

FUNDAMENTALS OF SAFETY AND ACCIDENT PREVENTION BY

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“I am a student of whoever I can learn from. I don't see myself in position like I'm above anybody else and I can never learn or no one can ever teach me anything

"The only thing that interferes with my learning is my education."

“The illiterates of 21st century will not be those who can't read, write or express but those who can not learn, unlearn and relearn



AAIYE SURAKSHA KA SHRIGANESH KAREIN

Three essential ingredients in any Organization.

Man,

Machine

Material

These form three angle of a triangle with **Management at center to control them.**

It is essential that this triangle is an equilateral triangle, maintaining the **essential equilibrium.**

MAN

MANAGEMENT

MACHINE


MATERIAL

A Machine can be programmed, Material flow can be controlled but Man can not be programmed or controlled in democracy like us.

HAZARD

“To expose to danger ,risk, chance of accidents, loss”





A **hazard** is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work.

"Condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event."

Table 1
Examples of Hazards and Their Effects

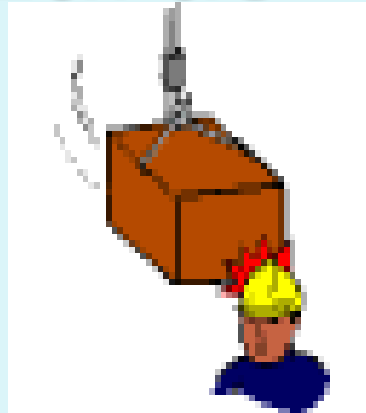
Workplace Hazard	Example of Hazard	Example of Harm Caused
Thing	Knife	Cut
Substance	Benzene	Leukemia
Material	Asbestos	Mesothelioma
Source of Energy	Electricity	Shock, electrocution
Condition	Wet floor	Slips, falls
Process	Welding	Metal fume fever
Practice	Hard rock mining	Silicosis

Types of Hazard

- **Physical**
- **Chemical**
- **Biological**
- **Ergonomics**

Physical Hazards

- Noise
- Vibration
- Radiation
- Temperature
- Pressure, Velocity, Height
- Electricity
- Physical characteristics



Chemical Hazards

- Explosives
- Flammable liquids
- Corrosives
- Oxidizing materials
- Toxic, carcinogenic, substances
- Gases and air particulate





Biological Hazards

- Biological wastes (blood, fluids, etc.)
- Drugs (antibiotics & others)
- Viruses, bacteria
- Parasites, insects
- Poisonous or diseased plants, animals



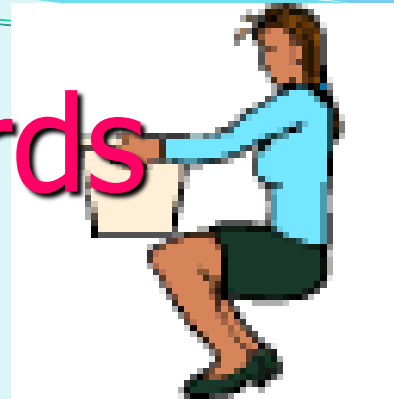
Ergonomic Hazards

- Physical
- Environmental
- Psycho-Social

Ergonomic Hazards

Physical

- Poor work, task design
- Repetitive motion
- Prolonged sitting
- Poor layout
- Poor posture
- Improper lifting and handling



Ergonomic Hazards

Environmental

- **Poor lighting, glare**
- **Poor ventilation**
- **Poor temperature control**
- **Poor humidity control**

Ergonomic Hazards

Psycho-social

- **Work rest cycles**
- **Violence, discrimination**
- **Extraneous stress**
- **Un even work load**
- **Lack of personnel space**
- **Poor inter staff relationships**

RISK

“A possibility of danger or harm”



What is risk?

Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss.

A Simple Risk Assessment

$$R = (P) \times (S)$$

R = Risk

P = Probability of occurrence / Likelihood

S = Severity of effect (consequence)

Difference between Risk & Hazard

The term "**risk**" is often confused with "**hazard**". A high voltage power supply, a sample of radioactive material, or a toxic chemical may present a hazard, meaning that they present the potential for harm.


