3000/-
- ❖ Delayed wage payments attract penalty f Rs.100/- per day

## 3.12 Minimum Wages Act, 1948

**Object of the Act**

To fix minimum rates of wages in certain category of employments & industries.

**Applicability of Act**

- The Act will applicable to certain schedule of employment in respect of which Minimum rates of wages have been fixed by the Act.
- It applicable to employees directly employed or employed through contractors, in such schedule of Industry.

**Fixation of Minimum Rates of Wages**

The appropriate government to fix minimum rates of wages from time to time for various industries/schedule of employments.

Procedure for fixing and revising Minimum Rates of Wages

Appointing Committee issue of Notification etc.

**Composition of Committee**

Representation of employer and employee in schedule employer in equal number and independent persons not exceeding 1/3rd or its total number one such person to be appointed by the Chairman.

**Payment of Minimum Rates of Wages**

Employer to pay to every employee engaged in schedule employment at a rate not less than minimum rates of wages as fixed by Notification by not making deduction other than prescribed.

Minimum time rate wages for piece work

Not less than minimum rates wages as fixed.

**Overtime**

For Over time work, the wages to be paid at double the normal rate. (1½ times or for agriculture labour)

**Maintenance of registers and records**

- Annual Returns
- Register for Overtime
- Register of Wages
- Wages slip
- Muster Roll

**Penal Provision**

For breach of provisions of the Act, the employer shall be punishable with imprisonment upto 6 months and/or fine upto Rs.500/-.

## 3.13 Employees'Compensation, Act, 1923

**Object of the Act**

This Act earlier known as "Workmen's Compensation Act is introduced as a kind of Social Security Scheme for the workmen who suffer employment injury, occupational decease etc.

**Applicability**

To those employers employing persons listed in Schedule II of the Act and to whom ESI Act, not applicable.

**Coverage of Workmen**

All workers irrespective of their status or salaries either directly or through contractor or a person recruited to work abroad.

**Eligibility**

Any workman who is injured by accident arising out of and in the course of his employment OR contracts occupational disease peculiar to his occupation.

**Benefits**

- In case of death results from injury, 50% of monthly wages X relevant factor OR Rs.1,20,000/- whichever is more.
- In case of Permanent total disablement resulted from the injury, 60% of monthly wages X relevant factor OR Rs.1,40,000/- whichever is more
- Where permanent, partial disablement or termporary disablement results from injurty, as per prescribed schedule.
- In case of death funeral expenses of Rs.5,000/-
- Relevant factor is based on the age of workman
- For the purpose of calculation of compensation, the monthly salary ceiling is Rs.8000/-, as per Central Govt. Notification dated 31.05.2010.
- In the event of death or in the event of any dispute, the compensation to be

deposited with the Commissioner within one month.

**When an employee is not liable for compensation**

- In respect of any injury which does result in the total or partial disablement of the workman for a period exceeding three days.
- In respect of any injury, not resulting in death or permanent total disablement caused by an accident which is directly attributable to-
- The workman having been at the time thereof under the influence of drink or drugs, or
- Willful disobedience of the workman to an order expressly given, or to a rule expressly framed, for the purpose of securing the safety of workmen, or
- Willful removal or disregard by the workman of any safety guard or other device which he knew to have been provided for the purpose of securing thesafety of workman.

**Report of accident**

Report of fatal Accident and Serious Injury within 7 days to the Commissioner (not application when ESI Act applies).

**Bar upon contracting out**

- Any workman relinquishing his right for personal injury not permissible.
- Bar of benefit under other enactments :- When a person is entitled to any of the benefits provided by this Act, he shall not be entitled to receive any similar benefit admissible under the provisions of any other enactment.

**Penal Provision**

In case of default by employer - 50% of the compensation amount + interest to be paid to the workman or his dependents as the case may be. Other offences attract fine upto Rs.5000/-

## 3.14 Contract Labour (regularation & Abolition) Act, 1970

**Object of the Act**

To regulate the employment of contract labour in certain establishments and to provide for its abolition in certain circumstances and for matters connected therewith.

**Applicability**

- Every establishment in which 20 or more workmen are employed or were employed on any day of the preceding 12 months as contract labour.
- Every contractor who employs or who employed on any day of the preceding twelve months 20 or more workmen.

**Registration of Establishment**

Every Principal employer employing 20 or more workers through the contractor has to register with the Authority by paying prescribed fees.

**Licensing of Contractor**

- Every Contractor engaging 20 or more workers should obtain License from the Authority by required fees and keeping specified Security Deposit.
- The License is issued for specified period.

**Prohibition of Employment of Contract Labour**

Only by the appropriate Government through issue of notification after consultation with the Board (and not Courts) can order the prohibition of employment of contract labour.

**Welfare measures to be taken by the Contractor**

- Canteen facility (if workers are 100 or more)
- First Aid facilities.
- Rest Rooms
- Drinking water, latrines and washing facilities.

**Liability of Principal Employer**

- To ensure provision for canteen, restrooms, sufficient supply of drinking water, latrines and urinals, washing facilities.
- Principal employer entitled to recover from the contractor for providing such amenities or to make deductions from amount payable.

**Registers of Contractors**

By Principal employer

To maintain a register of contractor in respect of every establishment in prescribed form.

**By Contractor**

- Maintain Muster Roll and a Register of Wages in Form XVI and Form XVII respectively when combined.
- Register or wage-cum-Muster Roll in prescribed Form
- Register of Deductions for damage or loss.
- Register or Fines
- Register of Advances
- Register of Overtime
- To issue wage slips to the workmen at least a day prior to the disbursement of wages.
- Obtain the signature or thumb impression of the worker concerned against the entries relating to him on the Register of wages or Muster Roll-Cum-Wages Register.
- When covered by Payment of Wages Act, register and records to be maintained under the rules
- To display an abstract of the act and Rules in English and Hindi and in the language spoken by the Majority of workers in such forms as may be approved by appropriate authority.
- To display notices showing rates of wages, hours of work, wage period, dates of payment, names and addresses of the inspector and to send copy to the inspector and any change forthwith
- To issue an employment card to each worker in prescribed form.
- To issue service certificate to every workman on his termination in prescribed form.

**Penal Provision**

- For contraventions of Provisions of the Act, imprisonment upto 3 months or fine upto Rs.1,000/-.
- For continuous contraventions of the Act, fine of Rs.100/- per day

## 3.15 Industrial Employment (Standing Orders) Act, 1961

**Object of the Act**

To standardize the service conditions of the workmen employed in any industrial establishment. The Act lay down uniformity in the serviceM conditions of the employees

in Industrial Establishments, so that the employer and the employees know in clear manner their rights and obligations.

**Applicability of the Act**

- Every industrial establishment wherein 100 or more employees are employed. In many States like Maharashtra, the Act is made applicable if the number of employees is 50 or more.
- There are some establishments where this Act is not Applicable such as any establishment/industry covered by Bombay Industrial Relations Act, 1946, M.P. Industrial Employment (Standing Orders) Act, 1961 & Industrial Establishments employing persons covered by Civil Service Rules.

**Matters to be provided in Standing orders**

- Classification of workmen, e.g., whether permanent, temporary, apprentices, probationers, or badlis. Manner of intimating to workmen periods and hours of work, holidays, pay-days and wage rates.
- Shift working.
- Attendance and late coming.
- Conditions of, procedure in applying for, and the authority which may grant, leave and holidays.
- Requirement to enter premises by certain gates, and liability to search.
- Closing and re-opening of sections of the industrial establishments, and temporary stoppages of work and the right and liabilities of the employer and workmen arising therefrom.
- Termination of employment, and the notice thereof to be given by employer and workmen.
- Suspension or dismissal for misconduct, and acts or omissions which constitute misconduct.

**Additional Matters**

- Service Record
- Token tickets,
- Record of age,
- Fixing Age of retirement

- Medical Examination
- Secrecy
- Exclusive Service

**Submissions of Draft Standing Orders**

The employer has to submit draft Standing orders for certification within six months from the date when the Act becomes applicable to an industrial establishment.

**Temporary Application of Model Standing Orders**

Till the certification is done by the Certifying Officer, the Model Standing orders provided by the Rules shall be applicable to the Establishment.

**Procedure for Certification of Standing Orders**

- The Draft Standing Order to be submitted to the Certifying Officer.
- The Certifying Officer has to forward a copy of draft standing orders to the trade union or in the absence of union, to the workmen of the industry.
- The trade union or the other representatives, as the case may be, are to be heard. (Sec.5)
- After hearing both the parties and after making necessary changes and amendment, the Certifying Officer shall certify the Standing order.

**Date of commencement of Operation of Standing Orders**

On the date of expiry of 30 days from certification or on the expiry of 7 days from the Appellate order if any passed.

**Display of Standing Orders**

The certified Standing Orders should be displayed in English language or in the language understood by majority of workmen on a notice board at or near the entrance of the Establishment.

**Penal Provisions**

- For contraventions of provisions of the Act, a fine upto Rs. 5000/- can be imposed.
- For repeated or continuous contravention of the Act, further fine of Rs. 200/- per day can be imposed

## 3.16 Mercantile Law or Commercial Law

**Definitions :**

**Proposal -** When one person signifies to another his willingness to do or to abstain from doing anything, with a view to obtaining the assent of that other to such act or abstinence, he is said to make a proposal.

**Promise -** When the person to whom the proposal is made signifies his assent thereto, the proposal is said to be accepted. A proposal, when accepted, becomes a promise. The person making the proposal is called the "promisor and the person accepting the proposal is called the It promise":

**Consideration -** When, at the desire of the promisor, the promisee or any other person has done or abstained from doing, or does or abstains from doing, or promises to do or to abstain from doing, something, such Act or abstinence or promise is called a consideration for the promise.

- ❖ It must move at the desire of the promisor
- ❖ It may move from promisee or any other person
- ❖ It may be act, abstinence,
- ❖ It may be past, present, future
- ❖ Need not be adequate
- ❖ It must be real and not illusory
- ❖ It must not be something which the promisor is already bound to do
- ❖ It must not be illegal / immoral
- ❖ Stranger to the Contract

**Agreement -** Every promise and every set of promises, forming the consideration for each other, is an agreement.

**Contract -** An agreement enforceable by law is a contract. An agreement not enforceable by law is said to be void.

**Sec 2(h) Contract -** An agreement enforceable by law is a contract.

**Sec 10:-**All agreements are contracts if they are made by the free consent of parties competent to contract, for a lawful consideration and with a lawful object, and are not hereby expressly declared to be void.

**Kinds of Contract :**

**Void contract -** A contract which ceases to be enforceable by law becomes void

when it ceases to be enforceable.

**Executed contract -** Where both the parties have performed their obligations, it is executed contract.

**Executory Contract -** Where neither of the parties have performed their obligations, i.e. both the parties are yet to perform their promises, the contract is executory.

**Implied Contract -** The terms of a contract are inferred from the conduct or dealings between the parties. When proposal or acceptance of any promise is made otherwise than in words, the promise is said to be implied. Such implied promise leads to Implied Contract.

**Quasi Contract -** Certain relations resemble those created by a contract. Certain obligations which are not contracts in fact but are so in contemplation of law are Quasi Contracts.

**Contingent Contract -** It is a contract to do or not to do something, if some event, collateral to such contract, does or does not happen.

**Voidable Contract -** A contract is voidable when one of the parties to the contract have not exercised their free consent.

**Speciality Contract -** It is a contract which is in writing, signed, sealed & delivered by the parties.

**Essential elements of a Valid Contract.**

1. Proposal & Acceptance.
2. Consideration.
3. Capacity of parties to contract.
4. Free Consent.
5. Agreement should not be expressly declared void.
6. Writing & Registration, if so required by law.
7. Legal Relationship.
8. Certainty.
9. Possibility of Performance.
10. Enforceable by law.

**Proposals :**

**Proposal -** When one person signifies to another his willingness to do or to abstain from doing anything, with a view to obtaining the assent of that other to such act or abstinence, he is said to make a proposal.

**Essentials of Proposal:**

1. Beyond expression of willingness, there must be something in the nature of a request.
2. Proposer cannot dictate terms.
3. An offer must be intended to create & capable of creating legal relations.

**Communication of proposals.**

The communication of a proposal is complete when it comes to the knowledge of the person to whom it is made.

**Eg -** A proposes, by letter, to sell a house to B at a certain price. The communication of the proposal is complete when B receives the letter.

**Acceptance**

When one person to whom the proposal is made signifies his assent thereto, the proposal is said to be accepted.

Proposal when accepted becomes promise.

The person making the proposal is called the Promisor and person accepting the proposal becomes Promisee.

**Essentials of Acceptance.**

1. Acceptance must be absolute and unqualified.
2. It must be expressed in some usual & reasonable manner.
3. Mental Acceptance is not sufficient in Law.
4. Acceptance must be communicated to the offerer.
5. Acceptance must be by a certain person.
6. Acceptance must be given within a reasonable time.
7. Acceptance must be given before the offer lapses or is revoked or is withdrawn.
8. Acceptance of proposal is acceptance of all terms.

**Communication of an acceptance**

The communication of an acceptance is complete, - as against the proposer, when it is put in a course of transmission to him, so as to be out of the power of the acceptor; as against the acceptor, when it comes to the, knowledge, of the proposer.

**Eg :** B accepts A's proposal by a letter sent by post. The communication of the

acceptance is complete, as against A when the letter is posted as against B, when the letter is received by A.

**Capacity of parties to Contract.**

An agreement becomes a contract if it is entered between the parties who are competent to Contract.

**Every person is Competent to contract**

1. Who is of the age of majority according to the law.
2. Who is of sound mind.
3. Who is not disqualified by any law.

**Free Consent**

"Free consent" - Consent is said to be free when it is not caused by -

1) coercion,
2) undue influence
3) fraud,
4) misrepresentation,
5) mistake.

Consent is said to be so caused when it would not have been given but for the existence of such coercion, undue influence, fraud, misrepresentation or mistake.

**Coercion**

Coercion is the committing, or threatening to commit, any act forbidden by the Indian Penal Code, or the unlawful detaining, or threatening to detain, any property, to the prejudice of any person whatever, with the intention of causing any person to enter into an agreement.

**Eg -** A, on board an English ship on the high seas, causes B to enter into an agreement by an act amounting to criminal intimidation under the Indian Penal Code.

**Undue influence**

A contract is said to be induced by "undue influence" where the relations subsisting between the parties are such that one of the parties is in a position to dominate the will of the other and uses that position to obtain an unfair advantage over the other.

**Fraud**

"Fraud" means and includes any of the following acts committed by a party to a contract, or with his connivance, or by his agent, with intent to deceive another party thereto of his agent, or to induce him to enter into the contract -

1) the suggestion, as a fact, of that which is not true, by one who does not believe it to be true;
2) The active concealment of a fact by one having knowledge or belief of the fact.
3) A promise made without any intention of performing.
4) Any other act fitted to deceive;
5) Any such act or omission as the law specially declares to be fraudulent.

**Misrepresentation**

"Misrepresentation" means and includes -

1) the positive assertion, in a manner not warranted by the information of the person making it, of that which is not true, though he believes it to be true.
2) any breach, of duty which, without an intent to deceive, gains an advantage to the person committing it, or any one claiming under him, by misleading another to his prejudice or to the prejudice of any one claiming under him.
3) causing, however innocently, a party to an agreement to make a mistake as to the substance of the thing which is the subject of the agreement

## 3.17 Right to Information

In modern India where politics plays a vital role, Corruption among the Public Officials is growing with a high speed day by day. To bring transparency and openness for the citizens to know about their Governmentary System and its administrative functions, the Government of India repealed 'Freedom of Information Act, 2002' and passed a new legislation 'Right To Information Act, 2005' called as one of the best transparency laws in the world.

The main aim of 'Right To Information Act, 2005' is to ensure accountability in the workings of every public authorities by providing access to information to the citizens and to bring reduction in corruption. As preamble itself speaks that the RTI Act was enacted to promote transparency and accountability in the working of every Public Authority in order to strengthen the core constitutional values of a democratic republic. One of the main purposes is also to make the government free from corruption and arbitrariness. This act

has its wider scope in the country like India where almost all the public officials are involved in the cases of corruption.

The Right and Duty/Obligation are correlated to each other. Every citizen of India has right to seek information from the public officer if needed, that is by filing a request or application and it is the duty of public officer to provide such an information without any failure. The right and duty are correlated to each other as two faces of the same coin. When the right is claimed by one person, the obligation arises on the other side.

'Right' means a well-founded claim which can always be implied by the nature of the human being. If the claim is founded or given by law, it is a legal right. Men are by their inherent nature moral and social beings, they have therefore mutual claim upon one another. Generally correlation of legal right is legal duty.

'Information' means only that information which is recorded in a material form not in a oral form and includes records, documents, memos, e-mails, opinions, advices, press releases, circulars, orders, logbooks, contracts, reports, papers, samples, models, data material held in any electronic form and information relating to private body which can easily be accessed by the public authority. Information asked should always be administrative in nature.

'Right To Information' is a statutory right conferred on the citizens of India which is equivalent to the right to freedom of speech and expression given under Article- 19(1) (a) of the Indian Constitution. Even Corporates and Associations can avail the information from the public authorities but only through the individuals who constitute their management. If the concerned public authority is failed in providing sufficient information then Public Information Officer can be penalized for such offence.

Public Authority means any authority or body or institution which is established by the government and set up under the Indian Constitution.

Procedure for obtaining information: The person, who is willing to obtain any information from the public officer, shall make a request to the Public Information Officer in writing under Form- A or through electronic means. For this he has to pay Rs: 20 by treasury challan and cash. Similarly a sum of Rs: 15 will be charged per hour, or any fraction thereof, to inspect the documents. The cost of photocopying one page has been fixed at Rs: 5, for computer printout Rs: 10 per page and for CDs and Floppies Rs: 100 per piece. The name of the person must be included while requesting for the information, though reason for requesting information need not be stated. Firstly the application should be filed before the Assistant Public Officer and he will transmit the application within 5 days to the Public Information Officer, who has to dispose the

application within 30 days. A prescribed fee as above stated should be paid to the public authority along with the application for seeking information. If the accurate information is not provided then complaint or application or appeal can be filed to Central/ State Information Commission. For First Appeal Rs: 40 and for Second Appeal Rs: 50 will also be charged. Public Information Officer is bound to find out sources and availability of the information. Frivolous information will not be entertained by the public authority.

Madhya Pradesh was the only first state in India to become actively engaged in securing the Right to Information for the public in October 1996. After which many states have brought out the act into force in the state.

**Exemption from disclosure of information:**

a) Information which affect the sovereignty and integrity of India.
b) Information which has been expressely forbidden by any court of law.
c) Information, if disclosed will lead to breach of privilege of parliament.
d) Information, if endangers lives of the whistle blowers.
e) Information received in confidence from foreign countries.
f) Information containing commercial and trade secrets.

If there is failure on the part of Public Information Officer in providing information and that too without any reasonable cause then penalty in the form of fine can be imposed which will be Rs: 250/- per day but should not extend to Rs/- 25000.

**Case Study:**

1. The Central Board of Secondary Education and Another V/S Aditya Bandopadhyay and Others (AIR 2011 SCW 4888)

According to this case question before the court was whether the answer book of a 'Student' is a document under 'Right to Information Act, 2005'. The Court held that when a candidate participate in an examination and submits its answer book containing answers to the examining body for evaluation and declaration of the result, the answer book is a document or record. The evaluated book of the Student is the opinion of the examiner and it can also be considered as 'information' under Section: 2 (f) & (i) of the Act.

2. Vijay Prakash V/S Union of India (AIR 2010 DEL 7)

According to this case it is stated that the disclosures of service records of a public servant sought by husband so as to establish his case in matrimonial proceedings. The court held that it shall not be permissible under Section: 8 of the 'Right to Information Act, 2005'

# Paper IV
# Disaster Risk Management

# Unit - 1 ❑ Disister, Hazards & Vuluerability

**Structure**



## 1.1 Necessity of studying Disaster Management

The word 'Disaster' has been derived from Middle French desastre and from Old Italian disastro, which in turn comes from the Greek pejorative prefix "dus"- means "bad" + "aster" means "star". Thus the root of the word "disaster" emanates from an astrological theme in which the ancients used to refer to the destruction or deconstruction of a star as a disaster.

Disasters are not new to mankind. They have been occurring constantly and showing

their ugly face to the human civilisation since time immemorial. However, whenever it occurs, a disaster is always accompanied by widespread damages to the nature and huge losses to mankind. It sets back the development trek of the human society and needs pooling of enormous resources from various sources to restore normalcy. Such resources could have been beneficially used for development works had there been no disaster. So a disaster is understood to be an extreme disruption of the functioning of a society that causes widespread human, material, or environmental losses that exceed the ability of the affected society to cope with its own resources. In recent times the incidents of disaster has increased considerably.

Disasters are often classified according to whether they are "natural" disasters, or "human-made" disasters. For example, disasters caused by floods, droughts, tidal waves and earth tremors which occur due to natural forces are generally considered "natural disasters." Disasters caused by chemical or industrial accidents, environmental pollution, transport accidents and political unrest are classified as "human-made" or "human induced" disasters since they are the direct result of human action.

A more modern and social understanding of disasters, however, views this distinction as artificial since most disasters result from the action or inaction of people and their social and economic structures. This happens by people living in ways that degrade their environment, over-population, rapid urbanisation and creation of social and economic systems that disturbs the natural balance of the environment. Communities and population settled in areas susceptible to the impact of a raging river or the violent tremors of the earth are placed in situations of high vulnerability because of their socio-economic conditions.

In fact, in the last few decades, the frequency and intensity of disasters have increased manifold. No wonder why the losses due to disasters are compounding every year. A study released at the World Conference on Natural Disaster Reduction, convened by the General Assembly in May 1994, showed that the previous three decades had seen a steady and rapid increase in the number of significant natural disasters and in the number of people affected. The trend continues to date and the situation seems to have worsened even further. The following table gives an idea of the global trend of occurrence of disasters during the period 1900 - 2009.

**Table 1.1: Events of Disasters globally during the period 1900 - 2009**

| Disaster Types | Decades | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1900 -09 | 1910 -19 | 1920 -29 | 1930 -39 | 1940 -49 | 1950 -59 | 1960 -69 | 1970 -79 | 1980 -89 | 1990 -99 | 2000 -09 |
| Hydro meteorological | 28 | 72 | 56 | 72 | 120 | 232 | 463 | 776 | 1498 | 2034 | 3529 |
| Geological | 40 | 28 | 33 | 37 | 52 | 60 | 88 | 124 | 232 | 325 | 354 |
| Biological | 5 | 7 | 10 | 3 | 4 | 2 | 37 | 64 | 170 | 361 | 612 |
| Total | 73 | 107 | 99 | 112 | 176 | 294 | 388 | 964 | 1900 | 2720 | 4495 |

Source: Centre for Research on Epidemiology of Disasters (CRED)

As is evident from the above table, there has been a rapid increase in incidents of disasters in the world. The increase in absolute number terms of such incidents has been the highest in the last decade. Incidentally, the last few decades have also experienced the very rapid growth in population and urbanisation. This clearly indicates that the frequency of disasters increases with the rise in human population.

The correlation becomes clearer from the fact that most of the disasters occur in the developing or third world countries where the population density is much higher than the developed countries. Asia, the most populated continent, accounts for 43% of the disasters 54% of the damages and 68% of the human lives lost globally (see table - 1.2).

**Table: 1.2: Continent-wise disaster occurrences and damages (as a percentage of the world figure) in the last decade:**

| **Continent** | **Asia** | **Europe** | **Africa** | **America** | **Oceania** |
|---|---|---|---|---|---|
| **No. of disasters (%)** | 43 | 19 | 14 | 22 | 2 |
| **Human lives lost (%)** | 68 | 3 | 14 | 14 | 1 |
| **Estimated damages (%)** | 54 | 19 | 3 | 23 | 1 |

India's geo-climatic conditions as well as its high degree of socio-economic vulnerability, makes it one of the most disaster prone country in the world. Earthquakes in Latur (1993), Bhuj (2001), Kashmir (2005) and Sikkim (2011); floods in West Bengal (1978, 2000), Uttar Pradesh (1998, 2005), Maharshtra (2005), Assam & Bihar (2004, 2007, 2008) and Andhra Pradesh & Karnataka (2009); Super Cyclone in Orissa (1999); Tsunami in Tamil Nadu & Andaman & Nicobar islands (2004) and Bhopal Gas tragedy (1982) are some of the most devastating disasters that have occurred in various parts of India. We will discuss about this in details in later chapters. The sufferings due to disasters are heart rending. People are forced into uncalled for misery. The condition of the poor and less resourceful becomes even more pathetic.

It is thus necessary to find ways to minimise the effects of disasters. This however can only be accomplished by acquiring detail knowledge of disaster management and mastering the relevant skills for its application. So the study of Disaster Management is inevitable in facilitating proper functioning of today's civilization.

Over the years, a paradigm shift has occurred in the theory and practice of disaster management. Earlier disasters were treated as a one-time event with focus on geophysical and engineering knowledge without considering the social and development aspects. Gradually the attitude shifted towards preparedness with emphasis on 'contingency planning' and relief supplies. However, as disaster losses continued to increase, there is a shift from response approach to a more proactive attitude. It is now being understood that disasters are related to vulnerability of the people, which in turn is dependent on the development pattern of the region.

With the experiences and new learning's in the field of disasters, there is demand for a human rights approach with focus on vulnerability reduction. It is therefore extremely important that we follow the culture of 'Disaster Risk Reduction', which means we PLAN, and undertake ACTIONS in a manner which reduces vulnerability and helps to prevent hazards from taking the shape of a disaster. Though we have moved ahead in theoretical construct, there is still a long way to go before substantial achievement is made in building resilient communities and a safe living environment.

Many of us, who start probing deeper into the subject area, find themselves amidst many queries like: Are natural disasters a consequence of the natural forces or are they a result of human activities? Do disasters differentiate between developed and developing countries or are disasters a manifestation of the development activities? Do disasters

discriminate among communities and between men and women? A frequently asked question by many individuals is how I can be prepared to deal with such events. How can I contribute for reducing disaster risk?

By studying disaster management like taking this course on 'Disaster Risk Management' one will be in a position to find answers to all such questions. A fair knowledge of the nature and characteristics of various disasters would make the people aware about the dangers waiting in disguise and motivate them to learn ways of mitigating the effects of the disasters or preventing them. Moreover there is a crying need for trained Disaster Managers who would be able to work with various organisations to help them prevent unnecessary disasters and facilitate capacity building necessary to bring about a culture of preparedness and mitigation among them. This course is designed to train the students to be good Disaster Managers. By undertaking this course one will also be equipped to help the society in augmenting its coping capacity so as to mitigate and overcome disasters.

## 1.2 The scope for a Disaster Manager

Students with education in Disaster Management along with a general subject have higher rate of employability in the country. Ensuring environmental sustainability being one of the Millennium Development Goals, the international community is committed towards integration of the principles of sustainable development into country policies and programmes and reversing the loss of environmental resources. The interlink between impact of disasters on development and global economy having been established for quite sometime, students taking up subjects relating to disaster management would definitely have an edge over others as far as opportunities in governments, companies, and non-profit organizations employing persons in the field of Development or Disaster Management is concerned. Further with the sustained effort of the international community towards eradication of poverty the opportunities for Disaster Managers are also growing.

Scope for Disaster Managers in NGO's: There are over 4,000 NGOs actively working in the State of West Bengal, and another 6,000 NGOs are working in the neighbouring states of Sikkim, Jharkhand, Bihar and Odisha. Out of these, over 200 NGOs are registered members who regularly work on Disaster Preparedness and Mitigation measures. They have some program or the other that has something to do with Disaster Management. This includes UN agencies (Unicef, UNDP, WWF), IRCS, International NGOs like World

Vision, Save the Children, Caritas, Oxfam, Concern Worldwide etc, and hundreds of mid-level NGOs. Such organisations quite often announce vacancies for jobs related to disaster management.

Scope for Disaster Managers in the Corporate and service sectors: The need for persons with education in Disaster Management is ever increasing. Today, even the malls are looking for Floor Managers who have knowledge and skills in disaster management such as crowd management, information management, response and first aid, knowledge of rescue mechanisms. The hospital administrators, NGO administrators, school principals, construction companies, transport industries, large industries and even banking sector is on the lookout for people with skills in disaster management. There is a need for engineers and skilled construction workers with knowledge of disaster management. Even in the agriculture sector there is a huge need for people who have knowledge of disaster management so as to successfully undertake risk planning and risk avoidance in case of agricultural produce.

Thus the field of disaster management is an ever expanding one with corresponding rise in job opportunities for persons with formal education in that field.

## 1.3 Definition of Disaster

The definition of 'disaster' is now all encompassing, which includes not only the events emanating from natural and man-made causes, but even those events which are caused by accident or negligence. Thus the Disaster Management Act, 2005 defines disaster as "a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area".

### 1.3.1 Types of Disasters

Disasters are often classified according to whether they are "natural" disasters, or "man-made" disasters depending upon the causes of such disasters. For example, disasters caused by floods, droughts, tidal waves and earth tremors which occur due to natural forces are generally considered "natural disasters." Disasters caused by chemical or industrial accidents, environmental pollution, transport accidents and political unrest are classified as "man-made" disasters since they are human induced and a direct result of human action.

The various kinds of disasters occurring around us can be classified under the above two broad types as follows:

***I. Natural Disaster:***

a) Flood, b) Cyclone, c) Earthquake, d) Hailstorm, e) Drought, f) Landslide, g) Erosion, h) Heat wave, i) Cold wave, j) Cloud-burst, k) Avalanche, l) Tornado, m) Tsunami.

***II. Man-made Disaster:***

a) Transport (Road, Rail, Air and Sea) disasters, b) Fire accidents, c) Building Collapse, d) Industrial accidents, f) Explosions, g) Terrorism h) War and i) Epidemics.

In India, we have experienced each and every kind of the above mentioned disasters at various points of time in the past. A description of this will be given in the next section. However, the point to be noted here is that on taking a closer look at the root causes of disasters, the distinction between natural and man-made disasters gets blurred. This is because most disasters result from the action or inaction of people and their social and economic structures. This happens by people living in ways that degrade their environment, over-population, rapid urbanisation and creation of social and economic systems that disturb the natural balance of the environment. Communities and population settled in areas susceptible to the impact of a raging river or the violent tremors of the earth are placed in situations of high vulnerability and are bound to be affected by disasters, sooner or later.

## 1.4 History of Disasters

As discussed in the previous chapter, disasters are worldwide phenomena. No part of this world can be claimed with certainty to be totally safe. In fact, in modern times the disasters are on the rise. A glance of Table-1.1 would make the picture clearer that how the frequency of disasters has increased phenomenally from 1900 to 2009. However, here we will focus our discussion on occurrence of disasters in India only.

India, due to its geo-climatic and socio-economic conditions, is prone to various disasters. During the last thirty years, the country has been hit by as many as 431 major disasters resulting into enormous loss to life and property. According to the Prevention Web statistics, during these three decades 143039 persons were killed and the cumulative figure for the number of people affected comes to around 150 Crores in the country. The disasters caused huge losses to property and other infrastructures, the total estimate of the damages amounting to US$ 4800 Crore. The most severe disasters in the country and their impact in terms of

people affected, lives lost and economic damages is given in the Table 2.1 below.

**Table 2.1: People affected, lives lost and economic damage due to Disasters in India between 1980 to 2010**

| Year | Type of Disasters | People affected | Life Lost | Economic Damage (USD x |
|---|---|---|---|---|
| 1980 | Flood | 30,000,023 | | |
| 1982 | Drought | 100,000,000 | | |
| | Flood | 33,500,000 | | |
| 1984 | Epidemic | | 3290 | |
| 1987 | Drought | 300,000,000 | | |
| 1988 | Epidemic | | 3000 | |
| 1990 | Storm | | | 2,200,000 |
| 1993 | Flood | 128,000,000 | | 7,000,000 |
| | Earthquake* | | 9,748 | |
| 1994 | Flood | | 2001 | |
| 1995 | Flood | 32,704,000 | | |
| 1996 | Storm | | | 1,500,300 |
| 1998 | Storm | | 2871 | |
| | Extreme Temp. | | 2541 | |
| | Flood | | 1811 | |
| 1999 | Storm | | 9,843 | 2,500,000 |
| 2000 | Drought | 50,000,000 | | |
| 2001 | Earthquake* | | 20,005 | 2,623,000 |
| 2002 | Drought | 300,000,000 | | |
| | Flood | 42,000,000 | | |
| 2004 | Flood | 33,000,000 | | 2,500,000 |
| | Earthquake* | | 16,389 | |
| 2005 | Flood | | | 3,330,000 |
| | Flood | | | 2,300,000 |
| 2006 | Flood | | | 3,390,000 |
| 2009 | Flood | | | 2,150,000 |

Source: EM-DAT: The OFDA/CRED International Disaster Database

* (includes Tsunami)

In India, the cyclone which occurred on 25th November, 1839 had a death toll of three lakh people. The Tsunami (2004) in Tamil Nadu and Andaman & Nicobar Islands, the Bhuj earthquake of 2001 in Gujarat and the Super Cyclone of Orissa on 29th October, 1999 are still fresh in the memory of most Indians. The most recent natural disaster of Cloud burst in Leh resulting in flash floods and mudflow in Leh and surrounding areas in the early hours of

6th August, 2010, caused severe damages in terms of human lives lost and property damaged. It was reported that 196 persons had died of this disaster, 65 persons were missing, 3661 houses were damaged and 27350 hectares of standing crop was affected.

Floods, earthquakes, cyclones, hailstorms, etc. are the most frequently occurring disasters in India. The following table gives an account of the loss due to above disasters during decade of 2001- 2010.

