

**COURSE TITLE: CONSTRUCTION MANAGEMENT AND ENTERPRENEURSHIP-21CV61****Prepared by: MS. POOJA D****CONSTRUCTION QUALITY, SAFETY AND HUMAN VALUES****INTRODUCTION:**

Construction has long been considered dangerous work. In addition, the construction industry is under constant scrutiny for quality of work. Combining safety and quality management principles and methods capitalizes on the similarities between these two management concepts to create a single 'synergistic' management system for improving both safety and quality. In the interest of improving safety and quality performance in the construction industry, a literature review was performed on construction research articles to find out if this integrated management system concept has been investigated.

Quality control and safety represent increasingly important concerns for project managers. Defects or failures in constructed facilities can result in very large costs. Even with minor defects, re-construction may be required and facility operations impaired. Increased costs and delays are the result. In the worst case, failures may cause personal injuries or fatalities. Accidents during the construction process can similarly result in personal injuries and large costs. Indirect costs of insurance, inspection and regulation are increasing rapidly due to these increased direct costs. Good project managers try to ensure that the job is done right the first time and that no major accidents occur on the project. As with cost control, the most important decisions regarding the quality of a completed facility are made during the design and planning stages rather than during construction. It is during these preliminary stages that component configurations, material specifications and functional performance are decided. Quality control during construction consists largely of insuring conformance to this original design and planning decisions.

While conformance to existing design decisions is the primary focus of quality control, there are exceptions to this rule. First, unforeseen circumstances, incorrect design decisions or changes desired by an owner in the facility function may require re-evaluation of design decisions during the course of construction. While these changes may be motivated by the concern for quality, they represent occasions for re-design with all the attendant objectives and constraints. As a second case, some designs rely upon informed and appropriate decision making during the construction process itself. For example, some tunneling methods make decisions about the amount of shoring required at different locations based upon observation of soil conditions during the tunneling process. Since such decisions are based on better information concerning actual site conditions, the facility design may be more cost effective as a result.


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With the attention to conformance as the measure of quality during the construction process, the specification of quality requirements in the design and contract documentation becomes extremely important. Quality requirements should be clear and verifiable, so that all parties in the project can understand the requirements for conformance. Much of the discussion in this chapter relates to the development and the implications of different quality requirements for construction as well as the issues associated with insuring conformance.

CONSTRUCTION QUALITY

Quality means conformance to specifications, standards and requirements. Quality is fitness for use. Quality refers to productivity, competitive costs, on-time delivery and the specification of the customer.

Quality refers to getting everyone to do what they have accepted to do, for the first and every time. The degree to which a set of inherent characteristics fulfill requirements.

DIMENSIONS OF QUALITY

1. Performance: It involves the various operating characteristics of the product. For a television, for eg, these characteristics will be the quality of the picture, sound and longevity of the picture tube.
2. Features: these are characteristics that are supplemental to the basic operating characteristics. In a automobile, for e.g., a stereo CD player would be an additional feature.
3. Reliability: it is the degree of dependability and trust worthiness of the benefit of the product for a long period of time. It address the probability that the product will work
4. Conformance: The degree to which the product conforms to pre-established standards. All quality products are expected to precisely meet the set standards.
5. Durability: It measures the length of time that a product performs before a replacement becomes necessary.
6. Serviceability: it refers to promptness, courtesy, proficiency and ease in repair when the product breaks down and is sent for repairs.
7. Aesthetic: It refers to its impact on the human senses such as how it looks, feels, sounds, tastes etc. depending upon the type of product.
8. Perceived quality: An equally important dimension of quality is the perception of the quality of the product in the mind of the customer. Honda cars, sony, rolex watches are perceived to be high quality items by the customer.



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DEFINE QUALITY:

The term “quality” implies that a product or a deliverable is fit for the intended purpose. Fitness normally involves a wide range of criteria, such as performance, safety, reliability, ease of handling, maintainability, logistical support, and no harmful environmental impacts.

Construction is not science, and it would be impossible to produce a project without some defects, failures and complains. However, the goal of the construction manager is to produce as few defects, failures, and complains as possible.

