

OCCUPATIONAL HEALTH AND SAFETY

CIVIL ENGINEERING

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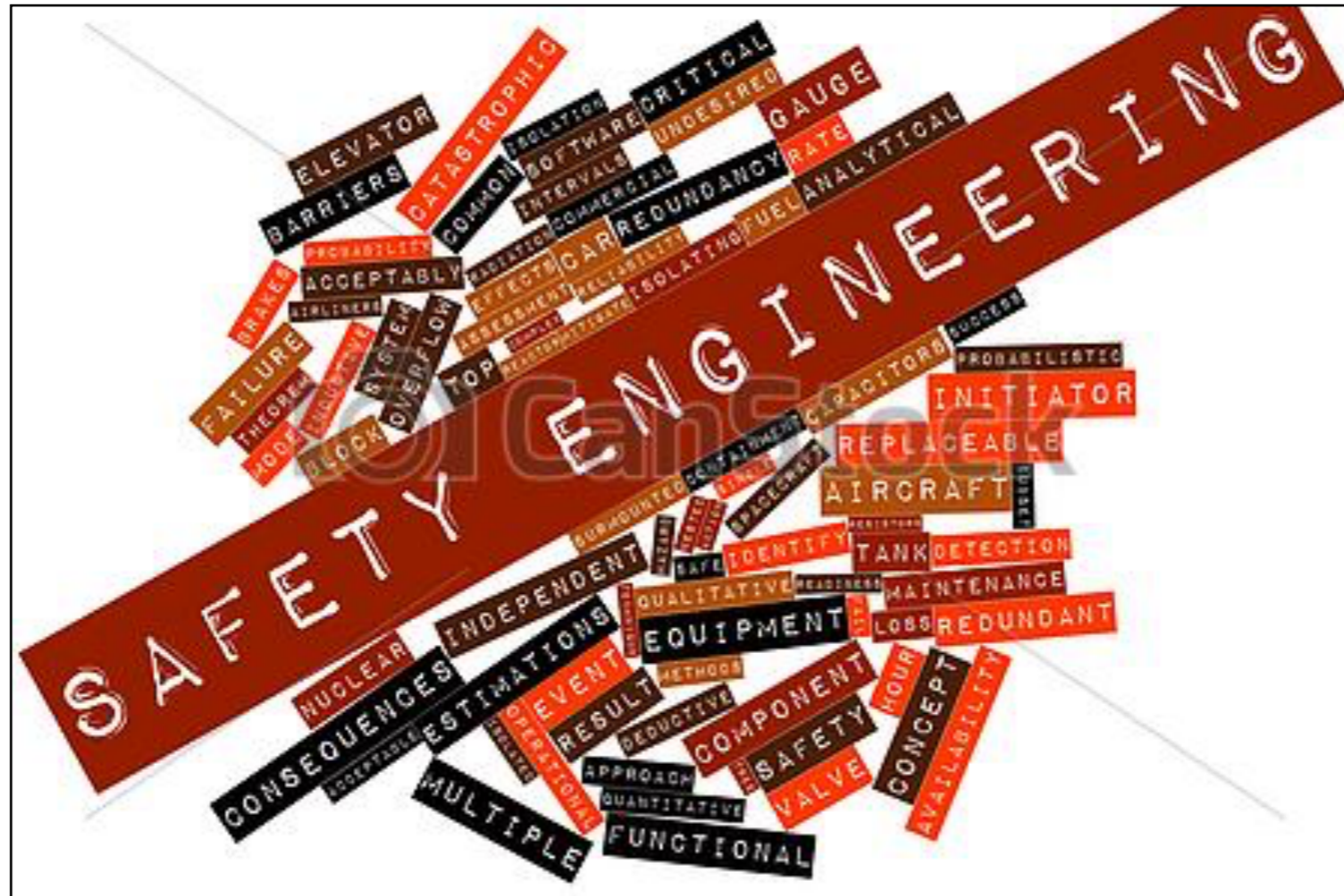


SJB
INSTITUTE OF TECHNOLOGY



CHAPTER 1

SAFETY ENGINEERING



Occupational Hazard and Control Principles: Safety, History and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident – causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation