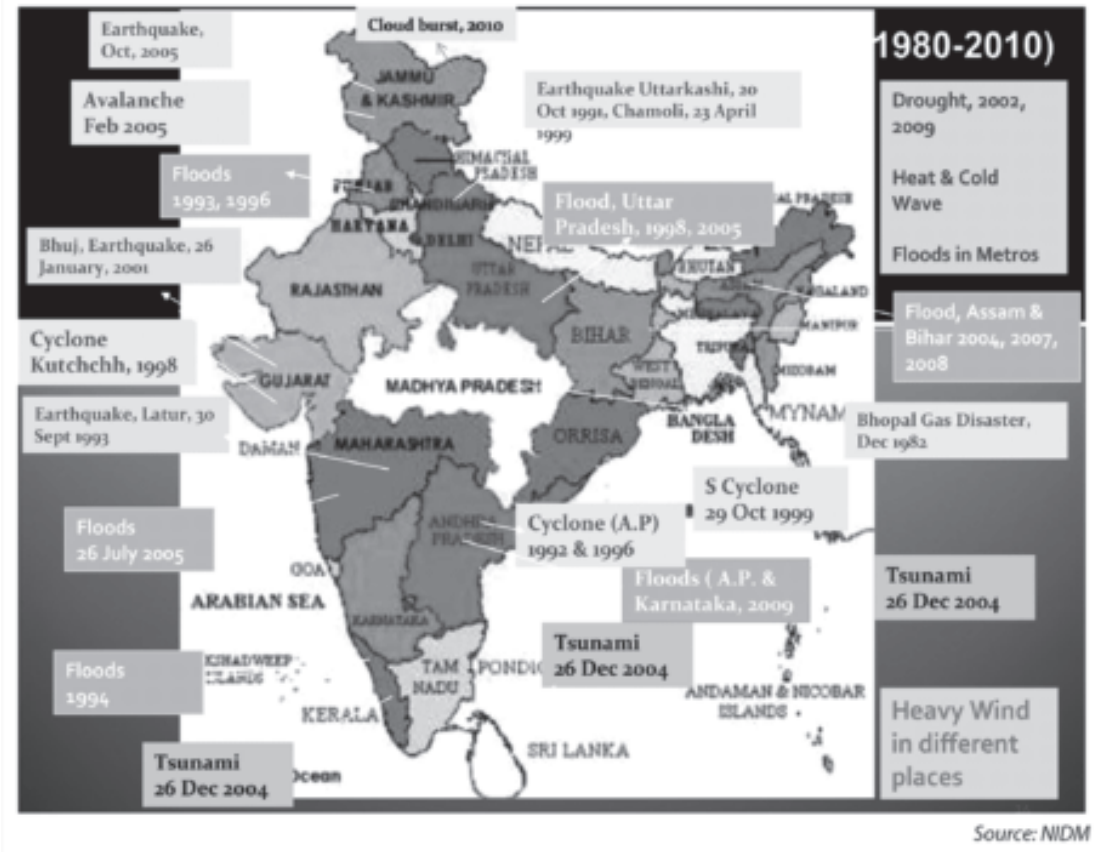
**Table-2.2: Year-wise damage caused due to floods, cyclonic storms, landslides etc. during last ten years in India**

| Year | Loss of human life (in No.) | Cattle Lost (in No.) | House damaged (in No.) | Cropped Area affected (in Lakh hectares) |
|---|---|---|---|---|
| 2001-02 | 834 | 21269 | 3,46878 | 18.72 |
| 2002-03 | 898 | 3,729 | 462700 | 21.00 |
| 2003-04 | 1992 | 25,393 | 682209 | 31.98 |
| 2004-05 | 1995 | 12,389 | 1603300 | 32.53 |
| 2005-06 | 2698 | 1,10,997 | 2120012 | 35.52 |
| 2006-07 | 2402 | 4,55,619 | 1934680 | 70.87 |
| 2007-08 | 3764 | 1,19,218 | 3527041 | 85.13 |
| 2008-09 | 3405 | 53,833 | 1646905 | 35.56 |
| 2009-10 | 1677 | 1,28,452 | 1359726 | 47.13 |
| 2010-11 | 2310 | 48,778 | 1338619 | 46.25 |

Source: Ministry of Home Affairs (MHA)

**Figure 1** gives a quick view of the major disasters that have occurred in the country from 1980-2010. During this period of 30 years the country has been hit by approximately 25 major disasters apart from the heat wave, cold wave and heavy winds affecting some areas of the country.

**Figure 1: Major Disasters in India from 1980 - 2010**




*Source: NIDM*

As is evident from the above picture there is a history of occurrence of major disasters all over India. Consequently, it is very important for us to know why so many disasters occur here and what are the factors contributing to occurrence of such disasters.

## 1.5 Factors causing Disasters

From the discussion in the previous sections it is clear that disasters occur quite frequently and cause heavy losses to life and property. Secondly, a continent-wise break up of the occurrence of disasters and losses incurred due to such disasters in the last decade given below indicates that Asia, the most populated continent, accounts for 43% of the disasters 54% of the damages and 68% of the human lives lost globally (see table - 1.2).

**Table: 1.2: Continent-wise disaster occurrences and damages (as a percentage of the world figure) in the last decade:**

| Continent | Asia | Europe | Africa | America | Oceania |
|---|---|---|---|---|---|
| No. of disasters (%) | 43 | 19 | 14 | 22 | 2 |
| Human lives lost (%) | 68 | 3 | 14 | 14 | 1 |
| Estimated damages (%) | 54 | 19 | 3 | 23 | 1 |

This brings out the fact that disasters do not occur uniformly throughout the world. Some parts of the world are more prone to disasters than others. What might be the reason for this?

To answer this question we need to go back to the definition of disaster. We defined disaster as an event or a series of events which gives rise to casualties and/or damage or loss of property, infrastructure, essential services or means of livelihood on a scale that is beyond the normal capacity of the affected communities to cope with unaided. An interpretation of this definition reveals that a disaster is brought about by "an event or a series of events" and affects "a community which is unable to cope with such an event on its own". These "events" are actually known as "hazards" and the "inability" of the community to cope with the hazards on its own is called its "vulnerability".

So there are the two factors leading to disasters -

1. Hazard or the event such as flood, earthquake, fire etc. which triggers the disaster and
2. Vulnerability or the inability of the community to cope with such hazardous events using its available resources.

So for a disaster to take place a hazardous event must occur in such an area where there are vulnerable people, infrastructures, services or means of livelihood that should get affected on a large scale leading to widespread losses. We can express this as follows:

$$\text{Disaster} = \text{Hazard} \times \text{Vulnerability}$$

i.e. disaster is a product of hazard and vulnerability. In other words, both hazard and vulnerability has to exist simultaneously at the same location. In the absence of either of the two factors, disaster cannot occur. A few examples may establish the above argument.

For example, vast areas on both the banks of the river Ganga gets flooded in the region called taal in Bihar but that never leads to any disaster because there is no habitation

in that area. This region is used only for agriculture after the water recedes. Here the vulnerability component is absent and hence no disaster occurs. Again, earthquakes of moderate strength occur regularly in Japan. But neither any person dies because of such earthquakes nor any property is damaged. This is so because the Japanese have constructed their structures in such a way so as to withstand the tremors i.e. they have minimized their vulnerability to almost zero.

Further, the Purulia district in West Bengal is inhabited by vast majority of poor people who hardly own resources worth mentioning. However, the district is located in a geo-climatic zone that has the least possibility of being struck by flood, cyclone or earthquake (see Hazard-Vulnerability map of West Bengal, pp ). In the absence of such hazards there is least possibility of occurrence of corresponding disasters although there is a huge population of vulnerable people residing in the district. Thus a disaster occurs only when a hazardous event strikes in any area which is vulnerable to damages.

### 1.5.1 Dimensions of Disasters

The extent of damage from the disaster depends on:

1. The impact, intensity and characteristics of the hazardous phenomenon, and
2. How people, environment and infrastructure are affected (due to their inherent vulnerability) by that phenomenon.

In other words, if the intensity (i.e. damaging potential) of a particular hazard and vulnerability is low, the disaster is of moderate dimension. On the other hand if either the hazard or the vulnerability of the elements concerned is high then the dimension of the disaster is also large. Again, if both the intensity of the hazard and vulnerability of the hazardous terrain are high then the magnitude of the disaster is very large leading to devastation. This can be represented pictorially as follows where the size of the letters depicts the magnitude:

Disaster = Hazard × Vulnerability

Disaster = Hazard × Vulnerability

Disaster = Hazard × Vulnerability

Disaster = Hazard × Vulnerability

For example, Japan has been experiencing numerous earthquakes and tsunamis. However, the scale of loss and damage in Japan is far less as compared to the tsunami or an earthquake of same magnitude experienced in India. This is because Japan has increased its capability to face such disasters through concerted efforts of capacity building and mitigation measures over a long drawn period of time. In that respect, India is far behind. It only overcame its slumber after the Gujarat earthquake started taking capacity building and mitigation measures seriously. So, in this case the intensity of the 'Hazard' is large but the 'Vulnerability' in case of Japan is low while that in case of India is high thereby causing bigger disaster in India than in Japan for earthquakes of the same intensity.

Again, in 1993, the Latur earthquake in India caused about 10,000 deaths and 200,000 households were affected due to damaged property and houses. However, a technically much more powerful earthquake in Los Angeles in1971 caused only about 55 deaths. Los Angeles is far well-developed with use of the latest technologies to prevent damages from earthquakes and the people there are much aware and well-prepared to face any sort of natural calamity and as such the 'vulnerability' is quite low. So even though the intensity of the earthquake was much larger the damages were much lower than that in India.

Floods are a regular feature in West Bengal. However the floods of 1978 and 2000 were of highest magnitudes. So the damages were also the highest compared to the other flood years. Again, the population density was much higher in 2000 compared to 1978 thereby increasing the vulnerability. Incidentally, the damages in 2000 floods were much higher. So it implies that when 'Vulnerability' is high and magnitude of 'Hazard' is large, the dimension of the disaster is also very high.

Thus the above case studies indicate that the dimension of a disaster is directly proportional to the intensity of the hazard and the degree of vulnerability.

### 1.5.2 Phases of Disaster

To have a clear view about a disaster, one has to perceive the different phases of a disaster based upon its timeline. If we take the case of a cyclone, before its on-set there appears a low pressure formation over the sea, which gradually deepens and keeps gaining energy until it attains sufficient wind speed to move towards land. During this time nature gives enough indications about the imminent disaster. This phase is known as the pre-disaster phase.

Again, when the cyclone starts moving and makes the land-fall, the strong wind which is often accompanied by heavy rains creates havoc leading to damages to life and properties

and disrupting the normal functioning of the society. All of a sudden there are lots of people without homes and belongings, the near and dear ones often go missing, many are injured and a number of them die. The essential services get disrupted roads get damaged, trees and electric poles get uprooted and even some bridges collapse. After some time the cyclone loses its vigor and dies down but leaves behind a trail of destruction, chaos and confusion everywhere. This may be called the disaster phase. People are in need of help in this phase and if there is delay in arrival of aid the losses may be more catastrophic.

After a lapse of a short period of time from the occurrence of the disaster, people start attempting to bring back normalcy in life either on their own or with outside assistance. They try to overcome their woes and losses, set things right and start leading somewhat a normal life. This phase is usually called post disaster phase.

This is true for every kind of disaster. A study of the specific features of a disaster in its above three phases is very much essential to ultimately carve out a fool-proof strategy for disaster management. This will be dealt with in detail subsequently in this course.

## 1.6 Concept and definition of Hazards

As discussed in the previous section, a disaster is the product of a hazard such as earthquake, flood or windstorm coinciding with a vulnerable situation, which might include communities, cities or villages. Without the occurrence of a hazardous event at a location having vulnerability of one or the other kind, there cannot be a disaster.

The extent of damage from the disaster depends on:

1. The impact, intensity and characteristics of the hazardous phenomenon, and
2. How people, environment and infrastructure are affected (due to their inherent vulnerability) by that phenomenon.

The relationship between hazard and vulnerability is best represented in the pressure and release, or "Crunch Diagram" :

Hazard → D I S A S T E R ← Vulnerability

Hazards are defined as "Phenomena that pose a threat to people, structures or economic assets and which may cause a disaster. They can be either man-made or naturally occurring in our environment" (Disaster Preparedness Training Manual, Philippine National Red Cross, 1994).

## 1.6.1 Types of Hazards

Hazards may be broadly classified into:

**I. Natural hazards:**

a) Flood, b) Cyclone, c) Earthquake, d) Hailstorm, e) Drought, f) Landslide, g) Erosion, h) Heat wave, i) Cold wave, j) Cloud-burst, k) Avalanche, l) Tornado, m) Tsunami.

**II. Man-made hazards:**

a) Transport (Road, Rail, Air and Sea) disasters, b) Fire accidents, c) Building Collapse, d) Industrial accidents, f) Explosions, g) Terrorism h) War and i) Epidemics.

However, based upon their sources there are four basic types of hazardous events that put societies at risk of disasters:

a. Those based in nature: Earthquake, droughts, floods, avalanches etc.
b. Those based in violence: War, armed conflict, physical assault, etc.
c. Those based in deterioration: Declining health, education and other social services, environmental degradation etc.
d. Those based in the failings of industrialized society: Technological failures, oil spillage, factory explosions, fires, gas leakage, transport collisions

For the present, we shall restrict our discussion to the natural hazards i.e. falling in category (a) above. A natural hazard pertains "to a natural phenomenon which occurs in proximity to a particular region and poses a threat to people, structures and economic assets caused by biological, geological, seismic, hydrological or meteorological conditions or processes in the natural environment." From the discussions in the previous section it is by now clear that there is hardly any region in the world which is not affected by any kind of natural disaster. So hazards are omnipresent. One or the other kind of hazard is present everywhere in this world. However, the situation is worse in case of India.

## 1.6.2 Hazard Profile of India

a) India is one of the ten worst disaster prone countries of the world. The country

is prone to disasters due to number of factors; both natural and human induced, including adverse geo climatic conditions, topographic features, environmental degradation, population growth, urbanisation, industrialization, non scientific development practices etc. The factors either in original or by accelerating the intensity and frequency of disasters are responsible for heavy toll of human lives and disrupting the life supporting system in the country.

b) The basic reason for the high vulnerability of the country to natural disasters is its unique geographical and geological situations. As far as the vulnerability to disaster is concerned, the five distinctive regions of the country i.e. Himalayan region, the alluvial plains, the hilly part of the peninsula, and the coastal zone have their own specific problems. While on one hand the Himalayan region is prone to earthquakes and landslides, the plain is affected by floods almost every year. The desert part of the country is affected by droughts and famine while the coastal zone is susceptible to cyclones and storms.

c) The natural geological setting of the country is the primary basic reason for its increased vulnerability. The geo-tectonic features of the Himalayan region and adjacent alluvial plains make the region susceptible to earthquakes, landslides, water erosion etc. Though peninsular India is considered to be the most stable portions, but occasional earthquakes in the region shows that geo-tectonic movements are still going on within its depth.

d) The tectonic features, characteristics of the Himalaya are prevalent in the alluvial plains of Indus, Ganga and Brahmputra too, as the rocks lying below the alluvial pains are just extension of the Himalayan ranges only. Thus this region is also quite prone to seismic activities. As a result of various major river systems flowing from Himalaya and huge quantity of sediment brought by them, the area is also suffering from river channel siltation, resulting into frequent floods, especially in the plains of Uttar Pardesh and Bihar.

e) The western part of the country, including Rajasthan, Gujarat and some parts of Maharashtra are hit very frequently by drought situation. If Monsoon worsens the situation spreads in other parts of the country too. The disturbance in the pressure conditions over oceans, results into cyclones in coastal regions. The geo tectonic movements going on in the ocean floor make the coastal region prone to tsunami disaster too.

f) The extreme weather conditions, huge quantity of ice and snow stored in the glaciers etc. are other natural factors which make the country prone to various forms of disasters.

g) Along with the natural factors discussed in the preceding text, various human induced activities like increasing demographic pressure, deteriorating environmental conditions, deforestation, unscientific development, faulty agricultural practices and grazing, unplanned urbanization, construction of large dams on river channels etc. are also responsible for accelerated impact and increase in frequency of disasters in the country.

## 1.7 Definition of Vulnerability

Vulnerability is defined as "the extent to which a community, structure, service, or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrain or a disaster prone area."

Vulnerability can be understood as a set of prevailing and long-term factors, conditions and weaknesses, which adversely affect the ability of individuals, households, organizations and the community to protect themselves, cope with or recover from the damaging effects of disasters. Vulnerability may exist due to many reasons such as geographic location, physical state, social exclusion and marginalization, economic instability or environmental conditions.

From another view point, vulnerability to disasters may be said to be a function of human action and behaviour. It is determined by a combination of several factors, including awareness of hazards, the condition of human settlements and infrastructures, public policy and administration, the wealth of a given society and organized abilities in all fields of disaster and risk management. This argument gains importance from the fact that there is a close correlation between the trends of increased demographic pressure, escalated environmental degradation, increased human vulnerability and the intensity of impact of hazards. Poverty and vulnerability is integrally linked and mutually reinforcing.

Vulnerability incorporates considerations of both the intrinsic value of the elements concerned and their functional value in contributing to communal well being in general and to emergency response and post-disaster recovery in particular. The concept of vulnerability therefore implies a measure of risk combined with the level of social and economic ability

to cope with the resulting event in order to resist major disruption or loss. This susceptibility and vulnerability to each type of threat will depend on their respective differing characteristics. In the following sections we undertake a detail study of the vulnerability profile of India with respect to various kinds of hazards.

### 1.7.1 Types of Vulnerability

**(i) Physical Vulnerability**

Physical vulnerability relates to the physical location of people and elements at risk; buildings, infrastructure, etc., and their proximity to the hazard. For example people are only vulnerable to a flood because they live in a flood prone area. Physical vulnerability also relates to the technical capacity of buildings and structures to resist the forces acting upon them during a hazard event.

**(ii) Socio-economic Vulnerability**

The recent perceptions of vulnerability indicate that the degree to which a population is affected by a calamity will not purely lie in the physical components of vulnerability but also has a contextual realisation to the prevailing social and economic conditions. The impact of a disaster is determined by the event, its effects on people and their environment, as well as its consequential effect on human activities within a given society.

People who occupy comparatively weaker positions within the social fabric or have limited access to social services have a lessened capacity to absorb or avoid the impact of hazards. These differences in capacities are exemplified in risk analysis. Its effects are seen to be directly proportionate to the poverty-gap and poverty- intensity in the society/ location as it is this group who normally live in high concentration in marginal areas (unstable slopes, flood plains) with little infrastructure and fewer resources to cope with such disasters. Research in areas affected by earthquakes indicates that single parent families, women, handicapped people, children and the aged are particularly vulnerable social groups (M. Erdik, 1993).

**iii) Psychological Vulnerability**

This relates to hopelessness, helplessness, negative attitude towards change, unawareness, passivity, negative belief etc. of the disaster affected people.

### 1.7.2 Vulnerability Analysis

Vulnerability analysis is the process of estimating the susceptibility of 'element of risk' to various hazards. This is necessary to have an understanding of the level of exposure of

a particular region, community or structure to the various hazards identified above. It involves two main steps:

1. Identifying what elements are at risk according to the type of the hazard, and
2. Analyzing the root causes of why those elements are at risk.

This exercise provides us with information on the sectors that are at risk; the type of vulnerability i.e. whether physical, social, economical or psychological and the type of risk involved. Such information sets the stage for assessment of the disaster risk and lays the foundation for an effective planning process for disaster management.

*Vulnerability: Choice and Recovery*

Physical vulnerability is as much a function of location and exposure to a hazard as to the physical performance of buildings and structures. Yet because of socioeconomic factors some sections of society have more choices as to where they live and what assistance they receive in a disaster. Thus it is often the case that the poorest are more vulnerable. However whilst poverty is not always linked to vulnerability, the latter is often related to capacity. The capacity to recover will depend on income levels, savings, social support systems etc.

Poverty and risk to disasters are mutually reinforcing. The poor section of the society is worst affected in case of disaster. The situation further aggravates due to the compulsion of the poor to exploit environmental resources for their survival, increasing the risk and exposure of the society to disasters, in particular those triggered by flood, drought and landslides. Poverty also compels the poor to migrate and live at physically more vulnerable locations, often on unsafe land and in unsafe shelters. These inhabitations of the poor at such locations are either due to the fact that there is no other land available at reasonable cost or it is close to the employment opportunities. The inhabitations of the poor people on marginal land are prone to all types of disasters. The type of construction of these houses further deteriorates the condition. These dwellings made up of low cost material without giving much consideration to technical aspect are easy targets of various hazards.

While speaking of socio-economic vulnerability of a community towards a disaster it is necessary to give special importance to vulnerabilities related to gender and age. Again, the rural and urban sectors also need to be dealt with separately.

**Gender related vulnerability:** When disaster affects a particular area, both male and female are equally affected. However, the capacity of the females to overcome the effects of the disaster is generally much less than that of the males. This may be because of the physiological and psychological differences between them. Males are physically well built compared to females. Again, the females are child bearers and the physical movement of a pregnant woman gets restricted. The females are more attached to their family. So they take longer time to overcome from the psychological shocks of losses due to the disaster. All these makes a female more vulnerable than a male and this should be taken care of while planning for disaster management.

**Age related vulnerability:** Again, people of all ages do not have the same vulnerability. The aged and the child members of the family do not have the same mobility and physical strength. They cannot move with the same ease as a young person. Again, if they get stuck up somewhere due to a disaster the aged members and the children have little chance of setting themselves free without the help of others.

Some sectors of economy are more vulnerable to hazards than others. Most obviously, the agricultural sector is potentially vulnerable, implying that the countries which rely heavily on agriculture may be particularly threatened by hazards. However, even here, the types of crops cultivated and techniques for growing them play a role in determining the scale of vulnerability.

### 1.7.3 Hazard-Vulnerability Profile of West Bengal

West Bengal is prone to almost all kinds of disasters. Floods are the most common and widespread of all natural disasters and can occur nearly anywhere in the State. Flooding along rivers is a natural phenomenon. West Bengal is situated along the Bay of Bengal and thus it is exposed to cyclone-related hazards. Cyclones have inflicted substantial damages periodically. In addition, there have been other natural calamities, such as drought, earthquakes and landslides, etc.

Districts on the western part of the State, especially Purulia, Bankura, parts of Paschim Medinipur and Birbhum are drought-prone because of receipt of inadequate rainfall. This zone is generally known as red lateritic zone because red soil is the main soil form in this area. It has very low water holding capacity thereby making the zone susceptible to drought.

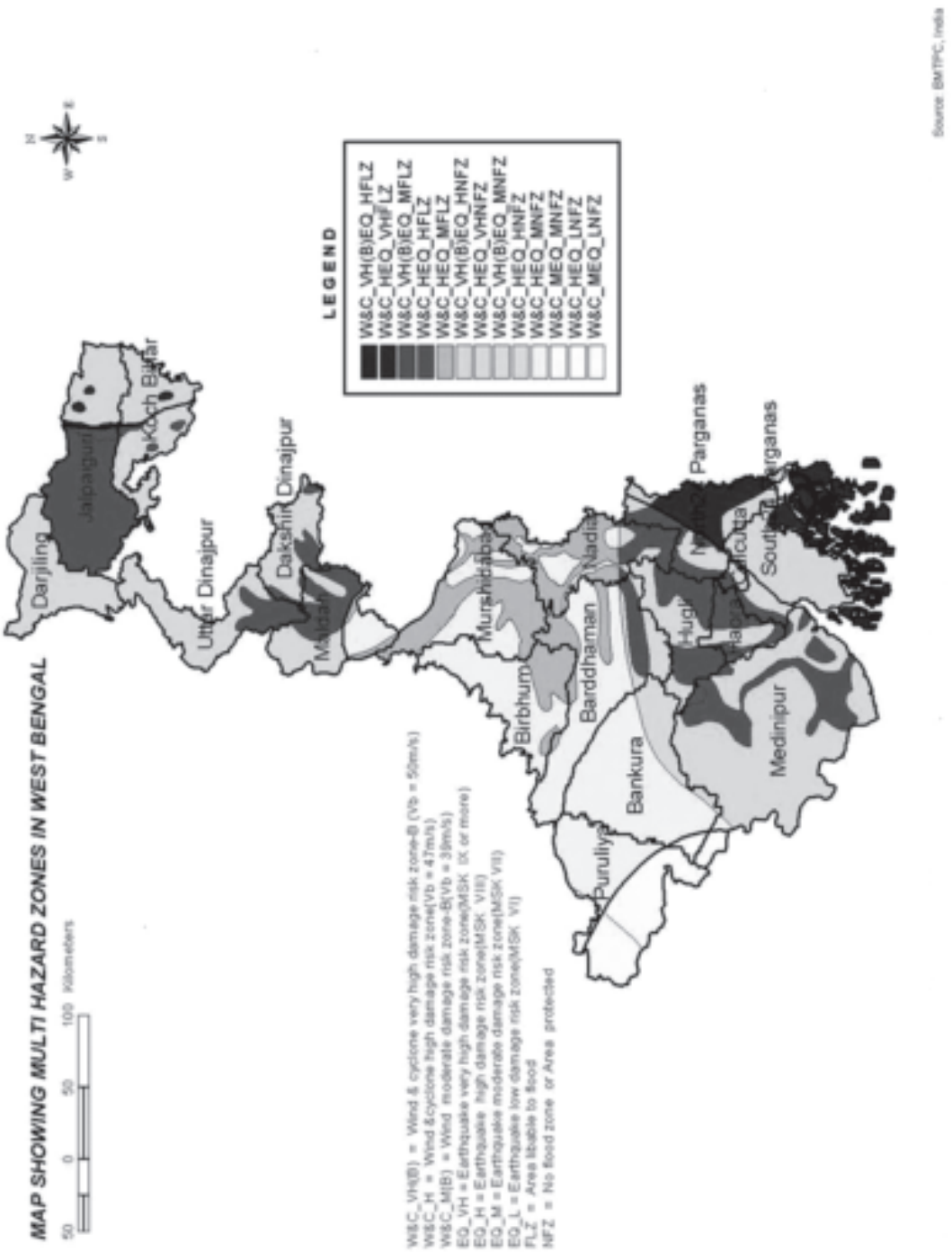
Landslides are common disaster phenomena in the district of Darjeeling. It is primarily the way of nature to adjust slope stability. But the process has been intensified by human interference mainly through rapid deforestation, incorrect land-use process, etc.

Earthquakes are not very common in the State. But most part of the State is quite vulnerable to earthquake because of the presence of a number of fault lines all over West Bengal. There have been instances of quite a few earthquakes in West Bengal, but frequencies had been relatively low. However, earthquakes occurring in the adjoining regions affect the State. The northern districts of the State are affected by massive earthquakes occurring in the Sikkim and Nepal region. Earthquakes in Bangladesh and the Ganga delta in North Bihar have also shaken the State.

The district-wise vulnerability status is given in the following table and Figure-4 gives the hazard-vulnerability picture of West Bengal.

<table>
<tr><th colspan="4">Districts vulnerable to Flood</th></tr>
<tr><th>Flood</th><th colspan="2">North Bengal</th><th>South Bengal</th></tr>
<tr><td>Highly vulnerable Districts</td><td colspan="2">Cooch Behar, Jalpaiguri, Uttar Dinajpur, Dakshin Dinajpur, Malda;</td><td>Nadia, Howrah, Murshidabad, North 24 Parganas, South 24 Parganas, Hooghly, Burdwan, Birbhum, Paschim Medinipur, Purba Medinipur</td></tr>
<tr><td>Less vulnerable Districts</td><td colspan="2">Darjeeling</td><td>Puruliya & Bankura</td></tr>
<tr><th colspan="4">Districts vulnerable to Cyclone</th></tr>
<tr><td>V = 50 m/s<br>Paschim Medinipur, Purba Medinipur, South 24 Pgs. North 24 Pgs. Howrah, Hooghly, part of Nadia, Burdwan and Bankura</td><td colspan="2">V = 47 m/s<br>Major part of Nadia, Burdwan, Bankura, Murshidabad, Malda, Uttar and Dakshin Dinajpur, Jalpaiguri, Cooch Behar, Darjeeling and part of Purulia</td><td>V = 29 m/s<br>Major portion of Purulia</td></tr>
<tr><th colspan="4">Districts vulnerable to Earthquake (seismic zone-wise)</th></tr>
<tr><th>V</th><th>IV</th><th>III</th><th>II</th></tr>
<tr><td>Major part of Cooch Behar and some parts of Jalpaiguri</td><td>Remaining parts of Cooch Behar and Jalpaiguri, entire Darjeeling, Uttar and Dakshin Dinajpur, major part of Malda, North 24 Parganas and South 24 Parganas</td><td>Malda, North and South 24 Parganas, Nadia, Murshidabad, Howrah, Hooghly, Burdwan, Bankura, Birbhum, Paschim and Purba Medinipur.</td><td>Purulia</td></tr>
</table>

**Figure 4:** Multi - Hazard Maps of West Bengal



# Unit 2 ❑ Disaster Risk

**Structure**



## 2.1 Definition

Disaster Risk is a measure of the expected losses (e.g. injuries, death, loss of assets, disruption of economic activities etc) due to a hazard event of a particular magnitude occurring in a given area over a specific time period. Risk is a function of the probability of occurrence of different types of hazards and the losses each would cause.

## 2.2 Factors of Disaster Risk

The level of Disaster Risk depends upon the following factors:

1) Nature of the hazard
2) Vulnerability of elements which affected
3) Economic value of those elements

It is obvious that for a disaster to happen there should be some probability of occurrence of a hazardous event in a particular region and the presence of a vulnerable community, structure or other vulnerable elements is a pre-condition. In absence of either of the two

factors, there shall not be any chance of a disaster. Consequently, if there is a region free of all kinds of hazards then there is no question of any disaster risk. Similarly, if we have a region which has been so well-developed and the community living there is so well prepared that they can on their own tackle the hazards to which the particular region is susceptible, then in that case the vulnerability is zero and hence the disaster risk would also be zero. However, there is hardly any region in the world where no hazard strikes or there isn't any vulnerability.

## 2.3 Disaster Risk analysis

Disaster Risk analysis involves determining the probability of event happening and the level of vulnerability of the people that may be affected by the event. Disaster is the realization of a risk.

The threat that is posed by a potential hazard is specific to the hazard type. In other words the risk involved with one particular kind of hazard is different compared to another kind of hazard. The following table illustrates a number of potential threats and the elements at risk.

| HAZARD | WHAT IS AT RISK |
|---|---|
| Floods | Everything located in flood plains.<br>Crops, livestock, machinery, equipment, infrastructure, weak buildings, their contents, people, local economy. |
| Earthquakes | Weak buildings, their occupants and contents.<br>Machinery, equipment, infrastructure, human lives etc. |
| Volcanic Eruptions | Anything close to volcano.<br>Crops, livestock, people, combustible roofs, water supply. |
| Landslides | Anything located on or at the base of steep slopes or cliff tops. Roads and infrastructure, buildings on shallow foundations, human lives, crops and vegetation. |

This risk will however increase with the intensity of the hazard, provided the vulnerability factor remains same. Again, for an element having higher economic value, the vulnerability is generally higher and hence the risk involved will be higher. Thus depending upon the

characteristics and magnitude of the above factors, the disaster risk of the element or region concerned may be high or low.

Considering the vulnerability factor in some more detail it can be said that, physical vulnerability is as much a function of location and exposure to a hazard as to the physical performance of buildings and structures. Yet because of socioeconomic factors some sections of society have more choices as to where they live and what assistance they receive in a disaster. Thus it is often the case that the poorest are more vulnerable. However whilst poverty is not always linked to vulnerability, the latter is often related to capacity. The capacity to recover will depend on income levels, savings, social support systems etc. Higher the capacity of the community or the elements concerned to cope with the effects of the disaster, lower will be the risk of disaster.

So considering all the factors, the relationship for having a measure of disaster risk involved with any particular region, element or community can be expressed by the following equation:

$$\text{Disaster Risk} = \frac{\text{Hazard} \times \text{Vulnerability}}{\text{Capacity}}$$

The relationship shows that Disaster Risk is directly proportional to Vulnerability. It means that disaster risk of a social group exposed to a particular hazard can be reduced by minimizing their vulnerabilities and building high coping capacity. This is also known as Disaster Risk Reduction formula and is being widely used as a development framework.

However, the complex nature of many disasters can also go beyond secondary effects. In some cases the interaction of differing hazards and processes of change may set in a chain reaction culminating in disastrous political and economic consequences. An example of this can be seen in many African famines; a lack of rain and subsequent drought does not always turn into a famine. However, when combined with failed market systems, political discord and internal conflict, drought can easily become a famine, which in turn compounds the negative effects of these other factors.

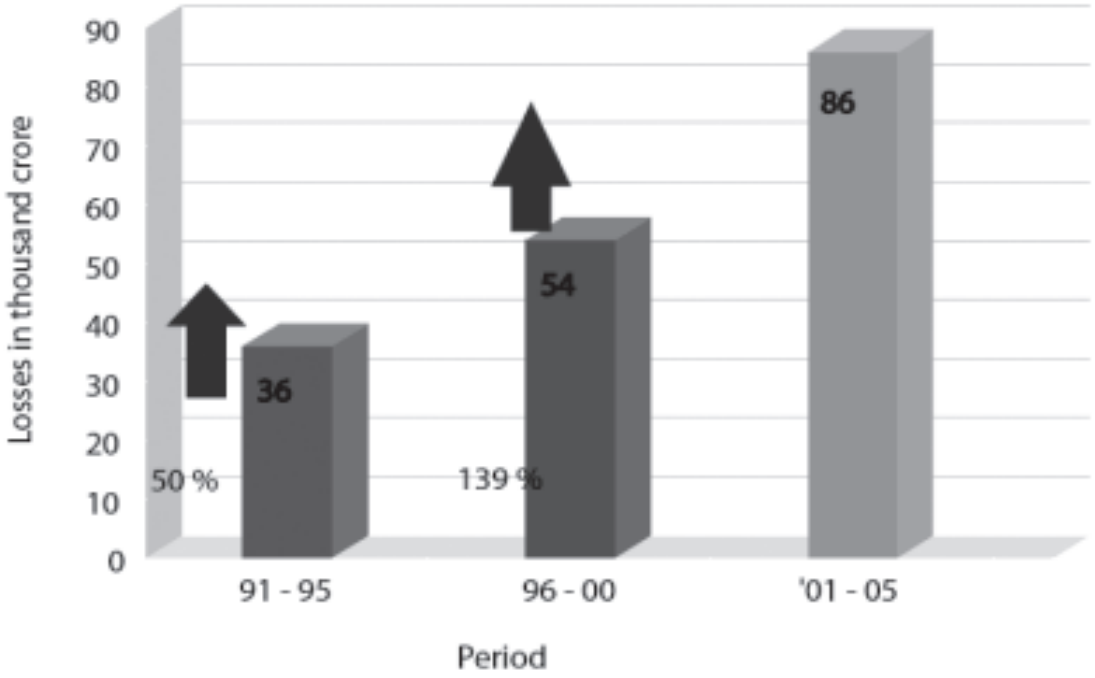
From the previous section on Hazard and Vulnerability the hazard-vulnerability profile of India must have become clear. That the whole country is disaster prone is evident from the disaster history of India. Moreover, 25 major disasters have occurred in the country in the last three decades (Figure-1).

These disasters have taken heavy tolls on the human civilisation. During the last two decades of the 20th century (1982-2001), natural disasters in India had claimed a total death toll of around 1, 07,813 people (on an average more than 5,390 death toll every

year). As mentioned above, India with its extended coast line is exposed to five to six tropical cyclones on an average, both from the Arabian Sea and Bay of Bengal.

So the disaster risk in India is quite high. This is because there is high probability of occurrence of hazardous events and the vulnerability is also quite high on account of the high population density and low capacity of a vast majority of the population (70% of the people live in rural India and depend on agriculture for livelihood. Agricultural productivity is too low compared to that of the more developed countries). A study by the World Bank shows that economic loss due to disasters is equivalent to approximately 2% of the GDP and it is rising. Losses due to disasters have been shown in Figure 3.

**Figure 5:** India - Losses due to Disasters




*Source: NDMA*

Vulnerability due to disasters in India is still on the rise. The heightened vulnerabilities can be related to the expanding population, urbanization and industrialization, development

within high-risk zones, environmental degradation and climate change. The nature of socio-economic development in vogue in India is a lot to do with the increase in vulnerability. Currently, vulnerability to disasters or emergencies of Chemical, Biological and Radiological origin has been increasing. All these increasing vulnerabilities have compounded to escalate the Disaster Risk in India to alarming levels. Serious thoughts need to be given towards Disaster Risk reduction without any further loss of time.