Risk indicates probability of hazard causing the harm.

HAZARD

Anything that
can cause harm
(eg. a chemical,
electricity, ladders, etc)

RISK

How great the
chance that
someone will
be harmed by
the hazard



It is thus evident that hazards are something we can do little about. The hazards posed by a carcinogen, a concentrated acid or an explosive substance are inherent properties of the material. The risks they pose, however, can be (and should be!) minimized by initially preparing a suitable risk assessment, and then by following the procedures laid down in that assessment.

SAFETY

A quality or condition of being safe from “danger, Injury, damage, loss, accidents”



WHAT IS SAFETY ?

- ▶ IS IT FREEDOM FROM ACCIDENTS ??
- ▶ IS IT REDUCTION OF ACCIDENTS ??
- ▶ IS IT ALL ABOUT COMPLIANCE OF LEGAL REQUIREMENTS ??

INDUSTRIAL SAFETY MEANS

CONTROL OF HAZARDS BY ABIDANCE TO BEST PRACTICES.

DEGREE OF PROTECTION OF HAZARDS.

CAN IT BE 100% ??

ANSWER TO THIS DEPENDS UPON THE DEFINITION OF THE TERM **HAZARD**

HAZARD

BASIC & INTRINSIC PROPERTY BY VIRTUE OF WHICH SOME THING OR SITUATION CAN CAUSE LOSS OR HARM.

THIS PROPERTY BEING INTRINSIC, CAN NOT BE CHANGED.

OUR KNOWLEDGE IS LIMITED BY EXPERIENCE.

HAZARD

As our knowledge increases with experience we try to apply better controls as well.

Due to our limited knowledge we are constrained from using the term 100% safe.

Hence we can say:

- ✓ Complete freedom from accidents is not possible.
- ✓ Safety does not mean Zero Accident.

HAZARD CONTROL HIERARCHY

- ELIMINATION
- SUBSTITUTION
- ENGINEERING CONTROL
- ADMINISTRATIVE CONTROL
- PPE'S

BEST PRACTICES

- ✓ NATIONAL STANDARDS : BIS, OISD, TAC.
- ✓ INTERNATIONAL STANDARDS :
ILO,API,UL,NFPA,EN,OSHA,NIOSH
- ✓ MANAGEMENT SYSTEMS:
ISO,OHSAS,DUPONT,BSC 5 STAR
- ✓ STATUTES –VARIOUS ACTS & RULES
- ✓ BENCHMARKING

WHY SAFETY IS REQUIRED ?

MORAL ARGUMENTS –

Obligation, Duty Of Care
Fatalities/Disabilities

SOCIAL ARGUMENTS

Loss to Society
Sufferings

LEGAL ARGUMENTS

Labour Laws
Penalty/Closure

FINANCIAL ARGUMENTS

Direct Cost
Indirect Cost

INCIDENT

An event that could or does result in unintended harm to people and /or damage to property and/or environment.

Incidents are divided into two categories.

INCIDENT

NO LOSS



NEAR-MISS
(No Loss-Type Incident)

RESULTING IN LOSS



ACCIDENT
(Loss-Type Incident)

- Facility or Injury
- Ill health
- Property Damage
- Environmental Damage
- Process Disruption
- Disturbance
- etc.

- A near-miss is an unplanned event that did not result in injury, ill health or damage, but had the potential to do so. Only a fortunate break in the chain of events prevented a loss. Near-miss is smaller in size and easier to deal with, and it is a cheaper – in fact, almost zero cost – learning tool than learning from actual loss.

WHAT IS ACCIDENT

AN UNINTENDED, UNPLANNED
EVENT WHICH HAS THE POTENTIAL
TO CAUSE HARM OR INJURY.

AN INCIDENT WHICH CAUSES HARM
OR HAS POTENTIAL TO DO SO.

