UNIT 4

SAFETY, RESPONSIBILITIES AND RIGHTS

4.1. INTRODUCTION

Safety has different connotations. A product or a project is safe, with respect to a person or a group, at a given time, if its risks were fully known, and if the risks are judged to be acceptable, in the light of settled perspectives. Safety is an objective as well as a subjective matter since most often value perspectives differ.

Many ethical problems and issues may come up during the career of an engineer. The most important aspect is safety. Engineering products and services must be safe for the consumer. This is a primary demand of the society and every individual consumer of such product and services. Whenever an engineering product is made, there are implementation. This brings in an element of risk. The product may not perform as expected and may result in harm or even failure. It would be extremely costly to deal with such a situation. Besides the economic damage, it may cause serious harm to the reputation and credibility of the company and deter future business. Safety is thus an important aspect of the engineering profession.

4.2. DEFINITIONS

Safety:

Safety means the state of being safe. Safe means protected from damages and harm. Not likely to cause or lead to damage, injury, loss etc.

An action is considered safe when the risks associated with it are known and are considered acceptable.

Risk:

The potential that something unwanted or harmful may occur. It is the possibility of meeting a danger or suffering harm or loss.

Hazard:

It is something than can be dangerous or cause damage. Something is hazardous if it has the potential to cause harm or ill effects.

4.3. THE CONCEPT OF SAFETY

"A thing is safe if its risks are judged to be acceptable". - William W.Lowrance.

Lowrance's definition in modified version is also given below.

"A thing is safe if, were its risks fully known, those risks would be judged acceptable in light of settled value principles. More fully, a thing is safe (to a certain degree) with respect to a given person or group at a given time if, were they fully aware of its risks and expressing their most settled values, they would judge those risks to be acceptable (to that certain degree).

The concept of safety and risk can be considered in three way.

(i) Underestimating the risk

(ii) Overestimating the risk

(iii)No estimation of risk.

Underestimating the risk

This is a very common occurrence in our country. Safety is not given prime consideration and great risks are taken. In many small construction sites in out country, temporary structures are placed arbitrarily without proper design. Temporary structures include scaffoldings and formworks used in construction.

The rickety bamboo poles and platforms prepared from not-so- strong wooden planks are an indication that we have under estimated the risks involved. Poles are not properly anchored on the ground and are tied with ropes that do not give a strong joint people work in very hazardous conditions on these scaffoldings.

Overestimating the risk

Some times, even if a product is comparatively safe and risks are less, some consumers may be over cautious or over consciousness about safety. Examples are, driving very slowly in normal traffic or avoiding a plane journey due to some air crashes that have taken place else where is the world.

No estimation of risk

A third situation may be where a group of people do no think of the risk at all. For them, being safe and unsafe does not matter. They simply do not make any judgment of risks. For example, a group of people crossing a stream in ankle deep water may not be aware of any dangers involved. A flash flood could come any sweep away many of them, who later die. According to the group, the activity under taken by them is neither safe nor unsafe.

Relative Safety

Relative safety is an expression of risk, when the alternatives are compared among themselves as regards to their safety. For example, stating airplane travel is safer than car travel and car travel is safer that travelling in a bike.

4.4. RISK

A risk is the potential that something unwanted and harmful may occur. We take a risk when we undertake something or use a product or substance that is not safe. Rowe refers to the "Potential for the realization of unwanted consequences from impeding events". Thus a future, possible, occurrence of harm is postulated.

Risk, like harm, is a broad concept covering many different types of unwanted occurrences. In regard to technology, it can equally well include dangers of bodily harm, of economic loss, or of environmental degradation.

These-in-turn can be caused by delayed job completion, faulty products or systems, and economically, faulty products or systems, and economically or environmentally injurious solutions to technological problems.

Probability of safety = 1- Probability of risk

Risk = Probability of a failure event **x** Severity resulting the failure **x** Probability based on frequency of failure

Threshold risk level

Some kinds of risk have threshold levels. The harmful effect due to noise pollution has a threshold level. Exposure to chemical fumes also has a threshold level. Exposure to nuclear radiation is harmful beyond a certain level. While designing for safety to avoid risks of this kind, one should keep in mind the threshold levels of the risk. One needs to ensure that the risk is well below the threshold level.

How safe should be for a product or service? It must be clear that nothing can be made to be absolutely safe and it is impossible to guarantee hundred percent safety in any product. Such a level of safety is neither attainable nor practicable. However, the design for safety is a must in engineering products.

The degree of safety proposed to be attained varies with the product, perception, and the cost of risk involved. An aircraft is designed with a much greater level of safety than an automobile. A manned space vehicle has much more safety features than an unmanned vehicle because the cost of human life is higher than the cost of material things life the

spacecraft. In addition, many standby systems are designed and incorporated to increase safety.

4.5. ENGINEERS AND SAFETY

As safety is an essential aspect for engineers, the following five criteria must be met to ensure a safe design. They are

1. Designs must comply with applicable laws.
2. Acceptable design must meet the standard acceptable practices.
3. Alternative designs that are potentially safe must be explored.
4. The engineer must attempt to foresee any potential misuse of the product by the consumer and must design to avoid their problems.
5. Once the product is designed, prototypes as well as the final product must be tested not only with reference to the technical specifications but also for safety.

4.6. DESIGNING FOR SAFETY

The steps involved in safe design are as follows:

1. Define the problem. This step includes determining needs and requirements, determining constraints and also the issues of safety in the product definition and specification.
2. Generate alternative solutions, creating multiple alternative designs.
3. Analyse each design with reference to pros and cons.
4. Determine whether the solutions solve the problem.
5. Test all alternatives.
6. Select the best alternative. In assessing the best alternative, safety considerations must be paramount alternative, safety considerations must be paramount and one should have relatively higher weightage than other issues.
7. Implement the chosen design.

4.7. PRODUCT SAFETY

Product suppliers and manufacturers have an obligation to ensure that only safe products are marketed. This can be done by providing clear instructions for use, including

✓ Warnings about possible misuse

- ✓ being aware of and meeting industry and mandatory standards.
- ✓ Developing product recall plans and procedures including effective communication strategies to the public (advertisements in media)
- ✓ Incorporating safety in product design.
- ✓ Developing appropriate safety standards through product improvement.
- ✓ Implementing a quality assurance programme, which includes consumer feedback.
- ✓ Responding quickly to safety concerns that arise.

4.8. RISK ANALYSIS

4.8.1. Analytical Methods

Several analytical methods are adopted in testing for safety of a product/project.

1. Scenario Analysis

This is the most common method of analysis, in which one starts from a given event, then studies the different consequences that might evolve from it. A scenario is a synopsis of events or conditions leading to an accident and subsequent loss. Scenarios may be specified informally, in the form of narrative, or formally using diagrams and flowcharts.

2. Failure Mode and Effect Analysis

The failure mode and effect analysis, systematically examines the failure modes of each component, without, however, focusing on causes or relationships among the elements of a complex system. FMEA is one of the qualitative tools, which support proactive quality strategies. Implementation of FEMA requires relevant knowledge and insight as well as engineering judgment. It defines, identifies and plans the actions that could eliminate or reduce the chance of occurrence of these potential failures. In a table format, it records all the possible failure modes and establishes the priorities based on expected failures and severity of these failures and help uncover over sights, misjudgments and errors that may have been made. In short FMEA is a cross functional team management.

3. Fault Tree Analysis

This is a qualitative method and was originated by Bell Telephones. It is technology based deductive logic. The failure is initially defined and the events leading to that failure are identified at different component level. This method can combine hardware failures and human failures.

4. Event Tree Analysis

The reverse of the fault tree analysis is the event tree analysis. This method illustrates the sequence of out comes which may arise after the occurrence of selected initial event. This method uses inductive logic. It is mainly used for consequence analysis and in identifying the potential hazardous existing situation in the system. It allows the observer to proceed forward in time from potential component failures to final accident.