## 2.4 Definition of Disaster Management

Traditionally, the term disaster management was restrictively used to address only post disaster operations. However, in recent times with more explorations and research in this field, the cause of disaster mitigation is increasingly becoming more important than post disaster activities. Disaster management is basically a range of activities designed to mitigate the effects of disaster and to provide a framework for helping people at risk to avoid or recover from the impact of the disaster. It involves steps to be taken prior to, during and after the disaster.

Having faced a series of major disasters in the 1990s like the Latur Earthquake (1993), Floods in Northern India (1993, 1996 and 1998), Cyclone at Kutchchh (1998), Earthquake at Uttarkashi (1999) and Orissa Super Cyclone(1999), the Government of India realized that some concerted efforts needed to be taken to mitigate the effects of these disasters. So a High Powered Committee (HPC) on Disaster Management was constituted in August'1999 to prepare the roadmap for the future course of action towards managing disasters. The HPC defined Disaster Management as "a collective term encompassing all aspects of planning for and responding to disasters, including both pre and post disaster activities. It may refer to the management of both the risks and consequences of disasters."

The Disaster Management Act 2005 gives a more elaborate definition. According to it, disaster management means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for (1) prevention of danger or threat of any disaster (2) mitigation or reduction of risk of any of its severity or consequences (3) capacity building (4) preparedness to deal with any disaster (5) prompt response to any threatening disaster situation or disaster (6) assessing severity or magnitude of effects of any disaster (7) evacuation rescue and relief and (8) rehabilitation and reconstruction.

These definitions clearly point out that disaster management encompasses a range of activities depending upon the different phases of a disaster. These activities however, keep changing with the nature and characteristics of the disasters. The term disaster management

has thus emerged as an umbrella term that encompasses the entire disaster cycle, including mitigation. The major activities that need to be done at various stages of the disaster cycle are discussed below.

## 2.5 Interventions for Disaster Management

Based upon its timeline, a disaster has various stages at each of which specific activities are needed to be performed to overcome its effects. These activities are arrayed in such a fashion that if one of these is not performed adequately, then the activities that follow it are likely to suffer considerably. This in turn will more often than not affect the quality of disaster management and may have a telling effect on its success. In order to achieve the objectives of disaster management, it is necessary that each intervention be carefully planned and executed. The following paragraphs give a description of the interventions.

1. **Search and Rescue:** As soon as a disaster strikes the first thing that needs to be done is to search and rescue the victims of the disaster. During this stage shifting the disaster affected people to safe shelters is the main job. It assumes paramount importance as well as urgency because the rate of casualty is highest at this stage. So all available resources for the purpose of search and rescue should be employed optimally with proper time management to minimize loss of lives. First-aid may invariably form an intricate part of this intervention.

2. **Relief:** Next comes 'Relief' which refers to the period immediately after the occurrence of disaster and involves steps to be taken to meet the immediate needs of survivors with respect to shelter, water, food, sanitation and medical care. This intervention is necessary to help the disaster affected people survive in the face of widespread losses and damages. Any laxity in this phase too may aggravate the losses due to the disaster.

These two interventions are often together called the 'Response' mechanism to the disaster event.

3. **Rehabilitation:** Includes activities that are undertaken to support the victims' return to 'normal' life and re-integration into regular community functions. Relief works can but go on for only a limited period of time. The disaster affected people need to be resettled in their original habitat as soon as possible. This is the first step towards bringing back normalcy after the disaster. The affected people are assisted in resuming their normal course of life by helping them rebuild their damaged or destroyed houses, providing them the basic amenities and help revive their source of livelihood.

4. **Reconstruction:** There are generally widespread damages to infrastructure and amenities when a disaster occurs. Soon after the rehabilitation works have proceeded to a considerable extent, the focus shifts towards reconstruction. Repair and reconstruction of

all the infrastructures, basic amenities and resources damaged in the disaster is taken up during this stage to ensure that the society starts functioning normally, as before.

Often the above two interventions of 'rehabilitation' and 'reconstruction' are combined together and termed as 'recovery'.

5. **Mitigation:** It is a collective term used to encompass all activities undertaken in anticipation of the occurrence of a potentially disastrous event with a view to bring about preparedness and long-term risk reduction (UNDP, 1994). It also includes steps undertaken to minimize the losses and sufferings in a disaster situation. Thus 'mitigation' involves reduction of the actual or probable effects of disasters on man and his environment.

'Mitigation' is often not given the same level of priority as 'recovery'. This is because there is a tendency to view disasters and development in terms of "trade-offs" with needed resources being diverted from development towards disaster mitigation. Yet disasters often undermine development efforts and fritter away resources, which have been allocated to these other sectors. They interrupt ongoing programmes and divert resources from their intended use and beneficiaries.

6. **Prevention:** It refers to activities which either reduce or modify the scale and intensity of the hazard or improve the elements at risk. An example of this may be the strengthening of river embankments to prevent flooding of adjoining areas.

7. **Preparedness:** It refers to measures that enable the Government, community and individuals to respond rapidly to disaster situations so as to cope with them effectively.

Disaster Preparedness has been defined by the United Nations Disaster Relief Office (UNDRO) as "... (a series of) measures designed to organise and facilitate timely and effective rescue, relief and rehabilitation operations in cases of disaster... Measures of preparedness include among others, setting up disaster relief machinery, formulation of emergency relief plans, training of specific groups (and vulnerable communities) to undertake rescue and relief, stockpiling supplies and earmarking funds for relief operations".

All the above interventions together constitute disaster management. Hence, 'Disaster Management (DM)' can also be expressed as the following function:

DM=f (D1, D2, D3, ……, D9) where,

- D1 - Pre disaster preparedness
- D2 - Warning
- D3 - Impact phase
- D4 - Rescue
- D5 - Relief
- D6 - Rehabilitation
- D7 - Reconstruction
- D8 - Vulnerability Reduction

o D9 - Other variables

In any given disaster situation, the Disaster Manager has to apply an appropriate combination of the above interventions to manage the disaster effectively. The choice of such a combination is what is known as planning for disaster management. Proper planning is very important for overall success of disaster management attempts. This will be discussed in detail subsequently in this course.

## 2.6 Crisis Management & Risk Management

Hitherto, the approach towards coping with the effects of natural disasters has been post-disaster management involving mainly actions like evacuation and warnings, communications, search and rescue, fire-fighting, medical and psychiatric assistance, provision of relief and sheltering, etc. After the initial trauma of the natural disaster occurrence is over within the first few days or weeks, the phase of reconstruction and economic rehabilitation is taken up by the people themselves and by the government authorities. Very often the occurrence of the disaster used to be relegated to history till the next one occurred again either in the same area or in some other part of the country. This approach to disaster management is termed 'Crisis Management'.

From the very nomenclature of this approach it is clear that the emphasis is on overcoming a crisis. Here the occurrence of a disaster event is a crisis. Normal life is jeopardised during the disaster and the society has to overcome the crisis to start functioning as before. Thus it becomes necessary to undertake interventions of 'search and rescue', 'relief', 'rehabilitation' and 'reconstruction' to wade through the crisis and establish normalcy in the society. If the disaster event had not occurred, none of these interventions would have been needed. Consequently, these interventions are collectively called 'crisis management'.

It is not possible to eradicate natural hazards completely. However, experience has shown that the damage from natural hazards can be minimised by way of a comprehensive Preparedness Plan which includes an early warning system, combined with preparedness on part of the vulnerable community as two of its essential components. Warning systems and preparedness measures considerably reduces and modifies the impact of disasters. A community that is duly prepared to face an eventuality, and has taken the necessary precautionary and mitigation measures, is far better equipped to deal with the situation and resume normal functioning at a much faster pace.

It may seem paradoxical but true that recipients of both disaster and development are increasingly becoming one and the same - usually the poorest and weakest groups within

the developing countries. These groups are those people most likely to be affected by disaster phenomena and also those most likely to be helped by long-term development programmes Disaster preparedness accordingly assumes much greater urgency.

It is becoming increasingly evident now that a relatively smaller investment in disaster preparedness can save thousands of lives and vital economic assets, as well as reduce the cost of overall relief assistance. In other words, this approach to disaster management with emphasis on 'preparedness', 'mitigation' and 'prevention' measures considerably reduces the risk of disasters. This approach to disaster management is known as 'Risk Management'.

Recognizing the rapidly rising worldwide toll of human and economic losses due to natural disasters, the UN General Assembly 1989 decided to launch a far reaching global understanding to save human lives and reduce the impact of natural disasters. The UN General Assembly Resolution 236 of 1989 launched the International Decade for Natural Disaster Reduction (IDNDR, 1990-2000) that effectively set the trend in shifting the focus of attention from rescue and relief to preparedness and mitigation. The main objective of IDNDR was to reduce loss of life, property and social and economic disruptions caused by natural disasters, especially in the developing countries through a concerted International Action.

The IDNDR workshop in Yokohama in May'1994 called for a shift in the focus of the Disaster Management towards disaster prevention, mitigation and preparedness. The international community having realised the importance of 'risk management', there has been a 'paradigm shift' in the approach to disaster management from 'crisis management' to 'risk management'. Taking a 'risk management' approach to 'disaster management' it is possible to minimize the losses due to disasters to a large extent. It is therefore increasingly important for the global community to lay greater emphasis on ways and means of preventing and preparing for disasters. There is a need to examine the relationship between environmental degradation and vulnerability to disasters, and their combined effects on both natural and man-made habitats. While preventive measures will not halt earthquakes or cyclones, they will certainly minimise the impact of such disasters on human life, public/private properties and the environment.

## 2.7 The Disaster Management Cycle

As discussed earlier, there are three key stages of activity within disaster management:

1. **Before a disaster (Pre-disaster):** to reduce the potential for human, material, or environmental losses caused by hazards and to ensure that these losses are minimised when the disaster actually strikes

2. **During a disaster:** to ensure that the needs and provisions of victims are met to alleviate and minimise suffering.

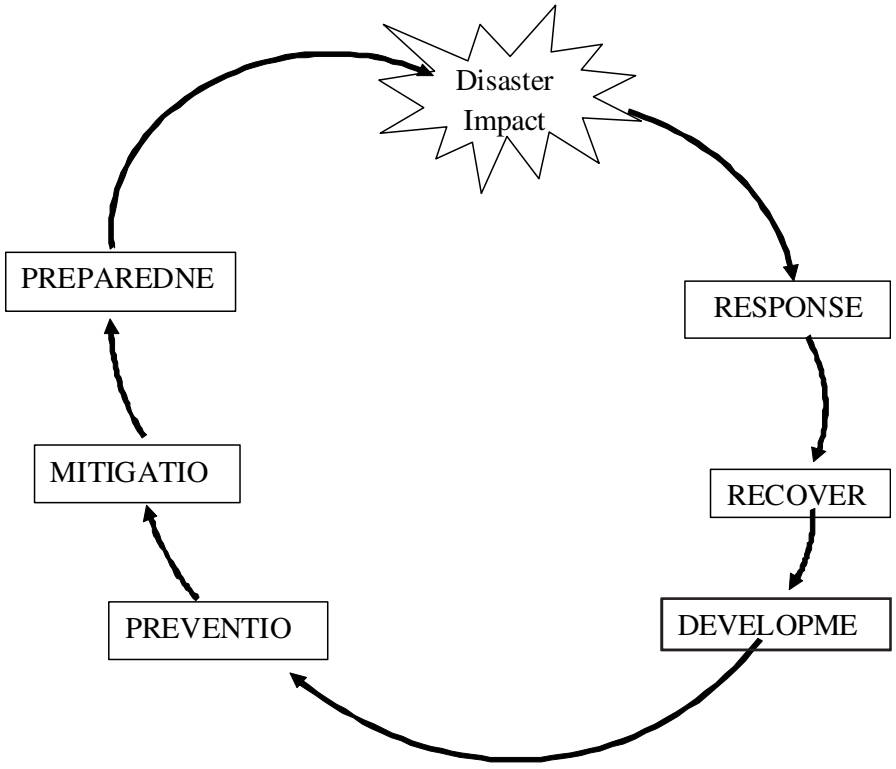
3. **After a disaster (Post-disaster):** to achieve rapid and durable recovery which does not reproduce the original vulnerable conditions.

Traditionally people think of disaster management only in terms of the emergency relief period and post disaster rehabilitation. This bias occurs since these two elements are by far the strongest in terms of high profile visibility, political support and funding provisions. Instead of allocating funds before an event to ensure prevention and preparedness, action normally only takes place after the event has occurred.

Whilst emergency relief and rehabilitation are vital activities, successful disaster management planning must encompass the complete realm of activities and situations that occur before, during and after disasters. These phases can best be represented as a cycle or continuum, which, if circumstances allow, reduce the negative effects of future disasters.

The different phases of disaster management can best be visualised as a disaster management cycle as indicated in the ensuing diagram:

**DISASTER MANAGEMENT CYCLE**



The Disaster Management cycle consists of the following broad stages:-

**1. The disaster event**

This refers to the "real-time" event of a hazard occurring and affecting elements at risk. The duration of the event will depend on the type of threat; ground shaking may only occur for a matter of seconds during an earthquake while flooding may take place over a longer sustained period.

**2. Response and Relief**

This refers to the first stage response to any calamity, which include setting up control rooms, putting the contingency plan in action, issue warning, action for evacuation, taking people to safer areas, rendering medical aid to the needy etc., simultaneously rendering relief to the homeless, food, drinking water, clothing etc to the needy, restoration of communication, disbursement of assistance in cash or kind.

**3. Recovery**

Recovery is used to describe the activities that encompass the three overlapping phases of emergency relief, rehabilitation and reconstruction.

- emergency relief: Activities undertaken during and immediately following a disaster, which include immediate relief, rescue, damage and needs assessment and debris clearance
- rehabilitation: Rehabilitation includes the provision of temporary public utilities and housing as interim measures to assist longer term recovery
- reconstruction: Reconstruction attempts to return communities to improved pre-disaster functioning. It includes the replacement of buildings, infrastructure and lifeline facilities so that long-term development prospects are enhanced rather than reproducing the same conditions which made an area or population vulnerable in the first place.

**4. Development**

In an evolving economy, development process is an ongoing activity. Long- term prevention/disaster reduction measures like construction of embankments against flooding, irrigation facilities as drought proofing measures, increasing plant cover to reduce the occurrences of landslides, land use planning, construction of houses capable of withstanding the onslaught of heavy rains/wind speed and shocks of earthquakes are some of the activities that can be taken up as part of development plans.

**5. Prevention and mitigation**

Reducing the risk of disasters involves activities, which either reduce or modify the scale and intensity of the threat faced or by improving the conditions of elements at risk.

Although the term 'prevention' is often used to embrace the wide diversity of measures to protect persons and property its use is not recommended since it is misleading in its implicit suggestion that natural disasters are preventable. The use of the term reduction to describe protective or preventive actions that lessen the scale of impact is therefore preferred. Mitigation embraces all measures taken to reduce both the effect of the hazard itself and the vulnerable conditions to it in order to reduce the scale of a future disaster

In addition to these physical measures, mitigation should also be aimed at reducing the physical, economic and social vulnerability to threats and the underlying causes for this vulnerability. Therefore, mitigation may incorporate addressing issues such as land ownership, tenancy rights, wealth distribution, etc.

**6. Preparedness**

This brings us to the all-important issue of disaster preparedness. The process embraces measures that enable governments, communities and individuals to respond rapidly to disaster situations to cope with them effectively. Preparedness includes the formulation of viable emergency plans, the development of warning systems, the maintenance of inventories and the training of personnel. It may also embrace search and rescue measures as well as evacuation plans for areas that may be 'at risk' from a recurring disaster. All preparedness planning needs to be supported by appropriate rules and regulations with clear allocation of responsibilities and budgetary provisions.

**Case Study:**

Swift response will not come only by capacity development and training. It will require capacity to anticipate problems and judicious decision making and people's participation in real time. One-way would be to revisit some of the well studied disasters to project future possible disaster scenario based on current state of knowledge about the area. The following case-study of a future earthquake scenario projected for the Kawasaki City of Japan for which it is preparing today is a great example India should emulate.

"Kawasaki is a highly industrial coastal city in Japan with a population of about 1.2 million. It is located south-west of Tokyo across the Tamagawa River, bordered on the south-west side of Yokohama city. The city covers a 30 km long stretch of land, 5 km wide, from the south-east to the north-west with its south-east edge forming a coastal area along Tokyo bay. An earthquake of magnitude of 7.9 strikes Sagami bay on a winter weekday evening at 5 p.m. The Urgent Earthquake Detection and Alarm System (UrEDAS) of the Railway Technical Research Institute (RTRI) detects the arrival of P-wave from its own observation network and determines the magnitude and location of the earthquake instantly. Using the information it stops the bullet trains (shinkansen) which travel at around

250 km or above on the Tokyo, Osaka line. Simultaneously, RTRI's Hazard Estimation and Restoration Aid System(HERAS) go into operation to collect damage estimations relating to railway system. The HERAS system is capable of providing damage informations on railways and associated facilities in about 5 min after an event. This information will be used in the recovery and restoration operations to the railway systems. At the same time the Seismic Information Gathering and Network Alert System (SIGNAL) of Tokyo Gas company goes in operation shutting off gas supply automatically in areas where ground shaking exceeded a prescribed threshold, in order to prevent fires from secondary damage such as gas leaks.

On the government side, the damage assessment and support system of Kawasaki City, which became operational in 1994, is activated. The system gathers real time earthquake information form a dense observation network, calculates ground motion estimates with the information from a Geographic Information System (GIS) consisting of soil, land cover, infrastructure, population distribution, housing condition and lifeline information. The estimated damage due to this earthquake will be on the order of 1.3 trillion yen, with about 91% of the 33 thousand wooden buildings predicted to be destroyed by fire at the prevailing wind speed of 6m/s from NNW direction. Fatalities will be up to 3120, road damages would be up to about 250 locations. There would also be widespread destruction to lifeline systems such as water supply and gas supply, which would require more than a month for complete recovery.

**Learning point:** A start of the art disaster detection and warning dissemination system is of utmost importance for 'disaster preparedness'.

## 2.8 Impact of Disaster on Development

Various studies have indicated that loss of lives and livelihoods due to natural disasters is higher in the developing countries. It is estimated that more than 90 percent of disaster deaths take place in developing countries.

It can be inferred that disasters are closely linked with the development pattern of the region. Let us understand the disaster and development relationship with the help of the following diagram (see figure below). It shows both the positive and negative dimensions of development and disaster.

Development can reduce vulnerability: Development programs if designed properly help to reduce vulnerability of the people. For example, Public buildings like schools, hospitals and housing built with strict enforcement of building codes and quality standards helps to develop a safe living environment for the people. Similarly, Investment in transport

like improvement in road capacity will help in quicker evacuation. Also, better connectivity would mean speedy delivery of relief services. Investment in communication services will help to provide early warnings to all.

Here are few points highlighting means through which development programs can reduce vulnerability:

- Strengthening of utility systems
- Ensuring hazard resistant building techniques
- Institutional strengthening and capacity building of local authorities
- Social welfare programs

Disasters can provide development opportunities: Disasters provide opportunity to initiate development programs. For example, urban development programs initiated after the earthquake have enhanced infrastructure facilities in the affected towns of Gujarat. Also various skill development programs initiated by the NGOs have provided livelihood security to many affected people.

Following are few points which reflect how disasters can provide development opportunities:

- By creating a social and political atmosphere of change
- By highlighting the general level of underdevelopment that caused disaster
- By focusing international attention and aid on the disaster area

Development can increase vulnerability: Development programs can also increase an area's susceptibility to disasters. Such as development policies of urban growth are leading to migration in cities. However, due to poor management policies and practices there is high demand but shortage in supply of affordable land. This is leading to growth of informal settlements and slums. These settlements are often located on unsuitable locations like steep slopes, along flood plains or adjacent to noxious or dangerous industrial or transport facilities making the people vulnerable to hazards.

Setting up industries will lead to population concentration around the plant. However, in absence of proper environmental management, it can lead to increase in air and water pollution around the industry. Also, depending on the type of industry there is possibility of toxic exposure for the people living in vicinity.

In India, Bhopal Gas tragedy of 1984 is the biggest industrial disaster. On December 2, there was leakage of Methyl Isocyanate from the Union Carbide India Limited factory killing more than 2000 people instantly. About 10,000 people have died over the years and about 2,00,000 have been affected because of the gas leakage. This factory was setup in 1969 by Union Carbide, as a development initiative to meet the challenges of food shortage

in the country. The green revolution involved major changes in agricultural practices and was adopted to increase the agriculture productivity through provision of chemical fertilizers, pesticides and irrigation network.

Following are some points which reflect how development can increase vulnerability:

- ❖ Development of hazardous sites
- ❖ Environmental degradation
- ❖ Increased technological failures or accidents
- ❖ Imbalance of pre-existing natural or social systems

Disasters can set back development level and destroy years of development. For example,

Mumbai floods of 2005 or the recent floods of Bihar in 2007 have destroyed various utility services and affected properties and livelihoods. These disasters have seriously affected the development initiatives being taken up in the region.

Following points reflect how disasters can set back development level:

- ❖ by increasing loss of resources
- ❖ by shifting of resources to emergency response
- ❖ by depressing the investment climate
- ❖ by affecting the non-formal sector

## 2.9 Components of Disaster Management

Disaster management can be divided into pre and post disaster contexts. This sequence embraces pre and post- disaster actions that are concerned with the six components of disaster management. These 'components' are envisaged as the different stages in disaster management and are laid down below:

1. inception of disaster planning
2. risk assessment
3. defining levels of acceptable risk
4. preparedness and mitigation planning
5. testing the plan
6. feedback from lessons learnt

Each grows out of the stage before it and leads to further action. Together the sequence can build up a planning and implementation system, which can become a powerful risk reduction tool. If disaster planning is restricted only to a preparedness plan, then the full benefits of disaster planning are unlikely to be realised. A wide range of tasks needs to be addressed in the following planning sequence for disaster management.

Stage one: inception of disaster management

The starting point would ideally comprise the following1:

- Political commitment at all levels of national and local government;
- A governmental structure with clearly defined authority and an appropriate budgetary commitment to maintain effective disaster planning;
- Up-to-date, well rehearsed preparedness plans that are comprehensive in scope and operational at all levels (central, provincial and community). These include an emergency management system, ideally the responsibility of a nominated national co-ordination body;
- Mitigation plans to reduce the hazard threats and vulnerability to them;
- Knowledge of disaster management and specific knowledge of local situations subject to disaster threats.

**Stage two: risk assessment**

The aim of risk assessment is to balance known risks against available resources. This process starts with the assessment of potential disaster risks through a combination of hazard mapping and vulnerability analysis. Risk assessment is ideally a three-part process that has to be undertaken in the following sequence:

- Hazard mapping Hazard mapping is the process of establishing geographically the areas that are particularly susceptible to hazards. Hazard information to be gathered includes location, frequency, duration and severity (i.e. wind speeds, water flow data etc.).
- Vulnerability analysis: This involves the process of estimating the vulnerability to potential disaster hazards of specified elements at risk. These include social, economic, natural and physical environmental factors. Vulnerability analysis is always a 'site-specific' process with a concern for unique characteristics of a local situation.
- Resource assessment: When potential losses have been estimated, a further assessment is needed of the resources or "capacities" existing to improve disaster planning. Resource assessment fulfils two purposes towards risk reduction:
- It provides a further indication of areas more at risk than others. If a location or entity has more capacity to withstand a shock the effects will be less than those in a similar location with a lower capacity or resource base
- The process of assessing the different capacities of those vulnerable to and those responsible for disaster management planning illustrate areas needing improvement. These may include increased training, better building regulations, land use planning etc.

**Stage three:** defining levels of acceptable risk

- The information gathered through the various processes of resource assessment is then analysed to enable a responsible course of action.

**Stage four: preparedness and mitigation planning**

Once the scale of the problem to be faced is known, the resources available to meet threat plans can be decided upon to reduce risk and future impacts. These actions include measures that are aimed to reduce disaster events in three ways.

- Through methods to reduce hazard impact, e.g. building flood protective embankments or walls, creating and managing dam storage, community grain stores, etc.
- Through preparedness measures that emphasise short-term activities focused on the emergency period, e.g. emergency regulation of water reservoirs in a drought situation. Properly done they can reduce loss of life and property whilst assisting the relief and rehabilitation
- Through longer term mitigation measures aimed at the reduction of physical vulnerability, socio-economic vulnerability and its underlying causes.

**Stage five: testing the plans**

One way is through simulation exercises and public drills. This approach is obviously a time and resource method to determine whether a preparedness plan or mitigation plan will work or not. However the value of such testing should not be minimised since it is often a vital element in raising public awareness.

The real test of protective measures of course will be an actual disaster situation. Following such events there is a requirement for accurate information to be collected, analysed and disseminated on the impact of the event in terms of deaths, injuries and damage to property as well as the specific needs of the surviving population. Such impact data must include knowledge of the developing disaster event, including any new threats that may be emerging as secondary impacts or hazard types. Data is also needed on the character, scale, location, timing and impact of assistance. Such information has to be gathered ideally in precise terms, e.g. scale of injury, level of building damage etc.

**Stage six: feedback from lessons learned**

Information on changes needed in preparedness and mitigation planning as well as on risk assessment will need to be continuously passed back to an appropriate stage in the cyclical planning process. This is essential to not only assess the success of measures

implemented but also so that constantly changing conditions of vulnerability and even the likelihood of hazard occurrence are taken into consideration.

## 2.10 Hyogo Framework of Action

Representatives from 168 countries participated in the global conference on Disaster Risk Reduction in January 2005 in Kobe, Japan. The Hyogo Framework of Action (HFA) 2005-2015 was adopted to work globally towards sustainable reduction of disaster losses in lives and in the social, economic and environmental assets of communities and countries. The framework set three strategic goals and five priority action areas given as under:-

Three Strategic Goals: Following are the goals as agreed to under the HFA-

(i) The more effective integration of disaster risk reduction into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.

(ii) The development and strengthening of institutions, mechanisms and capacities at all levels in particular at the community level that can systematically contribute to building resilience to hazards.

(iii) The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of the affected communities.

Five Priority Action Areas: Under the HFA the following priority areas have been identified for the countries to concentrate in their efforts for making the countries disaster resilient.

(i) Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation,

(ii) Identify, assess and monitor disaster risks and enhance early warning,

(iii) Use knowledge, innovation and education to build a culture of safety and resilience at all levels,

(iv) Reduce the underlying risk factors,

(v) Strengthen disaster preparedness for effective response at all levels.

Key Activities: Following key activities are envisaged under this framework

1. Promote socio-economic development practices,
2. Land-use planning and other technical measures,
3. Strengthening of institutional and technical capacities,
4. Review and implement preparedness and contingency plans,
5. Promote voluntarism and community participation,

6. Creation of provision of emergency funds,
7. Dialogue, coordination and exchange of information between disaster managers and development sectors.

India is one of the participating countries and works closely with the UN-ISDR to implement the Priority Areas of HFA for DRR. There is a Biennial Monitoring Framework developed by UNISDR and a National Progress Report submitted accordingly with UN-ISDR. To implement the framework's activities, a Working Group has been constituted under the Chairmanship of Joint Secretary (DM), MHA. The group comprises representatives from Ministries of Rural Development, Panchayati Raj, Urban Development, Health and Family Welfare, Environment and Forests, Women and Child Development, Earth Sciences, Science and Technology and also from Planning Commission, NIDM and NDMA.

## 2.11 Response of India to changes in international policy on Disaster Management

In response to the declaration of IDNDR by the UN General Assembly, India took the following steps:

1. A Disaster Management Cell was first formed under the Ministry of Agriculture.
2. National Committee on Disaster Management was formed under the Chairmanship of the Prime Minister to give due importance to disaster management. Recommendations of the NCDM formed the basis of National Disaster Risk Management.
3. Following a number of major disasters like the Latur earthquake (1993), Super Cyclone of Orissa (1999), etc. a High Powered Committee (HPC) on Disaster Management Plans was constituted in August'1999 for drawing up a systematic, comprehensive and holistic approach towards disasters. The HPC Report recommended the establishment of a separate institutional structure for addressing disasters and enactment of a suitable law for institutionalizing disaster management in the country.
4. The Ministry of Home Affairs in the National Government was made the new nodal ministry for Disaster Management. However, Ministry of Agriculture remained the nodal ministry for Drought Management.
5. The Disaster Management Act was passed by the Parliament in 2005.

Disaster Management Act, 2005: This Act provides for the effective management of

disaster and for matters connected therewith or incidental thereto. It provides institutional mechanisms for drawing up and monitoring the implementation of disaster management in the whole country. The Act also ensures measures by the various wings of the Government for prevention and mitigation of disasters and also for prompt response to any disaster situation.

The Act provides for setting up of a National Disaster Management Authority (NDMA) under the Chairmanship of the Prime Minister, State Disaster Management Authorities (SDMAs) under the Chairmanship of the Chief Ministers, District Disaster Management Authorities (DDMAs) under the Chairmanship of Collectors/District Magistrates/Deputy Commissioners. The Act further provides for the constitution of different Executive Committee at national and state levels.

Under its aegis, the National Institute of Disaster Management (NIDM) for capacity building and National Disaster Response Force (NDRF) for response purpose have been set up. It also mandates the concerned Ministries and Departments to draw up their own plans in accordance with the National Plan. The Act further contains the provisions for financial mechanisms such as creation of funds for response, National Disaster Mitigation Fund and similar funds at the state and district levels for the purpose of disaster management. The Act also provides specific roles to local bodies in disaster management.

## 2.12 India's engagement with external agencies on Disaster Risk Reduction:

India is engaged with UNDP and US Aid for building the capacity of its response mechanism, mapping the vulnerabilities to different kinds of disasters, besides strengthening the various institutions engaged in disaster management. It has entered into a MOU with the few countries in the field of disaster management and has been working closely with the several countries in the exchange of ideas and expertise developed to meet the challenges of several natural disasters. The efforts undertaken towards the aforesaid activities are given in the subsequent Paras.

**United Nations Development Programme:** UNDP established on 22nd November 1965 is the UN's global development network, with headquarters at New York to advocate for change and to connect countries through knowledge, experiences and resources to help people build a better life. In India, it works closely with the Government of India through its designated nodal department for different welfare programmes and the Department of Economic Affairs (DEA) in the Ministry of Finance.

After the successful implementation of this DRM Programme, the Government of India together with UNDP, has launched a new programme for Disaster Risk Reduction (DRR) with an outlay of $20 million. At present the DRR Programme is being implemented in 26 states and 58 cities across the country under the overall supervision of Programme Management Board headed by Secretary (Border Management).

**The GOI-UNDP DRR Programme (2009-2012):** This programme has two components:

(i) Institutional Strengthening and Capacity Building for Disaster Risk Reduction (DRR)

(ii) Urban Risk Reduction (URR).

DRR project is being implemented by NDMA with an outlay of USD 12.6 million and URR project is being implemented by Disaster Management Division, MHA with an outlay of USD 7.4 million. The Joint Secretary, MHA is the National Programme Director for URR component. The Joint Secretary, NDMA is the National Programme Director for DRR component.

The objective and major activities undertaken in the programme are as follows:

**Objective:** To strengthen the institutional structure to undertake disaster risk reduction activities at various levels (state, district, city, urban local body) including the risks due to climate change, and to develop preparedness for recovery.

**Major Activities:**

1. Strengthening the State and District Disaster Management Authorities to fulfil their responsibilities as stipulated in the Disaster Management Act, 2005
2. Developing methodologies and modalities for ensuring risk reduction through integration in development programmes of all partners at national, state and community levels
3. Enhancing the capacity for urban risk reduction by addressing planning capacity building, and ensuring suitable legislative and regulatory mechanisms to promote safe built environment
4. To strengthen the recovery framework, through which the people affected by disasters (especially the most vulnerable) are able to access resources for rebuilding their lives and reviving their livelihoods, and
5. To strengthen the knowledge and information sharing platform in disaster management.

United States Agency for International Development (USAID) - Assisted Disaster Management (DMS) Support Project:

USAID with its headquarters in Washington, D.C is a governmental agency of USA

providing economic, development and humanitarian assistance around the world in support of the foreign policy goals of the United States of America. A bilateral agreement was signed between USAID and the Government of India in September 2003 with the objectives to reduce vulnerability to disasters and build capacity of key Indian institutions. However a final agreement (in the nature of second amendatory agreement) was signed on 4th April 2007. The period of the original Agreement ended on 31st March, 2010. The scope of this bilateral agreement broadly includes three activities viz., Incident Response System (IRS), procurement of equipment and capacity building.

# Unit - 3 ❑ Assessing Disaster Risk

**Structure**



## 3.1 Disaster Risk

In many regions of the world the threat of natural or man-made events such as volcanic eruptions, earthquakes and tsunamis, hurricanes and tornadoes, extreme rainfall, droughts or forest fires are permanently present. People living in these regions are exposed to these natural hazards, but they may be able to prevent themselves from the grave consequences (e.g. earthquake-resistant building, a dyke or a good insurance policy). People who are unable to protect themselves sufficiently against the adverse effects of a natural event are particularly 'vulnerable' to disaster. The probability of harmful consequences, or expected loss (of lives, people injured, property, livelihoods, economic activity disrupted or environmental damages) results from interactions between natural or human induced hazards, and vulnerable / capable conditions. The disaster risk (of a region, a family, or a person) is therefore made up of two major elements viz. hazard and vulnerability.

As discussed in section 2.4 of the previous module, we know that:

$$\text{Disaster} = \text{Hazard} \times \text{Vulnerability}$$

Thus if the intensity (i.e. damaging potential) of a particular hazard and vulnerability is low, the disaster is of moderate dimension. On the other hand if either the hazard or the vulnerability of the elements concerned is high then the dimension of the disaster is also large. Again, if both the intensity of the hazard and vulnerability of the hazardous terrain are high then the magnitude of the disaster is very large leading to devastation. So these factors lead to risk of disaster. Risk identification starts with identifying the hazards and then followed by assessment of the core vulnerability, i.e. the possible repercussions in the event of occurrence of a natural phenomenon.

Therefore, disaster risk designates the extent of the damage and loss a natural event is expected to cause. In other words, disaster risk is the combined effects of the extent of damage and loss resulted from a natural event. It is determined as the product of the factors hazard and vulnerability. Hazard includes the probability and the magnitude of the anticipated

natural event; vulnerability comprises a number of political-institutional, economic, socio-cultural and geographical factors.

However, that is not the full description of disaster risk pertaining to a particular hazardous event. People who occupy comparatively weaker positions within the social fabric or have limited access to social services have a lessened capacity to absorb or avoid the impact of hazards. These differences in capacities are exemplified in risk analysis. Its effects are seen to be directly proportionate to the poverty-gap and poverty- intensity in the society/location as it is this group who normally live in high concentration in marginal areas (unstable slopes, flood plains) with little infrastructure and fewer resources to cope with such disasters. So disaster risk is inversely proportional to capacity.