1. **ACCIDENT** – incidents that **do cause** harm or damage. These are often called **LOSS-TYPE INCIDENTS**.
2. **NEAR-MISS** or **NEAR-ACCIDENT** – incidents that **could have caused** harm or damage but did not. These types of incidents are often called **NO-LOSS INCIDENTS**.

Clearly, **an event** is called a near-miss when meeting the elements below:

- It is an event as a result of a contact with a substance or a source of energy.
- The event is **unplanned** or **undesired**.
- The event could have caused harm to people and/or damage to property **but did not**.

HEINRICH THEORY OF ACCIDENT CAUSATION

INJURY IS THE RESULT OF COMPLETION OF 5 DOMINOS

1. Social Environment.
2. Fault of the person
3. Unsafe Action / Unsafe Condition
4. Accident
5. Injury

Domino no-3 i.e. Unsafe Acts & Unsafe conditions are the main contributory factor for accident causation.

Unsafe Acts – 88%

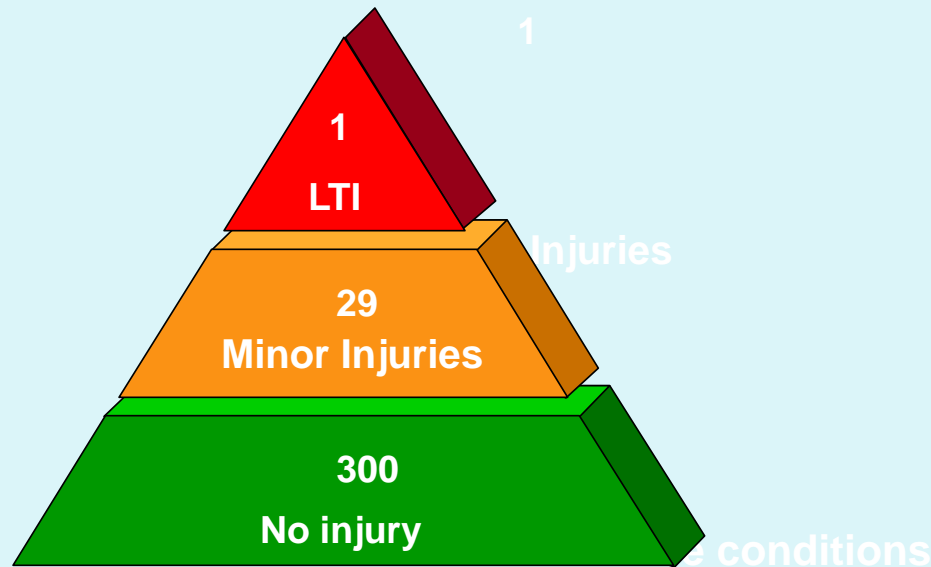
Unsafe Conditions – 10%

Others – 2%

It indicates that 98% of accidents can be prevented.