Untitled

Figure 1.1 Lorem Ipsum dolor amet, consectetur



IS AN APPLIED SCIENCE STRONGLY RELATED TO SYSTEMS ENGINEERING

FAULT – IS SET TO OCCUR WHEN SOME PIECE OF EQUIPMENT DOES NOT OPERATE AS DESIGNED

FAILURE – OCCURS IF A HUMAN BEING HAS TO COPE WITH THE SITUATION

CRITICAL FAILURE – ENDANGERS ONE OR A FEW PEOPLE

CATASTROPHIC FAILURE – ENDANGERS A SIGNIFICANT NUMBER OF PEOPLE

PROBABILISTICALLY SAFE – SYSTEM HAS NO SINGLE POINT OF FAILURE AND UNLIKELY TO CAUSE HARM

PRINCIPLES OF SAFETY

FIRST PRINCIPLE

- HAZARD IS AN INHERENT PART OF HUMAN EXISTANCE

SECOND PRINCIPLE

- WE CANNOT ELIMINATE HAZARD BUT WE CAN ONLY CONTROL, CONTAIN AND MANAGE HAZARDS

THIRD PRINCIPLE

- ACCIDENTS ARE NOT RANDOM HAPPENINGS, BUT ARE PATTERNED AND HAVE COMBINATION OF CAUSATIVE FACTORS

FOURTH PRINCIPLE

- ALL ACCIDENTS ARE CAUSED EITHER DUE TO UNSAFE CONDITIONS OR UNSAFE ACTS OR BOTH

FIFTH PRINCIPLE

- 88% OF ACCIDENTS ARE CAUSED BY UNSAFE ACT (DIRECT HUMAN ERROR)
- 10% OF ACCIDENTS ARE CAUSED BY UNSAFE CONDITIONS - 2% OF ACCIDENTS ARE CAUSED BY NATURAL CAUSES

SIXTH PRINCIPLE

- A SAFE AND ALERT WORKER IS SAFER IN AN UNSAFE CONDITION

COROLLARY

- AN UNSAFE AND UN ALERT WORKER IS UNSAFE IN A SAFE CONDITION

PRINCIPLE OF SAFETY IS PERFECTION OF SYSTEMS AS THOSE OF NATURE

CONSTITUTIONAL PROVISION

ARTICLE 21 OF INDIAN CONSTITUTION GUARANTEES THE PROTECTION OF LIFE AND PERSONAL LIBERTY OF A PERSON

DIRECTIVE PRINCIPLES OF STATE POLICY

- FOR SECURING THE HEALTH AND STRENGTH OF WORKERS, MEN AND WOMEN
- THAT THE TENDER AGE OF CHILDREN IS NOT ABUSED
- THAT CITIZENS ARE NOT FORCED BY ECONOMIC NECESSITY TO ENTER VOCATIONS UNSUITED TO THEIR AGE OR STRENGTH
- JUST AND HUMANE CONDITIONS OF WORK AND MATERNITY RELIEF ARE PROVIDED AND
- THE GOVERNMENT SHALL TAKE STEPS BY SUITABLE LEGISLATION OR IN ANY OTHER WAY TO SECURE THE PARTICIPATION OF WORKFORCE

NATIONAL POLICY : INDIA

INITIATED DURING THE YEAR 2002

DRAFT POLICY WAS NOTIFIED DURING 2006

DURING FEBRUARY 2009, THE UNION CABINET APPROVED THE "NATIONAL POLICY ON SAFETY, HEALTH AND ENVIRONMENT AT WORK PLACE"

FIRST SUCH LAW THAT SEEKS TO PROTECT WORKER'S RIGHT TO SAFE WORKING ENVIRONMENT

GOVERNMENT ORGANIZATIONS IN INDIA

CONSTITUTIONAL PROVISION

MINISTRY OF LABOUR

NATIONAL SAFETY COUNCIL OF INDIA, MUMBAI (1966)

MINISTRY OF HEAVY INDUSTRIES

MINISTRY OF CHEMICALS AND FERTILIZERS

NATIONAL INSTITUTE OF OCCUPATIONAL HEALTH

(<http://www.nioh.org>)