The equation for disaster risk may thus be visualized as:

$$\text{Disaster Risk} = \frac{\text{Hazard} \times \text{Vulnerability}}{\text{Capacity}}$$

In this equation, disaster risk is the ratio of the product of hazard and vulnerability to the capacity of the community to overcome the effects of disaster. Therefore, it is clear that a disaster risk exists only if there is vulnerability to the hazard posed by a natural event. For instance, a family living in a highly earthquake-resistant house would not be vulnerable to an earthquake of 6 on the Richter scale. So, they would not be at risk of the earthquake. Being earthquake resistant means the building has the capacity to resist damages due to earthquake. So with increasing capacity, disaster risk goes on decreasing. Again, if the hazard approaches zero, because, for example, buildings have been constructed in areas far away from continental plate subduction zones and tectonic faults, a house built with maximum precautions will be a safe place for the family, because they would only be vulnerable to very extreme events.

Beyond expressing a probability of physical harm, it is crucial to appreciate that risks are always created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.

Risks are present in every sphere of the society. It exists within the society but the people do not understand the extent of the risk and the reasons for such risks. Risk is a technical concept, which is used by engineering and management specialists to arrive at an estimation of losses in the event of a disaster and the expected probability of its occurrence. Risk is precisely defined by ISDR as "the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural and human-induced hazards and

vulnerable conditions". Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability.

Risk is different from threat. Threat is a more abstract concept while risk is an expression of perceived threat in specific terms. Threat is a danger that has an extremely low probability of occurrence.

## 3.2 Damage Potential of disasters

**Case studies:**

**Introductrion**

India, with its unique geophysical setting and socio-economic conditions is highly vulnerable to disasters. The country is prone to disasters due to number of factors, both natural and human induced, including adverse geo-climatic conditions, topographic features, environmental degradation, population growth, urbanization, industrialization, flawed development practices, etc. As far as the geographic dimensions of the country are concerned, the five distinctive regions of the country i.e. Himalayan region, the alluvial plains, the hilly part of the peninsula, and the coastal zone have their own specific problems. While on one hand the Himalayan region is prone to disasters like earthquakes and landslides, the plain is affected by floods almost every year. The desert part of the country is affected by droughts while the coastal zone is susceptible to cyclones and storms. If we analyse the layers of vulnerability statistically, out of 35 States and Union Territories in the country, 27 of them are disaster prone. Almost 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12 per cent of land) are prone to floods and river erosion; of the 7,516 km long coastline, close to 5,700 km, is prone to cyclones and tsunamis; 68 per cent of the cultivable area is vulnerable to drought.

On account of its multilayered vulnerability, the country has witnessed an increase in the frequency and intensity of disasters in the past resulting in widespread devastation. This inference is drawn only on the basis of disasters which have been reported. Many of the disasters, particularly in remote areas, go unreported because local administration lack the technical and human resources for community-level disaster monitoring and are not able to fully identify or map potential local hazards or develop the appropriate disaster management plans. Losses from low-intensity, but more extensive disaster events continue to affect housing, local infrastructure, and large numbers of people. These disasters at the local level are so frequent that many communities accept them as an integral part of their existence and, with varying degrees of success, learn to live with them.

During the year 2011-12, 14 States and one Union Territory reported damage to various disasters like cyclonic storms, heavy rains, floods, landslides, earthquakes, etc. in varying degrees. These states were Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Odisha, Punjab, Sikkim, Uttar Pradesh, Uttarakhand, West Bengal and Union territory of Puduchery. The provisional extent of damage in the country, as indicated by the Ministry of Home Affairs, is as follows: (Source: Ministry of Home Affairs, New Delhi).

The year 2011 started with a stampede in Kerala on January 14 in which 102 Sabarimala pilgrims were killed at Uppupara on the Pullumedu-Vallakadavu forest route in Idukki district. The event took place when thousands of devotees were returning after holy darshan at the shrine of Lord Ayyappa on Makar Sankranti day. The two month long pilgrimage, which had started in November 2010, had been mostly incident-free before this mishap.

In mid-September, heavy monsoon rains resulted in widespread flooding in Odisha. Within two weeks, a second round of floods resulting from a tropical depression in the Bay of Bengal inundated 19 of Odisha's 30 districts. In response to heavy rainfall and to prevent breakage, authorities released water from the Rengali dam on the river Brahmani, exacerbating flooding in low-lying areas. Although the death toll was 45 in number, but the floods resulted in affecting over 3.5 million people and caused extensive damage to crops and infrastructure.

This was followed by 6.9 magnitude earthquake which hit Sikkim Nepal border region at 6.10 pm on September 18. It was widely felt in north-eastern states of India, West Bengal, Bihar, Uttar Pradesh, Haryana, Rajasthan including the capital city, Delhi. Subsequently, two more aftershocks of 6.1 and 5.3 at 6:21 pm and 6:42 pm respectively were also felt. The earthquake killed 60 people, affected 719 persons and caused substantial loss of livestock. The strong tremor caused significant building collapse and mudslides. As the earthquake occurred in the monsoon season, heavy rain and landslides added to the woes of the affected community and made the rescue work more difficult.

During the south west monsoon period from June to September, in September 2011 rainfall was the second worst event in south interior Karnataka since 1971, and in north interior Karnataka, third worst event since 1971. Failure of monsoon during September caused lateseason drought of rare severity. The dry spell in interior Karnataka during September continued till October in many districts; 77 talukas recorded deficit rainfall during the period October 1st to October 14th. Ultimately Government of Karnataka declared 99 talukas as drought affected.

As we all know, in India, disaster management is essentially a state subject. However, when the state government is not able to meet the exigency, it can request the Central Government for assistance. In this report, we have discussed some major disasters for

which the state governments had requisitioned the Central Government for supplementary support. In addition, few disasters like the stampede in Sabarimala pilgrimage and fire breakout in hospital in Kolkata. have also discussed in detail due to the unique nature of these disaster events themselves and the large number of lives lost in the catastrophe.The list of disasters in which 10 or more human lives were lost is annexed at the end of the report. The list has been drawn from the daily disaster update compiled by the National Institute of Disaster Management for the reported disasters in 2011. The Ministry of Home affairs is the nodal agency for management of disasters in India.

**Sikkim Earthquake**

**Overview**

Sikkim is a mountainous state which is crisscrossed by narrow valleys and steep cliffs. It has a fragile ecology being the steepest and the highest state in India, and the third highest landscape globally. It is located in the highest seismic zone and has weak geological formations, comprising of sedimentary and low grade metamorphic rocks which are prone to landslides. The State also experiences heavy monsoons with an average rainfall to the tune of 2800 mm. Cupped in the lap of eastern Himalaya, the north eastern State of Sikkim falls in high seismic zone (Zone V). The region has experienced relatively moderate seismicity in the past, with 18 earthquakes of Magnitude 5 or greater over the past 35 years within 100 kilometres of the epicentre of September 18 event. The largest of them was of Magnitude 6.1 in November, 1980. The last significant earthquake in the region occurred in Febrauary, 2006 measuring 5.3 on Richter scale.

An earthquake measuring 6.8 on Richter scale occurred on September 18, 2011 at 18:10 hours in the Sikkim Nepal border region. The epicentre of the earthquake (27.7oN, 88.2oE) was located near the Sikkim-Nepal border, about 68 km northwest of Gangtok, Sikkim at a shallow depth of about 19.7 km. The earthquake caused strong shaking in many areas adjacent to its epicentre lasting for about 30-40 seconds. It was widely felt in all North Eastern states of India, West Bengal, Bihar, Uttar Pradesh, Haryana, Rajasthan including capital city Delhi. The Indian Meteorology Department recorded two aftershocks of M 5.7 and M5.1 within two hours and another of M 4.6 at 3:21 am on 19th September, 2011. The earthquake claimed 60 lives in Sikkim, including 16 at the Teesta Stage III hydroelectric power project site and injured 719 persons and caused extensive damage. The devastation caused by the earthquake was intensified by seasonal heavy monsoon rains that caused landslides, mud slides and also caused floods that destroyed thousands of homes, buildings and infrastructure. .More than 300 landslides occurred all over the state and disturbed the road connectivity to major towns like Mangan, Chungthang, and Lachung

and even NH31A, main route connecting Sikkim and West Bengal. It was followed by road blocks, falling boulders, lake bursts and flash floods with incessant rain which continued for over a week after the earthquake.


MAP showing the Earthquake Epicentre and Affected Areas:

At its location, the continental Indian and Eurasian Plates converge with one another along a tectonic boundary beneath the mountainous region of northeast India near the

Nepalese border. Although earthquakes in this region are usually interplate in nature, preliminary data suggests the Sikkim earthquake was triggered by shallow strike-slip faulting from an intraplate source within the over-riding Eurasian Plate. Initial analyses also indicate a complex origin, with the perceived tremor likely being a result of two separate events occurring close together in time at similar focal depths.

**Impact**

The north district of Sikkim, which mostly comprises of the tribal population was the closest to the epicentre and was badly hit. Extensive damage and loss of public infrastructure was reported in the following sectors all over the State:

1. Transportation infrastructure comprising of roads and highway networks, bridges, tunnels, culverts, retaining walls and village footpaths.
2. Energy infrastructure in the form of generation plants, electrical grid, substations and transformers
3. Water management infrastructure comprising of drinking water supply, drainage systems, irrigation systems and flood control systems.
4. Governance infrastructure of government offices at the village, block, district and state level, military infrastructure along with residential buildings.

Damage caused to various buildings in the Sikkim earthquake

5. Social infrastructure including the health care system, education and research system and social welfare system primarily ICDS.

6. Economic infrastructure comp rising of marketing hubs, manufacturing centers, agriculture, horticulture, animal husbandry, forestry and fisheries infrastructure.
7. Recreation infrastructure like community halls, playgrounds, sports complexes etc.
8. Cultural heritage infrastructure like historic monasteries, chortens shedas (monastic schools), archaeological sites, temples, churches etc .

The loss and damage from the Earthquake is depicted as the following :

**Loss and Damage**

Human Lives lost 60, Injured 710, Houses 34159, Government Buildings 1255, Cattle Lost 525, Sheep,Goats, Pigs lost 808, Agriculture crops 7500 Hectares, Roads Damaged 3230kms,Village footpaths 1596, Bridges/Culverts 8135

Water Supply schemes 1529,Minor Irrigation Works 204, Flood Control Management works 533, Power Infrastructure Major Damage.

**Damage**

Schools 759, Hospitals 377, ICDS (Anganwadi) 875, Historic Monuments, Monasteries and Religious Institutions 259

Gram Panchayat Offices 60, Village level co-operatives 49, Rural product Marketing Centres 8.

(Source: Memorandum submitted by Government of Sikkim)

The State estimated a loss to the tune of Rs 7425 crore and sought a relief from Rs 6890 crore.

**Response**

Heavy rain, fog and blocked roads prevented the rapid deployment of rescue workers in the initial phase of the earthquake response. Rescue teams experienced difficulties in accessing some of the remote worst affected areas in northern Sikkim State and in the eastern region of Nepal that borders the State. As heavy rains eased on 22 September, relief teams reached the worst affected areas in northern Sikkim State by Indian Air Force's (AIF) helicopters. Massive operations were launched to rescue the injured and trapped population from the buildings and houses by the state administration along with the army, ITBP, SSB, NDRF, central government and state agencies.

1Army and Indo-Tibetan Border Police personnel use Army jawans distributing food to the earthquake earthmoving equipment to clear the road at Bitu Village survivors after they were rescued from Chungthang in north Sikkim about 110 Kms from Gangtok.

About 103 relief camps were made operational in the entire four districts and 14360 members of the affected community were accommodated and provided with food, clothing and medical care. The relief camps were set up in almost every gram panchayat units. The State government declared an ex gratia payment of Rs 5 lakh each to the next of kin of the deceased while the central government announced an ex gratia payment of Rs 2 lakh. The central government also gave Rs 1 lakh for the injured persons while the state government gave Rs50,000/- to the families of each injured person.

**Rehabilitation and Recovery**

Several steps were taken at the central and state level to rehabilitate the affected community and to "build back better". The central and the state government worked together towards reconstruction and rehabilitation in such a way so as to mitigate any such future disaster. The Prime Minister Shri Manmohan Singh announced an assistance of Rs.1, 000 crore to the State of Sikkim to meet the requirements of relief and rehabilitation in the wake of the massive destruction caused by the earthquake. The central government assured the Sikkim government of "every possible assistance" to manage effectively the task of

reconstruction, rehabilitation and re-development". The Sikkim government was also advised to learn from its experience by using proper building technology and building by-laws so as to be better prepared in the event of recurrences of earthquakes. An expert's team on earthquake-resistant technology was sent by the Centre to assist the State in rebuilding its infrastructure and to make Sikkim a model State in earthquake mitigation and to show the way to other earthquake-prone States in the country.

The Ministry of Power had also asked the National Hydro Power Corporation (NHPC) to extend all possible assistance to State Government of Sikkim to bring normalcy to the earthquake affected areas near NHPC's Teesta Hydel Power Station and Rangit Hydel Power Station in the State. It was decided to avail the services of seismic experts from IIT Roorkee to analyse the earthquake data and conduct the earthquake impact study at the dam sites of NHPC in the region and more specifically those in Sikkim.Apart from this, an Expert Team of Geologists, Engineers and senior executives of NHPC from its Headquarters in Delhi were also asked to visit the site and submit report to the authorities. Power Supply position in Gangtok was also reviewed and Power Grid Corporation was

instructed to expedite restoration of power. North Eastern Electric Power Corporation (NEEPCO) was also asked to compile the seismic data collected from its power stations in North Eastern States for further analysis at Indian Institute of Technology, Roorkee.

**Karnataka Drought**

**Overview**

Karnataka covers an area of 1,91,976 sq km and comprises humid, sub-humid, semi-arid and arid climatological regions. The population of the State is 6.11 crores, out of which 66% are rural based and dependent on agriculture. Two thirds of the geographical area falls under semi-arid to arid conditions. Nearly 76% of the sown area is under rain fed agriculture and is vulnerable to the vagaries of the monsoon.

The Karnataka has experienced drought during the years 2001, 2002, 2003 and 2004 consecutively. During the year 2005, state was under heavy floods. During 2006, it experienced both flood and drought situations. During 2007, it repeatedly faced floods 4 times. For the years 2008 and 2009, there were both drought and flood in the State. During the year 2011 the monsoon started in time and all parts of the State, except Karavali and Malnad regions, experienced moderate rain during September 2011.

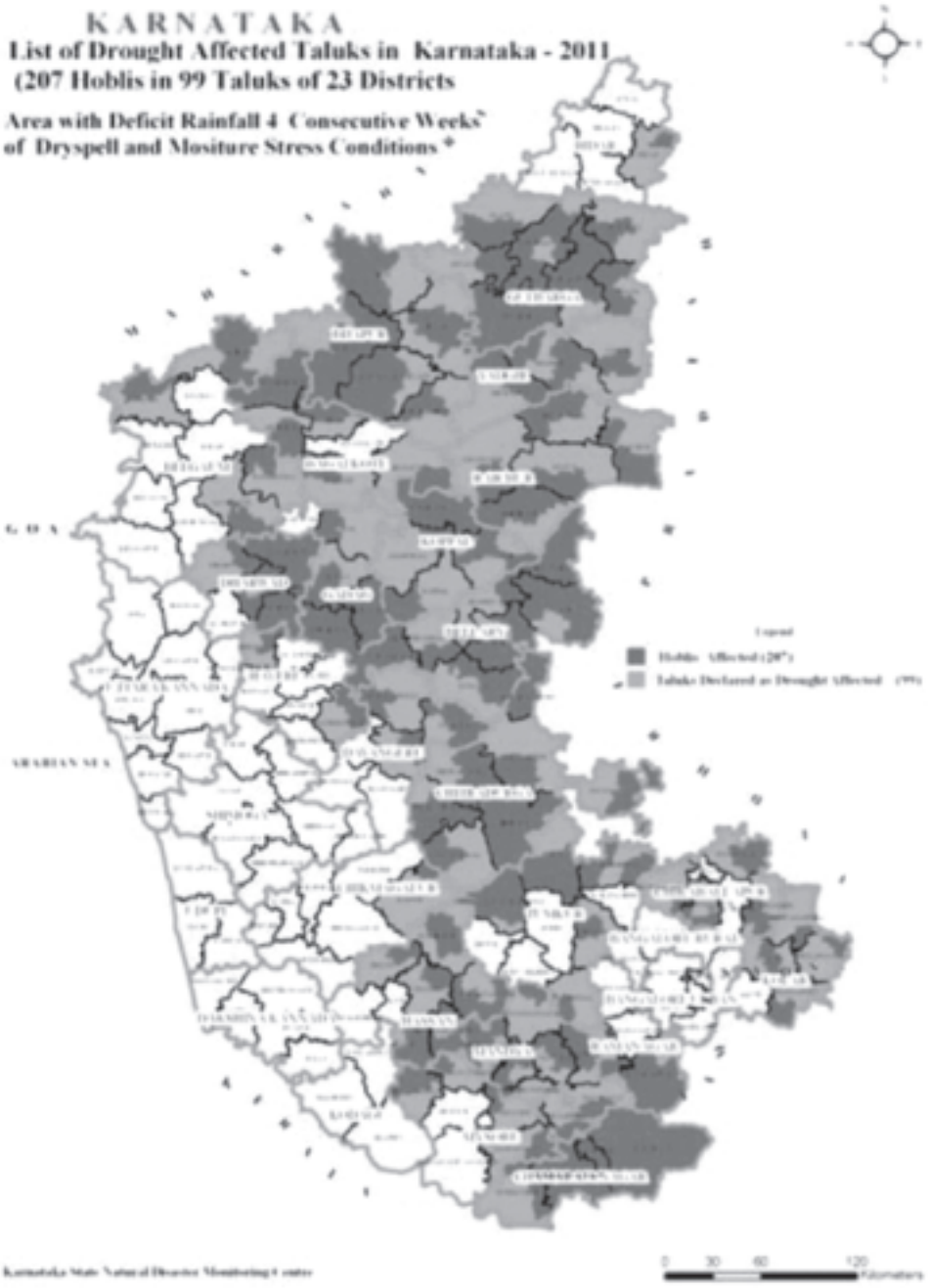
**Rainfall during south west monsoon - 2011**

During May-2011, the state as a whole recorded, 71.7 mm rainfall as against its normal rainfall of 85.2 mm, with departure from normal being (-) 16%. Out of 176 talukas in the State, 79 recorded deficit / scanty rainfall. The onset of monsoon over the southern part of State was on June 2nd and was on time. The progress of the monsoon trend was normal and covered most part of the State by June 10th, except parts of Bidar, Gulbarga, Yadgir and Raichur districts. Monsoon covered the entire state by June 15th. During June-2011 the State as a whole received actual rainfall of 200 mm as against its normal rainfall of 183 mm with (+) 10 % departure from normal. The interior parts of Karnataka received below normal rainfall but the rainfall was normal to excess in the districts of Malnad and coastal regions. During June rainfall was deficit in 58 talukas. During July, the state as a whole recorded 234 mm rainfall as against its normal rainfall of 266 mm with departure from normal being (-) 12 %. The districts of Chitradurga, Davanagere, Chamarajanagara, Mysore, Belgaum, Haveri, Dharwad, Hassan and Chikmangalur recorded deficit rainfall. However, during the month 72 talukas recorded deficit /scanty rainfall. The coastal, Malnad and South interior Karnataka regions recorded below normal rainfall. During August, the State received 230 mm rain as against normal rainfall of 196 mm with departure from normal of 17%. The rainfall was deficit during the month in the districts of Chitradurga and Bellary. The discussion indicates that the rainfall was more or less normal from May-August, 2011.

During September, the State witnessed scanty rainfall in 17 districts of interior Karnataka with departure from normal up to (-) 81%. The coastal and Malnad region received excess rainfall during the month. South interior Karnataka recorded only 44 mm rain during the month as against the normal rainfall of 134 mm. The North interior Karnataka region received 57 mm rainfall as against normal rainfall of 152 mm. September 2011 rainfall was the second worst event in South Interior Karnataka since 1971, and in North Interior Karnataka, third worst event since 1971. Failure of Monsoon during September 2011 caused late season drought of rare severity. The dry spell in interior Karnataka during September 2011 continued to October 2011 in many districts. 77 talukas recorded deficit rainfall during the period October 1-14 2011.(Fig.1)

Though the cumulative rainfall departure from normal for the State as a whole during June 1-14, 2011 was (-) 4% from normal, failure of monsoon during September and

October resultedin late season drought.(Fig.2 & 3) (Fig.1) (Soure : Memorandum, Government of karnataka )



**Key drought Indicators during Kharif 2011:**

The dry spell during the crop growth period causes agricultural drought. Agricultural drought occurs when soil moisture and rainfall are inadequate during the crop growing period causing extreme moisture stress and wilting. It thus arises from variable susceptibility of crops during different stages of crop development, from emergence to maturity. It is defined as a period of 4 consecutive weeks with a rainfall deficiency of more than 50 % of the long term average from mid-May to mid-October.

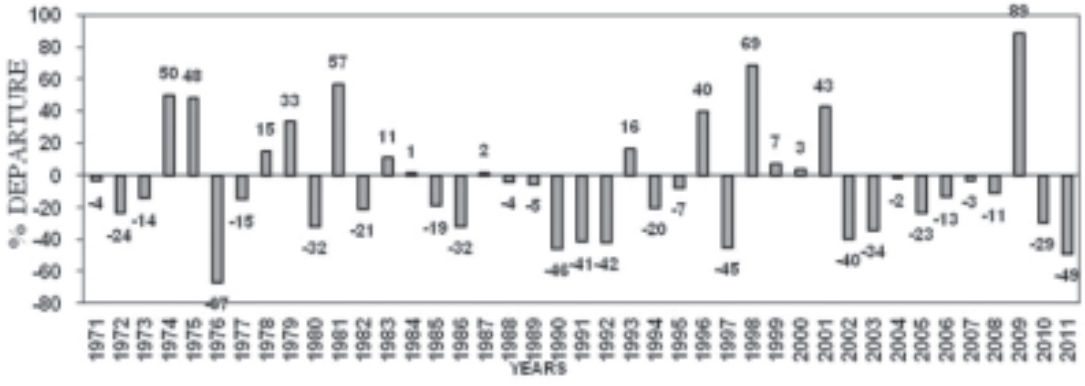
**Drought Monitoring:**

Karnataka has established institutional mechanism to monitor the drought indicators by setting up Drought Monitoring Cell way back in 1988. GPRS enabled Telemetric rain gauges have been installed and operational in all the 747 hoblis (villages) and 770 gram panchayats. GPRS enabled weather stations have been installed at 135 sites. Karnataka State Natural Disaster Monitoring Centre has taken a lead in monitoring the recurring drought situation on a scientific basis. The centre has made operational for various programmes on knowledge management and decision support system.

**Moisture Adequacy Index:**

Karnataka State Natural Disaster Monitoring Centre (KSNDMC) has developed moisture adequacy index based on rainfall, potential evopotranspiration, actual evopotranspiration, soil moisture condition, available water capacity of the soil and using soil water budgeting. Moisture adequacy index are classified into severe moisture stress (MAI < 25%), moderate moisture stress (MAI - 25.1 to 50%), agriculturally favorable (MAI - 50.1 to 75%) and Humid region (MAI >75%).

**Fig.2** **Percentage departure of cumulative rainfall from normal for the period for 1st Sept to 14th Oct for North-Interior Karnataka**




(Soure : Memorandum, Government of karnataka )

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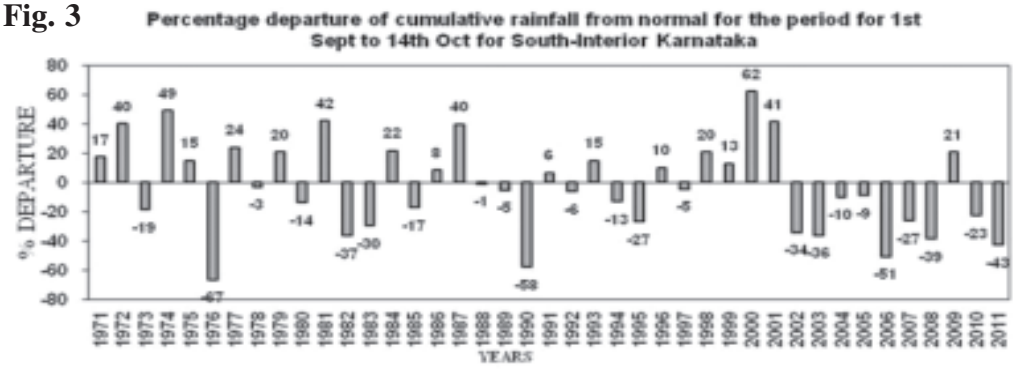
**Fig.2:** (Source : Memorandum, Government of Karnataka )

**Fig. 3**

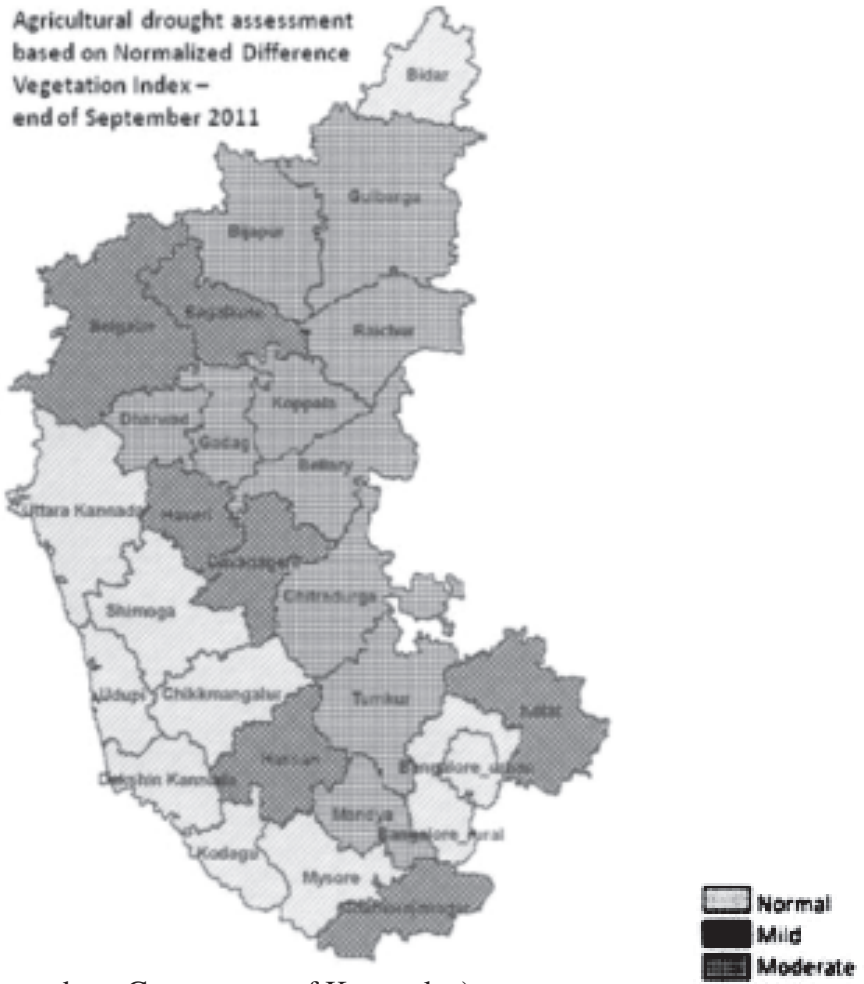



As on end of September 2011, 27% of the geographical area in the State was under moderate/severe moisture stress covering interior regions of the state. This indicator has assessed the moisture stress experienced by agriculture/ horticulture crops.

**Normalized Difference Vegetation Index:**

Assessment of agricultural drought and crop condition was carried out during Kharif 2011 by the State in association with National Remote Sensing Centre, Government of India. The report at the end of September has indicated drought condition prevailing in 20 districts of the Karnataka (Fig.4). It is also to be noted that out of 22 districts in the country under "Moderate drought", Karnataka had 11 districts under the category, which accounts to 50% of the total area in the country. Similarly out of the 49 districts in the country under "Mild drought", Karnataka has 11 districts falling under the said category constituting 22% of the total area of the country. Hence NDVI indicator had identified the drought situation in the State (Fig.4). Along with the above mentioned indicators, deficit rain, dry spell, moisture stress pattern were also vital indicators of drought.

**Fig.4**




(Soure : Memorandum, Government of Karnataka )


**Declaration of Drought:**

As per the recommendations of Cabinet Sub Committee in 2004, area with a continuous dry spell for more than 4 weeks period may be considered for declaring as drought affected. For declaring drought the following parameters were considered. 1) Continuous dry spell of 4 weeks or more. 2) Percentage departure of rain (-) 20% or more.

South West Monsoon drives the Kharif agricultural activities in the state of Karnataka. Generally September 30 2011 is the normal withdrawal of South West Monsoon in the state. Taking into consideration the drought indicators, deficit rain, dry spell/moisture stress prevailed in 70 talukas of the state and thus they were declared as drought affected on October 4 2011 and 14 talukas were declared as drought affected on October 7. The

situation was again reviewed on October 15 and 6 more talukas were declared as drought affected. With no respite in the situation, 9 more talukas were declared as drought affected on November 8. Thus in all 99 talukas were declared as drought affected in the State.(Fig.1)

**Impact**

The severe drought condition adversely affected not only agriculture, but other sectors like horticulture, livestock, etc. The summary of loss due to Drought during 2011, as per the memorandum submitted by Government of Karnataka, is presented below:

Summary of Loss due to Drought during 2011

(Source: Memorandum, Government of Karnataka)

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**Item Estimated loss**
**Relief claimed as per CRF**
**Norms in crores**

1. Agriculture Crop loss 4245.84 202.54
2 . Horticulture Crop loss 299.00 13.94
3 . Animal Husbandry
   a) Opening of Goshalas 23.92
   b) Purchase of Fodder mini kits 4.20
   c) Purchase of Fodder Banks 7.60
   d) Nutrient supply and Vety care 4.20

**Total of Sl No 3 39.92**

4. RDPR Dept
   a) Revival of PWS 24.42
   b) Revival of MWS 24.52
   c) Retrieval / hydro fracturing of bore-wells 18.23
   d) Drilling of new bore-wells 18.24
   e) Transportation of water 36.63

**Total of Sl. No. 4 122.04**

5. Additional funds under MGNREGS 4.80
6 .Additional funds under Health Sector 10.00
7. Additional funds under Power Sector 330.00

**Grand Total of Sl. No. 1 to 6 4544.84 723.24**

**Follow up action taken:**

The Government of Karnataka has been reviewing periodically the seasonal conditions of Agriculture crops at State / district levels. Agriculture Department was conducting periodic review of status of agriculture. Department was also in constant touch with taluka and District officials through weekly video conference to review the crop conditions. Contingent action plan was prepared by scientists of agriculture university and was executed in the affected districts. Nodal-officers were appointed in all the districts to review the seasonal crop conditions. "Bho-Chetana" scheme was extended to all the districts during the year. The scheme focuses on retaining / increasing soil fertility and micro nutrients of agriculture land and increase crop production. About 23 lakh farmers were covered under this scheme in the whole state. Seeds and fertilizer requirements in the districts were monitored constantly. Steps were taken to distribute seeds at subsidized rates for alternate crops. Close watch on Crop cutting experiments and special attention was paid to ensure none of the experiments will lapse. Micro and Macro irrigation programmes continued to cover more land under irrigation for less utilization of ground water. Scientists from university of agriculture, horticulture and fisheries were closely monitoring the seasonal conditions and advising farmers to improve crop conditions.

The villages, which were facing / likely to face shortage of drinking water, were identified and contingent action plan was prepared and implemented to tackle the issue. This mainly included - constant monitoring for effective implementation of on-going drinking water schemes, quick implementation of works approved during 2011-12, and repair and rejuvenation works, emergency supply of drinking water through tankers, purchase of more motor-pumps, extension of pipelines, effective implementation of flushing, deepening and hydro-fracturing works, functioning of control rooms at taluka level, drilling of bore-wells, steps to ensure effective supply of clean drinking water through tankers, etc. MGNREGS is one of the flagship programmes being implemented in all the districts of Karnataka. For the livelihood of rural people, who are poorest among the poor, are required to be provided employment in order to avoid migration. In order to combat the drought situation effectively, all the implementing officers were instructed to gear up the administrative machinery for providing employment to the people, by implementing the employment generation works, especially in the drought affected talukas. Further, circulars and guidelines have been issued to set-up goshalas, fodder banks, veterinary care centres, funds were released to the districts to purchase fodder mini kits to grow adequate green fodder in the affected areas. Health packages, including necessary medicines, vaccination, etc. were supplied to the affected districts for health-care of the cattle.

**Sabarimala Stampede**
**Karnataka Drought**
**Overview**

A stampede is a sudden rush of a congregated, active or polarized aggregate of people, resulting in many injuries and death from suffocation and trampling. The two major behavioural reasons of any stampede are anxiety and panic. It has been claimed that most of the stampede disasters can be prevented by simple crowd management strategies. The famous Sabarimala Sree Dharma Sastha Temple, dedicated to Lord Ayyappa, is situated on a hilltop (about 3000 feet above sea level), named Sabarimala in Pathanamthitta district of Kerala State. The uniqueness of the temple lies in the fact that it is open to all, irrespective of caste, creed or religion. However, the female between the age of 12 and 50 years are not allowed in the temple. It is open for worship only during the days of Mandalapooja Makaravilakku and Chitra Vishu. The temple attracts pilgrims not only from the southern states of Kerala,Tamil Nadu, Karnataka and Andhra Pradesh, but also from other parts of the country and abroad. It is said that the pilgrims have to follow fasting for 41 days to cleanse their minds before going to Sabarimala. The journey to the temple is to be taken through difficult paths in the forest as the vehicles can go only up to Pamba. To enter the Sabarimala temple, the pilgrim has to pass Pathinettampadi (holy eighteen steps).On January 14, a large number of pilgrims gathered to attend the Makarjyothi darshan, on the last day of a yearly festival which attracts millions of devotees, at a Hindu shrine in Pamba. After witnessing the Makarajyothi at Pamba, the pilgrims were returning and on way back around 8 p.m. the incident happened, killing 102 pilgrims and injuring at least 100 more.

Pilgrims gathering in sabarimala for worship makarajyothi (Soure: The times of india)

The preliminary report submitted by Idukki District Collector on Sabarimala stampede suggests that the tragedy occurred when an auto and jeep overturned. Both the vehicles were filled with the devotees. Initially, the fully packed auto overturned after it lost control. While the pilgrims were trying to lift the auto, the jeep overturned, triggering the stampede. The autopsy report also suggested that most of the pilgrims had died of injury to their internal organs due to the stampede at Pulmedu.