4.8.2. Cost Analysis

A quantitative risk analysis is made on (1) Primary cost: the loss of human lives, or property, crops, and natural resources are estimated, and (2) Secondary Costs: the loss of human capability or loss of earning capacity cost of treatment and rehabilitation, damage to the property etc are estimated.

4.9. RISK - BENEFIT ANALYSIS

While designing an engineering product, the risks are to be estimated. The costing of risks is a difficult job but has to be done to compare it with the benefits of the product, especially in the case of big projects. The comparison of risks and benefits is done using risk - benefit analysis. Many large projects are justified on the basis of risk - benefit analysis.

The major reasons for the analysis of the risk benefit are:

1. To know risks and benefits and weigh them each.
2. To decide on designs, advisability of product/project.
3. To suggest and modify the design so that the risks are eliminated or reduced.

Both risk and benefits are also probabilities. They have to be factored by the probability of their occurrence. Thus, risk - benefit analysis is not a simple task. It is only when the gains out weigh the risks that the product is considered fit for implementation.

Hence the primary questions to be asked before initiating the risk- benefit analysis are.

- ✓ Is the product/project worth applying the risk benefit analysis?
- ✓ What types and extent of risks involved ?
- ✓ Who are affected by the risk?
- ✓ Who are benefited by the project?

✓ What are the benefits involved ?

✓ Do risks overweigh the benefits ?

4.9.1. Reducing Risk (or) Improving Safety

The various methods adopted to reduce the risks (or improve safety) in a product/project are listed below:

1. Application of inherent safety concept in design, e.g. LPG cylinder is provided with frame to protect the valve while handling and facilitate cryogenic storage. A magnetic door catch provides an easy escape for children caught inside the refrigerator accidently.
2. Use of redundancy principle in the instrument protection. For example use of stand-bye systems and back-up storage for computer.
3. Regular inspection and testing of safety systems to ensure their reliability. For example fire extinguishes in buildings, earthing in electrical systems are checked periodically.
4. Training of operating personnel and issue of operation manuals.
5. Conducting regular safety audits to ensure that the procedures are understood, followed and the systems are kept in working condition.
6. Development of well-designed emergency evacuation plan and regular rehearsal/drills to ensure preparedness, in case of emergency.

4.9.2. Risk Benefit Value Function

The difference in perception of probable gain and probable loss is shown in figure 4.1. The typical risk-benefit value function shown there drops more steeply on the loss portion than it rises on the gain portion. We have included a loss side threshold on this graph. The threshold is ascribable to the human habit of ignoring smaller hazards in order to avoid aniexty overload; it means that no value is attached to a first, small amount of loss or that no effort is expended to overcome the loss. The threshold on the gain side is to account for normal human inertia and a certain amount of inherent generosity that often restrain people in how they set about seeking their own gain.

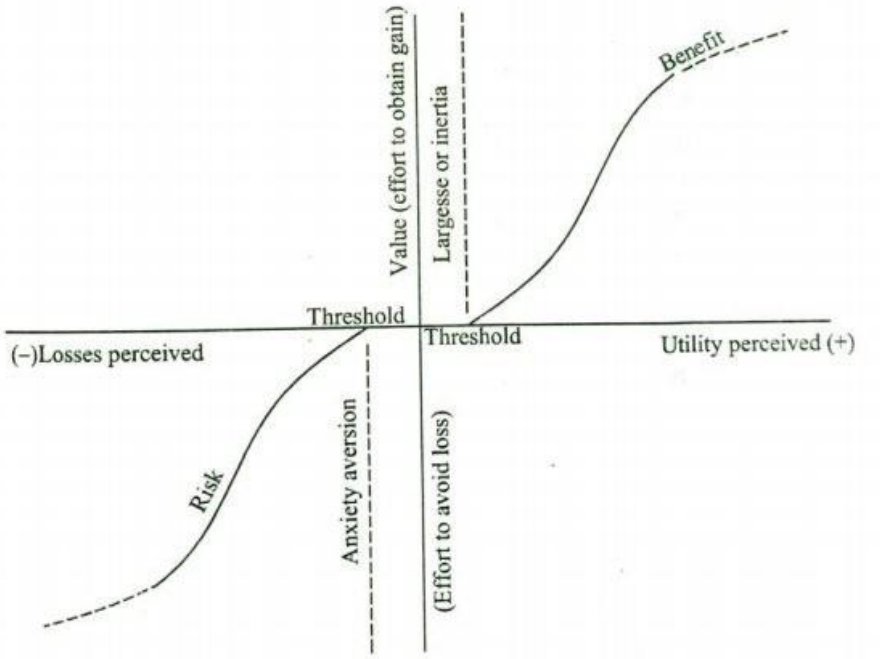

Figure 4.1 Typical risk-benefit value function

The thresholds are significant because they remind us that different tolerances for specific conditions. Some one with a respiratory illness, will react to the smallest amount of air pollution; thus, the threshold for pollution is near zero for that person. An entire population living near an oil refinery, however, will have a fairly high tolerance (a large threshold) as far as automobile emissions alone are concerned.

4.10. SAFE EXIT

A product cannot turn to be 100% safe and at some stage or other during its working life, it may fail and become hazardous. In such a situation, another safety requirement comes into play is that the product has to be abandoned safely or the persons near it should safely escape. This is called safe exit and this aspect of safe exit has to be incorporated in the design of the product itself. If the malfunction of a system or component can lead to injuries, death and other serious consequences, such a system must be equipped with safe exists.

1. The product, when it fails, should fail safely.
2. The product, when it fails, can be abandoned safely (it does not harm others by explosion or radiation).
3. The user can safely escape the product.

For example

1. Emergency exit in buses, trains etc.
2. Ships need sufficient number of lifeboats for all passengers and creus.

3. Multi-storeyed buildings need usable fire escapes.

4.11. TYPES OF RISKS

4.11.1. Voluntary and Involuntary Risks

Voluntary risk is the involvement of people in risky actions willingly, although they know that these actions for thrill, amusement and fun.

Involuntary risks are due to natural calamity, pollution due to noise or chemicals, thermal and electromagnetic radiation, electric shock etc. people are exposed to risk involuntarily.

4.11.2. Personal Risk

Given sufficient information, an individual is able to decide whether to participate in a risky activity. Study indicates that individuals are more ready to accept voluntary risks than the involuntary risks. Examples for personal risks are

- ✓ A person working in a nuclear power plant.
- ✓ A contract labour working in a fire works factory.

4.11.3. Public Risk

Assessing the public risk is relatively easy, as in the societal value system the cost of disability can be averaged out. For example, the U.S. National Safety Council 1 adopts an equivalent of 6000 days (16.42 years), for death, as per the personal value system for social costs of disability.

To asses the public risk, the loss on the assets and the correction costs are estimated. For example,

- ✓ Loss of or reduction in future income or earning capacity due to loss of limbs or their capability.
- ✓ Costs associated with accident, which includes the transplantation or reinforcement of body parts/limbs, and medical treatment.
- ✓ Cost of welfare, which includes rehabilitation, provision of less- demanding alternate jobs, and other disability benefits.

4.11.4. Short Term Vs Long Term Consequences

Some unsafe conditions or accidents can causes short term injury or disability that exists for a short period of a few days or weeks such as headache, cough, sprain, fracture and fevel.

There are certain instances of environmental pollution due to leakage of gases, dust or smoke, radiations which cause long term illness or injury or disability that exist for several months and years, leading ultimately to death or dysfunction of organs, such as cancer, tuberculosis, heart failure and asthma.

4.11.5. Delayed Vs Immediate Risk

People consider an activity that will not have immediate impact on them as safer than that by which they would be affected immediately. For several years there has been a campaign against smoking and everyone is aware that it will increase chances of cancer at a later date. Still, some persons, including the youth, still smoke because the risk is delayed.

Immediate risks are due to fall in a slippery floor, fall from the ladder or crane, explosion, electric shock and accidents. The effects are felt immediately and cause injury or disability to pople.

4.11.6. Inherent Risk Vs Residual Risk

Inherent risk is the risk that an activity would pose if no controls or other mitigating factors were in place (the gross risk or risk before controls). Inherent risk is expressed as a product of cost and threat.