THE DIRECTORATE GENERAL OF MINE SAFETY (DGMS)

THE DIRECTORATE GENERAL OF FACTORY ADVICE SERVICE AND
LABOUR INSTITUTES (DGFASLI)

OCCUPATIONAL HEALTH LAWS : INDIA

THE FACTORIES ACT, 1948

THE MINES ACT, 1952

THE DOCK WORKERS (SAFETY, HEALTH & WELFARE) ACT, 1986

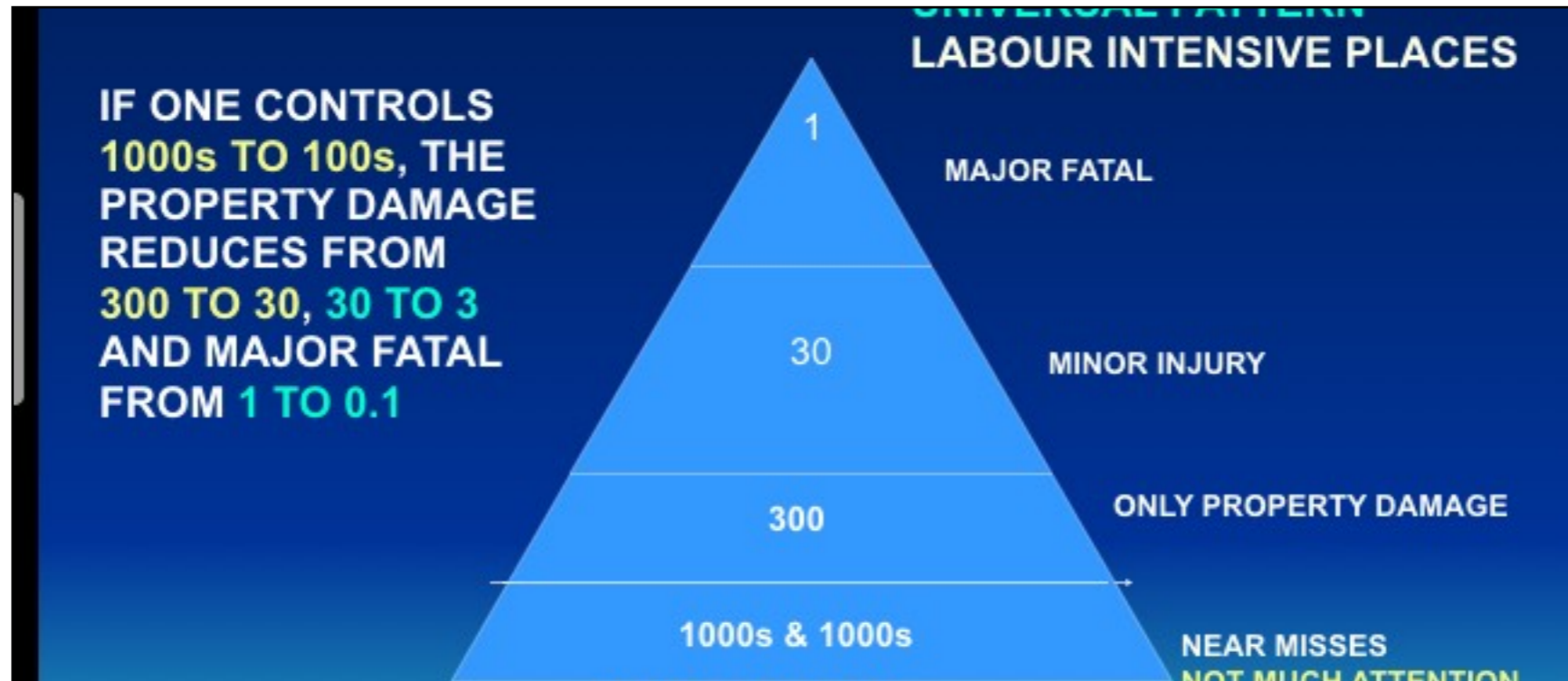
COMPENSATORY ACTS

EMPLOYEES STATE INSURANCE ACT, 1948

WORKMEN'S COMPENSATION ACT, 1923

HEINRICH'S TRIANGLE

Figure 1.2 HEINRICH'S TRIANGLE



FATHER OF SAFETY SCIENCE

RIGHT TO KNOW LAWS

DEFINITION :

LEGISLATION OR REGULATION THAT REQUIRES AN EMPLOYER OR PRODUCER TO DISCLOSE INFORMATION ON HAZARDOUS MATERIALS DISPOSED, EMITTED, PRODUCED, STORED OR USED IN A WORK ENVIRONMENT OR COMMUNITY.