Policeman inspects the site of stampede

**Recovery Measures**

Stunned and jolted by the Sabarimala tragedy, cautious Kerala Government came up with a new footpath, a bridge and a slew of measures to decongest the route leading to the Sabarimala temple. Retired High Court Judge Shri M. R. Hariharan Nair, was appointed for enquiring into the Pulmedu tragedy in Sabarimala and to submit the report to State Government. Earlier, Shri Nair had submitted an interim report to Hon'ble Chief Minister of Kerala, Shri Oommen Chandy, recommending measures to prevent such accidents in future during the pilgrim season. Public Works Minister, Shri V. K. Ebrahim Kunju, who was discussing the interim report of Pullumedu tragedy, submitted by Justice Shri Hariharan, stated that the repair works of damaged roads to Sabarimala would be completed before the start of next season. 63.5 crores were sanctioned for this task. The report, which was submitted by Justice Shri Hariharan had been accepted by the State Government for follow-up actions.

On the recommendations of the Commission's report, following decisions had been taken to ensure safety of pilgrims:

- To ban private vehicles in the Vandiperiyaar- Vallakadavu route.
- To introduce KSRTC chain service on the Vandiperiyaar- Vallakadavu route.
- To construct two queue complexes and a bailey bridge at Sannidhanam before the commencement of next season.
- To provide better sanitation facilities from Pampa to Sannidhanam. For this task 5 crores allotted in the budget would be utilized.
- To organise a meeting with Devasom Secretaries of Andhra, Tamil Nadu, Punducherry and Karnataka at Kottayam, to discuss the preparations for the next season.
- To open an Information Centre at Nilakkal for the pilgrims from North India. It has also been decided that an integrated security and safety plan involving police, rapid action force and disaster management contingents would be put in place during the two-month long pilgrimage season of Sabarimala Ayyappa temple. The security system being evolved had factored in the recommendations in the interim report of the judicial commission that probed the Pulmedu stampede tragedy. Besides Kerala Police and its various specially trained units, services of police from the neighbouring states would also be utilised as part of the comprehensive safety plan. Apart from strengthening intelligence gathering, trained commandos, bomb detection squads, disaster management units and RAF contingents would be deployed at the base camp Pampa, "Sannidhanam" atop the hill shrine and other places connected with the event. In view of the Pulmedu tragedy, vehicular traffic along the Uppupara route had been banned. Security in the trekking route, used mainly by devotees from Tamil Nadu, would be stepped up and other facilities like lighting would be improved. The Travancore Devaswom Board, administering the shrine, was also considering bringing more routes under the coverage of accident insurance scheme. A high-level meeting held in Kottayam had decided to form a joint council of five southern states for inter-state co-ordination of the pilgrimage, which attracts over 30 million devotees a year, mostly from Tamil Nadu, Andhra Pradesh and Karnataka.

**Case Study: Amri Hospital Fire**

**Overview**

Health systems rely on a range of public, private and non-governmental health facilities to work together to serve the community. The importance of hospitals and all types of health facilities extend beyond the direct life-saving role they play (ISDR, 2008-09). These facilities are not only the lifelines of the communities but also the powerful symbols of social

progress and a prerequisite for stability and economic development. Therefore, special attention must be given to their robust physical and functional integrity in emergency conditions. However, globally there are countless examples of health infrastructures - from sophisticated hospitals to small but vital health centres - that have not been operational and sustained loss of lives and infrastructure, not only during disasters but have themselves inflicted disasters on the community due to its own vulnerability. Failure of hospitals and emergency services during a disaster can greatly affect public morale and a community's social and health capital, but, nothing can be more traumatic when hospitals themselves become disasters by failing to provide safety to its users. It is unethical to allow scope for a place meant to save lives to turn into a death trap.

As we know very well that many new hospitals are propping up in India, catering to a growing middle class and even some foreigners are looking for inexpensive and quality care. While India is gaining a good reputation for its medical talent, the construction codes and public safety regulations are lagging behind. There is a serious need to look into building safety codes and plan for fire while issuing the licenses for running the hospitals. In addition to the lapses in building, codes and fire exit strategies, the widespread corruption often makes it possible for code violations to be overlooked. This year witnessed a major fire accident in AMRI Hospital, which is located in a posh area of Kolkata.

AMRI Hospitals was co-founded by Emami & Shrachi Groups in 1996, two of Kolkata's developing groups, along with Government of West Bengal to expand health coverage options for consumers. The Emami Group has varied interests comprising personal and health care, hospital, bio-diesel, real estate, ball pen tips and retail, while the Shrachi Group has varied interests comprising Agro machinery, Engineering, Real Estate, Health Care, Finance Securities and information technology. AMRI hospital is a center for training the student of Institute of Radiology & Medical Imaging and is ISO 9001:2000 certified. It is a multi-storyed private hospital which turned into a towering inferno in the early hours of the morning, when a fire broke out in the hospital in Kolkata on December 9, 2011. The fire spread fast from the basement of the hospital, engulfing one ward after the other and trapping hundreds of people.

**Impact and Response**

The fire was first noticed by local residents at around 3.30 am, who rushed to the gates but were stopped by security guards. The hospital authorities reported to the fire stations after an hour or so. Firemen, who reached at 4.30am, broke through the double-paned glass façade of the hospital and rescued a few lucky survivors. Around 25 fire

engines were rushed to the spot. The fire fighters were seen using hydraulic ladders to rescue the patients and office staff by cutting opens the glasses with gas cutters. Many patients were lowered down from the upper floors in safety harnesses attached to ropes; others were wheeled out on stretchers. But by then, it was too late for a majority of the 150 patients admitted at AMRI. Though the cause of the fire has not yet been ascertained, Gopal Bhattacharjee, Director of the fire department, opined that it was most likely to be the result of an electrical short circuit in the basement car park, which was being used illegally as a store for combustible material like LPG cylinders, engine oil, PVC pipes, bedding, etc. The hospital authorities had been asked by the Kolkata Police to vacate the store in July. The fire didn't spread at all and was confined to the basement. But the thick black smoke went up through the AC ducts and carried it through the rooms and corridors of the seven-storeyed hospital located in a densely populated area. AMRI HOSPITAL FIRE

Patients being rescued by fire personnel

The devastating fire killed 91 patients including three hospital staffers in the incident. While many patients died of burns, most died due to suffocation caused by carbon monoxide accumulation in the building. Critical patients trapped inside the smoke-filled ICU were the biggest casualties. In a desperate bid to rescue them, windows were broken by the local residents as fire-fighters collapsed due to humongous smoke.

**Follow up Action**

Hon'ble Chief Minister of West Bengal, Ms. Mamata Banerjee, who also holds the health portfolio, cancelled the license of the hospital immediately. A judicial investigation into the entire catastrophic incident was ordered. Six members of the hospital board, including leading industrialist Shri S. K. Modi, were arrested on charges of culpable homicide and negligence.

The Calcutta High Court on February 24, 2012 granted bail to AMRI Director, Shri R. S. Agarwal, but rejected similar pleas of four other board members, including Shri R. S. Goenka, Shri Manish Goenka, Shri Prasant Goenka and Shri Ravi Todi of the hospital. Two renowned doctors of the hospital, Dr. Mani Chettri, the managing director, in whose name the hospital had the licence, along with another doctor Dr. Pranab Dasgupta were also arrested. In response to the arrests made, FICCI came and issued a public statement that it was important to fix the responsibility of those directly involved in managing the hospital and distinguish them from others. At the same time, those who are not found guilty and are not responsible for day to day operations of any business should be released immediately. Implicitly, FICCI condemned the arrest of board of directors and demanded their release immediately stating that it would spread negative sentiments within the domestic investor community and discourage future philanthropic activity under which more hospitals have been established.

**Amri Hospital Fire**
**Relief**

An ex-gratia grant of Rs 2, 73, 00,000 at the rate of Rs 3 lakhs per casualty was provided to the next of kin of the deceased in the AMRI hospital fire by the Government of West Bengal. A sum of Rs 1.5 lakhs was drawn from the State Disaster Response Fund and an equal amount was drawn from the State budget for the purpose. At the Central level, the Prime Minister sanctioned an ex-gratia relief of Rs 2 lakh each to the kin of the deceased and Rs 50,000 each to those injured, from the PM's relief fund.

The Government of West Bengal also decided to provide job to the next of kin deceased in the fire breakout. The government job opportunity was also extended to the next of kin of deceased who belonged to other states as well including Tripura, Jharkhand, and Kerala. Meetings were also organized between the administration and police department officials to discuss the establishment of six new fire stations at most fire-prone commercial zones, including Burrabazar, Garia, Parama Island and Tiljala.

## Way Ahead

While insensitive and unacceptable patient care in India hospitals has been repeatedly talked about, the advent of high-end super-speciality hospitals with so called state of the art facilities has been shown as an answer to the lack of patient centric approach of the hospitals has proven to be an eye wash. While the patients have no choice but to surrender his life into the hands of such facilities, the governance should be proactive enough to make basic preventive mechanisms a regulation. Lack of regulations, awareness and trainings of the staff, poorly planned facility and unaccountable management of the hospital are the foremost reasons behind such tragedies. Disaster Risk Reduction in health facilities and hospitals is possible by including prescribed risk reduction measures in the design and construction of all new health facilities, and by reducing vulnerability in existing health facilities through measures such as demolishing the highly risky buildings and strengthening the important critical facilities.

## Cyclone Thane

### Overview

Cyclone is a natural hazard, which can neither be prevented from occurring nor can it be controlled or modified. Cyclone Thane made a landfall on the coast of Tamilnadu (Cuddalore District) and Puducherry in the early hours of December 30, 2011. The cyclone Thane was detected early and IMD issued warning much in advance. The first IMD warning was issued on December 25 2011.

There were precautionary alerts from IMD from December 25 onwards (five days in advance) and the cyclone movement was then closely monitored by administration of Cuddalore and Puducherry with the help of IMD. The district administration conducted an emergency meeting on December 29 morning at the respective districts. Specific tasks were assigned to district and sub district functionaries such as PWD, Electricity Board, Water Board, Fire, Police, etc. NDRF battalions were alerted on December 29 itself and it arrived from Arakonam in the evening to Cuddalore. The cyclone struck coastal region of Tamil Nadu and Puducherry in the early hours of December 30 causing huge devastation. The damage was more in the Puducherry town area, affecting the trees, roads, buildings, including inundation in some coastal areas along the beach road. Affected people had to be evacuated to nearby Government schools and community halls. People along the coast were shifted to the cyclone shelters, constructed by Government in 1985 and 2009, in Puducherry and Tamil Nadu. The administration, Cuddalore inspected coastal villages on morning of December 29 and alerted villages not to venture out to sea and not to sleep

in thatched huts during night hours and not to station their vehicles under tree. The administration also advised vulnerable population to stay in the earmarked shelters. The food and water was supplied to the evacuated people by the Government agencies as well by the community leaders. During the day the administration addressed gathering at various vulnerable villages taking the help of head men, religion heads, divisional officers, etc. The DC went on AIR Puducherry and Chennai and local TV channels on December 29 evening announcing various public safety measures. The administration mobilized 108 ambulance vehicles from neighbouring districts.

**Impact:**

The cyclone made a landfall over Cuddalore and Puducherry on the morning hours of December 30, 2011, with a wind speed of 145-150 km per hour, causing loss of 53 human lives (41 in Tamil Nadu and 12 in Puduchery) and massive property damages (details are given in the table below for Tamil Nadu and Puducherry). The Cuddalore district has a population of 26, 00,880 as per 2011 census. Approx. 7500 people in Cuddalore and 1760 people in Puducherry were provided shelter in community halls. Some of the people after seeing the intensity of the cyclone and high tides (storm surge) evacuated on their own to safe shelters near Chidambaram Taluk (Killai and Parangipettai areas). Transport provisions were arranged by District authorities for such evacuees. As a precautionary measure, the administration had cut the power supply on 29th evening both in Cuddalore and Puducherry, anticipating the damage and for preventing electrocution.

Most of the deaths during Thane cyclone were due to house collapses. The cyclone was accompanied by rains and gale that uprooted thousands of trees, knocking down electric poles, transformers, transmission towers, snapping power supply in several areas. National and State Highways were completely blocked. Power supply was severely affected. Water supply was affected mainly due to power failure. Fuels (petrol, diesel, etc.) shortages were reported on 30th itself due to power failure and short supply. Thatched houses were completely damaged mainly in the most affected region of Cuddalore, Panruti, Kurunjipadi and Chidambaram Talukas in Tamil Nadu. Semi concrete buildings and fully concrete were also damaged at some places in both Tamil Nadu and Puducherry. Massive damages to crops, mainly to cash crops such as cashew nuts, bananna, coconuts, sugarcane were reported from both Tamil Nadu and Puducherry. Severe damage to paddy and other crops was also reported.

Landlines (including fax) were not working at district head quarters, but mobile phones (including internet) were reported to be working, though the network was very poor.

## Response and Relief Management

The priority task, of clearing the highways (national and state), was achieved by December 30 evening in Tamil Nadu. NDRF and police provided help in this task. Approx. 400 generator sets were mobilized in Tamil Nadu, from various agencies, both from Chennai and other districts, including private agencies and some of these were used for operation of petrol pumps. The technicians from IOC and BPL and some other agencies were roped in to operationalize filling stations. Long cues were reported on 30th but by 31st, the situation was brought under control. Some of these Gen sets were deployed for restoring water supply. Water tankers (70) were also mobilized from Chennai (Metro Water), and some from Neyveli Lignite Corporation, NOCL etc in Cuddalore district, Tamil Nadu. Local engineering colleges volunteered water supply from their bore wells. The corporate also participated in providing Gen sets and restoration of essential services. For urban water supply, a large Gen set was mobilized from Thiruvannmalai district, Tamil Nadu. Entire Tamil Nadu state machinery was supporting and DC was the coordinating officer. In Puducherry too it was done in the same way and the control room was operationalized the moment the cyclone was reported by the IMD. In Cuddalore, seven senior IAS officers (Secretary rank) were deputed to oversee the management. These officers looked after specific sectors such as Highways, Electricity, Water Supply, Law and Order, etc. The senior officers managed their respective sectors and DC coordinated the overall management process. Revenue officials were also deputed to ensure that there is no theft or untoward incidents. 2000 electricity board workers from other districts were engaged for power restoration in Cuddalore.

In Tamil Nadu and Puducherry ex gratia was paid to the family of victims who lost their lives (2 lakh each family). Immediate compensation was provided to fully damaged and partially damaged houses along with a relief kit comprising of 10 kg rice, saree and dhoti, kerosene and candles in Tamil Nadu. Restoration of power supply was the priority, as it caused many related problems such as water supply, sense of insecurity (theft), operation of essential service such as ambulances, health centres, etc. Milk supply was a major concern on 30th and AVIN (Government owned Milk Supply agency in Tamil Nadu) was roped in for filling the deficit. By January 2, 40% of power supply in urban areas, water supply and hospital services were restored. Rural water supply restoration took about a week in Tamil Nadu and Puducherry. By January 14, 2012 total power supply was restored in Tamil Nadu.

**Way Ahead:**

The cyclone "Thane" was reported timely, regarding timing and location of its land fall and the early warning was very helpful for preparation to face the situation. However the devastation was very severe for the region, as these regions have never witnessed such severe cyclone in the past 50 years, as per the community's version. The public as well as the administration have realised that the cyclone 'Thane' could had further severe impact, however as there was no storm surge, due to winds the impact was comparatively less, along the coast. Similar cyclone with more wind speed occurred in Orissa Coast in 1999 during the super cyclone, which had devastated the state's economy, bringing the state to a halt. The community can be taught to be better prepared through awareness, training and community involvement in planning for such disasters. The volunteers can be mobilised in these areas, especially the youngsters, so that their energy is utilised in a positive way for the benefit of the community and the nation. Further the volunteers will be able to manage the disaster in a better way as they are located in the place of its occurrence and can utilise all the resources as they will be familiar with the area and start the operation immediately without waiting for administration and others, so that the golden hours are utilised in a fruitful way.

**Lessions Learnt:**

By three methods we may learn wisdom: first, by reflection, which is the noblest; second, by imitation, which is the easiest; and third, by experience, which is the bitterest." Confucius The year 2011 witnessed a number of major as well minor disasters, which were reported and many of them would have passed by unreported. On account of natural disasters, the loss of life was not much but in case of human made disasters, it was quite high. The fact however does not undermine the importance of mitigating the effects of both, natural as well as human made disasters. We have already discussed in the first chapter about how disasters result in loss of precious lives, damage to infrastructure and livelihood and carves a dent to the emotional well being of the affected community. It will be too huge a price to pay at the national level, at the community level and even at the individual level, if we do not learn from the past disasters and prevent the future hazards from becoming disasters. We need to incorporate the lessons learnt from the past disasters in our present to break the vicious cycle of hazards turning into disasters. The floods in Odisha highlighted the acute need for initiation of plan for permanent flood control or long term measures to tackle the flood and reduce its impact in the State. It calls for community participation so that the community is trained to cope, manage and spring back to normalcy in the minimum

time which also improves every year learning from their own experience, assisted by Government machinery. Another issue which needs to be looked into is that the livelihood of marginal farmers or the poor generally depends on the livestock he/she owns and ultimately the health and well being of the livestock. This is truer when the farmer is faced with challenges of coping with disaster and trying to regain normal life. The livestock helps in regaining the normal life and livelihood, atleast by partly supporting the livelihood of the affected community. So it becomes imperativeto cater to the livestock, in addition to care of human life and their settlement. This is possible by learning from Rajasthan, the way they manage the cattle population during drought, by way of "Ghosala" etc. so that there is some arrangement at each village as per convenience of the local population. The Government of Odisha might have realized that recurrent floods in these flood prone areas will have less impact, if livestock serve as part of their livelihood if they are also taken care of. This step will enhance the resilience of the farmers, after any disaster.

The recent figure of Planning Commission (Economic Times, March 20, 2012) shows that the population below poverty level in Odisha is 37.0% in 2009-10 as compared to 57.2 % in 2004-05 shows a good improvement. The situation can further improve if the recurrent disasters are efficiently managed and coping mechanism developed. Participation of local community in relief, rehabilitation and reconstruction work in the form of a core-team with Government officials along with other national and international stake holders is essential for success of propermanagement of the disasters. This will bring in the belongingness of the work being carried out and can lead to success, as the involvement of local community will ensure that it is as per the need of locality with all scientific input, as was seen in Gujarat Earth quake rehabilitation project of 2001.

The Sikkim earthquake highlighted the vulnerability of the state, and the region as a whole, to earthquake and a dire need for strict compliance with building bye-laws. The death of 16 people in the earthquake in hydroelectric power project shows that all developmental works, including power generation projects should incorporate disaster mitigation in their plans. We need to prepare not only for primary disasters but also resulting secondary disasters. As a result of the earthquake, a number of landslides were triggered. Hence, vulnerability assessment of the roads is extremely important. The roads were damaged not only due to earthquake but also because of resultant landslides and hence reaching the affected area was a tough task and took a lot of time. Precious lives were lost due to the delay caused in reaching the affected areas by the search and rescue teams.

Therefore, the need of the hour is to frame strategies to construct and maintain major hospitals, school buildings and public amenity building for storage of essential life saving

materials, to use as community halls, to store equipment and machinery for removal of damaged material, using disaster resistant technology of a higher order, so that these buildings not only serve as good examples of disaster resistant technology, but also could be utilized as relief shelters providing necessary support facilities. Despite the available knowledge base, the communities in high seismic regions such as Sikkim and neighbouring states are not adequately prepared, due to lack of implementation of earthquake-resistant building technology. However, with adherence to seismic codes and recommended construction practices, it is possible to mitigate such largescale disasters. The Karnataka drought drew attention to the fact that it was high time to think about the mainstreaming the drought risk management (DRM), especially in the areas which are prone to drought. The process can start with policy mechanism involving the stake holders, knowing their views how to go about it. The process will involve, defining a drought risk profile of various areas in the state, followed by identification of disaster risk management (DRM) options, defining the mainstreaming entry points, and finally internalizing DRM into the development framework. These steps can be followed by measuring the impacts of DRM mainstreaming, to assess the situation and carry out the needful modification or corrective measures so that the policy can be framed for mainstreaming. All these steps are vital and would be successful if the stake holders are included in every step starting from planning to implementation.

The process of drought risk management can also include the policy decisions in the field of water and land resources, to manage the fresh water, excess of which results in flood and scarcity in drought. It should be a holistic approach of integrated water and land management, which is key to the drought proofing, so that the agriculture and allied activities, the main livelihood of almost two thirds population of the country sustains even in the absence of a normal monsoon.

The important issue highlighted by Sabarimala stampede is the need to streamline the pilgrimage in a systematic way step by step. The entry and exit routes for pilgrims should have been segregated to decongest, as the arrival of large number of pilgrims was known beforehand, to enable safe passage of pilgrims and also of the response teams. Vehicular parking should have been near the base camp, where all the vehicles could be parked in such a manner to make way for a safe way out. Their movement should have been streamlined and restricted keeping the capacity of the parking lot. The movement of the pilgrims should have been structured in a long zig-zag path leading to the temple and monitored constantly. For all this, the pilgrims should be registered as is being done in Sri Mata Vaishno Devi Temple and Thirumala Devasthanam in Andhra Pradesh. If possible, pilgrims, who have to perform a particular pooja, may be routed through different path and

must have separate area for offering pooja or may be allowed at a different time. An integrated security plan, involving officials of temple administration, security staff and local police may be chalked out well in advance to have clear cut roles and responsibilities. Hospitals may be kept in ready condition to cater to any large influx of survivors from any such future incidents. Moreover, health administration within the temple administration must have liaison with both Government and private hospitals. For this an inventory of all the hospitals around the area may be done for future use. History of such incidents and the way in which these were dealt may be properly documented and displayed at different places for easy access to responders.

The AMRI hospital fire showed the possible violation of fire safety norms in this hospital, which took ninety one lives, needs a serious thinking regarding hospital fire safety in India or elsewhere in the world. Vital lessons need to be learnt by everyone who are connected with medical profession and governance at large. A no objection certificate has to be obtained from the Fire and Emergency Services before occupying/making use of a commercial building. The officials from the department need to conduct a spot inspection and suggest safety measures considering the purpose for which the building is used, its dimensions, the staff strength, the nearest approach road and its width, etc. A total adherence to these suggestions could minimise, if not, avoid fire accidents. However, many choose to bypass this crucialLprocedure before occupying buildings. The reason is not far to seek. The implementation of safety measures recommended by the department is always ignored due to investment of considerable money and the process is conveniently given a go by. The fire breakout incidents point out at the need for new hospitals to be safeguarded by risk- sensitive siting, design and building in compliance with building codes. We need to develop and implement national policies and programmes to make health facilities safe not only in emergencies but also in peace times.

The key issue in case Cyclone 'Thane' was that not many in both Cuddalore and Puducherry areas in spite of such accurate warning did not evacuate to safe shelters before the weather conditions deteriorated. This approach of 'wait and see' might have become very costly, had there been greater storm surge than what was observed during Thane. While poor maintenance of cyclone shelter remains one of the issues for people not moving easily to such shelters, a long absence of any severe cyclone affecting these areas has also been widely cited to be the reason for not believing that the cyclone's impact can be so damaging. The other issue which was noticed was the lack of crop insurance in place in many areas. The areas where cashew nut tree plantation (Panrutty Thaluk) was heavily damaged, though this area was not very near to the coast, there is a realization among

farmers that that they should have gone for crop insurance, as these crops take 6-7 years for full growth after cashew plantation. These farmers would have to wait for seven years to come to normalcy as their livelihood depends on these plantations. The Government can plan for some subsidy to promote insurance policies in such cases so that the financial burden is shared and the farmers have a responsibility and need not wait for the relief from the Government sector all the time, after such disasters.

The disaster history of 2011 has set the tone for accentuating that investments are made in disaster risk reduction in the reconstruction of housing, infrastructure, and other community assets. We need to frame strategies to construct and maintain major hospitals, school buildings and public amenity building using disaster resistant technology of a higher order, as pointed out above. Moreover, techno legal and techno financing regime should be brought in to ensure that all public funded housing and buildings and construction, be it for health, education, industry, community amenities, etc. be built only with disaster resistant construction features. Further, public financing institutions for housing and infrastructure development should be advised to extend financial assistance to projects from States only when disaster resistant construction features are introduced in the proposed housing and building construction programmes.

**Disaster risk Assessment:**

Risk assessment measures aim at ascertaining disaster risk in a certain region or sector of the population. Taking the equation for risk provided in earlier Chapter, the specific hazards and vulnerabilities of a society or group are assessed To make a realistic assessment of the hazard it is important to determine the probability and the possible intensity of the expected natural event. In the vulnerability analysis the different political-institutional, economic and sociocultural factors must be taken into account and a vulnerability profile drawn up accordingly. Risk assessment is the outcome of the investigation of the cause-effect matrix between hazards and vulnerabilities.

The main tools in risk assessment are:

- Records of past disasters and major natural phenomena. persons/households, condition of buildings, production activities, vehicles, animals, special abilities and needs in the case of an emergency).
- As precise as possible studies on the specific geological, climatic and other hazards in the national and/or regional context.
- Drafting and updating hazard maps and vulnerability profiles with a maximum level of participation.

- ❖ Surveys of the endangered population by gender and vulnerability (especially thorough analysis of these factors using the available tools enables us to identify specific disaster risk management measures for the endangered population.

**Risk assessment / analysis**

A process to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability / capacity that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

The process of conducting a risk assessment is based on a review of both technical features of hazards such as their location, intensity and probability, and also the analysis of the physical, social and economic dimensions of vulnerability, while taking particular account of the coping capabilities pertinent to the risk scenarios.

Risk Assessment is understood as " methodology to determine the nature and extent of risk by analysing the potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend." " The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of the vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios…."(I.S.D.R.)

Risk evaluation entails assessment of proposed risk reduction measures from the point of view of cost efficiency. Efficiency is examined by means of cost-benefit comparisons, which imply assessing benefits procured or expected to be procured from a measure against costs likely to be incurred. Assessment has significant administrative implications in that precise understanding of the underlying process of a hazard enables formulation of targeted risk reduction policies. Precise quantification of risk is often difficult in the absence of adequate data and proper analysis techniques. Moreover, certain areas are multi-hazard prone, which poses challenge for risk assessment. Risk reduction policy for such areas require risk assessments regarding each type of hazard to arrive at an estimation of losses involved. Besides, risks are not amenable to simple quantification in that intangible factors are involved that cannot be easily indentified and quantified.

Disaster risk is seen as a function of the hazard, exposure and vulnerability. To reduce disaster risk, it is important to bring down the level of vulnerability and to contain 'exposure' by relocating populations and property away from the hazardous zones.

# Unit - 4 ❑ Ways of Minimising Disaster Risk

**Structure**



## 4.1 Prevention and Mitigation

**Prevention—**Measures taken to detect, contain, and forestall events or circumstances which, if left unchecked, could result in a disaster.

**Mitigation—**Steps taken to contain or reduce the effects of an anticipated or already occurred disastrous event. Any action taken to minimize the extent of a disaster or potential disaster is called a mitigation measure.

Mitigation can take place before, during or after a disaster, but the term is most often used to refer to actions against potential disasters. Mitigation measures are both physical and structural, such as flood defences or strengthening buildings as well as non-structural, such as training in disaster management, regulating land-use and public education, among others.

**Prevention:**

Activities to provide outright avoidance of the adverse impact of hazards and related environmental, technological and biological disasters.

Depending on social and technical feasibility and cost/ benefit considerations, investing in preventive measures is justified in areas frequently affected by disaster. In the context of public awareness raising and education, prevention refers to attitude and behavior leading towards a "culture of prevention".

Activities to provide outright avoidance of the adverse impact of hazards and means

to minimize related environmental, technological and biological disasters are essential to prevent such disasters. Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters.

**Mitigation**

Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards. Disaster prevention and mitigation denotes activities that prevent or mitigate the adverse effects of extreme natural events, above all in the medium and long term. These include on the one hand, political, legal, administrative and infrastructure measures to address the hazard situation, and, on the other, influencing the lifestyle and behaviour of the endangered population in order to reduce their disaster risk.

**Measures designed to achieve these aims include:**

- National and local regulation of land use: regulations for the zoning of residential and commercial districts and nature reserves. Detailed land surveys and registers are required in order to achieve this. Use of land for habitation and commercial use needs to be regulated so that lands in fragile ecological areas can be protected. The lands near or inside nature reserves are precious for wild animals and the people who depend on forest products. These areas needs to be carefully used as they are important for sustaining ecological balance.
- Sustainable management and expansion of forestland: control of deforestation and slash-and-burn forest clearance, re-afforestation and implementation of sustainable forest management schemes.
- Zoning natural reserves on river flood plains, planting of trees and other vegetation types on riverbanks and possible reinforcement using infrastructure such as dams, dykes and embankments. To elaborate this, it may be said, saving embankments and river spill zones from encroachment, allowing the normal flow of rivers so that it does not affect human habitation by breaching embankments.
- Adjusting infrastructure to anticipated events including relevant legal and administrative regulations: raising the heights of bridges, retrofitting buildings, drainage and irrigation systems. This is mainly mitigation strategies to minimize damages from impending disasters.
- Strengthening local prerogatives and responsibilities through decentralization and democratisation.
- Training the population and local and national institutions on the causes, impacts and means of prevention of disasters.

- ❖ Assistance to the population and local and national institutions in the adequate organisation of disaster risk management and the building up effective cooperation capabilities.
- ❖ Introduction of mechanisms and instruments for spreading risk and/or risk transfer (e.g. insurance, safety reserves).

## 4.2 Disaster preparedness

**Preparedness**

Preparation is the third main operational area. The intention is to prevent or minimize deaths or other losses and damage in the case of an extreme natural event. Prior to the event it is necessary to prepare the institutions involved (above all disaster preparedness and civil protection, the fire department, the health service, administration, police) and the endangered population as to possible situations, and take precautionary steps.

Preparedness may be defined as, "activities and measures taken in advance to ensure effective response to the impact of disaster, including the issuance of timely and effective early warnings and the temporary removal of people and property from a threatened location".

These are activities and measures taken before a hazard event to ensure effective response to the impact of hazards. It involves measures that enable governments, community and individuals to respond rapidly to disaster situations and cope with them effectively.

**Preparedness includes**

- ❖ making of viable emergency plans
- ❖ development of warning systems
- ❖ maintenance of inventories
- ❖ training of personnel
- ❖ search and rescue measures
- ❖ Evacuation plans for areas that may be 'at risk' for a recurring disaster.

**The preparedness measures may also include:**

- ❖ Establishing a legal framework and specifying government assistance for disaster preparedness.
- ❖ Establishing a deployment and coordination apparatus, task allocation and communications structure; drawing up emergency plans: clarifying the competences, resources available and tasks of the population; evacuation plans; securing contingency supplies (first aid, food, drinking water, medication).

- Building up or strengthening local and national disaster preparedness capabilities and rescue services (particularly, personnel and financial resources, logistics and communications).
- Infrastructure measures: fitting out possible emergency accommodation, securing lines of communication and evacuation routes.
- Training: conducting disaster protection exercises in evacuation, recovery, rescue, emergency medical measures, occupation and organisation of emergency accommodation. Improving abilities for rapid assessment of the requisite assistance as well as damage in the case of an emergency in order to ensure rapid and systematic delivery of needed.
- Building up appropriate decentralized early-warning systems to ensure that endangered population relevant local and national actors receive timely information.

**Raising awareness**

Raising awareness involves helping people and institutions to better grasp the hazard problem and current levels of vulnerability, as well as the cost and benefit connection in disaster risk management at the economic, social and political level. The awareness of decision-makers and experts in different local and national institutions (e.g. municipal administration, construction and health sector, civil protection) can be raised through a combination of training, and joint implementation of practical measures. The following aspects must be taken into account here:

- The cost-benefit analysis should be as realistic as possible in order to convince decision-makers in particular. Beneficial side-effects (e.g. gain in prestige) can also play a role.
- In order to motivate experts and decision makers and make the topic more amenable to them, disaster risk management should not be conveyed as something new, but rather as an additional development to their activities to date.
- High personnel turn over rates and strict hierarchical structures that limit consciousness raising to individual specialists are common problems. The topic should be introduced to as broad (horizontal and vertical) a section of the institutional personnel as possible in order to bring about lasting change.

Awareness in the population can also be raised through a number of measures. Information campaigns (e.g. radio or brochures) can draw short-term attention to definite dangers and needed precautions (e.g. at the beginning of the rainy period), or promote acceptance for forthcoming pre preventive activities (e.g. a law on environmental protection or a vaccination campaign). Provided it is long-term (e.g. in schools) training/education can also alter people's attitudes and behaviour. The most effective way to raise awareness,

however, is to actively involve as many people as possible in implementing measures in the different operational areas of disaster risk management.

Disaster risk management approaches that aim at mobilizing the population in this way are called participatory disaster risk management. They proceed from the precept of motivating people on a voluntary basis in order to:

- build up a sufficient pool of informed and trained personnel for an emergency,
- inculcate disaster risk management attitudes and behaviour in broad sectors of the population using the volunteers involved and
- ultimately strengthen the self-help capabilities of the endangered population.

**Strengthening local disaster risk management capabilities**

High priority is attached to strengthening local capabilities for two reasons:

- Disaster risk frequently varies significantly by micro-region. This is why use must be made of local knowledge, and disaster risk management tailored at the local level to local hazards and vulnerabilities, as part of the national and regional systems.
- National disaster preparedness authorities are at present still centrally organized in most developing countries and unable to provide effective help in an emergency, particularly to rural populations.

Even national early-warning systems (e.g. information on hurricanes) often reach the endangered population too late or not at all. So endangered areas must rely on their own capabilities of taking precautionary measures. A way of helping to build an effective local disaster risk management system is by stimulating community-based disaster risk management. The local system should form part of a national system and should assure the participation of all relevant social actors at the municipal level.

**Early warning**

The provision of timely and effective information, through identified institutions, that allow individuals at risk of a disaster, to take action to avoid or reduce their risk and prepare for effective response.

Early warning systems consist of three elements (i) forecasting and prediction of impending events, (ii) processing and dissemination of warnings to political authorities and population, and (iii) undertaking appropriate reaction to warnings.

A systematic approach to managing the "risks" associated with disasters can prevent or mitigate their impact. The process must consider the likely effects of natural hazards and the measures by which they can be minimized.

The concept of disaster risk is used to describe the likelihood of harmful consequences arising from the interaction of natural hazards and the community. Two elements are essential

in the formulation of disaster risk: the probability of occurrence of a hazard, and the vulnerability of the community to that hazard.

A closer look at the nature of hazards and the notions of vulnerability allows for a better and more comprehensive understanding of the challenges posed by disaster mitigation:

**i. Nature of hazard —** By seeking to understand hazards of the past, monitoring of the present, and prediction of the future, a community or public authority is poised to minimize the risk of a disaster. The NMHSs play a key role in this aspect of risk management of weather-related natural disasters; and,

**ii. Notions of Vulnerability —** The community vulnerability is the susceptibility and resilience of the community and environment to natural hazards. Different population segments can be exposed to greater relative risks because of their social and economic conditions. Reducing disaster vulnerability requires increasing knowledge about the likelihood, consequences, imminence and presence of natural hazards, and empowering individuals, communities and public authorities with that knowledge to lower the risk before severe weather events occur, and to respond effectively immediately afterwards.