Residual risk is the risk that remains after controls are taken into account. The residual risk is expressed as the product of cost, threat and vulnerability (preventive, detective and corrective controls).

4.12. CASE STUDY

4.12.1. Three Mile Island Accident

The Three Mile Island case refers to an accident at the Three Mile Island nuclear power generation station near Harrisburgh in Pennsylvania. The plant was owned and operated by General Public Utilities and the Metropolitan Edison Company. The power plant used a pressurized water reactor manufactured by Babcock and Wilcox. The accident took place due to a partial core meltdown in Unit 2, a pressurized water reactor. The accident was the most serious in the US commercial nuclear power plant operating history, even though it led to no deaths, injuries to plant workers, or members of the nearby community.

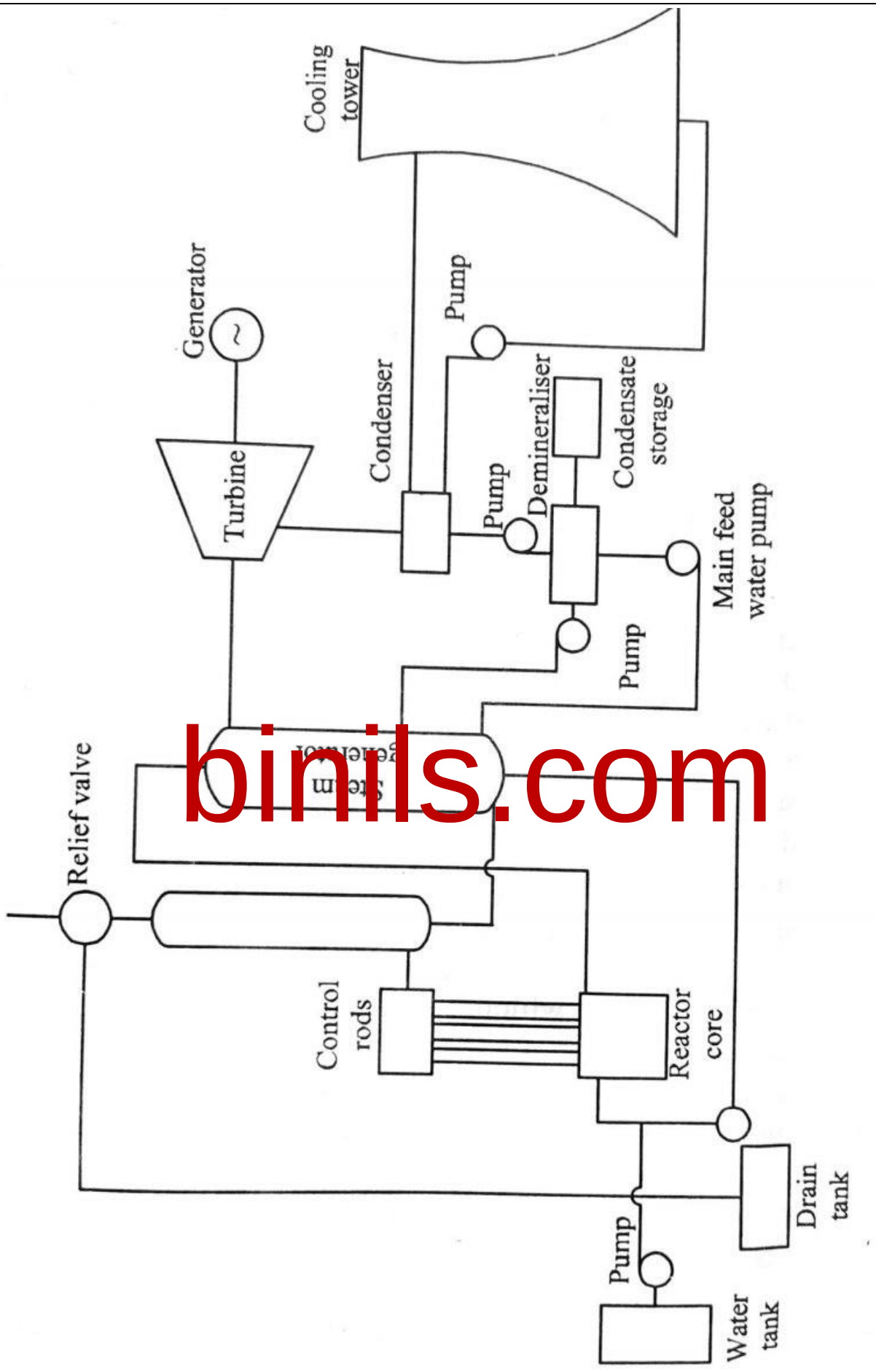

Figure 4.2 shows the system components of Three Mile Island nuclear power plant Unit 2

The accident began about 4,00 AM on 28 March 1979, when the plant experienced a failure in the secondary, non-nuclear section of the plant. The main feed water pumps stopped running, caused by either a mechanical or electrical failure, which prevented the steam generators from removing heat. First the turbine, then the react of, automatically shut down. Immediately, the pressure in the primary system began to increase. In order to prevent that pressure from becoming excessive, the pilot - operated relief valve opened. The valve should have closed when the pressure decreased by a certain amount, but it did not, signals available to the operator failed to show that the valve was still open. As a result, cooling water poured out of the stuck-open valve and caused the core of the reactor to overheat.

As coolant flowed from the core through the pressurizes, the instruments available to reactor operators provided confusing information. There was no instrument that showed the level of coolant in the core. Instead, the operators judged the level of water in the core by the level in the pressurizes, and since it was high, they assumed that the core was properly covered with coolant. In addition, there was no clear signal that the pilot - operated relief valve was open. As a result, as alarms rang and warning lights flashed, the operators did not realize that the plant was experiencing a loss of coolant accident. They took a series of actions that made conditions worse by simply reducing the flow of coolant through the core.

Since adequate cooling was not available, the nuclear fuel overheated to the point at which the zirconium cladding (the long metal tubes which hold the nuclear fuel pellets) ruptured and the fuel pellets began to melt. It was later found that about one half of the core melted during the early stages of the accident. Although the TMI -2 plant suffered a severe core melt down, the most dangerous king of nuclear power accident, it did not produce the worst-case effects that reactor experts has long feared. The chemical reaction between steam and the zinc alloy fuel elements produced hydrogen and the hydrogen accumulated caused explosion of the structure. After 13 hours and half, the reactor was put under control. Three Mile Island was a financial disaster.

Conclusion

- ✓ The operators were unable to diagnose or respond properly to the unplanned automatic shut down of the disaster.
- ✓ Deficient control room instrumentation.
- ✓ There was no senior engineer available at the size to take action during an emergency.

- ✓ The training given to the operators was also inadequate, as the action taken by them worsened the condition rather than mitigating it.
- ✓ The loss of coolant and overheating led to the melting of the fuel pellets. This could have resulted in a very serious accident but that did not happen in this particular case. The radiation release was not in very quantities and this reduced the impact of the accident.

4.12.2. Chernobyl Disaster

The Chernobyl disaster was an accident associated with a nuclear power plant near Kiev at USSR. With the planned additions of Units 5 and 6, for which foundation work was under way, the site would be the world's second largest power plant with an output of 6000 MW. The accident occurred at reactor number 4 at the Chernobyl plant, near the town of Pipriyat. At the time of the accident, a system test was being performed. The accident occurred due to a sudden surge in output, which was aggravated by an emergency shutdown effort. This resulted in a further hike in power output, leading to a rupture of the reactor vessel. A series of explosions took place.

The reactors were of a type called RBMK; they are graphite moderated and use boiling water pressure tube. On 25 April 1986, a test was under way on reactor 4 to determine how long the mechanical inertia of the turbine - generator's rotating mass could keep the generator turning and producing electric power after the steam supply was shut off.

This was of interest because reactor coolant pumps and other vital electric machinery have to continue functioning though the generators may have had to be disconnected suddenly from a malfunctioning power grid. Special diesel generators will eventually start to provide emergency power for the plant, but diesel units cannot always be relied on to come up promptly. This test was undertaken as part of a scheduled plant shut down for general maintenance purposes.