INFORMATION WAS RESTRICTED BY THE OFFICIAL SECRETS ACT OF 1889, AMENDED IN 1923 BY THE BRITISH RULE IN INDIA

RTI ACT 2005 (ACT NO. 22/2005) NOTIFIED ON 15TH JUNE 2005 AND CAME INTO FORCE FULLY ON 13TH OCTOBER 2005

PROVIDES ACCESS TO PUBLIC TO THE RECORDS OF BOTH CENTRAL AND STATE GOVERNMENTS

RIGHT TO REQUEST

ANY INFORMATION

TAKE COPIES OF DOCUMENTS

INSPECT DOCUMENTS, WORKS AND RECORDS

TAKE CERTIFIED SAMPLES OF MATERIALS OF WORK

OBTAIN INFORMATION IN FORMS OF PRINTOUTS, DISKETTES, FLOPPIES, TAPES, VIDEO CASSETTES OR IN ANY OTHER ELECTRONIC MODE

INFORMATION NOT TO BE PROVIDED

PREJUDICIALLY AFFECT THE SOVEREIGNTY OF INDIA, SECURITY, STRATEGIC, SCIENTIFIC OR ECONOMIC INTERESTS OF THE STATE

RELATION WITH FOREIGN STATE

INFORMATION FORBIDDEN BY ANY COURT OF LAW OR TRIBUNAL

BREACH OF PRIVILEGE OF PARLIAMENT OR STATE LEGISLATURE

PUBLIC INFORMATION OFFICER (PIO)

TIME LIMIT : 30 TO 35 DAYS

RIGHT TO KNOW LAWS – ROLE OF GOVERNMENT

SECTION 26 OF THE ACT ENJOINS THE CENTRAL AS WELL AS

STATE GOVTS. (EXCLUDING J&K) TO INITIATE NECESSARY

STEPS TO:

DEVELOP EDUCATIONAL PROGRAMMES

PROMOTE TIMELY DISSEMINATION OF ACCURATE INFO TO THE PUBLIC

TRAIN OFFICERS AND DEVELOP TRAINING MATERIALS

COMPILE AND DISSEMINATE A USER GUIDE IN THE OFFICIAL LANGUAGE

PUBLICISE NAMES, DESIGNATION , POSTAL ADDRESS AND CONTACT DETAILS OF PUBLIC INFORMATION OFFICERS, FEES TO BE PAID, REMEDIAL CLAUSES ETC.,

RIGHT TO KNOW LAWS - OSHA

TITLE 28

LABOR AND LABOR RELATIONS

CHAPTER 28-21

HAZARDOUS SUBSTANCES RIGHT-TO-KNOW ACT

SECTION 28-21-1 DUTY OF EMPLOYER

AN EMPLOYER WHO USES, TRANSPORTS, STORES, OR OTHERWISE EXPOSES ITS EMPLOYEES TO TOXIC OR HAZARDOUS SUBSTANCES SHALL OBTAIN, MAINTAIN, AND MAKE AVAILABLE IN EACH WORKPLACE A LIST OF ALL HAZARDOUS SUBSTANCES TO WHICH EMPLOYEES ARE OR MAY BE EXPOSED.

THE LISTS OF ALL HAZARDOUS SUBSTANCES SHALL BE READILY AVAILABLE TO EMPLOYEES FOR EXAMINATION DURING ALL HOURS OF OPERATION

SECTION 28-21-5 FIRE SAFETY

(a) An employer shall provide to the person responsible for the administration and direction of a fire department in a fire district or municipality, including a fire chief or fire administrator, or that person's designee:

A list of work areas, sufficiently identified by name and location, where designated substances are present, containing the chemical and common name of each substance regularly present;

Upon request, material safety data sheets for each hazardous or toxic substance included in this list.