The importance given to social and economic vulnerability as a rapidly increasing factor of risk in most of today's societies underlines the need to encourage the participation of a wide spectrum of stakeholders in hazard and risk reduction and response activities. Stakeholders are those people or organizations who may affect, be affected by, or perceive themselves to be affected by, a decision or activity. In developing a disaster risk management system, no single agency can provide a fully comprehensive solution. It is essential that agencies work together and with stakeholders to narrow knowledge gaps and to develop disaster risk management plans using a coordinated approach (WMO 2010).

Well-developed governance and institutional arrangements support the successful development and sustainability of sound early warning systems. They are the foundations upon which early warning systems are built, strengthened and maintained. Good governance is encouraged by robust legal and regulatory frameworks and supported by long-term political commitment and effective institutional arrangements. Effective governance arrangements should encourage local decision-making and participation which are supported by broader administrative and resource capabilities at the national or regional level.

Vertical and horizontal communication and coordination between early warning stakeholders is also essential.

1. Here weather-related hazards is assumed to include water-induced and climate-related hazards
2. Implicitly the poor are the most vulnerable. They are also likely to benefit the most from early warning systems since large protective infrastructure projects designed

to reduce vulnerability, often result in the dislocation of poor residents to other risk prone places (World Bank 2010, Rogers and Tsirkunov 2011).

**Design of a Warning System**

The detailed design of a warning system depends on the particular features of the hazard phenomenon, the vulnerability of the region, and the needs of the potentially affected communities. In general, however, the design of a warning system must provide the following basic requirements (Zillman 2003):

- A sound scientific basis of understanding of the meteorological or hydrological phenomenon concerned including the scientific basis for its predictability;
- Rapid access to global data streams in order to initialize forecast models for the short- to medium-range forecast process;

Rapid access to regional data, including locally processed remotely sensed data, in order to initialize short-range regional models and mesoscale models to provide prior and during-the-event guidance on the fine time and space scales, and also to provide monitoring of conditions during the event;

- Hardware and software to store and retrieve data, to analyze and display information, and to perform the extensive calculations required of today's numerical weather prediction (NWP) models;
- Systems to automatically detect and alert forecasters to severe weather events. These include the algorithms to detect downbursts from radar data, or expert systems, which can alert forecasters to the likelihood of severe weather events based on observational or forecast data;
- Communications to provide information to emergency management authorities and other users with lead times that allow adequate response time for emergency managers to complete preparedness action.

**Effective Early Warning Systems**

A warning system must empower individuals, communities and businesses to respond timely and appropriately to hazards in order to reduce the risk of death, injury, property loss and damage. Warnings must get the message across and stimulate those at risk to take action.

Increasingly precise warnings are required by disaster mitigation decision-makers. These require improvements in weather warnings (Gunasekera 2004):

i. extending the lead time of warnings;
ii. improving the accuracy of warnings;

iii. greater demand for probabilistic forecasts;
iv. better communication and dissemination of warnings;
v. using new techniques to alert the public;
vi. targeting of the warning services to relevant and specific users (right information to right people at right time and right place); and
vii. warning messages are understood and the appropriate action taken in response.

Longer lead times should be considered together with the need to reduce false alarm rates and a balance should be struck between the two whereby decisions can be based on optimum lead times for warnings (Rogers and Tsirkunov 2010).

**People Centered Early Warning Systems**

There is general agreement on the structure of people centered early warning systems; namely, risk knowledge, monitoring and warning service, dissemination and communication, and response capabilitySince the concept was introduced the capacity to provide tailored information to individuals has increased along with an ever expanding access to mobile technology. Thus it is now possible to be increasingly specific about warnings to individuals at risk, increasing the importance of the concept of people centric warning systems. It also means that individuals need to be more aware of their risks and the warning systems must increasingly support forecasts of impacts so that those at risk can fully understand the consequences and actions that need to be taken.

**Risk Knowledge**

Risks arise from the combination of hazards and vulnerabilities at a particular location. Identification and assessments of risk require systematic collection and analysis of data and should consider the dynamic nature of hazards and vulnerabilities that arise from processes such as urbanization, rural land-use change, environmental degradation and climate change. Risk assessments and maps help to motivate people, prioritize early warning system needs and guide preparations for disaster prevention and responses.

**Monitoring and Warning Service**

Warning services lie at the core of the system. There must be a sound scientific basis for predicting and forecasting hazards and reliable forecasting and warning systems that operate 24 hours a day3. Continuous monitoring of hazard parameters and precursors is essential to generate accurate warnings in a timely fashion. Warning services for different hazards should be coordinated where possible to gain the benefit of shared institutional, procedural and communication networks. This can be achieved through a multi-hazard

early warning system that coordinates and integrates the needs of different stakeholders.

In the past forecasting agencies have focused on provided warning information directly linked to the hydro-meteorological forecasts that they calculate; however, the impact of heavy precipitation, for example, will vary over a catchment area depending on many factors that contribute to the vulnerability of people. Some will have little risk others may be in life-threatening situations. It is very important to make sure that those at risk are properly informed and actions are taken to protect them. Targeting those at risk also creates a more effective response and reduces the risk of warning fatigue and false alarms.

**Response Capability**

It is essential that communities understand their risks; respect the warning service and know how to react. Education and preparedness programs play a key role. It is also essential that disaster management plans are in place, well-practiced and tested. The community should be well informed on options for safe behavior, available escape routes, and how best to avoid damage and loss to property.

**Cross-cutting Issues:**

**Involvement of Local Communities**

People-centered early warning systems rely on the direct participation of those most likely to be exposed to hazards. Without the involvement of local authorities and communities at risk, government and institutional interventions and responses to hazard events are likely to be inadequate. A local, 'bottom-up' approach to early warning, with the active participation of local communities, enables a multi-dimensional response to problems and needs. In this way, local communities, civic groups and traditional structures can contribute to the reduction of vulnerability and to the strengthening of local capacities.

**Consideration of Gender Perspectives, Cultural Diversity and Disability**

In developing early warning systems it is essential to recognize that different groups have different vulnerabilities according to culture, gender or other characteristics that influence their capacity to effectively prepare for, prevent and respond to disasters. Women and men often play different roles in society and have different access to information in disaster situations. In addition, the elderly, disabled and socio-economically disadvantaged are often more vulnerable.

Information, institutional arrangements and warning communication systems should be tailored to meet the needs of every group in every vulnerable community.

### A Multi-Hazard Approach

Where possible, early warning systems should link all hazard-based systems. Economies of scale, sustainability and efficiency can be enhanced if systems and operational activities are established and maintained within a multipurpose framework that considers all hazards and end user needs. Multi-hazard early warning systems will also be activated more often than a single-hazard warning system, and therefore should provide better functionality and reliability for dangerous high intensity events, such as tsunamis, that occur infrequently. Multi-hazard systems also help the public better understand the range of risks they face and reinforce desired preparedness actions and warning response behaviors.

Housed within a National Meteorological or Hydro-meteorological Service is the ideal solution since the main elements of the system can be exercised as part of the routine forecasting and analysis functions of the service. Thus in many countries disaster risk reduction activities are the responsibility of public weather services.

### Dissemination and Communication

Warnings must reach those at risk. Clear messages containing simple, useful information are critical to enable proper responses that will help safeguard lives and livelihoods. Regional, national and community level communication systems must be pre-identified and appropriate authoritative voices established. The use of multiple communication channels is necessary to ensure as many people as possible are warned, to avoid failure of any one channel, and to reinforce the warning message.

### Planning in context of Disaster Preparedness:

Planning in the context of disaster preparedness is holistic. It needs to keep in view the developmental concerns, disaster policy, the disaster scenario, organisational structure, administrative arrangements and resources. A Disaster Preparedness Plan is to be formulated and executed at all levels from national to grass-root to the community level. In geographical terms, the nation, state, province, district and a village- all could have a Disaster Preparedness Plan. Individual organizations too, have such plans. An effective basis of planning and the maintenance of relevant plans gives a clear and coherent approach in dealing with disasters. Within cities, planning is generally practiced at the level of local government, either by s department of that government or by an authority separately established to execute delegated powers.

The advocacy approach is often propagated by presenting a well-publicised plan, but not one that necessarily has been formally approved. By stages, it becomes accepted as

the appropriate way ahead. The planner using an advocacy approach is all too aware that householders have their considerations as well as disaster mitigation. For example, being near to place of work, school or marketplace is of considerably greater interest to the average householder. On the other hand, when it is supported by existing planning laws and by administration of developmental control, physical planning is credible and likely to be implemented. The planning process will then have the status to lead and guide development in particular locations within the zones of concern.

The purpose of planning is to anticipate future situations and requirements, thus ensuring the application of effective and coordinated counter-measures. This is a useful definition for disaster management officials because it indicates the wide nature of requirements for counter-disaster planning. In other words, planning is not confined not merely to preparedness to respond to specific disaster events. It should cater, as far as possible, to the various phases of the disaster management cycle. Therefore, requirements for planning involve a considerable flexibility of approach.

Planning to be effective needs to take into account certain important aspects as given below:

a. Involvement of professional planners.
b. Clear-cut objectives.
c. Memorandum to explain the rationale of planning.
d. Wide consultation to make planning fruitful
e. Monitoring
f. Utility of planning

**A Disaster Preparedness Plan made at any level:**

a. Provides for hazard identification and risk analysis
b. Indicates basic information about resources, demography, existing organisational structure, administrative facilities at that level, be it state, district and local levels
c. Lists preparedness and mitigation measures and response mechanisms
d. Defines specific roles and responsibilities for various actors at various levels: and
e. Ensures networking/coordination with the media, NGOs, international agencies and other stakeholders.

A Disaster Preparedness Plan facilitates the following:

a. Clarifying authority, responsibility and relationships
b. Obtaining resources
c. Establishing the control system
d. Directing an controlling, and
e. Monitoring, evaluation and updation.

## Key Players in Disaster Warning

The United Nations International Strategy for Disaster Reduction (UN/ISDR) identifies several key parties that play major roles in the disaster management process, especially in disaster warning (UN/ISDR, 2006).

Communities, particularly those most vulnerable, are vital to people-centred early warning systems. Their input into system design and their ability to respond ultimately determine the extent of risk associated with natural hazards. Communities should be aware of hazards and potential negative impacts to which they are exposed and be able to take specific actions to minimize the threat of loss or damage. As such, the geographic location of a community is an essential determinant in the selection of disasters on which the system should focus their community education.For example, coastal communities need to be educated and prepared for the possibility of a tsunami, while a mountain community can be educated to respond to an early warning system for landslides.

Local governments should have considerable knowledge of the hazards to which their communities are exposed. They must be actively involved in the design and maintenance of early warning systems, and understand information received to be able to advise, instruct or engage the local population in a manner that increases their safety and reduces the potential loss of resources on which the community depends.

National governments are responsible for policies and frameworks that facilitate early warning, in addition to the technical systems necessary for the preparation and issuance of timely and effective hazard warnings for their respective countries. They should ensure that warnings and related responses are directed towards the most vulnerable populations through the design of holistic disaster response and early warning frameworks that address the specific needs of the related micro- and macro-level actors. The provision of support to local communities and local governments to develop operational capabilities is an essential function to translate early warning knowledge into risk reduction practices.

Regional institutions and organizations should provide specialized knowledge and advice in support of national efforts to develop or sustain the operational capabilities of countries that share a common geographical environment. Regional organizations are crucial to linking international capabilities to the particular needs of individual countries and in facilitating effective early warning practices among adjacent countries.

International bodies should provide support for national early warning activities and foster the exchange of data and knowledge between individual countries. Support may include the provision of advisory information, technical assistance, and policy and organizational support necessary to ensure the development and operational capabilities of national authorities or agencies responsible for early warning practice.

Non-governmental organizations (NGOs) play a critical role in raising awareness among individuals and organizations involved in early warning and in the implementation of early warning systems, particularly at the community level. In addition, they play an important advocacy role to help ensure that early warning stays on the agenda of government policy makers.

The private sector has a diverse role to play in early warning, including developing early warning capabilities in their own organizations. The private sector is also essential as they are usually better equipped to implement ICT-based solutions. The private sector has a large untapped potential to help provide skilled services in the form of technical manpower, know-how, or donations of goods or services (in-kind and cash), especially for the communication, dissemination and response elements of early warning.

The media plays an important role in improving the disaster consciousness of the general population and in disseminating early warnings. The media can be the critical link between the agency providing the warning and the general public.

The scientific community has a critical role in providing specialized scientific and technical input to assist governments and communities in developing early warning systems. Their expertise is critical to analysing the risks communities face from natural hazards, supporting the design of scientific and systematic monitoring and warning services, fostering data exchange, translating scientific or technical information into comprehensible messages, and disseminating understandable warnings to those at risk.

**Channels Used for Disaster Warning**

The following are some of the media - both traditional and new - that can be effectively used for disaster warning purposes. Some may be more effective than the rest, depending on the nature of the disaster, the regions affected, the socio-economic status of the affected communities and their political architecture. However, it is not a question of one medium against another. All are means to a common goal of passing along disaster warnings as quickly and as accurately as possible. A

**Radio and Television**

Considered the most traditional electronic media used for disaster warning, radio and television have a valid use. The effectiveness of these two media is high because even in developing countries and rural environments where the tele-density is relatively low, they can be used to spread a warning quickly to a broad population.The only possible drawback of these two media is that their effectiveness is significantly reduced at night, when they are normally switched off. A study on media, perception and disaster-related behaviour in Bangladesh revealed that early, easily understandable and language-appropriate warning

dissemination through radio can reduce the potential death toll of catastrophic cyclone and tidal bore. The study, conducted by the Forum for Development, Journalism and Communication Studies, recommended that relevant authorities develop innovative warning signal systems and take necessary steps to disseminate the warning in easily understood language through radio at least two days before a cyclone hits, hence mitigating the loss of lives and property every year in Bangladesh. Mohammad Sahid Ullah, the Chittagong University professor who led the study, suggests that part of the process is increasing public confidence in broadcast media since self-evacuation and the poor quality of shelters are the major causes of death (Sahid Ullah, 2003). After the Indian Ocean tsunami of 2004,many radio manufacturers considered introducing new digital radio alert systems that react even if the set is switched off. In order to trigger this alarm, a special flag integrated into the received signal from a terrestrial transmitter or a satellite would be used and the set would automatically tune to the emergency broadcast channel. The only disadvantage of this system is that to introduce a new generation of receivers in analogue environment generally takes 5 to 10 years. With digital receivers, this would be somewhat easier (Dunnette, 2006).

**Telephone (Fixed and Mobile)**

Telephones can play an important role in warning communities about the impending danger of a disaster.There were many examples of how simple phone warnings saved many lives in South Asian countries during the 2004 tsunami. Perhaps the most famous was an incident that occurred in one small coastal village of Nallavadu in Pondicherry, India. A timely telephone call - warning about the impending tsunami - was said to have saved the village's entire population of 3,600 inhabitants, as well as those of three neighbouring villages. Villagers of Nallavadu were involved in the M.S. Swaminathan Research Foundation's Information Village Research Project. Vijayakumar, a former project volunteer, was working in Singapore and heard a tsunami alert issued there. He immediately phoned the research centre in Nallavadu, which issued an alert. His quick thinking, followed by swift and coordinated action, led to the evacuation of the four villages before the tsunami hit the coast (Subramanian, 2005). In some countries, mechanisms called 'telephone trees' are used to warn communities of impending dangers. An individual represents a 'node' in a telephone tree.When that individual receives a warning message (either through phone or by other means), s/he is supposed to make a pre-determined number of phone calls (usually four or five) to others in a pre-prepared list. This arrangement not only ensures the timely delivery of the warning message, but also ensures the minimum duplication of efforts. However, there are two drawbacks to using telephones for disaster warning. Telephone

penetration in many areas is still not satisfactory - particularly in rural and coastal areas most at risk. Even with the exponential increase in the number of phones that has occurred in recent years, there are still many regions in the Asia-Pacific region, where a telephone is considered a luxury. The other drawback is the congestion of phone lines that usually occurs immediately before and during a disaster, resulting in many phone calls in that vital period that cannot be completed.

**Short Message Service**

Short message service (SMS) is a service available on most digital mobile phones that permits the sending of short messages (also known as 'text messages', 'SMSes', 'texts' or 'txts') between mobile phones, other handheld devices and even landline telephones. During the 2005 Hurricane Katrina disaster in the US, many residents of affected coastal areas were unable to make contact with relatives and friends using traditional landline phones. However, they could communicate with each other via SMS more easily when the network was functional. This is because SMS works on a different band and can be sent or received even when phone lines are congested. SMS also has another advantage over voice calls in that one message can be sent to a group simultaneously.

**Cell Broadcasting**

Most of today's wireless systems support a feature called cell broadcasting. A public warning message in text can be sent to the screens of all mobile devices with such capability in any group of cells of any size, ranging from one single cell (about 8 kilometres across) to the whole country if necessary. CDMA, D-AMPS, GSM and UMTS [4] phones have this capability. There are four important points to recall about the use of cell broadcasting for emergency purposes:

- There is no additional cost to implement cell broadcasting. It is already resident in most network infrastructure and in the phones, so there is no need to build any towers, lay any cable, write any software or replace handsets.
- It is not affected by traffic load; therefore it will be of use during a disaster, when load spikes tend to crash networks, as the London bombings in 2005 showed. Also, cell broadcasting does not cause any significant load of its own, so it would not add to congestion.
- Cell broadcasting is geo-scalable, so a message can reach hundreds of millions of people across continents within a minute.
- It is geo-specific, so that government disaster managers can avoid panic and road jamming by telling each neighbourhood specifically if they should evacuate or stay put.

The only possible disadvantage to cell broadcasting is that not every user may be able to read a text message when they receive it. In many Asia-Pacific countries, a sizeable population of the phone users cannot read and understand a message sent in English. Thus, it is essential to send warning messages in local languages. However, these messages would still be inaccessible to those who cannot read, even in their own language. The Dutch Government plans to start using cell broadcasting for emergency warnings. The infrastructure is already in operation with the operators KPN, Telfort and Vodafone. It is believed to be the first multi-operator warning system in the world, based on cell broadcasting with government use (Clothier, 2005).

**Satellite Radio**

A satellite radio or subscription radio is a digital radio that receives signals broadcast by communications satellite, which covers a much wider geographical range than terrestrial radio signals. Satellite radio functions anywhere there is line of sight between the antenna and the satellite, given there are no major obstructions such as tunnels or buildings. Satellite radio audiences can follow a single channel regardless of location within a given range. Satellite radio can play a key role during both disaster warning and disaster recovery phases. Its key advantage is the ability to work even outside of areas not covered by normal radio channels. Satellite radios can also be of help when the transmission towers of the normal radio station are damaged in a disaster.

**Internet/Email**

The role Internet, email and instant messages can play in disaster warning entirely depends on their penetration within a community and usage by professionals such as first responders, coordinating bodies, etc.While these media can play a prominent role in a developed country, where nearly half of all homes and almost all offices have Internet connections, this is not the case in the developing world. In many developing countries, less than 5 percent of the population uses the Internet and even those who are users do not use it on a regular basis. In such a situation, it is difficult to expect Internet and email to play any critical role. In spite of that drawback, many disaster-related activities are already underway within the Internet community. For example, a new proposal for using the Internet to quickly warn large numbers of people of impending emergencies is currently being drafted by the Internet Engineering Task Force.

At a 1997 international conference on 'Harnessing the Internet for Disasters and Epidemics', participants raised issues affecting their ability to use the Internet for improving crisis management. Concerns included the high cost of technology, a lack of content in local languages, and governmental controls on information exchange."The most significant obstacle

impeding widespread Internet usage was the widening gap between those with unlimited access and those, whose access to information and new technologies was restricted by economic, linguistic, cultural or administrative constraints", highlights the Pan American Health Organization's report on the conference. Without direct communication between decision makers and without a free flow of reliable information among all involved, effective contingency planning and emergency response are at risk (Putnam, 2002).

**Amateur and Community Radio**

For almost a century, amateur radio (also known as 'ham radio') operators have assisted their communities and countries during disasters by providing reliable communications to disaster relief organizations at a moment's notice - especially when traditional communications infrastructure breaks down. In such a situation, amateur radio operators transmit emergency messages on voice mode about the well-being of survivors and information on casualties to friends and relatives. As was evident during the Indian Ocean tsunami that destroyed electricity and communications infrastructure in the Andaman and Nicobar Islands, amateur radio operators were the critical link between the islands and the Indian mainland and helped in the coordination of rescue and relief operations.

Besides disseminating voice-based messages, some amateur radio operators can also transmit in digital modes that include technologies such as radio teletype, tele-printing over radio, packet radio transmission and the recent Phase Shift Keying, 31 Baud - a type of modulation. Amateur radio broadcasters are authorized to communicate on high frequency (HF), very high frequency (VHF), ultra high frequency (UHF) or all three bands of the radio spectrum. They require a license from the licensing authority to ensure that only competent operators use their skills. However, depending on the country, obtaining a license can be a long process.

The most effective mode to exchange messages in an email-style is pact or using Airmail as email client and Winlink2000 as network on shortwave. A very valuable advantage is that the user can address any valid email address worldwide through hf-radio and winlink. Destroyed internet infrastructure can be bridged by this technology until a gateway (more than 150 worldwide RMS) with working internet access can be reached. Messages can be disseminated using one or more of the available bands. HF waves travel long distances, while VHF and UHF waves travel very short distances as these are line-of-sight propagation. However, repeaters increase the communications range and temporary repeaters can be set up in an emergency so that messages can reach the nearest town or city (Acharya, 2005).

There are no well-known case studies where community radio has been successfully

used for disaster warning purposes. The main reason can be because this is not a widespread media channel in many countries. Even where there are community radio systems, they operate within limited areas. Nevertheless, community radio is a medium that can be very effectively used for disaster warning purposes. The effectiveness of this medium is being tested through a disaster warning system implemented by Sarvodaya, the most widespread NGO in Sri Lanka (Daily News, 2006).

**Sirens**

Though not necessarily an ICT-based solution, sirens can be used in tandem with other ICT media for final, localized delivery.

GIS and Remote Sensing in Disaster Management [5]

GIS can be loosely defined as a system of hardware and software used for storage, retrieval, mapping and analysis of geographic data. Spatial features are stored in a coordinate system (latitude, longitude, state, plane, etc.) that references a particular place on the earth.Descriptive attributes in tabular form are associated with spatial features. Spatial data and associated attributes in the same coordinate system can then be layered together for mapping and analysis. GIS can be used for scientific investigations, resource management and development planning.

Remote sensing is the measurement or acquisition of information about an object or phenomenon by a recording device that is not in physical or intimate contact with the object. In practice, remote sensing is the remote utilization (as from aircraft, spacecraft, satellite or ship) of any device for gathering information about the environment. Thus, an aircraft taking photographs, earth observation and weather satellites, monitoring of a foetus in the womb via ultrasound, and space probes are all examples of remote sensing. In modern usage, the term generally refers to techniques involving the use of instruments aboard aircraft and spacecraft. As disaster management work usually involves a large number of different agencies working in different areas, the need for detailed geographical information in order to make critical decisions is high. By utilizing a GIS, agencies involved in the response can share information through databases on computer-generated maps in one location. Without this capability, disaster management workers have to access a number of department managers, their unique maps and their unique data. Most disasters do not allow time to gather these resources. GIS thus provides a mechanism to centralize and visually display critical information during an emergency. There is an obvious advantage to using a map with remote sensing or GIS inputs instead of a static geographical map. A static map is mostly analogous and is not interactive. On the other hand, a vulnerability map with GIS input provides dynamic information with cause and effect relationship.

## 4.3 Disaster Risk Management (DRM) plan

Hazard Risk and Vulnerability Assessment (HRVA) is one of the important and integral parts for disaster risk reduction. Currently several methodologies are being used worldwide for multi hazard risk assessment, vulnerability & capacity assessment and risk analysis for development of effective strategies for disaster risk reduction. However, when we consider them for application in Indian context it is marred by several issues and challenges, which have been discussed below:

Limited agencies working in the field of HRVA, who can guide and advice development practitioners in selection, development and implementation of such methodologies suitable to the local context.

- Limited technical expertise in the form of resource agencies and individuals, who can help decision makers and government agencies in implementation.
- Lack of availability of time series and spatial database on various socio-economic, environmental and infrastructural paramet ers along with demographic details on public domain/ public access that dissuades action research in this field.
- Hazard mapping and development of probability matrix of various hazard events necessitates use of advanced software like GIS, remote sensing and high resolution satellite imageries, which often has high cost implications and require high level of technical expertise for its application.
- Lack of historical legacy in the form of learnings that can be drawn from application of these methodologies in context of various hazards in India.
- Limited number of research agencies working in the field of development and application of new methodologies.
- Limited work on practical application of methodologies used worldwide in various hazard situations to assess its suitability and adaptation to Indian context.

In light of the above issues it becomes a challenge for policy/ decision makers, government & relief agencies, NGOs and other development practitioners to select a suitable methodology for assessment of hazard risks, vulnerability & capacity assessment and risk analysis to develop appropriate action plan for disaster preparedness and mitigation in a given local situation and need. Thus there is a need to take stock of the existing methodologies and review them in this context. The objective of this 'Baseline Document' is to develop a common understanding and knowhow about the various methods and tools available to conduct HRVA at various levels (national, state, district and community).

**What do we mean by Hazard Risk and Vulnerability Assessment (HRVA)**

The objective of undertaking a HRVA is primarily to anticipate the potential problems and possible solutions to help to save lives, protect property, assets, reduce damage and facilitate a speedy recovery. It is worthwhile to mention that HRVA is a means towards becoming disaster resilient and is not an end in itself. HRVA is a critical part o f the disaster risk reduction program and it has the potential to help the necessary authorities to prepare for emergencies. Use of HRVA helps the policy makers, administrators and the community to make risk based choices to address vulnerabilities, mitigate hazards, and prepare for response to and recovery from hazard events. Apart from the central government, the state governments, district authorities and even the local level governance institutions (like municipalities and village panchayats) can undertake hazard risk and vulnerability analysis based on their respective locations vis-à-vis hazards.

**The State Plan**

The Role of the State Disaster Management Authority (SDMA)/ State Executive Committee (SEC) and the State Departments:

Section 23 of the DM Act 2005 provides that there shall be a DM plan for every state. It outlines the broad coverage of the plan as well as the requirements of consultation in the preparation of the state plans. It also provides for annual review and updating of the state plan, and enjoins upon the state governments to make provisions for financing the activities to be carried out under the state plans. It provides for the departments of the state governments to draw up their own plans in accordance with the state plan. The state plans shall be prepared by the SEC in conformity with the guidelines to be issued on related matters by the SDMA having regard to the guidelines laid down in this regard by the NDMA, and after such consultation with local and district authorities and the people's representatives as the SEC may deem fit. The state plan prepared by SEC shall be approved by the SDMA.

**Levels of Disasters**

- The approach to the preparation of the state DM plan should be holistic and address all the hazards the state is vulnerable to. It should take into account past lessons and experiences, build on good existing systems at different levels. It should address the need to streamline the systems and develop operational and management procedures.
- The state plan may also adopt the generic categorisation of disasters with specific plans at the state level by various departments to handle different disasters.

- The levels of disasters have already been categorised and disseminated as L0, L1, L2 and L3, based on the ability of various authorities to deal with them. Various colour codes relating to the level of alerts have also been assimilated.
- L0 denotes normal times which are expected to be utilised for close monitoring, documentation, prevention, mitigation and preparatory activities. This is the planning stage where plans at all levels from community to the State shall be put in place. Training on search and rescue, rehearsals, evaluation and inventory updation for response activities will be carried out during this time.
- L1 specifies disasters that can be managed at the district level, however, the state and centre will remain in readiness to provide assistance if needed.
- L2 specifies disaster situations that may require assistance and active participation of the state, and the mobilisation of resources at the state level.
- L3 disaster situations arise from largescale disasters where districts and the state may not have the capacity to respond adequately and require assistance from the central government for reinstating the state and district machinery.
- Even though there cannot be watertight compartmentalisation of responsibilities between states and the centre, especially in the case of man-made disasters, the participation by the Centre will normally be at the L3 level.

**Objectives**

The aim of the state DM plan is to ensure that the following components of DM are addressed to facilitate planning, preparedness, operational, coordination and community participation. Flowing from the national vision and the aforementioned approach, the objectives guiding the policy formulation are:

- Promoting a culture of prevention and preparedness by ensuring that DM receives the highest priority at all levels.
- Ensuring that community is the most important stakeholder in the DM process.
- Encouraging mitigation measures based on state-of-the-art technology and environmental sustainability.
- Mainstreaming DM concerns into the developmental planning process.
- Putting in place a streamlined and institutional techno-legal framework for the creation of an enabling regulatory environment and a compliance regime.
- Developing contemporary forecasting and early warning systems backed by responsive and fail-safe communications and Information Technology (IT) support.
- Promoting a productive partnership with the media to create awareness and contributing towards capacity development.

- ❖ Ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.
- ❖ Undertaking reconstruction as an opportunity to build disaster resilient structures and habitat.
- ❖ Undertaking recovery to bring back the community to a better and safer level than the pre-disaster stage.

**Need for Immediate Action**

Ideally, state DM plans should be made after vulnerability assessment and risk analysis of a state have been undertaken. Guidelines issued by the NDMA will also need to be internalised in these plans. Even though this process has begun, it is likely to take some time. It is felt that the preparation of plans cannot, and should not, await the outcome the disaster risk analysis. On the basis of extant information and knowledge, a plan should be formulated by every state and updated regularly adding fresh inputs on an ongoing basis. Pending detailed micro-level vulnerability assessment and risk analysis, information as currently available about the vulnerability profile of different areas of a state, including information contained in the Vulnerability Atlas of India published by the Ministry of Urban Development may be incorporated in the plan.

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- ❖ Promoting a culture of prevention and preparedness by ensuring that DM receives the highest priority at all levels.
- ❖ Ensuring that community is the most important stakeholder in the DM process.
- ❖ Encouraging mitigation measures based on state-of-the-art technology and environmental sustainability.
- ❖ Mainstreaming DM concerns into the developmental planning process.
- ❖ Putting in place a streamlined and institutional techno-legal framework for the creation of an enabling regulatory environment and a compliance regime.
- ❖ Developing contemporary forecasting and early warning systems backed by responsive and fail-safe communications and Information Technology (IT) support.
- ❖ Promoting a productive partnership with the media to create awareness and contributing towards capacity development.
- ❖ Ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.

- ❖ Undertaking reconstruction as an opportunity to build disaster resilient structures and habitat.
- ❖ Undertaking recovery to bring back the community to a better and safer level than the pre-disaster stage

**1. Implementing Disaster Risk Management Plan:**

**Roles and responsibilities of various agencies:**

a. Central Government, State Government, District Administration, Local Administration, TRIs and Municipal Bodies.
b. Role of armed forces, role of police, role of para-military forces, role of fire services.
c. Role of NSS, NCC, Scouts and Guides.
d. Role of International Agencies, role of NGOs, role of CBOs
e. Role of community, role of family and individuals
f. Role of media.

The key responsibilities of DM and emergency response system departments/agencies of the state government could be envisaged as:

❖ **Planning:** Development of strategies and requirement analysis for resource utilisation. The establishment of structures, development of systems and testing and evaluation by organisations of their capacity to perform as per allotted roles.

❖ **Coordinated Execution of Plans:** Increased coordination, convergence and synergy among the departments and institutions should be promoted in order to promote sharing of resources, perspectives, information and expertise through support of training centres, academic and applied research, education and awareness generation programme, etc.

❖ **Mainstreaming DM Concerns into Development Programmes:** This deals with integration of measures for prevention of disasters and mitigation into developmental plans and projects including mitigation projects and to facilitate provision of adequate funds for DM. Plans may be shown in three broad categories, viz. short, medium and long term. The structural and non-structural measures to be taken may be brought out in each category.

**Guiding Principles for the Preparation of State Plans:**

**Participatory Approach**

The plan preparation process essentially aims at strengthening the communities, elected local bodies and state administration's response and preparedness. The plans should be prepared through a participatory approach including identification of vulnerabilities and

risks, and also be holistic, inclusive, sustainable and environment friendly. The plans should be sensitive to the special needs of vulnerable sections such as pregnant and lactating mothers, children, the elderly and physically and mentally challenged persons. The concerns of women may be specifically addressed.

**Community Based DM**

During any disaster, communities are always the first responders. Community participation ensures local ownership, addresses local needs, and promotes volunteerism and mutual help to prevent and minimise damage. Therefore, states should make all efforts to assist communities in understanding their vulnerabilities and the lead role that they can play in managing risks with less dependence on external entities, through robust campaigns. Also arrangements for community based disaster preparedness should form the basis for preparation of plans.

Guiding Principles-Themes Underpinning the Plans

- The vulnerability of different parts of the state to different kinds of disasters.
- The measures to be adopted for prevention and mitigation of disasters.
- The manner in which mitigation measures shall be integrated with development plans and projects.
- The capacity building and preparedness measures to be taken.
- The roles and responsibilities of each department of the government of the state in relation to the measures specified above.
- The roles and responsibilities of different Departments of the government of the state in responding to any threatening disaster situation or disaster.
- The state plan will be reviewed and updated annually. Appropriate provisions will be made by the state governments for financing the measures to be carried out under the state plan.
- Copies of the state plan will be made available to the departments of the government of the state and such department will draw up their own plans in accordance with the state plan.

NDMA has accordingly framed these guiding principles for the preparation of state DM plans.

An outline to be followed by the states for preparing the plan has also been indicated.

**The Framework**

The framework of the plan should highlight the paradigm shift in DM from a relief-centric approach to a regime that anticipates the importance of preparedness, prevention

and mitigation, and comprises three parts:

- General issues including broad vulnerability profile of the state. It will also comprise other thematic issues such as community based DM, medical preparedness, awareness generation, training needs analysis and development of a state Human Resources (HR) plan, knowledge management, early warning and forecasting system standards for relief, rehabilitation etc.
- Disaster specific issues and methodologies.
- Cross-cutting issues common to all situations in any disaster. It will specifically deal with implementation, monitoring and review arrangements.

**Basic Features**

It will be in conformity with disaster specific guidelines, which are being issued from time to time by the NDMA wherein the last chapter of each guideline will detail outlines of the plans to be made. The plan will also address cross-cutting activities in DM, the vertical and horizontal linkages requiring coordination between the union, state and local governments on the one hand and a host of government departments and agencies on the other.

**Coordinating and Monitoring Mechanism**

This should include a reference to the following, as part of the coordination and monitoring mechanism:

- The role of elders, senior citizens and locally respected leaders.
- The role of the NGOs, Self Help Groups and other Community Based Organisations(CBOs).
- The role of women as active participants in DM including risk reduction, mitigation, preparedness and awareness generation.
- The role of urban and rural local bodies particularly gram sabhas.

**Sections of the Framework**

The framework will comprise sections that deal with:

- Operational.
- Administrative.
- Financial.
- Legal Aspects.
- Process.