It requires 3600 MW of thermal power in the RBMK reactor to produce 1200 MW at the generator output. Unit 4 had been gradually reduced from 3200 MW to 1600 MW and was to be slowly taken down to between 1000 and 700 MW, but at 2 PM the power dispatch controller at Kiev requested that output be maintained to satisfy an unexpected demand. This means a postponement of the test. In preparation for the test the reactor operators had disconnected the emergency core cooling system so its power consumption would not affect the test results. This was to be the first of many safety violations. Another error occurred when a control device was not properly reprogrammed to maintain power at the 700–1000 MW level. When at 11 PM the plant was

authorized to reduce power, its output dropped all the way to 30 MW, where the reactor is difficult to control. Instead of shutting down the reactor, the operators tried to keep the test going by raising the control rods to increase power. Instead of leaving fifteen controls inserted as required, the operators raised almost all control rods because at the low power level the fuel had become poisoned by a build up of Xenon -135,. Which absorbs neutrons.

The power output stayed steady at 200 MW still below what the test called for-but the test continued. In accordance with the test protocol, two additional circulating pumps were turned on to join the six already in operation. Under normal levels of power output this would have contributed to the safety of the reactor, but at 200 MW it required many adjustments to maintain the balance of steam and water.

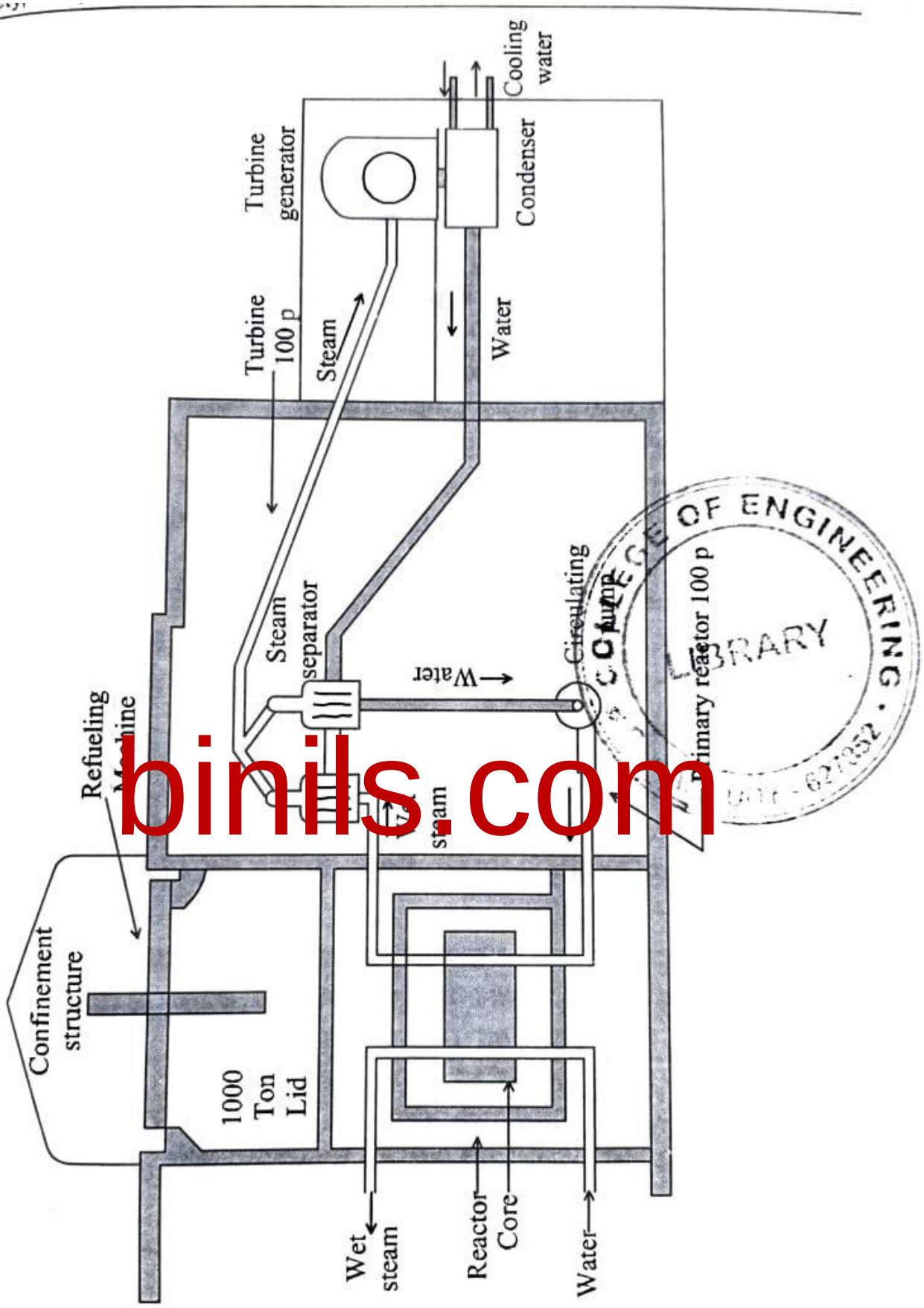

Figure 4.3 shows the schematic diagram of reactor 4 at Chernobyl

In addition, the operators at this point recognized that because of the instabilities in this reactor and the way xenon poisoning builds up, once the reactor is shut down, they would have to wait a long time before starting it up again. So deciding to proceed with the test, the operators blocked the emergency signals and automatic shutdown controls because they would have activated on removal of the electrical load.

This left the reactor in a precarious position. The reactor was now running free, isolated from the outside world, its control rods out, and its safety system disconnected. At 1.23 AM the test began. When the steam Valves were closed its load was effectively removed, the reactor's power and temperature rose sharply. The reactor core melted and due to the hydrogen accumulation, the reactor caught fire and the radioactive waste began to spread out.

Conclusion

- ✓ When test conditions could not be achieved, the test was not aborted or rescheduled. It was decided to proceed with the experiment even though the test conditions would not have given satisfactory results.
- ✓ When the shift during which the test was to be conducted was changed, no attempt was made to brief the new set of operators about the test and the procedure. The set of operators who has been briefed about the test were not available at the time of the test.
- ✓ Lack of operator training to deal with emergency situations was evident from the sequence of events.
- ✓ Later analysis showed design faults in the reactor and its components.
- ✓ The response system and flow of information was not adequate for a tragedy of such magnitude. There was massive evacuation of people and their rehabilitation.
- ✓ The Chernobyl reactor continued to operate for a long time even after the tragedy, despite knowledge of the potential dangers in its operation.

4.13. COLLEGIALITY

Collegiality is the tendency to support and cooperate with the colleagues. It is a virtue essential for the team work to be effective.

Craig Ihara offers the following definition:

"Collegiality is a kind of connectedness grounded in respect for professional expertise and in a commitment to the goals and values of the profession, and as such,

collegiality includes a disposition to support and cooperate with one's colleagues". In other words, the central elements of collegiality are respect, commitment connectedness, and cooperation.

Respect is valuing one's peers for their professional expertise and their devotion to the social goods promoted by the profession. In the case of engineering this means affirming the worth of other engineering engaged in producing socially useful and safe products. Like friendship, collegial respect ought to be reciprocal, but unlike friendship it need not involve personal affection.

Commitment means sharing a devotion to the moral ideals inherent in the practice of engineering. Even where there is a fierce competition among professionals working for rival profit making corporations there should be a sense that other engineers share a concern for the overall good made possible through this competition. This is analogous to how members of competing teams in sports (ideally) maintain a sense of underlying valued beyond winning.

Connectedness is an awareness of being part of a cooperative undertaking created try shared commitments and expertise. It is more than acting in ways that show respect for peers. One must do so with an appropriate attitude of affirming peer 's' and with a sense of being united with them in an enterprise defined by common goals. This sense of unity with engineers evokes cooperation and mutual support.