(b) The person responsible for the administration and direction of a fire department in a fire district or municipality, including a fire chief or fire administrator or that person's designee, shall maintain the information provided by the employer under subsection (a) of this section and shall provide copies of this information:

(c) Currently conducted fire safety inspections may include, at the discretion of the fire chief or the inspector, compliance with the employer notice requirements of this chapter as enumerated in § 28-21-3(a).

SECTION 28-21-8 EMPLOYEE RIGHTS

REFUSING TO WORK

DISCIPLINE, DISCRIMINATION PROHIBITED

WAIVERS PROHIBITED

REMEDIES AND COMPLAINT PROCEDURE FOR EMPLOYEES

IN ADDITION TO BUT NOT IN LIEU OF THE ACTION IN PARAGRAPH (I) OF THIS SUBDIVISION, ANY EMPLOYEE MAY COMMENCE ANY ACTION IN ANY APPROPRIATE COURT OF LAW TO ENFORCE ANY OBLIGATION, DUTY, OR RESPONSIBILITY IMPOSED UPON HIM OR HER OR THE EMPLOYER UNDER THE PROVISIONS OF THIS CHAPTER.

SECTION 28-21-9 TRAINING AND EDUCATION PROGRAM

EACH EMPLOYER SHALL PROVIDE AN EMPLOYEE TRAINING AND EDUCATION PROGRAM PRIOR TO AN EMPLOYEE'S INITIAL ASSIGNMENT DESIGNED TO INFORM EMPLOYEE(S) ABOUT THE DESIGNATED SUBSTANCES TO WHICH THEY ARE EXPOSED.

THIS TRAINING SHALL BE REPEATED ANNUALLY

28-21-10 TRADE SECRETS

(a) A MANUFACTURER OR EMPLOYER MAY WITHHOLD THE PRECISE CHEMICAL NAME OF A CHEMICAL IF:

(1) THE MANUFACTURER OR EMPLOYER CAN SUBSTANTIATE TO THE DEPARTMENT OF LABOR AND TRAINING THAT IT IS A TRADE SECRET

(2) THE CHEMICAL IS NOT A CARCINOGEN, MUTAGEN, OR TERATOGEN AS PUBLISHED IN OSHA REGULATIONS

(3) THE CHEMICAL IS IDENTIFIED BY A GENERIC CHEMICAL CLASSIFICATION THAT WOULD PROVIDE USEFUL INFORMATION TO A HEALTH PROFESSIONAL

(4) ALL OTHER INFORMATION ON THE PROPERTIES AND EFFECTS OF THE CHEMICAL REQUIRED BY THIS CHAPTER IS CONTAINED IN THE MATERIAL SAFETY DATA SHEET

(5) THE MATERIAL SAFETY DATA SHEET INDICATES WHICH CATEGORY OF INFORMATION IS BEING WITHHELD ON TRADE SECRET GROUNDS; AND

(6) IN ANY EVENT, THE WITHHELD INFORMATION IS PROVIDED ON A CONFIDENTIAL BASIS TO A TREATING PHYSICIAN WHO STATES IN WRITING, EXCEPT IN AN EMERGENCY SITUATION, THAT A PATIENT'S HEALTH PROBLEMS MAY BE THE RESULT OF OCCUPATIONAL EXPOSURE.

ACCIDENTS

Figure 1.3 ACCIDENT



ACCIDENT IS AN UNPLANNED, UNWANTED AND AN UNDESIREDD EVENT.

ACCIDENTS OCCUR WHEN HAZARDS ESCAPE DETECTIN DURING PREVENTIVE MEASURES

JOB OR SAFETY PROCESS ANALYSIS HAZARDS ARE NOT OBVIOUS COMBINATIONS OF CIRCUMSTANCES THAT WERE DIFFICULT TO FORESEE SERIOUS AND NON-SERIOUS ACCIDENTS.