**The plan should:**

i) Take into account the socio-cultural realities of the state, and should be equity based recognising the differential needs of all sections of the society, including marginalised groups such as the elderly, pregnant and lactating mothers, children, physically and mentally challenged persons etc. It should specifically address the concerns of women.

ii) Be in harmony with national, district, block, village and community level plans and should incorporate implementation strategies as well as indicate specific monitoring and evaluation mechanisms. The latter should also be able to capture the qualitative outcomes.

iii) Develop a base line and identify the total risk and also agree on the minimum acceptable level of risk. It must capture all aspects of the DM cycle from preparedness to recovery. However, the initial plan formulation need not await completion of the risk assessment exercise.

iv) Include a reference to the components of the state Human Resource Development (HRD) plan for DM, which specific emphasis on features specifically such as:
   - ❖ Training needs analysis.
   - ❖ Involvement, besides the Administrative Training Institutes (ATIs), of other sectoral training and educational institutions in the exercise.

v) Contemplated professional training for micro planning, which should adopt the multi-hazard approach and develop inbuilt simulation techniques for the application of the plan.

vi) Describe the role of the Emergency Operations Centre (EOC): time bound action plans must be indicating for creating facilities for environment scanning, intelligence gathering, operations and logistics management under one roof for holistic and efficient management of disasters at the state and district level.

   Arrangements must be made and procedures must be laid down for manning the EOC on 24 X 7 X 365 basis. The plan must also cover in detail the indigenised Incident Command System at the state, district and local body levels.

vii) Incorporate Medical Preparedness and Mass Casualty Management: The following points must be reflected in the state plan:
   - ❖ Listing of all hospitals and primary health centres including private nursing homes and their capacities.
   - ❖ Emergency casualty management plans at the local, district and state level.
   - ❖ For effective management of big cities like Delhi and Mumbai, nearby medical facilities must also be built into plans.

- ❖ Availability of mobile hospitals and/or plans for acquiring the same.

viii) Outline various life-line structures/ infrastructure (e.g., bridges, roads, school buildings, hospitals, communication network etc.) and also highlight the arrangements for the maintenance and management of these structures during disasters.

ix) Take note of the fact that seven battalions of the National Disaster Response Force (NDRF), coexisting with the proposed National Disaster Mitigation Resource Centres (NDMRCs) have already been positioned at nine different locations to cover the entire country. These NDMRCs have been evolved to help the states in capacity development, running of mock drills and facilitating the process of central assistance to the states. State governments should take all steps to upgrade and strengthen the Civil Defence and Home Guards, in sync with the efforts being made by the GoI in this regard.

x) In major cities (with a population exceeding 10 lakhs), municipal corporations have a large administrative system including departments like engineering, public health and revenue, and sometimes fire services. These should provide a good mechanism for coordinated response in case of any crisis/disaster. Therefore, management of major cities should be planned as a unit. In metropolitan cities it is also advisable to make the urban metropolitan government directly responsible for DM.

xi) Include the essentials of a scientific approach in damage assessment exercise so that timely and adequate relief can be provided.

xii) Identify emergency management problems with spatial aspects appropriate for Geographic Information System (GIS). GIS can be part of the solution to many emergency management problems. Evaluation the costs of institutionalising GIS as an emergency management tool in terms of staffing, training, data collection, hardware and software.

xiii) Lay due emphasis on the conduct of mock exercises and drills for different disasters. These exercises are essential for role clarity of the stakeholders concerned at the district level and for synergising coordination of various emergency support functions. In case of water and climate related hazards, exercises in different vulnerable areas of the state may be planned before the onset of the rainy season. For other kinds of disasters, exercises may be planned at regular intervals as considered appropriate.

xiv) Describe the mechanism of convergence of existing national, state, district and local resources.

xv) Address logistic issues in preparedness, response, rehabilitation and recovery related matters.

xvi) Incorporate modalities for inter-state coordination as worked out in consultation with the neighbouring states.

xvii) Include details of inter-country coordination as worked out for states sharing common international boundaries in consultation with the central government and the NDMA.

xviii) Include requirements of infrastructure, communication, training and HRD in a phased manner.

**Administrative**

i) As the formulation of the XIth Five Year plan is underway, the plan must be in accordance with the development plans of the state five-year plans. The plan should also be in conformity with the state DM policy.

ii) The systems and institutions for implementation of the plans must be clearly identified and spelt out. The plan should explicitly take note of the available NDRF, Civil Defence, Home Guards, youth and students organisations etc., The National Cadet Corps (NCC), National Service Scheme (NSS) and Nehru Yuva Kendra (NYK) networks. Specific plans for capacity building and training should also be included in a separate chapter.

iii) Public-Private Partnerships will be factored into the DM approach and the modalities through which these will work also need to be incorporated.

iv) Knowledge Management-the following aspects will be covered in this section:

- ❖ Establishment and operation of Community Service Centres (CSCs). The CSCs are an essential component of realising the goal of becoming a knowledge-driven society. These centres form the core for the use of ICT for rural development and are designed to build around several other initiatives and programmes, such as self help groups, skill building, microcredit, micro-enterprises, markets, literacy and education, agriculture, health, governance and entitlements etc.
- ❖ Measures for documenting the indigenous local practices for DM.
- ❖ Regular updation of the resource Inventory

As disasters do not recognise man-made boundaries, inter-state, inter-district coordination issues will have to be prominently factored into the plan.

vi) DM involves a multi-disciplinary approach of many initiatives converging at the district and local level. It is here that there is greater need for inter-disciplinary coordination and monitoring. The facilities of the DM cells in all administrative training institutes should be fully utilised and strengthened to contribute to the development of DM related skills.

vii) Interface with Panchayati Raj Institutes/ CBOs, NGOs and the community at large and utilising their assistance should be clearly brought out.

viii) A mechanism must be put in place to ensure that the plan is updated on a regular basis (at least once in a year) and is ableto accommodate changes over time.

**Financial**

The plan should:

i) Be supported with necessary budget provisions for short, medium and long term activities. The DM Act, 2005 mandates the constitution of a State Disaster Response Fund at the state level and District Disaster Response Funds at the district level. The modalities for the creation of these funds as well as guidelines for their utilisation may be included in an annexure to the plan document. If it is not possible to put in place such a fund, in the near future, a reference to the establishment of these funds should be made in the plan.

ii) Incorporate details regarding building in DM concerns into developmental plans. Details of mitigation and capacity development measures must be spelt out.

iii) Be a component sub-plan of the state's annual and five-year plans, indicating upfront the allocation of each of the departments involved along the lines of the tribal area sub-plan.

iv) Reflect the provision of adequate funds for the requirements of relief material when disaster strikes, estimated on the basis of past experience. Care should also be taken to make full provision for the requirements of forces deployed on these occasions. Availability of funds for district and local authorities from the plans should be ensured.

v) Furnish, while referring to external aid details of the nodal arrangements for coordination.

**Legal**

This section will cover aspects such as:

i) The responsibility of the SEC:
   - ❖ To coordinate and monitor the implementation of the national policy, the national plan and the state plan.
   - ❖ To provide information to the NDMA relating to various parameters of DM.
   - ❖ To earmark funds for prevention and integration of disasters in their development plans and projects.

ii) Put in place techno-legal regimes; e.g., amending building bye-laws, bringing in flood plain zoning legislation etc.

**The Process**

This section will:

i) Designate the nodal department for coordinating formulation of the state plan.
ii) Identify the focal point in each relevant department; consisting of a core group of officers and provide for adequate training to professionalise their approach.
iii) Involve administrative/ technical institutions for providing technical support.
iv) Describe nodal department(s) for involvement of NGOs, CBOs, corporate sector, youth organisations, educational institutions, Panchayati Raj Institutions (PRIs), urban local bodies, media and other stakeholders-and the modalities of such partnerships.
v) Outline the logistics management in all aspects of DM from preparedness to recovery.
vi) Describe the consultative process with local authorities, district authorities and people's representatives.

**2. Risk transfer and insurance:**

Governments and business can reduce the financial impact of hazards by insuring key assets and infrastructure, establishing loans that can be executed in the after shock of an adverse event of a given magnitude and setting aside catastrophe funds.

### 4.3.1 Linkage between Risk Transfer and other Components of Disaster Risk Management

Disaster risk transfer ensures that funds are readily available to rectify the damage or replace the facility, should a loss occur. It does not reduce actual vulnerability. As a result, risk transfer mechanisms should always be implemented in support of, rather than as a replacement for, broad disaster risk reduction initiatives, such as improved building practices and land use planning, among others.Risk transfer and financing as the other areas of risk management build on activities of risk identification such as hazard characterization, vulnerability assessments, and risk scenarios which provide critical information to establish the feasibility and cost benefit analysis for the risk transfer instruments.

The main components of risk transfer and financing are:

❖ **Insurance—**Market insurance and re-insurance.

❖ **Risk financing—**Budget self-insurance, public asset coverage financing, catastrophe bonds, disaster assistance funds.

## 4.4 Insurance

Contract by which an insurance company assumes the risk of occurrence of an uncertain adverse event, committing itself to pay for losses determined in the contract in exchange for a premium. The premium must be paid by the customer in anticipation.

Insurance is an integral part of a disaster risk management strategy and risk transfer. It distributes the losses (transfers the risks) among a pool of at-risk households, businesses and/or governments and to the reinsurance markets. As primary and reinsurance markets become more international and attract capital from investors throughout the world, insurance becomes an instrument for transferring disaster economic risks over the globe.

Insurance and other insurance-related instruments are a cost-effective way of transferring and spreading the economic risks of natural disasters in developing countries. However, in developing countries, insured losses are negligible.

**Facts:**

Insured losses in developing countries, however, are negligible. In low income countries only about 1% of disaster losses are insured (Hoff et al., 2003).

Asia (excluding Japan) and Africa only represent 6.3% of the world insurance market.

Of all natural catastrophes in 2002, only 4.8% were insured in Asia and 1.1% in Africa (Swiss Re 2003), and only 3.8% of all damages from natural disasters between 1985-1999 were insured in Latin America and the Caribbean (Aufrett, 2003).

Catastrophic risks are becoming more insurable as developments in computer technologies provide improved methods for estimating the risks. On the other hand, insurers are pulling out of many catastrophic risk markets because of the increasing frequency of occurrence of mega-loss events which have threatened the solvency of a number of insurers and raised alarms that insurers may be over exposed in many regions and states. This has led to an increase in premiums on catastrophe insurance with a corresponding reduction in demand.

Many factors contribute to the relatively high and volatile cost of insurance, such as high exposure to hazards, limited financial reserves, high administrative costs, great reliance on reinsurance and the prevalence of under-insurance (World Bank, 2002). To increase private sector coverage, both insurers and public institutions have called for public-private partnerships, which could help to start-up insurance schemes for the previously "uninsurable."

The intention of the public-private partnership is to allow governments to subsidize private sector premiums so as to ensure a larger proportion of the "uninsurable" building stock has insurance coverage.

### 4.4.1 The types of insurance that will be discussed in this lesson plan are as follows

**Budget Self-Insurance, Market Insurance and Reinsurance.**

**A) Market Insurance:**

Mechanism by which losses are stabilised through pre-payment in the form of regular premium payments.In market insurance the insurer assumes the risk. Insurance makes funds available to undertake repairs or rebuild after a disaster.

**Examples:**

- Business interruption insurance can help companies and their employees survive the recovery and rehabilitation period.
- Hurricane, earthquake, fire insurance of a property covers the cost of the losses stated in the clauses of the policy.

**B) Reinsurance**

Insurance by another insurer of all or a part of a risk previously assumed by an insurance company.

A significant insurance practice is that of reinsurance, whereby risk may be divided among several insurers, reducing the exposure to loss faced by each insurer. Reinsurance is done through contracts called treaties, which specify how the premiums and losses will be shared by participating insurers. The extent of disaster insurance in the developing countries is very low in comparison with developed countries. It is purchased by businesses, hotels, and other types of enterprises. Governments, whether from internal or external sources, have difficulties to insure assets and properties. On the other hand, unless there is a express policy regarding finance protection, there is a strong limitation to maintain available funds for post-disaster recovery and reconstruction. If insurance premiums are set to reflect the risk, this will create incentives for homeowners and businesses to take disaster risk reduction measures and to relocate out of high-risk areas. In spite of the arguments mentioned previously, there are some references that show different results due to the insurance market pressure and the imperfect incentive mechanisms.

**What is reinsurance?**

Reinsurance occurs when multiple insurance companies share risk by purchasing insurance policies from other insurers to limit the total loss the original insurer would experience in case of disaster. By spreading risk, an individual insurance company can take on clients whose coverage would be too great of a burden for the single insurance company to handle alone. When reinsurance occurs, the premium paid by the insured is typically shared by all of the insurance companies involved.

Reinsurance can help a company by providing:

1. **Risk Transfer —** Companies can share or transfer of specific risks with other companies
2. **Arbitrage —** Additional profits can be garnered by purchasing insurance elsewhere for less than the premium the company collects from policyholders.
3. **Capital Management —** Companies can avoid having to absorb large losses by passing risk; this frees up additional capital.
4. **Solvency Margins —** The purchase of surplus relief insurance allows companies to accept new clients and avoid the need to raise additional capital.
5. **Expertise —** The expertise of another insurer can help a company obtain a proper rating and premium.

## 4.5 Disaster Risk Financing

Risk financing mechanisms allow losses to be paid off in the medium to long-term via some form of credit facility. Such mechanisms provide cost-effective, multi-year coverage that assists with the stabilisation of premiums and increases the availability of funds for insurance purposes. The types of risk financing instruments that are discussed in this lesson are budget self insurance, public asset coverage financing, catastrophe bonds and disaster assistance funds.

**A) Budget Self-insurance**

Measures taken by individual property owners to allocate a modest yearly budget for improvement, maintenance, and selected retrofit investments for their property (buildings, land, infrastructure) which help to reduce future expected losses in the event of a disaster. The owner need not incur the cost of the purchase of regular insurance. Additionally, the owner can claim a higher tax deduction for property maintenance. As a result of these, the

cost of insurance is reduced. Examples: Building a river barrier; housing retrofitting; installing impact resistant windows; installing shutter systems; installing hurricane straps on the roofs of houses.

**B) Public Asset Coverage Financing**

Process by which governments seek to finance the reconstruction of damaged critical public assets which are important for restoring economic growth in the aftermath of a disaster. Governments carry a large and highly dependent portfolio of infrastructure assets. Some of these are critical for restoring economic growth. However, most public assets are not covered by insurance. Funds for rebuilding damaged assets must come from annual budgets or external sources and these are typically limited. However, public budgets are under tremendous pressure in the post-disaster period.

**Best Practices**

- ❖ Insurance coverage for critical public assets will ensure that key infrastructure can be rebuilt or rehabilitated if damaged by an adverse event.
- ❖ Selection of assets that merit insurance coverage is based on careful prioritisation of public facilities and on comprehensive vulnerability assessments for public facilities.

**C) Catastrophe Bonds**

Bonds that are purchased by investors which transfers risks to the global capital market. Recently, another risk-transfer instrument, commonly called a catastrophe or cat bond, has emerged, which can be used to replace traditional reinsurance. Cat bonds make use of different formulas to trigger compensation based on losses or on a physical phenomenon such as wind speed or precipitation. These bonds are purchased by investors and thus transfer the risk to the global capital markets. Catastrophe bonds emerged as instruments primarily for insurers. Insurers cannot diversify dependent risks by writing a large number of similar policies, and therefore locally operating insurance companies diversify through reinsurance. Reinsurance companies, in turn, manage their risk by an even wider and more global diversification, but in the early 1990s large losses from U.S. catastrophes strained the capacity of the reinsurance markets and raised the price of reinsurance. The cat-bonds constitute another alternative at this level.

**D) Disaster Assistance Funds**

Resources assigned to respond to adverse events of important magnitude and declared

disasters. These resources should be available and be kept as liquid assets that can be accessed immediately when required. While these investments are not used, they should be generating interests.

The disaster in Japan on 11 March 2011 has made clear how vulnerable society and the economy are in the face of geophysical events, which have been receiving less attention in recent years due to the all-pervading discussion on climate change. The Tohoku quake was also possibly the first natural disaster leading to long-term energy policy changes (nuclear phase-out in Germany and Switzerland, cancellation of the introduction of nuclear power in Italy) in numerous countries far away from the affected region.

The ramifications of the event pose new challenges for the scientific community and the insurance industry regarding issues such as the complex economic interactions involved and the quality of hazard maps, earthquake models, early warning systems and disaster response organisation. With economic losses amounting to some US$ 380bn, 2011 has been the most expensive natural disaster year to date, far surpassing the previous record (US$ 220bn) set in 2005. At US$ 105bn, insured losses also reached a new high. The loss figures were dominated by 2011's earthquakes - in addition to Japan, above all the devastating event in New Zealand. The year also saw disastrous floods in Australia, Thailand, France and Italy and the tornado outbreak in the USA. Weather-related risks in the USA and Canada are constantly altering as a result of anthropogenic climate change and natural climate cycles like La Niña.

The Tohoku earthquake is not only the most expensive natural disaster on record worldwide to date, it also shows that the enormous efforts undertaken in the areas of earthquake research, earthquake resistant construction methods and early warning systems, even in countries such as Japan, cannot prevent such major disasters. Although an earthquake of this magnitude had not been expected in the region, the overall risk in Japan is adequately reflected in the available models. The level of the ground motions and the resulting losses lie within the range of expectations. Model results are always associated with significant uncertainties. However, major uncertainties in loss and risk assessment are due to a lack of sufficiently high-resolution exposure information and this too has been demonstrated once again by the Japanese earthquake.

**Growing-gap**

The increasing severity and frequency of natural catastrophes are driving up the cost

of disaster relief and reconstruction. The gap between the actual economic loss and the insured loss is large, especially in developing and emerging markets - which are those most hurt and the least prepared - just think of the devastating earthquake in Haiti, a country which has had to rely almost entirely on humanitarian aid for its reconstruction.

Thanks to innovative solutions, the reinsurance industry can help close the gap between economic and insured losses. For example, the Caribbean Catastrophe Risk Insurance Facility paid out $8m to the government of Haiti in the aftermath of the disaster. Measured against the loss of life and devastation on the island, the CCRIF's payout was not a major sum of money. But that's not the point, the point is that the Haitian catastrophe has highlighted the potential of parametric insurance as an innovative solution to help countries plan for and pre-finance natural disasters as part of a comprehensive disaster risk management strategy. The payout provided much needed liquidity to get the wheels of government turning again.

**Available relief:**

Each year features new headlines about devastating natural catastrophes in different parts of the world. The resilience of a country not only depends on the severity of the catastrophic event but also on available funding for relief, recovery and reconstruction. Currently, a large part of the economic costs are not insured. New approaches to financing disaster risks are, therefore, key to making societies more resilient, as no organisation or country can fully insulate itself against extreme events.

Governments too should play their part by building up financial reserves or using insurance solutions, they can reduce their financial burden after a disaster occurs. These measures also lower the volatility on the government budget and help improve planning certainty for the public sector. But disaster financing instruments should never be seen in isolation. Rather, they must be viewed in a country's wider risk management context, as risk mitigation and risk transfer must go hand in hand.

### 4.5.1 Disaster risk financing: a paradigm shift

The Asia-Pacific region is again badly hit by natural disasters. In the three months to October 2009, Typhoon Morakot devastated Taiwan and created havoc in coastal China, then two ultra-powerful typhoons battered the Philippines, a massive earthquake rocked western Sumatra in Indonesia, serious floods swept southern India, and an earthquake and tsunami struck Samoa.

All these natural disasters not only caused widespread damage and placed heavy burdens on public budgets; they also sounded again urgent alarm calls for more sustainable risk financing arrangements - before disasters strike -- to enable the affected regions to recover swiftly.

**Rising impact of natural disasters**

Over the last few decades, heightened natural disaster activity has impacted virtually all nations. According to Swiss Re's sigma study, "Natural catastrophes and man-made disasters in 2008", 2008 was one of the worst years for natural and man-made catastrophes creating a total economic loss of USD 269bn and claiming more than 240,000 lives with Asia suffering the most. As most of these catastrophe losses were not covered by insurance, the gap between economic and insured losses has been widening (see Figure 1).

Emerging economies are particularly vulnerable to disasters due to insufficient urban planning, high population growth and environmental degradation. In addition, risks are accumulating in regions most exposed to natural catastrophes, for example, along coastal regions. The insurance penetration, however, is typically very low.

**Securing risk financing before a disaster - not afterwards**

Given the huge impact of natural disasters on society and the economy, comprehensive national disaster management policies have grown in importance around the world.

These policies address disaster preparedness and relief, as well as disaster prevention and mitigation. "Ex-post" risk financing, in other words financing risk after the event has occurred (e.g. by issuing debt, raising taxes, relying on international aid) is becoming unsustainable given the magnitude of disasters and the growing risk exposure. This has led to a widening gap between available funds and post-disaster requirements. As a result, proactive risk management and mitigation strategies have become the top priorities in managing natural disasters in order to minimise losses and related funding requirements.

Understanding the overall risk landscape is important. Disasters are classified as either low risk (i.e. "high frequency/low severity") or high risk (i.e. "low frequency/high severity"). For each category of risk, specific risk management strategies and potential risk transfer/ financing solutions are needed. From a government perspective, natural disasters which fall in the high risk category need to be effectively managed. Governments can either transfer risk to traditional insurers and reinsurers or issue catastrophe bonds. They may also purchase derivatives and other financial instruments in order to hedge the risk. Figure 2 provides an

overview of different loss financing mechanisms and instruments.

Re/insurance has always been a widely adopted tool for risk financing. However, insurance markets in some emerging economies are still under-developed and will take many years to grow up - hence, government push on this front is much needed.

Innovative ways of financing risk mitigation and management are now available thanks to the emergence of capital market solutions and various reinsurance arrangements. These mechanisms can be especially advantageous to emerging economies as they supplement traditional insurance which is still largely under-developed. They:

- Ensure availability of funds during recovery and rebuilding efforts.
- Protect financial budgets and reduce volatility; pre-determined premiums also allow for budget certainty, particularly in multi-year contracts.
- Have no payback obligation (in contrast to loans) and limit the pressure to divert funds from other important projects to disaster-affected areas.

**Public-private partnership in risk financing**

The financing and effective reduction of disaster risks requires a joint response from the private and public sectors. As complexity and costs rise, neither group can meet the challenge alone. This is particularly true for emerging economies that lack funds, yet must also deal with the increasing frequency and severity of natural disasters. Moreover, as the underlying risk exposure increases, the inflation-adjusted costs of future events could far exceed the limited government budget.

Public-private partnerships, especially those involving reinsurance and capital market solutions, can improve disaster planning and prepare stakeholders for the consequences of climate change. They can also facilitate risk awareness and joint solutions using various risk transfer mechanisms. Solutions for risk prevention, risk transfer and financing include:

- Partnerships for risk prevention: Insurers have the expertise needed to identify risk prevention measures and can offer more attractive premiums if such measures are implemented. The public sector, on the other hand, is better able to enforce and finance risk prevention measures, such as building codes, fire prevention regulations, etc.
- Partnerships for risk transfer and financing: Government can play a significant role by creating a legal framework that enables market mechanisms to function. Given the insurability challenges, the public sector can assume different roles in each

transaction. For instance, the public sector may be involved in:

- The development of risk transfer solutions that involve the collection of critical exposure data. In doing so, governments can also draw on the support and know-how of re/insurers.
- Expanding the availability of risk transfer solutions for individuals and corporations.
- Becoming the de facto insurer of last resort; it can support protection coverage on a national basis and can partner with the private sector to transfer the risk using international reinsurance or capital market solutions.

The public sector can transfer the expenses stemming from immediate relief and emergency efforts. The main benefit is improved budgeting certainty and lower debt levels after a disaster.

Overall, such partnerships play an important role in managing the increasing cost of disaster relief, and enable the public sector to fund disaster relief proactively. This can be an effective way for governments to provide relief at lower costs, without creating a significant burden on public finances.

## Paper V

# Communication and Equipment Handling

# Unit - I ❑ Communication System

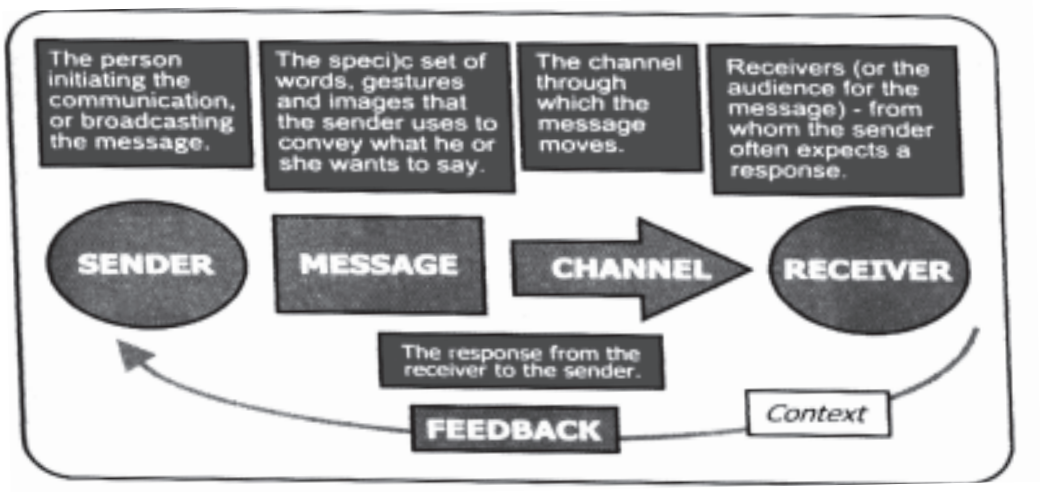
**Structure**



## 1.1 Introduction

Communication is sending and receiving ideas, thoughts or feelings from one person to one or more person in such a way that the person receiving it understands it in the same way the sender wants him/her to understand.

**Communication Skills**



- ❖ Know the overview of effective communication.
- ❖ Understand significance of body language
- ❖ Understand non-verbal communication
- ❖ Understand listening skills
- ❖ Know 10 commandments of Human Relation.

**Types of Communication :** It is of two types

- ❖ Verbal Communication - Refers to expression of one's self language in the form of spoken words
  1. Ensure it fits the purpose
  2. ABC : Accuracy, Brevity, Clarity
  3. KISS : Keep it Short & Simple
  4. Deliver information in 3 stages :
     - o Introduction
     - o Main body of the content
     - o Summary
- ❖ Non Verbal Communication - It includes facial tones of voice, gesture, eye-contact, spatial arrangements and pattern of touch, expressive movements, cultural differences and other "non-verbal" acts.

## 1.2 Communication Ideas (K - P - A - C - A - I) Method

**K —** Know the purpose

**P —** Prepare the material

**A —** Analyze your audience

**C —** Choicest selection of expression (words)

**A —** Appropriate use of medium

**I —** Identifying possible barriers to effective communication

## 1.3 Means of Communication

According to the way of expression the communication may be of 2 types:

A. ORAL COMMUNICATION - Is direct face to face communication between 2

individuals. In this, both the … exchange their ideas through oral words either face to face conversation or through mechanical/ electrical devices such as telephone, mobile, etc.

Ex: Meeting, Conference, Lectures and Interviews are important media of such communication.

B. WRITTEN COMMUNICATION - When communication is reduced into writing is called Written Communication. This includes written words, graphs, diagrams, pictures. Some common forms of written communication are circular, notes, magazines, manuals, letters, etc. written communication are extensively used in modern offices.

**Speaking like a STAR**

S — Situation

T — Task

A — Action

R — Result

7 C's of communication = So your audience gets message.

1. **C**lear
2. **C**oncise
3. **C**oncrete
4. **C**orrect
5. **C**oherent- logical
6. **C**omplete
7. **C**ourteous

## 1.4 Handing and operation of wireless communication equipments

**Radio Communications**

**Types of Radio Sets**

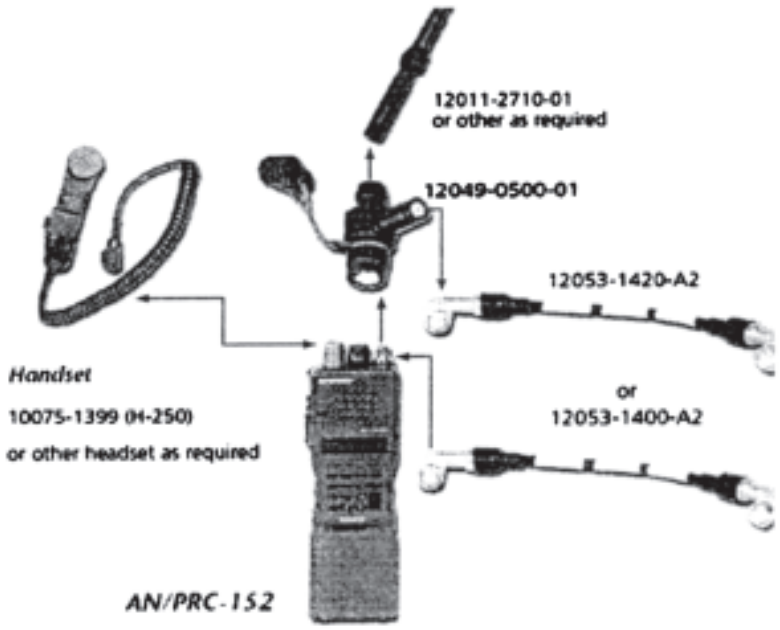
- **Handheld:** Wireless radio sets that can be carried in the hand. It is also called a walkie-talkie.
- **Fixed or Base Station:** Wireless radio sets that ate stationery or fixed in nature. It has a long and elevated antenna to enable wider reach and range.

- **Mobile Radio Sets :** Wireless radio sets when installed in a vehicle or man pack sets are called mobile radio sets.

**Benefits of Wireless Radio Sets :**

- **Instant :** The message is reached immediately.
- **Wireless :** As the radio set comes without a wire, easy to carry. The hassles of requiring plug points, sockets, power availability, etc., are eliminated.
- **Closed Conferencing :** On an open squelch mode all the stations will be able to hear the message, instructions, etc. Generally, the radio sets are kept on an open squelch mode.
- **Wider Reach / Range :** Covers large area and distance and can transfer the message easily, for example, message can reach beyond the city and town.
- **Portable :** Can be carried around, but within its range.

**Main Parts of a Handheld Radio set**




**Base Station Radio Set**

Any radio set can be utilized as a base station. It is also not unusual to ensure radio sets used as base stations have longer range by virtue of their power or antenna length or both.

| PHONETICS | | | |
|---|---|---|---|
| A | ALPHA | N | NOVEMBER |
| B | BRAVO | O | OSCAR |
| C | CHARLIE | P | PAPA |
| D | DELTA | Q | QUBEEC |
| E | ECHO | R | ROMEO |
| F | FOXTROT | S | SIRA |
| G | GOLF | T | TANGO |
| H | HOTEL | U | UNIFORM |
| I | INDIA | V | VGICTOR |
| J | JULIET | W | WHISKY |
| K | KILO | X | X-RAY |
| L | LIMA | Y | YANKY |
| M | MIKE | Z | ZULU |

## 1.5 Basics of computer

Definition of Computer: A computer is an electronic device that manipulates information, or data. It has the ability to store, retrieve, and process data. It solves problems according to instructions given to it by the computer user. It is a digital machine used in all fields.

**Parts of the Computer :**

Computer is initially divided in two section—Software and Hardware

**Hardware:** It is any part of the computer that has a physical structure, such as the computer monitor, keyboard, mouse, etc.

**Software:** it the application that accomplishes the set of task given to the computer. Examples: web browser, games or word processors such as Microsoft word, Excel, Power Point, page maker, Corel draw, etc.

**Hardware components of the Computer:**

1. **Monitor :** Display screen

2. **CPU:** The central processing unit is the main computer that holds all the components and executes all the functions.

3. **Keyboard:** It is an input device that allows a person to enter symbols like letters and numbers into a computer.

4. **Mouse:** A computer mouse is an input device that is most often used with a personal computer. Moving a mouse along a flat surface can move the on-screen cursor

to different items on the screen. Items can be moved or selected by pressing the mouse buttons (called clicking).

**5. Speaker:** Computer speaker is an external device to the computer. This is one of the output device of a computer

**6. Printer:** it is a peripheral device that produces hard copy of documents stored in electronic form.

**Input/Output device in a computer:**

An input device sends information to a computer system for processing, and an output device reproduces or displays the results of that processing.

| INPUT DEVICE | OUTPUT DEVICE |
|---|---|
| 1. Mouse | 1. Monitor |
| 2. Keyboard | 2. Printer |
| 3. Microphone | 3. Projector |
| 4. Webcam | 4. Speaker |
| 5. Joystick | |
| 6. Pen drive | |

**Advantages of Computer:**

1. Helps us prepare proper documents
2. Helps us prepare good presentation
3. Helps us prepare reports with graphs and tabular sheet
4. Helps us prepare and keep updated database
5. Helps us to store files, pictures, songs, movies, presentations etc. in an organized way
6. Sending emails

**Use of computer technology:**

Today computer is used in every sector of the industry. Major places where computer is being used intensively (apart from the software industry) are -

1. Medical
2. Railways
3. Banks
4. Educational Institutes
5. Stock Market

**Note:** Computer understands only BINARY LANGUAGE (1, 0)

**Memory size in computer :** The size of any file in a computer is calculated in bytes

8bits = 1 byte

1024 bytes = 1 Kilobytes (KB)

1024 KB = 1 Megabytes (MB)

1024 MB = 1 Gigabytes (GB)

1024 GB = 1 Terabytes (TB)

## 1.6 Working on the computer

1. **Turning on/off the Computer:**
   - ❖ Plug the monitor and CPU to a socket and turn on the switch
   - ❖ Press and hold the CPU power button for 5 to 10 seconds. If an external power backup is connected to the computer, first press and hold the power button of the external back system and then turn the CPU on.
   - ❖ The computer will automatically boot up.
   - ❖ To turn the computer off, we first have to click on the "Shut Down" option which will come on the screen
   - ❖ For Windows 7 and lower, go to start menu →click on Turn Off →Press Shut Down
   - ❖ For Windows 8, first save and close all the files, applications or programs that were running. Together press ALT+F4. A window will appear. Choose the option "Shutdown" and click "OK"
2. **Hardware and Software properties:**
   - ❖ **View all the hardware and it's properties**

     **Step 1:** Right click on the computer icon

     **Step 2:** Click on properties

     **Step 3:** Click on device manager. All the hardware's connected to the computer will be displayed

     **Step 4:** Again right click and select properties.
   - ❖ View software on the computer:

     **Step 1:** Right click on the computer icon

**Step 2:** Click on properties

**Step 3:** Click on Control panel Home and select programs

**Step 4:** Go to Programs and Features to view all the softwares installed on the computer.

3. **How to change the desktop background**

**Step 1:** Right click on the desktop screen

**Step 2:** Click on personalized/ properties

**Step 3:** Go to desktop background. A new window will appear.

**Step 4:** Browse the picture or select a picture from the option. Position the picture and click on ok.

4. **How to create a screen saver**

**Step 1:** Right click on the desktop screen

**Step 2:** Click on personalized/ properties

**Step 3:** Go to screen saver. Choose a screen saver style from the dropdown menu.

**For 3D text.**

Choose screen saver style as 3D text and go to settings. Type in the text and do the necessary formatting. Click ok

**Step 4:** Click on apply and then OK.

5. **How to change taskbar/ title bar color**

**Step 1:** Right click on the screen and go to personalize/ properties

**Step 2:** Go to Color and select any color of your choice.

**Step 3:** Click on OK.

6. **How to hide, re-position and resize buttons on the taskbar**

**Step 1:** Right click on the taskbar and go to properties

**Step 2:** Choose the location from the "taskbar location on screen" dropdown

**Step 3:** To make the taskbar buttons smaller and hide the taskbar, tick on the check boxes.

**Step 4:** Click ok to apply

7. **How to create, rename, delete a folder**

**Step 1:** Right click on the screen and go to New

**Step 2:** From the options click on Folder.

**Step 3:** A new folder is created. Name the folder and press Enter button. The folder opens

**Step 4:** To rename the folder. Right click on the folder and select rename. Rename and press Enter to complete

**Step 5:** To open an existing folder. Double-click on the folder.

**Step 6:** To delete the folder, Right click on the folder and select delete. Click ok to confirm.

## 1.7 Important short-cut keys

**I. Using the Clipboard**

1. Ctrl+ C Copy what's selected
2. Ctrl+X Cut what's selected
3. Ctrl+V Paste what you last copied or cut
4. Ctrl+A Select all
5. Ctrl + Z Undo an action

**II. Windows**

6. Alt+F4 Exit the active window
7. Alt+Tab Switch to the previous active window
8. Alt+Esc Cycle through all open windows
9. +D Show desktop (hit it again to show windows)
10. + L Lock the computer
11. Alt + Enter Displays the properties of the selected object.
12. F5 Refresh the active window.