Fundamentally, quality plan must focus on 3 primary objectives:

- Doing things right the first time
- Preventing things from going wrong
- Continually improving the process

INSPECTION

Inspection is the first stage of quality management. Inspection is defined as the process of testing, measuring and assessing the product against pre-determined specifications, standards requirements before passing on to the customer.

Inspection came into existence- to check the product, to meet the requirements of its intended purpose before handling over the customer.

Functions of Inspection Department

1) Inspection of Sub Soil:

Inspection of sub soil is necessary to test the bearing capacity of the sub soil.

2) Inspection of Materials:

Supplies of materials for construction work need to be inspected before they are used. Field and lab test may be conducted for this purpose.

3) Inspection of Equipment:



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Supply of equipment for construction work need to be inspected before the items are recorded in books. Thereafter, regular periodical inspections are necessary to ensure that the equipment is kept in serviceable condition.

4) Inspection of work at each Stage:

The inspectors must inspect the work before the contractor's proceeds with the next stage. For example, inspections are necessary after excavation has been complete, before all under ground work is covered up; for the formwork and steel before concrete is poured. In case any defects are noticed, they must be got rectified before proceeding to the next stage. Inspection of mixing and placing of concrete is also necessary in some cases to ensure that the proper procedure is being followed.

QUALITY MANAGEMENT IN CONSTRUCTION PROJECTS

Quality Management in construction projects is different from that in manufacturing. Quality in construction projects includes not only the quality products and equipment used in the construction, but the total management approach to completing the facility as per the scope of works to customer/owner satisfaction within the budget and in accordance with the specified schedule to meet the owners defined purpose.

The nature of the contracts between the parties plays a dominant part in the quality system required from the project, and the responsibility for fulfilling them must therefore be specified in the project documents. The documents include plans, specifications, schedules, bill of quantities etc.

Process of Project Quality Management:

- Quality Planning
- Quality assurance
- Quality control

QUALITY PLANNING

Quality Planning guides future quality activities, it sets the requirements and standards to be met and the actions necessary to meet them

The quality plan for construction projects is part of the overall project documentation consisting of the following:



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1. Well defined specification for all the materials, products, components, and equipment to be used to construct the facility.
2. Detailed construction drawings.
3. Detailed work procedure.
4. Details of the quality standards and codes to be complied.
5. Cost of the project.
6. Manpower and other resources to be used for the project.
7. Project completion schedule.

QUALITY ASSURANCE

Quality assurance is referred as a scheme adopted by a construction company to maintain the standard or quality consistent. It is primarily an internal management system of a construction company. Generally a company maintains a quality assurance chart by specify various checks at different levels as well as constantly improving its attributes. A quality assurance program may include

- Arranging periodical training for its worker
- a good safety Programme
- a sound procurement system to get best quality material and suppliers
- A reward scheme for innovative work and competitive career progress scheme
- If a company is involved in repetitive work, then implementations of statistical control of the process. Such as in concreting, regular sampling scheme control the production of concrete. Similarly in asphalt work, regular satisfied quality control is carried out.

QUALITY CONTROL

Quality control is the periodic inspection to ensure that the constructed facilities meet the standard specified in the contract. It is usually carried by team of owner's engineers or its morning. As for example, in a high way project, engineers check that compaction of soil is carried out properly by measuring its density; workability of concrete is checked by employing slump test etc. or checking compressive strength of concrete at periodical level.


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Quality assurance is good management scheme whereas quality control is an inspection or sampling process.

Government works is generally carried out using lowest bid system. In lowest bid system, high quality work carried out by contractor does not play a major role rather price quoted by them is an important criteria.

The procedure for selection of contractor affects the quality control in the construction. Low bid system hardly provides any incentive to high quality work carried out by the contractor.

Quality control includes

- a. Setting up specific standard for construction
- b. Checking the deviation from the standard
- c. Taking action to correct or minimize the variation
- d. Improvement of the standard.