H.W.Henriech- Analysis of 75000 accidents in 1931

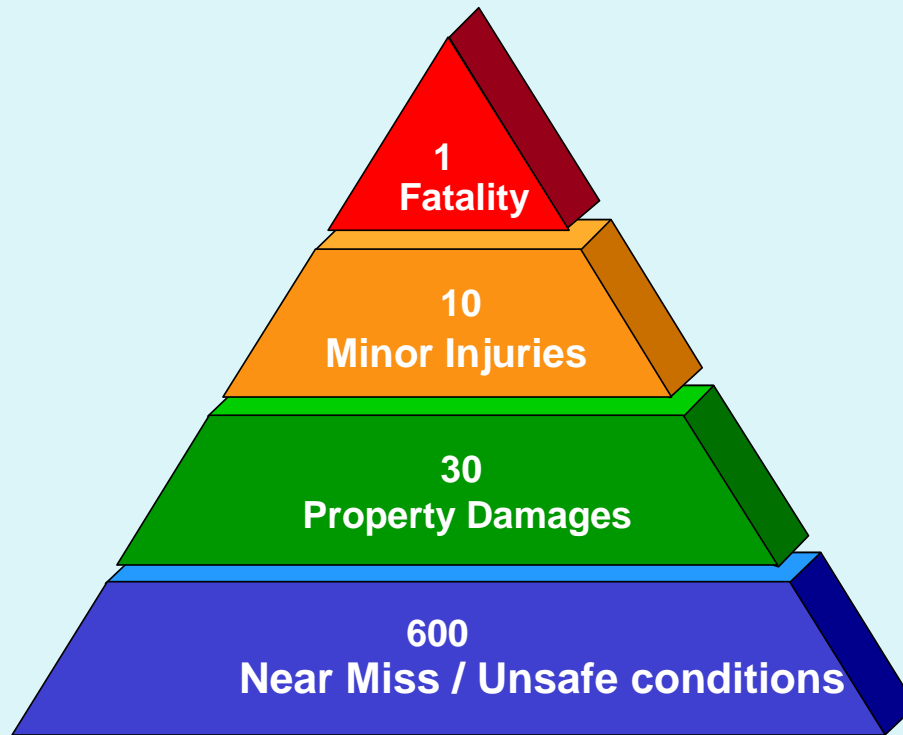
Theories of Accident Causation



- The above figures are averages. Injury can occur the first time also
- Should analyze root cause of problem than attacking the symptoms

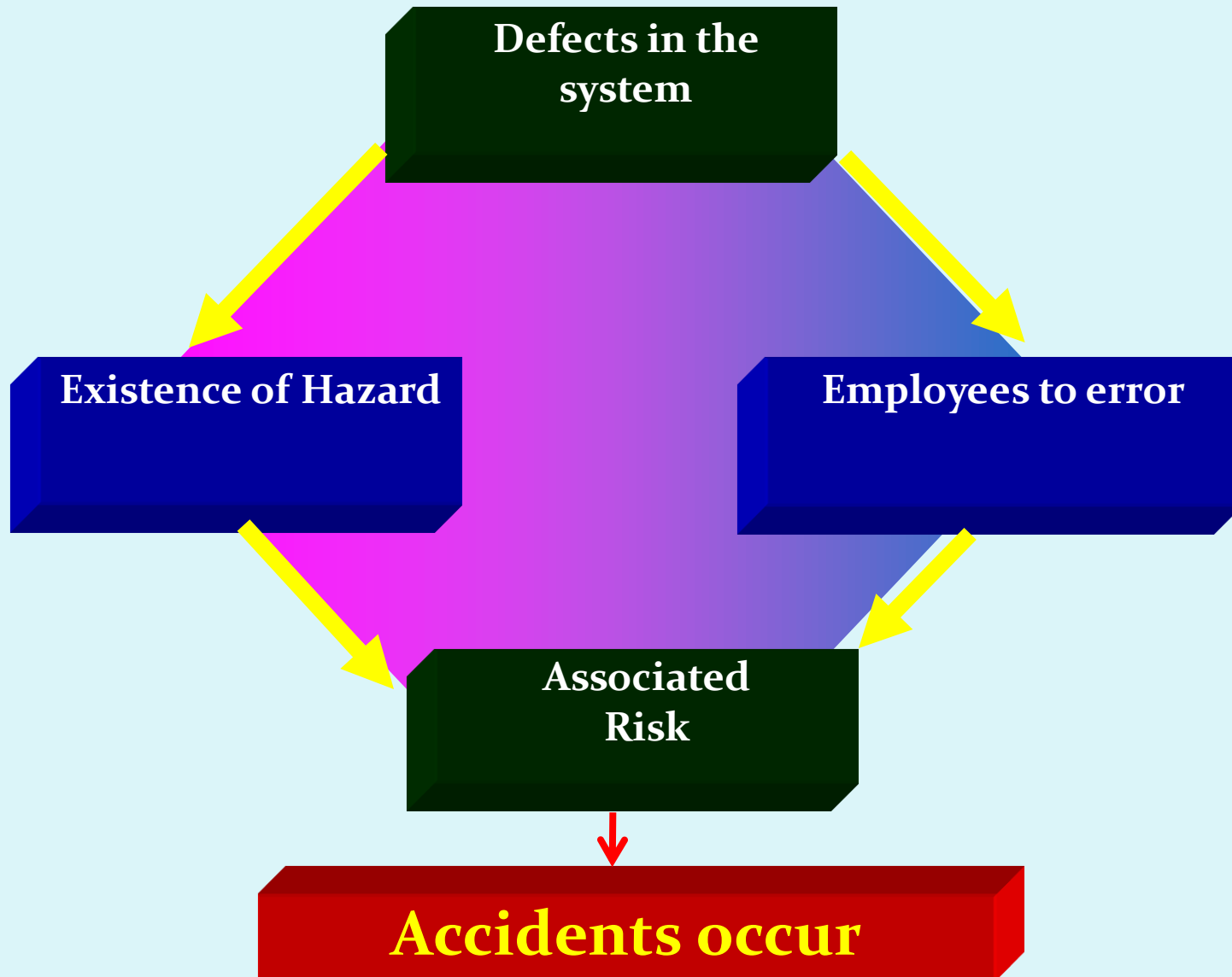
Frank Bird analyzed 1.75 million accidents in 1969