**III. Documents and Files**

13. Ctrl +N Create a new document
14. Ctrl+O Open an existing document
15. Ctrl+W Close the current document
16. Ctrl+S Saves the current document
17. Ctrl+P Print the current document

## 1.7.1 Internet

❖ **Definition of Internet:**

The Internet, sometimes called simply "the Net," is a worldwide system of computer networks. It is a means of connecting a computer to any other computer anywhere in the world via dedicated routers and servers. When two computers are connected over the Internet, they can send and receive all kinds of information such as text, graphics, voice, video, and computer programs.

❖ **What is a website?**

A website, also written as web site, or simply site, is a set of related web pages typically served from a single web domain. A website is hosted on at least one web server, accessible via a network such as the Internetor a private local area network through an Internet address known as a uniform resource locator (URL). All publicly accessible websites collectively constitute the World Wide Web (WWW).

❖ **Web Browser**

A web browser (commonly referred to as a browser) is a software application for retrieving, presenting and traversing information resources on the World Wide Web. An information resource is identified by a Uniform Resource Identifier (URI/URL) and may be a web page, image, video or other piece of content.

**Examples:**

1. Google Chrome
2. Mozilla Firefox
3. Internet Explorer
4. Opera Mini
5. Safari
6. Net Scape

❖ **What is a webcam?**

A webcam - short for 'web camera' - is a digital camera that's connected to a computer. It can send live pictures from wherever it's sited to another location by means of the internet. Many desktop computer screens and laptops come with a built-in camera and microphone, but if yours doesn't, you can add a separate webcam at any time.

There are various types. Some are plugged into computers through USB ports, but others are wireless (wifi). Other features might include:

- an integral microphone
- the ability to pan and tilt

- ❖ in-built sensors that can detect movement and start recording
- ❖ a light that, when on, will let you know that the camera is in use.

There's a wide range of things that you can do with a webcam. The most common is to video chat over the internet using Skype - see our Skype guides for all the information you need to get going.

And always remember, and remind your children, that any images you make available to others via your webcam could remain on the internet forever.

## 1.8 Access Control

**Introduction:** Access Control is defined as restriction or denial of access to a place or other resources involving physical as well as informational security. Access Control gives organization the ability to monitor, restrict, exercise control and protect resource availability, integrity and confidentiality within.

**Sum up:**

A. Allow to gain entry of authorized/ Right Person/ Vehicles/ Materials

B. Deny the entry of unauthorized Person/ Vehicles/ Materials

**Access control operation**

Access Control operations are carried out through physical and electronica method.

**a. Physical Access Control** - can be achieved by the interaction of human such as security guard, security staff, receptionists, front office personals, etc., and also using mechanical means like locks and keys.

In this process, a person or a vehicle is stopped by the security guard at the access-point of any premises to either let in or to let away.

In this operation the disadvantages are as follows:

i. A slow process

ii. Prone to human error

iii. Difficult to handle large volume of traffic.

**b. Electronic Access Control -** process involves the use of computers, electronic sensors and bio-metric devices to impose the process.

It allows access to person or vehicle based on the verification of credentials stored in the database of the system. The system also monitors access control points or doors and sounds alarm in case of forced entry or tailgating attempt detected.

**Personal access control equipment**

i. **Turnstiles:** form of gate which is designed to allow only one person at a time. These are extensively used in metros, malls, amusement parks, multiplex, airports, museums, etc.

**Types :**

Waist - High Turnstiles

Full Height Turnstiles

Flap Barrier

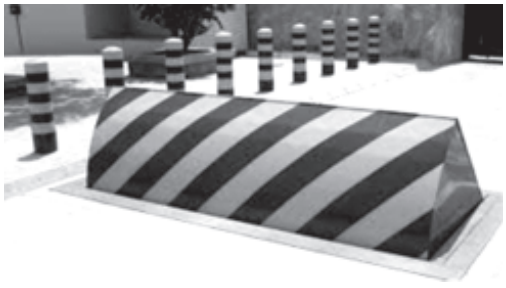
ii. Bio-metric: is the product of science & technology that Measures and analyze biological data of human body such as Finger prints, finger vein recognition, facial patterns, eye Retinas, voice patterns etc., for identification and authorization and recording purpose. The biometrics is Being used extensively in India for UID also known as AADHAR.

## 1.9 Vehicle access control equipment

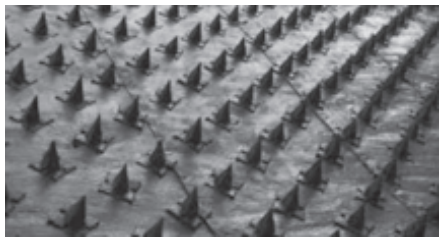
Boom Barrier

Spikes

Security bollard



Road Blocker



Surface Barrier

**Situation faced during access control**

Access Control operations at any premises may lead to difficult situations due to various reasons, requiring tact& professionalism from security Personnel in diffusing the situation.

a. Lost, expired and defaced ID Cards
b. Forget, tampered and unauthorized ID Cards.
c. Surreptitious entry, impersonation and forced entry
d. Tailgating, queue and crowd formation and aggressive behavior
e. Visitors expecting preferential treatment mainly for parking space, the visitors seek preferentialtreatment for parking violating the traffic management.

## 1.10 Anti-Sabotage Checking

The aim of Anti Sabotage Checking (ASC) is to prevent wrongful entry of persons, Vehicles & Materials inside the premises, deny prohibital/restricted articles intended to be carried inside by wrongful means in a clandestine way.

**Types of search.**

a) Personal Search
b) Vehicle Search
c) Baggage Search
d) Material Search

**Prohibited Items:** These are generally listed items like weapons, firearms, amenities, Explosive banned chemicals, inflammable materials such as petrol, kerosene oil, gas cylinder etc.

**Unauthorized /Restricted items:** These items are forbidden by organization polices & instructions which may include mobile sets, laptops, Hard disc, Cigarette , lighter sharp

edges tools, property and other materials.

In ASC, our security staff should be more vigilant about their personal belongings. For saferside they should check their own baggage & belongings before start of duty. They should ensure that no one temper with their luggage boots of cars, two wheelers, cycles etc ,either personal or official should be checked and always kept lock. At all-time one should be aware of one surroundings to which anything amiss, out of context or placed in awkward/ unnecessary position. There is no hard and fast rule in the matter but underlying emphasis should be on eliminating unauthorized object. Visual ASC should be conducted Electrical points, fixture and also electric items like computers, 'Xerox' machine, fax & telephone etc.

Equipments of anti-sabotage checking are available in various shape & size are


Hand held metal detector (HHMD

Doorframe metal detector (DFMD)

Under Search mirror /trolley mirror  X BIS - X Ray baggage Inspection System/ Scanner

Overhead Mirror


Computer

Explosive Detector


Police Dog.

## 1.11 Surveillance

In the modern day scenario of all round development , intense use of technology has been made to ensure full proof made the present security systems &methods more efficient and highly successful, incorporating effective use of technology based & security & surveillance equipment. It is man-mix electronic gadgets. It is important a security guard is conversant with such system.

**Surveillance Equipments.**

**a) Closed Circuit television Video Camera (CCTV)**

These are best suitable for monitoring surveillance in one as which are difficult to physically observe & monitor. These are installed in places. Such as banks, Airport, malls, traffic junction and other installations..

In industrial area, office complex etc CCTV Camera are extensively used to observe the premises from a central control room. From CCTV Cameras, the footage of past events can be retrieved. Such footage is important for detection of crime.

**b) Internet Protocol Camera( IP Camera)**

It is digital, video camera commonly used for surveillance which send & receive signals & data through a computer network & internet. There are two types IP Camera.

i) Centralized IP

ii) Decentralized IP

**c) Spy Camera: -** A Spy camera is hidden & miniature device used for spying / surveillance of public place. The camera can be hidden in any small objects, such as radio, cigarette lighter or built invisible objects like brief-case, ball point pens, etc.

d) It is a device that gives sound or vibration to indicate the occurrence of some undesirable events. Example:

i) Clock Alarm

ii) Siren

iii) Burglar/Intruder alarm

iv) Smoke Sensor

v) Fire Sensor

vi) Surveillance item:- It is RADAR (Radio Detective and raying) based surveillance_ alarm which gives direction & detection of a persons crossing premises by group radio signals.

All alarm /sensors installed as part of the early warning system are connect to a control Room for security personnel to abort the incident time.

Observation Equipment:- Binocular NVD, telescope , Magnifying glass, Zoom camera etc

Smart Card:- In security field smart card plays an important role as these are used for identification, authentication, authorized only.

Its application in security field are as follows:

i) High end security identification

ii) Access Control

iii) Attendance Recording

iv) Payment at the parking fees

v) Entry/Exit recording

**Sensor/Alarm:-** Both works together to make a very effective. Early warning system for prevention and protective security acting by the security guards sensor - a device that works because of light increase or decrease of temperature, pressure etc. due to this its gives signals/current to alarm to start.

## 1.12 Access Control/Frisking

The first question that comes to mind is why Access control / frisking required and how can it be done and what mitigation measures can be suggested?

The straightforward answer is :

Access control or frisking is required for providing :

- Security protection of facilities at offices, factories, installations and even residences
- Denial of entry or exit to unauthorized persons
- Apart from frisking, maintenance of entry or exit records in the form of Daily log books acts as a moral check and cautions persons with bad intentions as their particulars are recorded
- Access control can be done even for pedestrians inside facilities at offices, factories, installations and residences. It includes search of men and women but one has to know what to do once the weapons are discovered or persons are found to be disorderly or if they are carrying illegal items.
- Is done to prevent entry of unwanted elements or materials.

Vehicle access control and search procedures covering and search procedures covering driver identification, vehicle compartment and body frame search, truck and vendor access procedures, vehicle and cargo search, etc.

**How is access control and/or frisking done:**

Use of access control such as electronic body and package search equipment, personal search equipment, personal searchers, vehicle search, building search for suspected bombs, visitor control procedures like issuance of badge and visitor entry and exit monitoring are becoming normal.

Access control includes visitor control procedures such as issuance of badges and

visitor entry and exit monitoring and/or providing escorts for visitors within the premises.

Package and mail search and bomb search can be done with electrical equipments and through manual search.

Personnel identification procedure are followed for identification of staff members, their dependents,official visitors and checking their identification documents.

Access violation plus threats emerging can be handled by:

- Use of communication equipment for prompt reporting of an incident to the appropriate authorities whenever a suspicion arises is the best practice.
- US of alarm systems.
- Bomb threat emerging during frisking has to be handled by calling for bomb disposal procedures and through intimation to appropriate authorities.

**Mitigation measures should cover:**

- Training in use of physical force in self defence.
- Training in tactfully restraining of persons and use of restraining equipments.
- Skill in reading messages and pictorial reports generated by surveillance equipments like CCTVs, sensors. Etc.
- Skill in reading the body language and behaviour of persons.
- Skill in giving first aid and cardio-pulmonary resuscitation to a sick or injured person during an armed attack or in the event of violent attack.
- Use of handheld and vehicle mounted radio communication system.
- Wearing proper uniforms.
- Know the use of weather protective clothing.
- Use of flashlights
- Use of batons.
- Use of whistles and special signals for alert communication
- Use of high frequency mobile radios
- Use of walkie talkies
- Knowledge of driving vehicles

## 1.13 Skills for dealing with anti-sabotage checking & emerging threats

**Introduction**

There can be different types of threats emerging during anti sabotage checking, major civil disturbance, bomb threat, aircraft emergency, barricade or hostage situation, or other acts of terrorism. Only a few are discussed here, and these may be threatening telephone calls. Bomb threats, etc.

**Threatening telephone calls**

In most cases telephonic calls are hoax calls but from the security point of view, such calls should not be dismissed lightly.

Irrespective of the nature of such calls, they should be reported to the designated official.

The designated official should intimate the appropriate authority so that the identity of the caller can be established.

The contents of the call and all other details must be reported as accurately as possible so that those information and help in subsequent evaluation of the threat and correlated with incidental threats or crime related crimes.

Efforts must be made to split the telephonic call into bits such as -- the point of threat whether it is directed to an organisation or group or class of people, etc.

Threatening bomb threats in a building

The bomb threat can be to a building.

The bomb threat can be in the form of a telephonic call, or a written message, or a suspicious letter or a claimed package or parcel left behind in some premises of the building.

There must be a designated official to an act in case of such threats. Decision must be taken promptly on issues such as -- full or partial evacuation , search operations, intimation to respective authorities, etc.

Floor wardens must be appointed who will ensure that, during evacuation, no one is left behind they must be trained to know what to look for during searches of the respective areas. The floor warden must quickly assess the type of each bomb and the threat they can pose.

**What to do during a perceived threat evacuation**

The building may have to be quickly searched before any evacuation.

A pre-notified evacuation signal may be announced to draw attention of inmates before evacuation.

A evacuation route may be established and before that the area should be checked for any evacuation.

The doors and windows are to be left open to allow ventilation for possible fumes or gases after an explosion.

The lifts and elevators must be rendered non-operational so that people do not get trapped.

Ensure orderly evacuation takes place and people do not panic when moving away.

The sick, the disabled, the children, the females must be sent at least 100 metres away in order to prevent an injury from the impact of the blast due to flying glasses, masonry splinters, etc.

**What to do after the evacuation ?**

A thorough search of the building should be conducted before allowing people to re-enter. This should be done by a person from the bomb defusal squad.

In case a suspicious object is located, it must never be touched.

Arrangements may be made to inspect the same by experienced personnel before the bomb defusal squad finally arrives.

During the search, only persons familiar with the area should be sent in.

No object should be shaken or moved during the search.

If the intimated bomb threat gives out a possible Time target , the bomb search operation should themselves evacuate 30 minutes before the given threat time and they should not resume search until 30 mins after the specified time.

**What to look for during an anti-sabotage checking / search?**

The threat call may specify the description of the threat and therefore the searchers must look fo that type of object.

Any object that is unusual for the area may be searched.

Any object which is of exceptional shape or size or which may emit some smell or peculiar sound must be located.

An object in which wires or batteries are noticed must be checked first.

Any object marked as explosive, fire, danger, etc. must be checked seriously.

Searches may be made of unidentified bags, luggages, rates, etc.

False ceils must be given special attention as those are the easy spots for planting time bombs.

Rest rooms, wash rooms,etc. Are also places for planting bombs and those must be searched thoroughly.

**Cordoning & sealing equipment handling**

The fire brigade is often called where no one else knows what to do. Particularly if an incident involving hazardous materials has occured, expert knowledge and equipment are vital.

**Procedures for operations involving contaminants**

1. Identify risk (measuring devices)
2. Cordon off the danger zone.
3. Rescue people (observing self protection requirements)
4. Stabilize the situation (collect- seal- pump out)

**Put up danger signs, indicate the presence of danger**

Hazardous materials are classified into three categories according to their risk potentials:

Atomic hazards

Biological hazards

Chemical hazards

The packages are structured according to the following scheme:

- Blockage material
- Measuring devices
- Protective equipment
- Sealing materials
- Collecting containers
- Pumps
- Earthing material
- Electrical material

- Tools
- Hoses
- Other materials

**Atomic hazards**

**Main focus :** self protection ( measuring devices and protective equipment)

**Measuring radiation level is a vital duty**

An equipment called ELECTRONIC DOSIMETER EDW 150 with alarm functions which is small and handy and simple to operate is used for measuring the gamma radiation and x-rays digital dose indication on LC- display (7digits)

## Protective Equipment

Isotemp radiation protection suit is used. This is made of steel fibre, oil and water repellent fabric, flame- retardant.

## Breathing Mask

Only suitable in areas where the contaminated air contains at least 20% of oxygen. Made of soft neoprene which improves comfort and facial seal. Comes with an inner mask with non-return valves as well as separate inhalation and exhalation channels.

## Electronic Hands Searchlight

This searchlight is explosion- proof. It is fitted with a set of Ni- Cd sealed rechargeable batteries, which are leak- proof. The searchlight is provided with an emergency flashing device. DC complete with cables.

## The Detection of Biological Hazards

Hand held biological agent detector is a portable, hand-held thermal cycler capable of detecting both bacterial and viral pathogens quickly and accurately,using polymerase chain reaction (PCR) technology.

**Benefits:** Portable bio detection capability, can process simultaneously process 6 divergent samples, test results available in 30 minutes or less, detects both bacterial and viral pathogens.

Protable Spectrophotometer for Water Analysis

Protective Equipment

Total Encapsulating Suit

Medium duty, gas tight and chemical proof suit for use against all common chemicals and gases.

## Measuring Devices

Simultaneous test set indicator substances for test of inorganic fire gases and simultaneous for test of organic fire gases.

The other equipment is a gas detector consisting of a gas detector pump and a choice of more than 150 different tubes to measure a wide range of gases and vapours.

## Temperature Measurement Infrared Thermometer

This thermometer with graphical display automatically charts the last ten temperature points using maximum and minimum values to establish the range. Its purpose is to check for hot spots in electrical panels, circuit breakers, generators and gearboxes. It also monitors supply and return registers, air stratification, duct leakage and also monitors temperatures of petrol and diesel engine cylinders, railroad axles, bearings.

Other Sundry Equipments are :

Protective clothing

Chemical protection gloves

Chemical resistant safety boots

Breathing mask

Multipurpose filter with connection

Breathing apparatus contour with air cylinder

Compressed air cylinder bar with gastight valve

Chem tape for chemical protection

Chemical splash goggles comfortable to wear in

Connection with optical glasses

Disposable cover to protects against concentrated inorganic acids and bases

And against a wide range of organic chemicals.

## Sealing Materials

Contains leak sealing bag basic kit which is suitable for sealing of punctured tanks, containers or large diameter pipes.

Other accessories are :

Collecting tube, cover for collecting tube, stainless steel bucket and interception, man made fibre fabric

Submersible pump, made of stainless steel. The unit is suitable for pumping chemical contaminated sewage water and acids.

## Quick Acting Stop Cock

Protective clothing, reducers, sealings, etc. allow the handling of even major incidents.

Air supply system for the control room and an air supply unit compressor for breathing apparatus.

Contamination = pollution of persons, items, rooms or the environment by radioactive, biological or chemical substances

In dry decontamination the main component is towels. It facilitates the protective suits follow up treatment in the breathing apparatus workshop.

For minor contamination and wet decontaminant the main component is water.

## Decontamination Starts with the Washing of Hands

A kit for personal cleaning has to be kept handy.

This set includes in a small box (fits in almost every fire fighting truck) with all necessary things for an easy and fast decontamination containing :

5mm hoses with D-couplings

Dividing breeching

Nail brush

Hand brush

Limited use of protective clothing

Paper towels

Garbage bags

Liquid soap

Identification of IED (Improvised Explosive Devices) is a skill but at the same time, the security personnel must have operating skills for handling mines, improvised explosive devices, etc.

In today's environment, security risks arise due to planting of mines, booby traps and unexploded improvised explosive devices ( IED) in various areas.

The security personnel must use their common sense and intuitive precautions as defence against such explosive devices.

Another security measure is to remain alert and aware about the pesence of such dangers.

The security personnel must be properly dressed with long trousers, long sleeved shirts, cotton or woollen if possible ( not nylon or polythene) .

The security personnel driving in mine infested areas must follow the following rules:

- ❖ Drive with windows open
- ❖ Drive cautiously
- ❖ Keep eye open for obvious hole on the road surface
- ❖ Never to drive with worn out trays.
- ❖ The vehicle floor must be completely covered covered with sand bags or soil in plastic bags.

Mines may be either anti personnel mines or anti tank mines. Other explosive devices may be include booby traps, grenades and IED all of which are dangerous.

Mines may be of different shapes and size . The security personnel must be taught to never disturb those. Anti-tank mines do not explode even if those are trampled by pedestrian traffic.

Personnel must be given mine awareness training and told where those could be found in that location such as:

A. Places of unrest

B. Around police or military caps

C. Slides of unused footpaths or tracks

D. On the verges of roads or rail tracks

E. In or around culverts and bridges

F. Near or inside abandoned or dilapidated housed

G. In or around water bodies or water tanks

H. In areas where people might hide

I. At crossing point of small streams

Security Personnel May be trained to use Minesweepers in Order to Trace Mines Planted Near :

1. Dead animals
2. Near small potholes
3. On the ground where small wire may peep out

4. On barbed wire fences
5. Near small serviceable roads or tracks
6. On cultivated fields
7. Small plastic bags or flag hanging around trees
8. Sticks inserted into the barks of the trees

**What to do if a mine is located?**

The security personnel must report immediately to the local controlling office.

The security personnel must never panic.

The security personnel must ask everybody to STOP.

The security personnel must try to find more mines.

The security personnel must retreat from the area and return with reinforcements.

The security personnel must stay alert and inform all the community members.

## Equipment for Identification of Narcotic Material

Mobile field laboratories are now available as a narcotics identification system. The law enforcement professionals can quickly and easily perform presumptive drug testing in the field without destroying evidence. They simply have to place and cover the unknown material on the portable device and narcotics detecting technology rapidly scans it and creates an unique spectral fingerprint of the substance.

This unique chemical fingerprint is then compared to the embedded database of over 3600 illegal narcotics narcotics, cutting agents, and controlled prescription drugs to ensure objective and reliable identification.

Illegal narcotics include cocaine, heroin, ecstasy, and the synthetic stimulants used in bath salts.

How to Conduct Body Search of Individual’s

The following is a general procedure to be followed :

Remove the person's outer clothing.

Set aside hats, shoes, coats and accessories.

If another person is available see that he can call the police of if possible call the authorities, set the articles of clothing aside or check for weapons before returning them. If the person being searched is in a violent state of mind, think carefully about the items that could be dangerous before giving them back. Someone could use pencils, pens, combs and keys as weapons as well.

Make the person stand facing a wall, with his palms upon it and legs spread shoulder width apart so that, if the person tries to assault the person searching will be in a position to overpower him.

The searcher will start patting and searching the person's body from head (including hair) downwards including underarms and all personal areas with his palms since the palm is in a positive to sense anything inside between the clothing and the skin.

Hand-held metal detector can be used by the person searching.

## Premises Search and Area Search

The entire building premises has to be quickly searched before any evacuation.

A pre-notified evacuation signal may be announced to draw attention of inmates before evacuation.

The doors and windows are to be left open allow ventilation for possible fumes.

The lifts and elevators must be rendered non-operational so that people do not get trapped.

Ensure that orderly evacuation takes place and people do not panic which moving away.

The sick, the disabled, the children, the females must be provided special assistance.

The electric connection must be snapped and gas lines must be disconnected in order to eliminate possibility of fire hazard.

The evacuated people must be sent at least 100 metres away in order to prevent injury from the impact of the blast due to flying glasses, masonry splinters,etc.

## Working of Anti Sabotage Checking Gadgetry

The very common items are:

**Electron Vapor Detector :** is a portable explosives detector which detects explosive vapors and gives results in seconds.

Non Linear Junction Detector is a device that illuminates a small region of results of space with high frequency, radio frequency energy.

Probes / piercing rod are handheld pinpointing metal detectors.

Elevated / mounted mirror

Trolley mirror used to search for unwanted items undercarriage of vehicles being checked.

Deep search metal detector

Door frame metal detector

## Role of Sniffer Dogs in Security Operations

Routine checks are made on containers vehicles, baggage and people at our seaports and airports. Where further investigation is deemed necessary, sniffer dogs are released by their handlers to carry out a more active search. The dogs know their job. They methodically cover every section of the area they are needed to explore.

Dogs are trained to detect specific smells above others but have the ability to identify, for example,firearms too. A sniffer dog that is trained to find drugs will seek smells related to illegal drugs but will respond if it picks up the scent of other known objects or substances. Even when illegal drugs have been deliberately covered with other strong smells, in an effort to disguise them, the dedicated working dog will not be distracted from his task.

Other work that sniffer dogs are used for security, search and rescue operations including bomb detection, and people (search and rescue as well as suspects on the run). Cadaver dogs are trained to search for dead bodies in disaster areas and missing person investigations where it is thought relevant to do so.

## First Aid

First aid is the immediate aid and care offered to an injured or ill person is general related to medical treatment which may be minor or major in nature requiring deeper and longer subsequent care and attention.

It consists of a series of systematic life saving procedures by trained personnel with minimum equipment.

While first aid can also be performed on all, the term generally refers to care of other than human patients.

The key aims of first can be summarized in three key points which are-

1. To preserve life through first aid, medical care aimed at saving lives.
2. To protect and prevent further harm so that the condition does not deteriorate further after an injury or illness due to external factors. Here attention is paid to patient's breathing, bleeding and bones.
3. To promote recovery of a victim through first aid initially such as applying a plaster or a bandage to a small wound.

Some organisations teach the same order of priority using the 4Bs : Breathing, Bleeding, Brain, Bones.

## Types and Techniques of Patrolling

Purpose is to prevent crimes.

There is no such thing as routine patrol.

The patrol party must familiarize itself with the assigned area viz:

A. Physical structures- building layouts

B. Streets

C. Block numbers

## Types of Patrol

**Automobile patrol-** provides speed, mobility, ability to carry equipment, officer protection, prompt service.

**Bike patrol-** stealth, fairly quick, limited equipment, easy parking

**Foot patrol-** dense population areas with heavy traffic, provides person to person contact, opportunity to learn area, ability to sneak up on situations with less attention, but slow and inability to carry equipment.

**Motor patrol-** quick, use for escorts, effective traffic enforcement because of small size.

**Patrol division-** is backbone of department.

The basic duties are primarily: protection & service

**Other objectives:**

1. Preventive enforcement- prevention of crime through the noticeable presence of officers
2. By merely being seen, we stop crime.
3. If not stop, it will change the location of crime
4. Selective enforcement- being seen in areas in which there is trouble or where troublr is likely.
5. Used for both traffic and criminal problems
6. Based on officer's experience and statistics on:
   - ❖ Locations
   - ❖ Time of the day
   - ❖ Potential hazards
   - ❖ trends

**Handling Mob Attack**

A crowd that is unruly or hostile or notorious and can cause harm is called a mob.

Police, security personnel or any other law enforcement team must wear safety gear, helmets and protect itself with body armour, bullet proof jackets and shields of various kinds.

To control a mob, the following methods, devices, equipment may be adopted and one can see the use of:

1. Tear gas
2. Horse mounted police
3. Trained attack dogs
4. Water cannons
5. Plastic bullets
6. Rubber bullets
7. Pepper spray
8. Flexible strong batons/ canes

Handling and Operation of Wireless Communication Equipment

How does wireless communication work?

A central unit communicates wirelessly with a range of devices which connects and controls the connection with a range/ proximity

Wireless communication only uses a small amount of power, only a small bandwidth is required to provide data or messages about switching appliances on and off. Infact, power consumption is so low that one can use batteries rather than mains power, for sensors and meters. This allows considerable freedom to position the equipment where it is needed, irrespective of the power is in the vicinity or not.

Handling and operating basic fire fighting equipments-

Firefighters are expected to develop skills to fight against fire for the purpose of preventing fire from spreading, controlling fire, for rescuing people in distress due to fire and preserving property under fire or that may get engulfed in fire

For the above stated purpose, the firefighters are required to possess various equipments and they must be trained to handle those. The following are the standard equipments required (mentioned in alphabetical order):

1. **Automatic distress signal unit-** an alarm use to signal a firefighter in trouble. It is activated manually by the firefighter.

2. **Aerial ladder-** a rotating ladder which is power operated mounted on self propelled fire apparatus.
3. **Air bag-** this is an inflatable device used for lifting
4. **Aqueous film forming foam-** used to spread a non- volatile film over the surface of the fuel. It is pumped through fire hose to a foam nozzle.
5. **Attic ladder-** is a collapsible ladder used to reach narrow passages.
6. **Breathing apparatus-** self contained for the firefighter
7. **Booster hose-** this is attached to a fire pump and is used for small fires
8. **Bunker gear-** are protective boots and pants for firefighters during rapid deployment
9. **Claw tool-** used for early striking and prying to get entry
10. **Carbon dioxide extinguisher**
11. **Compressed air foam system-** here water and foam are mixed with compressed air
12. **Dry chemical-** an agent used for breaking the chemical chain reaction
13. **Dry powder-** an agent used on inflammable metals
14. **Dry sprinkler-** this has pressurized air to activate water inside pipes during freezing temperatures
15. **Encapsulated suit-** this is a clothing use for protecting a firefighter
16. **Fire alarm control panel-** used to announce location of fire based on inputs from smoke, flame, heat detectors
17. **Fire streams-** this is water mixed with foam emitted at nozzle, directed at burning materials
18. **Fire grenade-** this is thrown into the fire in order to mix with air and produce non combustible mixture
19. **Fibre glass helmet-** for the firefighter
20. **Flashlights**
21. **Hydraulic platforms-** is an aerial platform for firefighters to stand on while fighting a fire
22. **Iron axe-** for forcible entry and breaking'
23. **Life net-** to catch victims falling or jumping from upper floor
24. **Light water-** used for extinguishing petroleum fires
25. **Multi gas detector-** to detect gases like oxygen, CO, volatile organic compounds, HCN

26. **Oxyacetylene cutting torch-** to cut metal
27. **Pick headed axe-** for the firefighter
28. **Pompier ladder-** to climb from one window to another
29. **Potable water tank-** to bring water by tank
30. **Ringdown ( radio)-** to alert fire station or an ambulance
31. **Roof ladder-** to attach at the roof
32. **Safety boots and gloves**
33. **Shove knife-** used to open a latch or any type of spring door
34. **Smoke detector units-** to detect and signal evidence of smoke
35. Spanner wrench
36. Water mist fire suppressor
37. Water tender tanker
38. **Thermal imaging camera-** to detect hidden people, animal, heat sources i.e. sources of fire.
39. **Turnout gear-** is a protective gear used as an shield by firefighters

## Musketry Handling & Firing Personal Weapons

Rifles, muskets, carbines, shotguns, revolvers, pistols and all other deadly weapons are firearms from which a bullet, ball, shot or other missile may be discharged by means of gun powder or other explosives

"Permission to carry firearm outside of residence" is to be obtained in written from the appropriate authority.

An individual may hold under license a max of only (1) low powered rifle or musket and one pistol or revolver for the purpose of self defence.

Officers and non commissioned police officers enlisted personnel in the active service and in the retired list of armed forces may hold under a license of only one low powered rifle or shotgun and one shotgun.

Commissioned officers can hold under license a max of one rifle or shotgun and on side arm.

Such weapons shall be personal weapons kept in custody for restrictive use of self defence.

# Model Questions
# Diploma in Safety Skills & Security Management
## (One Year Diploma)
## Term End Examination
## Paper : II
## Security Operational Skills

### UNIT -1

**Answer *any five* questions:**

1. What are the main differences in nature of job between a security guard & a supervisor?
2. What are the points to be remembered for a security guard while on duty at Main Gate of Chemical Plant?
3. Discuss, why crowd control is necessary while strike or labour unrest in a factory?
4. What is the difference between the activities of Central Security Force and Private Security Agencies, how & where they are developed?
5. Briefly define day to day activities of Security In-charge of any public places.
6. Briefly define for planning crisis Management.
7. How to tackle Natural & Nuclear Disasters?

### UNIT-II

**Answer *any five* questions:-**

8. What are the important duties & responsibilities of Security Personnel while developed at the following places (any five):
   a) Research Centre
   b) Commercial Places
   c) Hospital Main Gate
   d) Airport operating skill for guard force.
   e) Heritage Building
   f) Museums
   g) Factory Main gate
   h) Shopping Mall or Corporate Office Gate
   i) B.A. operating procedure

### UNIT-III

**Answer *any two* questions:-**

9. Write a short note on sudden bomb explosion at any public places, how to tackle the situation?

10. If any advance report received by the Chief Security Officer of a factory regarding terrorist activities, what precautions should be adopted to safe the factory?
11. What type of preventive measures to be taken by the security personnel in case of criminal activities in a factory?
12. How to control coal mines explosion and other explosive devices?
13. How do you tackle for security of women & children drilling with threats?

## UNIT-IV

**Answer *all* the questions:-**

**Tick the right answers:**

1. If explosive identified
   a. To inform police ☐ b. Try to remove ☐ c. To cordon the area ☐
2. Where nuclear disaster may be happen?
   a. In Nuclear Power Plant ☐ b. In Nuclear Research Plant ☐ c. Natural & nuclear disaster area. ☐
3. Security checking of women & children preferred by
   a. Male Security Staff ☐ b. Lady Security Staff ☐ c. Security Officer ☐
4. Which communication system may be preferred in factory
   a. Land Phone ☐ b. By Walkie Talkie ☐ c. Public Address System ☐
5. Red alert for security purpose
   a. For terrorist attack ☐ b. Explosion of coal mines & other explosives. ☐
   c. Sabotage & handling with hijacking situation. ☐

**Answer any 10 Questions:-**

1. Discuss about Operating Procedure of B.A. Set.
2. How to handle natural Disaster and nuclear disaster?
3. Write a note on Guard Force Management.
4. How to tackle drilling with threats?
5. Discuss about the crowd control management.
6. What is crisis management and media interaction?
7. Write a short note regarding coal mines & other explosive devices.
8. Discuss about trickling & protecting hostages.
9. Discuss about skill for security of women & children.
10. Write a note on security of front office & administrative management.
11. Write about India's three major disaster situations.
12. What are effective communication skills referred to radio/wireless communication?
13. Write short note on B.A. Set features with a sketch & name of the parts.
14. Discuss about survivors during hi-jack situation.
15. Why crowd control is necessary in a factory while labour unrest or strike called by political parties?