COST OF QUALITY IN CONSTRUCTION

Quality of construction is defined as 1) Scope of the work 2) Time 3) Budget

- 1) **Scope of the work**-Cost of quality refers to total cost incurred during the entire life cycle of construction project in preventing non-conformance (does not meet the specifications) to owner requirements. There are certain hidden costs that may not directly affect the overall cost of the project; however it may cost the consultant/designer to complete the design within the stipulated schedule to meet owner requirements. Rejection/ non-approval of executed works by the supervisor due to noncompliance with specifications will cause the contractor loss in terms of material, manpower and time.
- 2) **Time**-Timely completion of a project is one of the objectives to be achieved. To avoid delay, proper planning and scheduling of construction activities are necessary. Since construction projects have the involvement of many participants, it is essential that the requirement of all the participants is fully co-ordinated. This will ensure execution of activities as planned resulting in timely completion of the project.



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- 3) **Budget**-Since quality is always related to value for the money, quality planning should consider the money spent, quality planning and should consider the costs and benefits of quality activities. A cost benefit analysis is performed to evaluate and justify proposed quality activities, and to compare the cost of quality assured and control activities.

Cost of quality can be classified as

- Prevention: costs of training, design reviews, and any activity aimed at preventing errors, include cost of quality planning.
- Appraisal and control: cost of evaluating products and processes, including product review, audits, tests and inspections.
- Internal failure: costs associated with non-conformities discovered by the producer, includes costs for scrap, rework, and retest.
- External failure: cost incurred as a result of product failures after delivery to the customer, includes costs for replacements, warranty repairs, liability, lost sales, and damaged reputation.

QUALITY STANDARDIZATION

ISO 9000 standards fix the standard for quality. ISO stands for International organization for standardization. This organization founded in Switzerland in 1947. Similar standards for Indian context are IS 14000 – 04.

ISO 9000 series of standard are quality assurance standard that assures client that the organization having obtained the certification works according to specified requirement.

It stands for system standardization and certification. Emphasis is given to defining and laying down the procedure; process etc in the form of documents.

ISO is important because it offers an internationally recognized systematic approach, coupled with institutionalization of the institutes, policies, procedures, record keeping, technologies and resources for managing quality work.

BENEFITS OF ISO 9000 CERTIFICATION



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1. Customer satisfaction and confidence in the organizations products/ services.
2. Management's confidence
3. Improvement in staff performance
4. Effectiveness in utilization of staff
5. Efficient utilization in time, money and other resources
6. Improved quality, higher productivity and profitability
7. Consistency in products/ service quality
8. Access to global market
9. Organizations become system dependent and not people dependent
10. Continuous improvement in organizational process

Basic Management principles advocated by ISO are –

- Customer Focus - Resulting in meeting customer requirements and striving to exceed them.
- Leadership- Aiming to create an internal environment in which people are fully involved.
- Involvement of people- who are the essence of an organization.
- Process approach- resulting in improved efficiency to obtain desired results.
- Systematic approach to management –leading to improved effectiveness and efficiency through identification, understanding and management of interrelated processes.
- Continual improvement – which becomes a permanent objective of the organization.
- Factual approach to decision making – Based on the analysis of data and information
- Mutually beneficial supplier relationships- Based on an understanding of their interdependence.

ISO 9000 series standards are –

ISO 9000, ISO 9001, ISO 9002, ISO 9003, ISO 9004

TOTAL QUALITY MANAGEMENT (TQM):

- TQM is an enhancement to the traditional way of doing business. It is a proven technique to guarantee survival in world-class competition. Only by changing the actions of management will the culture and actions of an entire organization be transformed.
- Analyzing the 3 words we have:
Total: Make up the whole



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Quality: degree of excellence a product or service provides

Management: Act, art, or manner of handling, controlling, directing, etc.