Theories of Accident Causation



Reporting and investigation of *“No injury accidents”*, *“Near misses”* can improve the safety performance of a unit

How do accidents occur ??



ACCIDENTS CAUSATION

Components

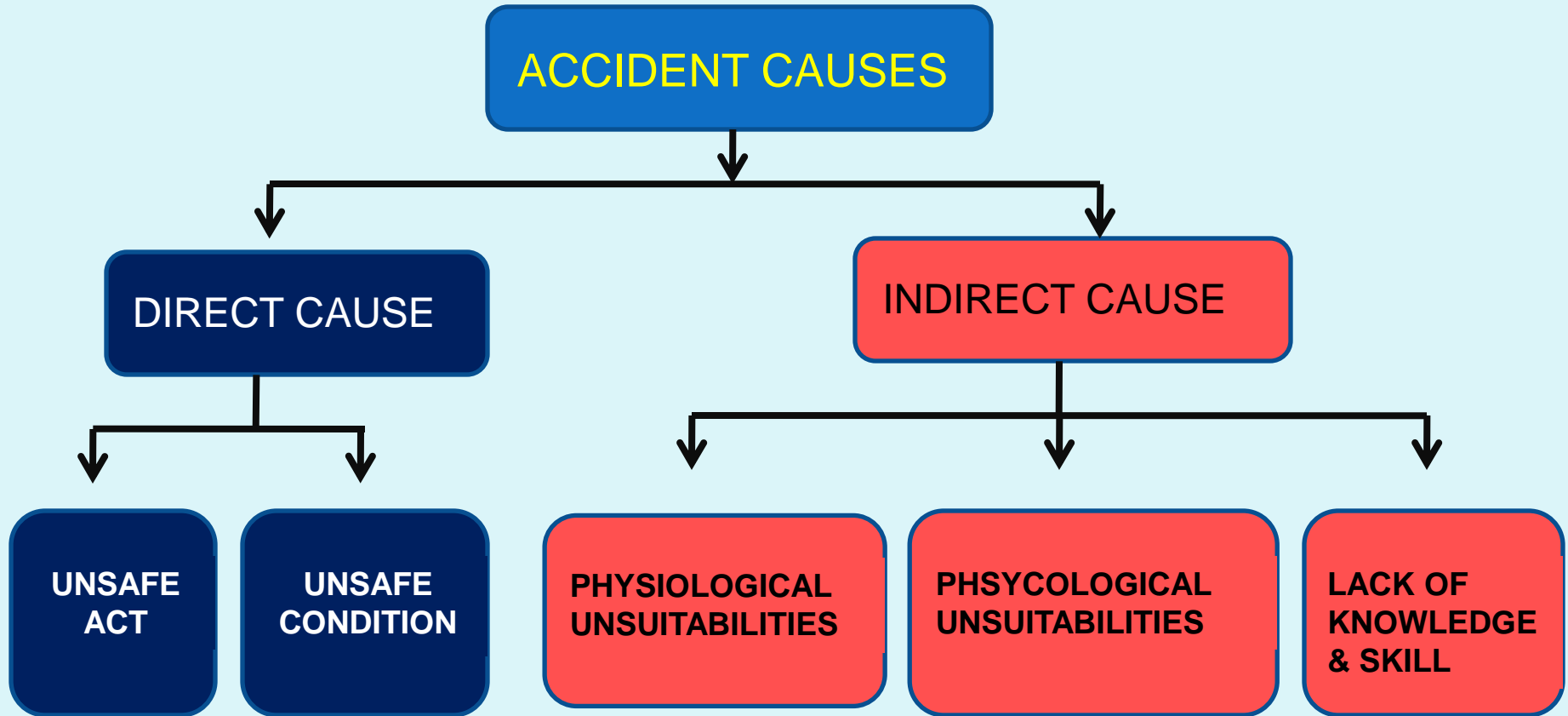


Today's thinking



1. Accidents do not just happen, they are caused
2. It is not simply due to human or technological failure, but failure of Management Control Systems
3. Accidents are due to uncontrolled events or activities
4. It is a mgt. Function to control all events/activities in its physical, technological and human aspects

CAUSES OF ACCIDENTS



Causes of Accident

Causes

Direct

Unsafe Act

- Operating without authority
- Bypassing safety devices
- Operating at unsafe speed
- Using wrong tool / equipment
- Unsafe Placing
- Unsafe Loading
- Taking unsafe position or posture
- Working on dangerous or moving equipment
- Not using PPE
- Horse playing at work place etc.

Indirect

Unsafe Condition

- Unguarded or inadequately guarded machines / equipments
- Defective conditions of m/c's, equipments, tools etc.
- Unsafe methods of storing, piling etc.
- Inadequate or incorrect illumination
- Inadequate Ventilation
- Improper House Keeping-- things not at their proper places
- Unsafe design or construction of machines and equipment etc.

Causes of Accident

Indirect Causes