4.14. LOYALTY

Loyalty is more than 'obligation' or 'duty', which are more specific. Obligation and duty are more 'formal responsibility' oriented. Their base is legal and positional. By contrast, loyalty is more a function of attitudes emotions and a sense of identity. People may note the job that do not like their employer, but they would still perform their duty as long as they are employs. Can they be automatically considered loyal? Which is a more desirable character attribute?

Loyalty is important to an employer and it would be expected of all employees when they work for him. A U.S. court gives the definition of loyalty thus: "we have read into every contract of employment and it is implied duty that an employee is to act solely for the benefit of his or her employer in all matters within the scope of employment".

Loyalty is exhibited in two senses, namely;

1. Agency Loyalty
2. Identification Loyalty

1. Agency Loyalty

Agency loyalty is acting to fulfill one's contractual duties to an employer. These duties are specified in terms of the particular tasks for one is paid, as well as the more general activities of cooperating with colleagues and following legitimate authority within the corporation. As its name implies, agency loyalty is entirely a matter of actions, whatever its motives.

2. Identification Loyalty

Identification loyalty, by constrast, has as much to do with attitudes, emotions, and a sense of personal identify as it does with action. It includes willingness to meet moral duties, with attachment, conviction, and trust with employer.

4.15. RESPECT FOR AUTHORITY

Authority is the right to command subordinates. Authority is the right to do something or to tell someone else what to do. Authority is the key to the managerial job. It principally consists of the right to decide and command subordinates. Authority empowers the superior to make a subordinate to do the work. Everybody in the organization from top to bottom level, posses some authority to secure co-operation from subordinates.

Lines of authority should be clearly established in the organization structure in order to avoid overlapping acts, omissions of acts etc.

Institutional Authority

Institutional authority is acquired, exercised, and defined within institutions. It may be defined as the institutional right given to a person to exercise power, to complete the task and force them to achieve their goals. Duties such as resource allocation, policy dissemination, recommendation, supervision, issue orders or directions on subordinates are vested to institutional authority. Managerial tasks, for example, may be to allocate money or other resources, to make policy decisions or recommendations, or to oversee projects and issue directives to subordinates on particular topics. In order to enable managers to meet these duties, organizations assign them the requisite authority. Project engineers, for example, have the institutional duty to ensure that the projects they supervise are successfully completed, and they are given the institutional rights or authority necessary to carry out this duty.

Expert Authority

A part from institutional authority, there is an authority because of the knowledge and expertise. Expert authority is the possession of specialist knowledge, skill or competence to perform some task or to give sound advice. It is also known as 'authority of leadership'. These experts direct others in effective manner, e.g., advisers, experts and consultants are engaged in an organization for a specific term.

4.16. COLLECTIVE BARGAINING

Collective bargaining is a process, which is used by companies to solve interpersonal problems between them and their employees. It is the bargain by the trade union for improving the economic interests of the worker members. The process includes negotiation, threatening verbally, and declaration of strike. Collective bargaining assumes unionism. Every organization employing more than 20 persons could have a union. In some organizations, they have a single union. More than one is also permitted. Unions are formed to take care of the interests of employees. They have lot of bargaining power due to size. Unions can often prevent unethical acts of the employers. They give job security and protection against ill treatment.

The collective bargaining process requires

- ✓ A clear goal and time bound programme.
- ✓ open conduct and transparency.
- ✓ Clear communication.
- ✓ Respect for the other's point of view.
- ✓ Patience.
- ✓ A win-win attitude.
- ✓ Build trust.
- ✓ Attack problems and not people.
- ✓ Tolerance and flexibility about the change for the benefit of all (most good for most people).

4.17. CONFIDENTIALITY

When a professional is employed in any organization, he/she is privy to a lot of information that may be treated confidential for various reasons. Keeping such information confidential is one of the responsibilities of a professional.

Confidentiality means keeping the information on the employer and clients, as secrets. It is one of the most important aspects of team work confidentiality implies that a communication is kept secret and will remain private.

In legal professions, it is a necessary that the defense lawyers must keep their client's information confidential, without which the opponent party is likely hold of the weak points and win the cases. Teachers are expected to keep personal information about their students confidential. Even in the medical profession, the patient's medical information must be kept a secret. This information may be shared and discussed with the near relatives freely, when their decision is important during treatment. In case of engineers, design and drawings, process charts etc. are to be kept confidential.

When employees shift or change jobs, it is important not to leak out confidential information. This means that confidentiality does not cease when employees change jobs. Thus the relationship of trust between employer and employee in regard to confidentiality continues beyond the formal period of employment.

Some of the types of information that should be kept confidential are

- ✓ Information about the unreleased products.
- ✓ Design procedure and formulas used.
- ✓ Test results and the data.
- ✓ Technical specifications and processes.
- ✓ Quality control procedures
- ✓ Informations related to business such as number of persons working on projects, the supplier's list, marketing strategies, production costs.

Types of confidential information

(i) Privileged information

This is the type of information where the access is available to only certain category of employees connected with specific assignments. It covers information that has not yet become public or widely known within an organization.

(ii) Proprietary information

Proprietary information is information that a company owns or is the proprietor of. It refers to a new knowledge established within the organization like an invention or process development that is under experimentation stage and can be legally protected from use by others.

(iii) Trade secrets

A trade secret can be virtually any type of information that has not become public and which an employer has taken steps to keep secret. It may be data about designs and technical processes, organization of plant facilities, quality control procedures, customer lists, business plans, and so on. Trade secrets are given limited legal protection against employee or contractor abuse.

(iv) Patents

Patents differ from trade secrets. Patents legally protect specific products from being manufactured and sold by competitors without the express permission of the patent holder. Thus, a patent holder has legally protected monopoly power. Trade secrets have no such protection. Patents are protected by statute laws passed in order to provide incentives for creativity by contrast, the legal protection accorded trade secrets is limited to upholding relationships of confidentiality and trust.

4.18. CONFLICTS OF INTEREST

A conflict of interest occurs when the employee pursues an interest other than his regular employment. Sometimes such an interest involves in serving some other professional role, like and engineer working in a company and also acting as a consultant to a competitor's company. In this case, he may not be able to fully meet his obligations to his regular employer, or sometimes, not even to his client. This is termed as a professional conflict of interest.

Professional conflicts of interest are situations where professionals have an interest which if pursued might keep them from meeting their obligations to their employers or clients.

A 'conflict of interest' is different from 'conflicting interests'. A student, for example, may have interests in excelling on four final exams. She knows, however, that there is time to study adequately for only three of them, and so she must choose which interest not to pursue. Or an investor may strongly desire to invest in two stocks but nave sufficient funds for investment in only one. In these cases 'conflicting interests' means a person has two or more desires that cannot all be satisfied given the circumstances. But there is no suggestion that it is morally wrong or problematic to try pursuing them all. By contrast, in professional conflicts of interest it is often physically or economically possible to pursue all of the conflicting interests, but it is morally problematic whether one should do so.

4.18.1. Types of Conflicts of Interest

1. Actual conflict of interest

This refers to the situation where the objectivity is lost in decision making, and the inability to discharge the duty to the employer. It is the result of weaker judgment and service. A civil engineer working in the public works department has a financial interest in a contracting company, which has submitted a bid for the construction of a bridge.

There may be a variety of outside interests. But the conflict arises when the outside interest influences or threatens the professional judgment in serving the employer or clients.

2. Apparent conflict of interest

Apparent conflict of interest decreases the confidence of the public in the objectivity and truthfulness of the professional services. An engineer is paid based on a percent of the cost of the design involved and there is no incentive for him to cut the costs. In this situation, it appears that the engineer makes the design more expensive in order to get larger percent of commission for him. This situation leads to doubting the engineer's interest and ability for professional judgment.

3. Potential conflict of interest

Potential conflicts of interest arise when there are no pre-set outside interests for the engineer but he is motivated by gifts or bribes to influence his professional judgment. This is called potential since the judgment is based on the receipt of the bribe.

4.18.2. Gifts and Bribes

A bribe a substantial amount of money or goods offered beyond a stated business contract with the aim of getting an advantage. Bribes are generally given in secret. Bribes are illegal or immoral because they threaten fairness in competitive situations.