- Therefore, TQM is the art of managing the whole to achieve excellence. TQM is defined as both a philosophy and set of guiding principles that represent the foundation of a continuously improving organization.
- It is the application of quantitative methods and human resources and human resources to improve all the process within the organization. And exceed customer needs now and in future. TQM integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach.
- TQM Management is accomplished through an integrated effort among all levels in a company to increase customer satisfaction by continuously improving current performance.
- TQM Philosophy is to continuously improve the organizational capacity to meet current and future customer's needs.
- TQM is a way of running a business that concentrates on satisfying the customer.
- It will result in repeat and continued business. Beside , satisfying the customer TQM also is concerned with empowering the workers.
- This will ensure that their skills are effectively used and they feel they have a stake in the success of organization.
- The philosophy of TQM is one of prevention rather than defect detection.
- The final aspect of TQM is the use of statistics to determine the correct areas to make changes and improvements.
- The essential elements of TQM are management commitment and leadership, training, teamwork, statistical methods, cost of quality, supplier involvement.

SAFETY MANAGEMENT

Safety is one of the vital issues in the success of the project. Safety programme ensures the worker to be mentally and physically prepared to execute a job quickly, fearlessly and efficiently. Safety is a way of life. It must be part of every individual at every time during performance of any activity.


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Working in a fearless protected environment makes the team to be more productive and efficient. Safety is an important parameter to measure a project, as cost of implementation and time of completion of the project. Although every manager, supervisor, worker accept their safety requirement, but it is by-passed by just lip service. Construction is highly accident prone industry.

In India, construction industry is labour intensive, with unskilled and untrained worker. Fatal accidents and minor accidents are very frequent. For example, it has been reported that more than two people died in the construction of dam like Bhakhara-Nangal project.

In our country, in construction work, a large number of inexperienced laborers are employed. They are unaware of the hazard during their work and generally the company hardly make an effort to explain this worker's inherent risk involved with the job. Medical check-up of the workers is not carried out before engaging them in the construction work.

Also, many accidents occur due to the use of improper tools and equipments. Improper methods and processes are used to cut the time of execution. Such as scaffoldings are not properly made, ladders are not checked the major causes of accidents in construction industry are due to –

1. Fall from high elevation.
2. Electrocutation.
3. Being struck by equipment.
4. Being caught by equipment.
5. Trench excavation, cave-in.
6. Drowning (bridge and offshore construction).
7. Overexertion.

It has been found that more than 40-50% of accidents due to fall from height or fall of an object . Many a time poor quality of safety belts are used, which gets broken during accident.

SALIENT POINTS OF SAFETY MANAGEMENT

- It is the responsibility of the construction manager to create safety programs that will prevent these accidents.


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- The philosophy of the company must be that all accidents are prevented and the actions expected to accomplish that goal must be clearly stated to the employees.
- Without a safety plan, a project cannot be described as a successful construction project. The safety should be the highest priority of the company. The company must be committed to the improvement of safety.
- The safety code of conduct should be communicated to the employees in the company, who should also be made aware of the pros and cons of the accidents.
- A company with a better culture of safety attracts the right kinds of employees and builds a good, consistent safety record.
- During the project planning in the beginning of the work, a unique job-specific safety plan must be developed.
- Task specific hazard should be addressed daily.

SAFETY PROGRAMMS

Safety program should be developed as a culture of the company. It should be at all times, at all places and all types of work. Every employee of the company should think and work about safety. Supervisors and managers play a very important role in safety management. The workers should feel that the safety constraints are for their betterment. A company can develop its own plan and culture.

Some of the major components of a company safety plan should be –

First aid equipment should be available and known to the employee.

Every employee's need requires personal safety equipment.

Formal training program for each employee should be mandatory.

Procedures for emergency evacuation of injured employees should be clearly explained and employees should be trained for such situations.

Safety record and accident report of the company should be honestly examined.



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Site visit requirement for supervisory personnel plays a very important role in safety management.

Training for all supervisors and the managers should be mandatory.