Physiological Unsuitability's

- Poor eye sight
- Hard to hearing
- Intoxicated
- Physiological disabled

Psychological Unsuitability's

- Negative attitude towards safety
- Ignorance of safety rules and procedures
- Frustration & Conflict
- Morale
- Individual differences
- Acclimatization
- Motivation & aspiration
- Boredom & monotony

Lack of Knowledge & Skill`

COST OF ACCIDENT

DIRECT COST –

- ❖ Insurance Claims
- ❖ Loss of Production or reduced output
- ❖ Product loss or damage
- ❖ Damage (plant, materials, premises)
- ❖ Sickness cover/ sick pay
- ❖ Medical treatment
- ❖ Repairs to plant & equipment
- ❖ Replacement of equipments
- ❖ Compensation
- ❖ Business opportunities, Share prices

INDIRECT COST

- **Business interruption**
- **Product liability**
- **Loss of orders**
- **Legal fees/fines/penalties**
- **Delay in production**
- **Start up cost**
- **Increased insurance renewal costs**
- **Training replacement**
- **Cancellation of orders**
- **Reduced productivity, overtime/additional wages**

- **Loss of profit**
- **Loss of corporate image**
- **Cost of time spent on -**
 - ✓ **Investigations**
 - ✓ **Supervisors assisting victim**
 - ✓ **Workers stopping to discuss the incident**
 - ✓ **Preparation of reports**
 - ✓ **Attendance on court proceedings**
 - ✓ **Hospital visits & dealing with relatives**