Gifts are not bribes as along as they are small gratuities offered in the normal conduct of business. Often companies give gifts to selected employees of various government agencies they deal with or partners in trade. A gift is a bribe if you can't eat, drink or smoke it in a day.

The conflict arises when accepting large gifts from the suppliers. Bribe is different from a gift. Table 4.1 shows a comparison of the nature of bribe and gift.

Table 4.1. Comparison between bribe and gift

S.No	Bribe	Gift
1.	Made is secret	Made in open
2.	Given before	Given after
3.	Large amount	Small amount, articles of daily use
4.	Expect under favour	Expect a favour or thanking for a favour
5.	It will damage the good and reputation of the person and organization	No damage is involved

4.18.3. Moonlighting

It is a situation when a person is working as employee for two different companies in the sparse time. Moonlighting refers to the act of a person working in another company apart from his original company. The second one may be on part-time basis during the evenings. Because the person returns home from his second employment during late night hours, it is called moonlighting. This is very common in teachers or professional engineers teaching in institutions conducting evening courses, and sometimes in other companies as part time accountants, auditors etc. This type of moonlighting is not immoral as long as the part time job does not involve in working with competitors or in tasks that are detrimental to the full time employer. It is also said that moonlighting makes a person exhausted in general and he may not perform his full time job efficiently.

4.19. OCCUPATIONAL CRIMES

Occupational crimes are illegal acts made possible through ones lawful employment. It is the secretive violation of laws regulating work activities. They are illegal acts performed by professionals by using information and data that they gain as part of their employment for self-interest or profit. When committed by office workers or professionals, occupational crime is called "white - collar crime".

Many of these crimes are examples of conflicts of interest. They are motivated by personal greed, corporate ambitions, corruption and misguide by loyalty. Even the crime

to promote the interests of the employer, is an occupational crimes occur when a professional

- ✓ takes the opportunity of using official information for personal gains
- ✓ has knowledge that he/she provides to friends or relatives for making profits.
- ✓ uses such information and sells that information to others for making profits and financial or other gains for oneself.
- ✓ performs some illegal acts for making profits.

Some of the examples of occupational crime are

Industrial Espionage

Industrial espionage means industrial spying. Industrial espionage relates to stealing trade secrets or other information and selling it to another party for pecuniary benefits. This crime is mostly done on the instructions of some outsides, trying to get some secret information from the company, by bribing and using illegal services of few employees who have access to those confidential tiles. Now a days, such espionage has become easier due to the easy availability of CD, DVD, pen drive and computer chips, etc., because of their small size compared to the information stored in them. By nature the computer chips are very small and can be carried off easily. These crimes can also be done by physically passing on certain products or designs for easily duplication by the competitors. Employees of the original company involved in these activities may pass on the information through agents.

Price Fixing

Price Fixing by illegal means is a common practice. Suppliers from cartels and manipulate the prices. A tend is supposed to be a secret procedure to ensure that one pays a realistic price for the goods supplied. It this case, the contractors form a cartel, communicate with each other, and quote rates so that they are able to get better prices for the goods and make enormous profits. Communication between contractors who quote for a tender is illegal. The very tendering process is vitiated by this illegal act.

An agreement between participants on the same side in a market to buy or sell a product, service, or commodity only at a fixed price, or maintain the market conditions such that the price is maintained at a given level by controlling demand and supply is illegal.

In price fixing, the contractors

- ✓ form a cartel to discuss and decide the bid process.
- ✓ allocate bids to each one as per some criteria such as present market share.
- ✓ manipulate bids so that prices are quoted above the present market level to make reasonably high profits.
- ✓ form an agreement on the price to be quoted by each vendor for each of the works/items.

Bootlegging

Manufacturing, selling or transporting products that are prohibited by law, is called bootlegging. In engineering context, it refers to working on projects which are prohibited or not properly authorized.

Endangering Lives

Employers who expose their employees to hazards usually escape criminal penalities. Victims have the right to sue, but only to claim some monetary compensation. The asbestos industries in USA were responsible for lung diseases and caner. Between 1940 and 1979, over 27 million US workers were exposed to asbestos. More than 1 lakh worker died and many worker were affected with cancer.

Grease Payments

Grease payments are offered to facilitate business routines such as clearing the passage of goods through customs, check posts and getting faster processing or permits or licenses. These payments are relatively small compared to bribe.

Reverse Engineering

The development of computer chips is extremely competitive and fast moving. Due to advancements the products are out dated within two years because of the introduction of new chips.

However, the manufacture of computer chips is very expensive and hence reverse engineering is adopted. The competitor's product is identified and purchased from open market. Then it is broken down physically or by tests to identify the circuit diagram, design and other components. The details of the manufacturing process and technical specifications are developed and designed accordingly. The process may be immoral but not illegal, unless the duplicated product is given the original brand name and patent rights are violated. However, some companies, in order to avoid even the cost and labour

of this reverse engineering, simply try to procure the designs of leading industries by illegal ways.

Cyber Crimes

Cyber crimes are computer related crimes. Many nuisance activities and criminal acts are performed with computer systems. These unethical acts can cause loss of property and harassment.

4.20. PROFESSIONAL RIGHTS

Engineers have several types of moral rights, which fall into the sometimes overlapping categories of human, employee, contractual and professional rights. As human beings, engineers have fundamental rights to lively and free pursue their legitimate interests. In particular, they have a human right to pursue their work and not be unfairly discriminated against in employment on the basis of sex, race or age.

As employees, engineers have special rights, including institutional rights that arise from specific agreements in the employment contract. For example, there is the right to receive one's salary and other company benefits in return for performing one's duties.

Finally, engineers as professionals have special rights that arise from their professional role and obligations it involves. These include

- ✓ Right to form and express one's professional judgment freely.
- ✓ Right to refuse to carry out illegal and unethical activity.
- ✓ Right to talk publicly about one's work within bounds set by the confidentiality obligation.
- ✓ Right to engage in the activities of professional societies.
- ✓ Right to protect clients and the public from the dangers or harm that might arise from one's work.
- ✓ Right to professional recognition for one's services.
- ✓ Right to pursue higher studies and research.
- ✓ Right to whistle blowing.

4.20.1. Responsibilities of Professionals

Some key responsibilities of the professional are listed below.

- ✓ Be a global citizen and considering that we live and work in a global village.

- ✓ Be creative and innovative for your own benefits and for the benefit of the community.
- ✓ Make efforts to excel in anything that you do.
- ✓ Do not use your expertise and knowledge for illegal gains.
- ✓ Always keep the public good in mind.
- ✓ Continuously learn to make products and services better.
- ✓ Fight against corrupt elements in the profession and in the system.
- ✓ Know your rights and act upon them.
- ✓ Know professional standards from the professional societies.
- ✓ Understand the code of ethics of your profession.

4.21. EMPLOYEE RIGHTS

- ✓ You have a right to get a compensation package commensurate with your qualifications, experience and skills, as per industry norms or standards. Many times people are underpaid or under employed. You have a right to seek a job that matches your qualifications and get a remuneration package that corresponds to that.

- ✓ You have a right not to be discriminated against in the course of your benefits. There should be no discrimination based on sex, religion, caste, colour of skin etc.
- ✓ You have the rights conferred on you by the employment contract. You have the right to salaries and perks as per the norms of the organization. In addition, there are may other benefits that you may demand as paid leave and travel allowances.
- ✓ You have the right to pursue some outside activities that do not interfere with your work such as a hobby or other interests.
- ✓ You have a right to be a member of an organization of employees for collective bargaining for getting their just rights.

4.21.1. Whistle Blowing

The term whistle blowing comes from the field of sports where a whistle is blown when a player commits a foul. In ethics, a whistle is blown when something bad or unethical has happened. Whistle blowing thus, refers to the phenomenon when some one comes out with the information that something unethical has happened or is happened.

There are four main features of whistle blowing

(i) Act of disclosure

Information is intentionally conveyed outside approved organization channels or in situations where the person is conveying it is under pressure from supervisors or other not to do so.