GENERAL CAUSES OF ACCIDENTS :

- INADEQUATE MAINTENANCE
- POORLY DESIGNED EQUIPMENT
- UNTRAINED EMPLOYEES
- LACK OF POLICY ENFORCEMENT OR STANDARD PROCEDURES
- SAFETY ENGINEER'S RESPONSIBILITY

MECHANICAL FAILURE DUE IMPROPER TOOL OR EQUIPMENT DESIGN, SIZE OR APPLICATION

HEALTH FACTORS, PHYSICAL LIMITATIONS OR PHYSICAL INCOMPATIBILITY WITH THE JOB

MENTAL INABILITY TO PERFORM THE JOB

LACK OR MISUSE OF SAFETY EQUIPMENT OR INCORRECT SPECIFICATIONS FOR VARIOUS DEVICES

INADEQUATE ERGONOMIC DESIGN

PHYSICAL STRESS INDUCED BY WORKING IN HIGH NOISE ENVIRONS, PROLONGED TEMPERATURE EXTREMES AND LABOUR FATIGUE CONDITIONS

POORLY ORCHESTRATED (PLANNED) DOWNSIZING OR EXPANSION

LACK OF SUFFICIENT HUMILITY ON THE PART OF MANAGEMENT

GLOOMINESS IN THE WORK PLACE

INADEQUATE OPERATIONAL CONTROLS

LACK OF MANAGEMENT SUPPORT

LACK OF PERSONAL JOB FULFILLMENT

LACK OF SHARED SAFETY RESPONSIBILITY

INADEQUATE HIRING STRATEGIES

INADEQUATE OR INEFFECTIVE TRAINING

SLEEP DEFICIT AND SHIFT

MISCELLANEOUS CAUSES

LUCK

CARELESSNESS

UNCLEAN LIVING & THE CONSEQUENCES OF SIN

STUPID EMPLOYEES OR UNCARING MANAGEMENT

BAD ATTITUDES FROM MANAGEMENT AND EMPLOYEES

INSUFFICIENT REGULATION OR TOO MUCH REGULATION

ACCIDENT INVESTIGATION :

REASONS TO INVESTIGATE:

TO FIND OUT CAUSE OF ACCIDENTS

TO PREVENT SIMILAR ACCIDENTS IN FUTURE

TO FULFILL ANY LEGAL REQUIREMENTS

TO DETERMINE THE COST OF AN ACCIDENT

TO ASSESS THE COMPLIANCE WITH APPLICABLE SAFETY REGULATIONS

TO PROCESS WORKERS' COMPENSATION CLAIMS.

TO IDENTIFY PREVIOUSLY OVERLOOKED PHYSICAL, ENVIRONMENTAL, ADMINISTRATIVE OR PROCESS HAZARDS

TO ASSESS THE NEED FOR NEW OR EXTENSIVE SAFETY TRAINING

TO PREVENT UNSAFE WORK PRACTICES

THE DEPTH AND COMPLEXITY MAY VARY WITH THE CIRCUMSTANCES AND SERIOUSNESS OF THE ACCIDENT.

INVESTIGATION APPROACH:

FORM AN INVESTIGATION TEAM

TAKE CONTROL OF THE ACCIDENT SITE / PLACE / AREA

DEAL WITH THE EMERGENCY

CONDUCT THE POST ACCIDENT INVESTIGATION

RECORD THE INFORMATION, DETAILS AND ACCOUNTS BY THE EYE

WITNESSES AND WORKERS INVOLVED IN THE ACCIDENT

ANALYSE THE DATA GATHERED

IDENTIFY THE CAUSE/S OF THE SUGGEST THE CORRECTIVE MEASURES

RECOMMEND CONSTRUCTIVE SUGGESTIONS

FINALIZE THE REPORT AND SUBMIT.

WHO SHOULD DO THE INVESTIGATION?