The Cost of Accidents

"Iceberg" analogy of costs

*Accidents are
just the tip of
the iceberg.....*

Direct Cost

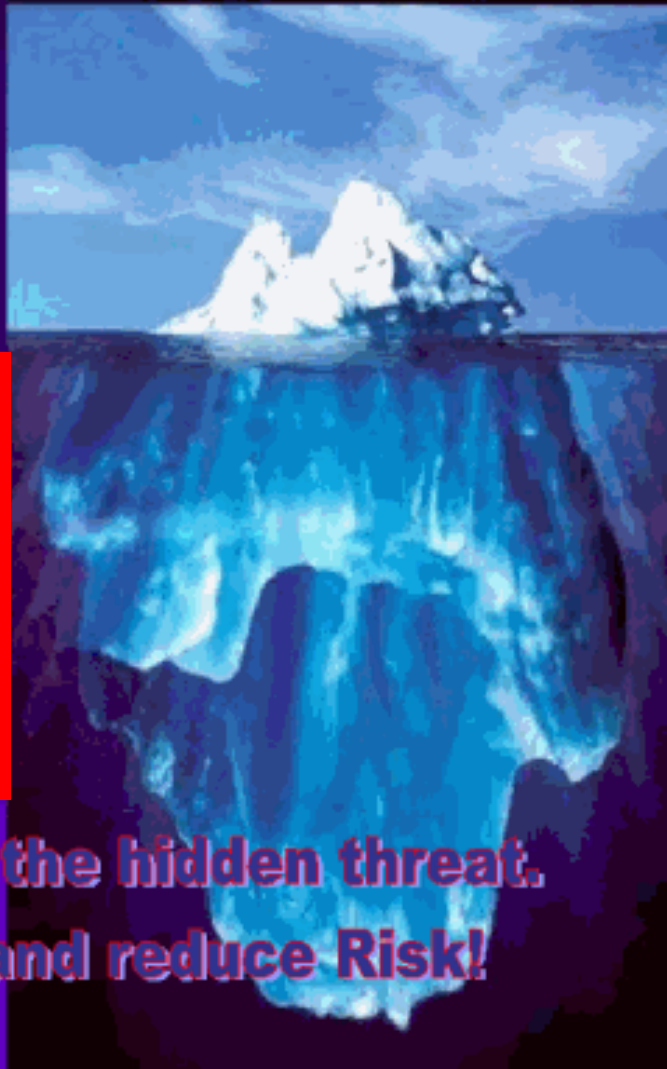
- Compensation
- Medical Expenses
- Equipment damage

Indirect Cost

- Cost of Lost time
- Production loss
- Over head & administrative expenses etc.

*.....Potential
ones are those
hidden in the
murky lights of
the future.*

**Beware of the hidden threat.
Identify and reduce Risk!**



PRINCIPLE OF SAFETY MANAGEMENT

“Unsafe action / Unsafe condition & accidents are only the symptoms of some thing wrong in the safety management systems”.

“Safety should be managed like any other company function.

“The key to effective line safety performance is management procedures that fix **ACCOUNTABILITY**”.

Reasons for Accident Prevention



How to achieve Safety ?

Broadly it is grouped in to 5 **ES** methods;

- 1 Engineering - Process Control
- 2 Enforcement -Rules & Procedures
- 3 Education - Training
- 4 Enthusiasm -Behavioral Aspect
- 5 Evaluation - Audit, Mock Drills

Safety Helmet is required but
Positive Thoughts are important
Safety Goggles are required but
Conscious Vision is important
Safety Hand Gloves are required but
Righteous Protective Action is important
Safety Shoes are required but
Quick and Safe Steps are important
means
Safety Equipments are required but
Trained, Alert & Safe Man is more
important in any Disaster Prevention
programme.

KNOWLEDGE

What to do ?



WILINGNESS

Want to Do ?

INTELEGENCY

Why to do ?

EXPERIENCE

How to do ?

A trained workforce alert of hazards, aware of guards & facilities and also aware of the need to work safely is indeed **an asset** because it is ultimately the safety performance on the shop floor that matters. Hence **human touch** to all your shop floor policies is an important strategy in any Organisation for a **Total Disaster Prevention Program.**

Here are some dangerous thoughts

Do you ever think this way?