(ii) Topic

The whistle blower believes that the information is about a significant problem for the organization or an organization with which the company does business. Examples of significant problems are criminal behaviour, unethical policies or practices, injustices to workers within the organization, and serious threats to public safety and well-being.

(iii) Agent

The person disclosing the information is an employee or former employee or a person having a close link to the organization.

(iv) Recipient

The information is conveyed to a person or organization in a position to act on the problem. The action may consist in remedying or merely protesting the problem, and the recipient may in fact decide not to act on the information received. Usually, the recipients are not aware of the information fully or even partially.

4.21.2. Types of Whistle - Blowing

Whistle blowing can be of many types. These are discussed here.

(i) External whistle-blowing

This occurs when an employee gives out information about unethical acts to agencies outside the organization he/she works for.

(ii) Internal whistle-blowing

Internal whistle blowing occurs when the information is conveyed to someone within the organization.

(iii) Open whistle-blowing

In open whistle - blowing individuals openly reveal their identity as they convey the information.

(iv) Anonymous whistle-blowing

This is when the person disclosing the information does not disclose his/her identity. Anonymous whistle - blowing is generally not taken seriously.

4.21.3. When Should Whistle - Blowing be Attempted?

- ✓ When you have the need.
- ✓ when you have full knowledge of the situation.
- ✓ When you are in the proximity.
- ✓ When you have the capability to attract attention.
- ✓ When you have the clear definition of targets.
- ✓ When you think it is a last resort.

4.21.4. Guidelines for Ethical Whistle - Blowing

Here are some of the instructions that should be followed before blowing the whistle.

- ✓ Follow normal organizational channels, except for extremely rare emergencies.
- ✓ Get to know both the formal and informal rules for making appeals within the organization.
- ✓ Consult colleagues for a advice and avoid isolation.
- ✓ Use polite and tactful language. Avoid any personal criticisms that might create antagonism and divert the attention from solving those issues.
- ✓ As much as possible keep supervisors informed of your actions through informal discussion or formal memorandums.
- ✓ Be accurate in your observations and claims, and keep formal records documenting relevant events.
- ✓ Before going outside the organization, consult the ethics committee of your professional society.
- ✓ Consult a lawyer regarding potential litigations.

4.21.5. Whistle Blowing Situations

- ✓ A criminal offence like fraud, corruption or theft has been or is likely to be committed.
- ✓ A miscarriage of justice has been or is likely to occur.
- ✓ The health or safety of any individual has been or is likely to be endangered.

- ✓ The environment has been or is to be damaged.
- ✓ Public funds are being used in an unauthorized manner.
- ✓ The council's constitution, including standing orders financial regulations, etc., are not being observed or being breached by the members and/or officers.
- ✓ Sexual or physical abuse of any member of staff or service recipient is taking place.
- ✓ Discrimination is occurring to any member or service recipient on grounds of sex, race or disability.
- ✓ Any other form of improper action is taking place.
- ✓ Information relating to any of the above is being deliberately concealed or attempts are being made to conceal the same.

4.21.6. How Corporations can Prevent Unwanted Whistle Blowing

- ✓ A strong corporate ethic structure.
- ✓ Defined commitment to ethical behavior from top to bottom.
- ✓ Clear lines of communication.
- ✓ Openness and transparency of rules, understood by all employees.
- ✓ Empowerment of the employees.
- ✓ All employees having meaningful access to the top management.
- ✓ Rewarding of really eye opening whistle-blowing.
- ✓ A sense of job security.
- ✓ Willingness of management to admit mistakes.
- ✓ High employee morale.

4.22. INTELLECTUAL PROPERTY RIGHTS

4.22.1. Intellectual Property

It is the information and original expression that derives its original value from creative ideas, and is with a commercial value. Intellectual property permits people to have fully independent ownership from their innovations and creativity, like that of own physical property. This encourages the Intellectual Property owners towards innovation and benefit to the society. It is an asset that can be bought or sold, licensed, and exchanged. It is intangible i,e., it cannot be touched by specific parameters.

IP plays an essential role to stabilize and develop the economy of a nation. This protection actually stimulates creativity, research and innovation by ensuring freedom to individuals and organizations to benefit from their creative intellectual investments. The IP serves many purpose, such as

(i) It prevents other using it.

(ii) Prevent using it for financial gain and misuse.

(iii)Prevent plagiarism.

(iv) Fulfill obligation to funding agency.

(v)Provides a strategy to generate steady income.

4.22.2. Types of Intellectual Property Rights

The term intellectual property rights include

- ✓ Patents
- ✓ Trade marks
- ✓ Copyright
- ✓ Trade secret

Patents

Patent is a contract between the inventor and the society. Patents protect legally the specific products from being manufactured or sold by others, without permission of the patent holder. To be patented, the invention must be useful, novel and unobvious. One cannot patent a pure idea, such as a mathematical theorem.

The invention must be some product or process that embodies an idea. Patent holder has the legally - protected monopoly power as one's own property. The validity is 20 years from the date of filing the application form for the patent. It is a territorial right and needs registration. While applying for a patent, it is essential to submit the documents in detail regarding the problem addressed, its solution, extent of novelty or innovation, applications, resources used and the particulars of the inventor.

Trade mark

Trade mark is a wide identity of specific goods and services, permitting differences to be made among different trades. It is a territorial right, which needs registration. Registration is valid initially for 10 years, and renewable. A trade mark is a word,

symbol, phrase, a heading, a label, a device, a letter, a numerals or any combination of these. The main function of trademark are

- ✓ Just as persons are identified by their names, products identified by their trademarks.
- ✓ The trademark serves product promotion. Without a trademark, there can be no advertisement. It serves as a medium for advertising the products.
- ✓ The trademark carries with it an inherent indication or impression on the quality of goods, which indirectly demonstrates that it receives customer's satisfaction.

Copyright

The copyright is a specific and exclusive right, describing rights given to creators for their literary and artistic works. This protects film, music, sound recording, broad casting, multimedia, Software, paintings, sculptures, literary material, aesthetic material, artistic drawings, paintings etc. It is a proprietary right and comes into existence as soon as the work is created. A copyright held by an individual, for example, lasts 50 years beyond his or her life time.

Trade secret

A trade secret is the information which is kept confidential as a secret. This information is not accessed by any other than the owner and this gives a commercial advantage over the competitors. The trade secrets are not registered but only kept confidential. These are given limited legal protection, against abuse by the employee or contractor, by keeping confidentiality and trust. The trade secrets may be formulae, or method, or programs, or processes or test results or data collected, analyzed and synthesized. These are related to designs, technical processes, plant facilities, list of suppliers or customers etc. This information should not be disclosed or used by any other person.

4.23. DISCRIMINATION

Discrimination is defined as making unfair and morally unjustified differentiation in one's treatment of people. The term discrimination is partiality in treatment. Discrimination may be based on gender, age, race, religion, language, community, nationality, disability etc. Discrimination is the opposite of equality.

4.23.1. Instances of Discrimination

Discrimination may exist either in selection of an employee during recruitment process or in fixing up the salary. Even after the employee joins the company the

discrimination may continue by way of ill-treating him in comparison to others in his day-to-day working.

Discrimination reduces morale and kills initiativeness and creativity of the employee and gives a bad reputation to the company. The following instances can be cited as discriminative behavior:

- ✓ Doing job interviews, selecting candidate only from a certain gender, community or race.
- ✓ Fixing different salary structure based on their community.
- ✓ Fixing lesser salary for women employees selected under the same job specifications
- ✓ Provision of differential work atmosphere.
- ✓ Ill-treatment during work.
- ✓ Being harsh to one person in contrast of being kind to others.
- ✓ Belittling a subordinate in front of others.
- ✓ Not passing the leave applications or medical bills of a particular subordinate.
- ✓ Wrongful termination.
- ✓ Dismissing employees who are at the verge of their retirement.
- ✓ When the company is forced to reduce the number of staff due to economic reasons, selecting only those from specific communities or gender for dismissal.