SOME ONE EXPERIENCED IN

ACCIDENT CAUSATION

INVESTIGATIVE TECHNIQUES

FULLY KNOWLEDGEABLE WITH THE WORK PROCESSES and PROCEDURES

INVESTIGATION TEAM:

EMPLOYEES WITH THE KNOWLEDGE OF THE WORK

SAFETY OFFICER

HEALTH AND SAFETY COMMITTEE

UNION REPRESENTATIVE

OUTSIDE EXPERT

REPRESENTATIVE FROM LOCAL GOVERNMENT

EMPLOYEES WITH EXPERIENCE IN INVESTIGATIONS

INVESTIGATION STEPS:

REPORT THE OCCURRENCE TO A DESIGNATED PERSON WITHIN ORGANIZATION

PROVIDE FIRST AID AND MEDICAL CARE TO INJURED PERSONS

PREVENT FURTHER INJURIES OR DAMAGE

INVESTIGATE THE ACCIDENT

IDENTIFY THE CAUSES

REPORT THE FINDINGS

DEVELOP A CORRECTIVE ACTION PLAN

IMPLEMENT THE PLAN

EVALUATE THE EFFECTIVENESS OF THE PLAN

MODIFY, MAKE CHANGES FOR CONTINUOUS IMPROVEMENT

COLLECTION OF FACTS :

INJURED WORKERS

PHYSICAL EVIDENCE – POSITION OF INJURED WORKERS, EQUIPMENT BEING USED, MATERIALS OR CHEMICALS, SAFETY DEVICES IN USE, DAMAGE TO EQUIPMENT, HOUSE KEEPING, WEATHER, TIMING ETC.,

EYE WITNESS'S ACCOUNTS

INTERVIEWING

BACKGROUND INFORMATION

INVESTIGATION ANALYSIS :

INVESTIGATORS GATHER INFORMATION, DETAILS, ANALYSE IT, DRAW CONCLUSIONS AND MAKE RECOMMENDATIONS

WRITE DOWN STEP BY STEP ACCONT OF WHAT HAPPENED

SUPPORT IT BY EVIDENCES

BE CLEAR ON EVIDENCES (DIRECT, OR EYE WITNESS, ASSUMPTION ETC.,)

RECOMMENDATIONS :

MOST IMPORTANT & FINAL STEP

SHOULD BE SPECIFIC

SHOULD BE CONSTRUCTIVE

SHOULD GET AT ROOT CAUSES

IDENTIFY CONTRIBUTING FACTORS

FOLLOW - UP ACTION :

RESPOND TO THE RECOMMENDATIONS IN THE REPORT

DEVELOP A TIME SCHEDULE FOR CORRECTIVE ACTIONS

MONITOR ACTION PLAN IMPLEMENTATION

CHECK THE CONDITION OF INJURED WORKERS

INFORM & TRAIN OTHER WORKERS AT RISK

RE-ORIENT WORKERS UPON THEIR RETURN

INVESTIGATIVE QUESTIONS :

MUST BE SIMPLE AND STRAIGHT FORWARD

SHOULD NOT HURT THE EMPLOYEE OR THE EMPLOYER

MUST GET THE SIMPLE ANSWERS

MUST BE DECENT AND DIPLOMATIC

MUST NOT PROVOCATE ANYBODY

ROLES & RESPONSIBILITIES OF INVESTIGATION TEAM :

DEPARTMENT / SECTION / DIVISION

ENSURE INVESTIGATION OF ACCIDENTS

ENSURE CORRECTIVE ACTIONS ARE TAKEN

SUPERVISORS

Gallery 1.1 Accident causes



PARTICIPATE IN INCIDENT INVESTIGATIONS

TAKE CORRECTIVE

INVESTIGATE ACCIDENTS PROMPTLY

ISSUE ACCIDENT INVESTIGATION REPORTS

Interactive 1.1 Accident causes



PROVIDE TRAINING IN INVESTIGATION METHODS AND TECHNIQUES WHEN NEEDED

INDIVIDUAL Should COOPERATE DURING INVESTIGATIONS WITH SUPERVISORS AND INVESTIGATING TEAM

Gallery 1.2 SAFETY PICS



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Movie 1.1 ACCIDENT VIDEO Review 1.1 Accident questions



- A. Engineering
- B. Facilities
- C. Logistics
- D. Research and Design

Check Answer



Accident

AN UNPLANNED AND UNDESIRABLE EVENT

Related Glossary Terms

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Index

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Risk

CHANCE OR PROBABILITY OR LIKELINESS OF THE OCCURRENCE OF AN ACCIDENT

THE CHANCE OF DAMAGE CONSEQUENCE OF AN ACCIDENT

Related Glossary Terms

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