- I have been doing this job for years and have not faced an accident yet.
- There is no need for safety glasses because I am only going to be grinding for a few seconds.
- I'll clean it up later.
- I'll stack this in front of the exit and pick it up later.
- Anyone who is able to drive a car can manage to drive any vehicle!
- Why bother about it.



**SAFETY
FIRST**

**DON'T TAKE
CHANCES**

Dangerous thoughts, continued..

- The next shift can deal with the overheating- why bother with it now. To take care of it, I would have to stay back.
- I'll leave this on the stairs, so that I remember to take it when I go down.
- Why wear my seatbelt, it's just a few blocks away.
- That's safety-it's not my responsibility.
- Why ask someone how to do this job. I do not want them thinking I am not capable of handling it.

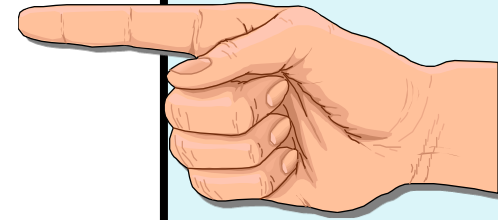


**SAFETY
FIRST**

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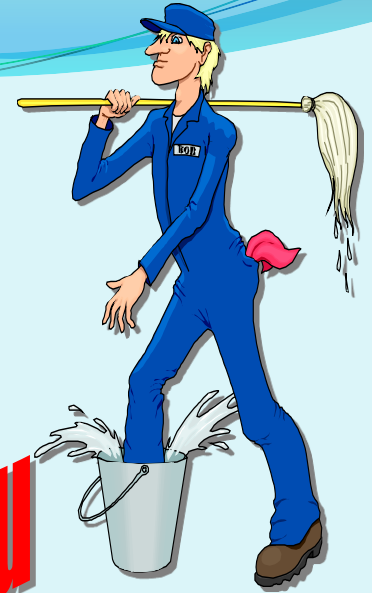
The above thoughts are the kind that could **lead to accidents and injuries** to ourselves and other people.

Try **making safety a habit** and apply it at all times. For example, a first aid kit in your vehicle or fire extinguisher in your home adds to safety. At work, make sure you checked all safety aspects before proceeding with a job.



**SAFETY
FIRST**

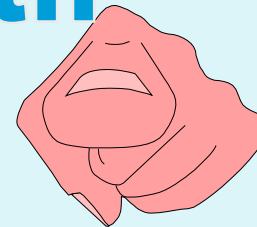
**DON'T TAKE
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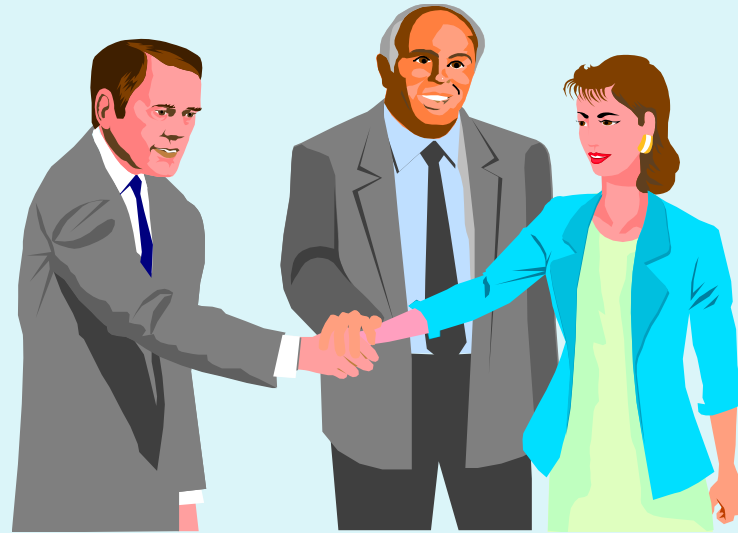
**Take hold of safety
before an accident takes hold of you**



**Remember
safety
starts with
you**



Don't try to change the people



Change the environment

**i.e. method of working, training,
instructions, supervision, inspection &
Safety culture**

to

have ZERO tolerance for Accident

Thank You.....