4.23.2. Preferential Treatment

There can be two kinds of preferential treatment

Weak preferential treatment

Weak preferential treatment involves giving an advantage to members of traditionally discriminated against groups over equally qualified applicants who are members of other groups.

Strong preferential treatment

Strong preferential treatment involves giving preference to minority applicants or women over better qualified applicants from other groups.

4.23.3. Sexual Harassment

The term sexual harassment is currently applied to a wide variety of sexually oriented acts and practices that may involve physical and psychological attacks, coercion, abuse of authority, and a variety of unwanted provocations. One definition of it as applied to women is "any sexual oriented practice that endangers a woman's job - that undermines her performance and threatens her economic liveli hood".

Sexual harassment may come in many forms:

- ✓ Following an interview for a job as a secretary, a woman is told that the job is hers if she is willing to grant sexual favours to the interviewer.
- ✓ A woman is told by her superior that she will have first priority for receiving a promotion if she is nice to him, and talk of a motel makes it clear what is meant by the term nice. When she refuses to be that nice, she is not given the promotion and there after is assigned less challenging work.
- ✓ Against her will, a woman is grabbed and kissed by her employer, who had asked her to stay after house at work. She resists and is fired the following day.
- ✓ A woman turns down her boss's request for a date. She makes it clear she is not interested in going out with him ever, but to her chagrin he continues repeatedly to ask her out during the following weeks.
- ✓ The male colleagues of a woman continually leer at her and make sexually suggestive comments about her clothing and body.
- ✓ A male engineer enjoys telling his secretary about has sex life, disregarding her protests against hearing about it.

REVIEW QUESTIONS

1. Define the term safety.
2. What is Lowrance's definition of safety.
3. Define risk.
4. What do you mean by relative safety?
5. Compare safety and risk.
6. 'Safety should be an integral part of design' - Discuss.
7. 'Safety is paramount important to engineers' - justify.
8. List the analytical methods of testing for safety of product / project
9. Explain in detail the effect of information on risk assessments.
10. Write briefly on risk - benefit analysis.
11. List the factors to asses public risk.
12. What is meant by voluntary risk?
13. What is Collegiality?
14. What is Loyalty?
15. Differentiate between collegiality and loyalty.
16. What is collective bargaining?
17. Write briefly on collective bargaining.
18. Define collective bargaining. Explain the role of collective bargaining in work place rights and responsibilities.
19. What is authority?
20. Define confidentiality.
21. What are occupational crimes?
22. Explain the importance of collegiality and loyalty in team work.
23. Differentiate between bribe and gift.
24. Write an essay about the employee rights.
25. What does whistle blowing mean? When one can attempt whistle blowing?

26. Discuss the ways and means of reducing occupational crime in industries.
27. What is intellectual property rights? Explain various elements of IPR in detail.
28. What is the importance of intellectual property rights?
29. What is discrimination?
30. What is sexual harassment?

Two Marks and Answers

1. Define confidentiality. [Apr / May 2021]

Confidentiality means keeping the information on the employer and clients, as secrets. It is one of the important aspects of team work.

2. State the industrial definition on safety. [Nov / Dec 2020]

A thing is safe with respect to a given person or group at a given time, if its risks were full known, if those risks would be judged acceptable in light of settled value principles.

3. What is meant by Disaster? [Nov / Dec 2020]

A disaster is a result from the combination of hazard, vulnerability and insufficient capacity or measures to reduce the potential chances of risk.

4. Differentiate Bribe from Gift. [Nov / Dec 2020]

- Gifts are not bribes as long as they are gratitudes of smaller accounts. But bribes are illegal and immoral because they are worth of substantial amounts.
- Gifts may play a legitimate role in the normal conduct of business, whereas a bribe influences the judgment.

5. What is Hired Gun? [Apr / May 2021, Nov / Dec 2020]

Hired gun refers to an expert who is biased and does not appear to be impartial. He / she adapts his / her expert evidence to the requirements of the party that calls him / her as a witness. A hired gun expert is easily recognizable.

6. What is Professional Right?[Apr / May 2019]

Professional rights are the rights possessed by virtue of being professionals having special moral responsibilities.

Example:

- Right to exercise one's professional judgment on the basis of his conscience
- Right to refuse to involve in unethical activities

7. Define the term safety and relate it to risk. [Apr / May 2018, Nov / Dec 2018]

Safety is defined as the risk that is known and judged as acceptable.

Probability of safety = 1 – Probability of risk

Risk = Probability of occurrence x Consequence in magnitude

8. What is meant by conflict of interest?

A conflict of interest occurs when the employee has more than one interest. A professional conflict of interest is the situation where the professional has an interest that, if pursued, might prevent him from meeting these obligations to his employees or clients.

9. What is meant by confidentiality and why it is needed? [Apr / May 2018]

Confidentiality means keeping the information on the employer and clients, as secrets. It is one of the important aspects of team work. It is very much needed that, the rights of stakeholders and right to the intellectual property of the company are protected.

10. What is the use of risk analysis? [Apr / May 2015, Apr / May 2017]

Risk analysis is the review of the risks associated with a particular event or action. It is applied to projects, information technology, security issues and any action where risks may be analyzed on a quantitative and qualitative basis.

11. Define the term „collective bargaining". [Apr / May 2021, Nov / Dec 2020, Nov / Dec 2016, Apr / May 2017]

It is the bargain by the trade union for improving the economic interests of the worker members. The process includes negotiation, threatening verbally, and declaration of „Strike".

12. Define „Risk" in professional ethics perspective. [Apr / May 2021, Nov / Dec 2016]

According to professional ethics perspective, risk is potential that something unwanted and harmful may occur.

13. Differentiate between Risk analysis and Risk benefit analysis. [May / Jun 2016]

Risk analysis: The process of identifying, assessing and reducing risks to an acceptable level.

Risk benefit analysis: Risk benefit analysis is a technique, similar to cost-benefit analysis used to analyze the risk in a project and to determine whether the project should be carried out or not.

14. Define „collegiality". What are its elements? [Apr / May 2015]

Collegiality is the tendency to support and cooperate with the colleagues. It is a virtue essential for the team work to the effective.

Part B

1. Define the concept of confidentiality in professional ethics. [**Nov/ Dec 2020**]
2. Discuss on the importance of Collective Bargaining. **[Apr / May 2021, Nov/ Dec 2020, Apr / May 2019]**
3. Explain the procedure in risk benefit analysis and discuss its role in reducing risks with suitable examples. **[Nov/ Dec 2020, Nov / Dec 2018]**
4. Discuss the „faithful agent argument" and „public service argument" of collective with suitable examples. **[Nov / Dec 2018]**
5. Discuss the testing strategies for safety with suitable examples. Mention the difficulties in assessing the personal risks. [**Apr / May 2018**]

6. Safety in a commodity comes with a price‟ – substantiate with explanation. Discuss how the knowledge of risk is always better for safety with suitable examples. [**Apr / May 2018**]
7. Explain the Bhopal gas tragedy. Discuss the violation of moral, ethical and professional codes of standards in it. Write conclusion to avoid such tragedy in future. [**Apr / May 2015, Apr / May 2018**]
8. Describe the concept of Risk-Benefit analysis and Fault free analysis with an example. **[Nov/ Dec 2020, Apr / May 2015, Apr / May 2017]**
9. Discuss in detail about the “Employee Rights” and its role in the organizations. **[Apr / May 2019, Apr / May 2017]**
10. Define the term Risk and Safety. How we, Engineers assess the safety? **[Nov / Dec 2016]**
11. Discuss **Event Tree analysis** with some practical example of risk analysis. **[Nov / Dec 2016]**
12. What are the factors that affect risk acceptability? What is the use of knowledge of risk acceptance to engineer? [**May / Jun 2016]**
13. Discuss the significance of intellectual property rights. Also explain the legislation covering IPR in India. [**Apr / May 2021, Nov/ Dec 2020, May / Jun 2016]**
14. Discuss the significance of loyalty and collegiality in team work. **[Nov/ Dec 2020, Apr / May 2015]**