SAFETY RULES IN CONSTRUCTION COMPANY

- 1) Shoes/gumboots shall be provided to the staff working at site and concerned workers like concreting gang, reinforcement filters etc., when required.
- 2) Safety helmets should be worn by people working in areas like pots, trenches, near the building and by carpenters, filters, erectors, fabricators, while working on construction.
- 3) Safety belts shall be worn by erectors, fabricators, painters, fabricators, painters, masons while working at heights above 10 metres.
- 4) Clothing of workers, supervisors, engineers should not be loose fitting .
- 5) Any person on top of scaffolding must make sure at first that the scaffolding is properly secured by bracings etc. and is safe.
- 6) Safe and sufficient access for every work place shall be provided and maintained to the extent it is practiced.
- 7) Openings, corners and edges shall be guarded so as to prevent accidents due to falling.
- 8) Adequate and suitable lighting may be provided for all working places, approaches, dangerous openings .
- 9) Sanitary convenience shall be provided and maintained and kept clean.
- 10) First aid boxes at all times shall be kept in convenient places like offices, stores etc.
- 11) Welder shall ensure that protective equipment like welding helmets, hand shields, welding goggles, leather gloves is used etc. during welding. No workman shall be allowed to ride on bucket/ component which is being lifted.
- 12) No workman shall be allowed to ride on bucket/ component which is being lifted.
- 13) Warning signs such as “danger-440 volts, no smoking etc. shall be displayed where necessary.
- 14) Firefighting equipment such as extinguishers and sand buckets shall be easily available in the vicinity of electrical operations and storage of inflammable materials.
- 15) Any accident of serious nature shall be investigated by site authorities and report shall be complied and corrective actions shall be taken to it.



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SAFETY MEASURES TO BE TAKEN FOR FOLLOWING CONSTRUCTION WORK

• **EXCAVATION**

- 1) In all works an experienced and competent foreman or supervisor should look after the excavation work. He should have authority to enforce safety rules and prevent the use or defective bar unsafe appliances.
- 2) Before doing the excavation work, a complete knowledge of underground structures, such as sewers, water lines, gas mains etc. is essential.
- 3) Safety shoes helmets should be worn by all persons entering a trench where hazards from falling stones, timber or other materials exist.
- 4) Whenever workmen have to excavate in trenches in soil, soft or fissured rock or hard soil exceeding 2mm in depth, the trenches should be properly shored and timbered.
- 5) At place where public is likely to trespass fencing and barricades should be erected to avoid accidents, during nights adequate lighting should be provided.
- 6) Sheathing should be placed against the side of the trench so that the length of each piece of sheathing is vertical. Where the trench is excavated in loose or soft soil, each piece of sheathing should be driven into the bottom of the trench so as to be firmly held in a place.
- 7) Heavy equipment's, such as excavating machinery, trucks, dampers etc. should be kept away from excavated sides .

• **DRILLING AND BLASTING**

- 1) Detonators and other explosives for blasting shall be transported to the site of work in the original containers or in securely locked separate non-metallic container and shall not be carried loose or mixed with other materials.
- 2) Care should be taken in loading and unloading of explosives.
- 3) Explosives shall be stored only in a magazine which is clean, dry, ventilated , reasonably cool, correctly , protected against lightening.
- 4) Any package containing explosives shall not be dragged, dropped or handled roughly. The packages shall be opened at a safe distance.



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- 5) Smoking shall not be permitted nor matches, open lights, fire, flame or any other device capable of producing sparks or flame shall be carried while handling or using explosives.
- 6) Blasting shall be carried out only with the permission of the engineer in charge.
- 7) All the materials, tools and equipment used for blasting, operations shall be of approved type.
- 8) The blaster shall be in good physical condition and not under influence of drugs, alcohol, intoxicants etc.
- 9) The position of all holes to be drilled shall be marked out with white paint.
- 10) The bore-hole shall be carefully checked for length, presence of water, dust etc. with the wooden tamping hole or a measuring tape before loading.
- 11) It shall be cleared of all debris before explosives are inserted.
- 12) Metallic devices of any kind shall not be used during tamping.
- 13) Before blasting sufficient warning shall be given to enable the people working. In the blasting area, to get off the danger zone. All persons, other than the blaster shall leave the danger area atleast 10 minutes before the blasting starts.
- 14) The blaster shall not return to blasting site after firing until atleast 5 minutes have elapsed.

• **HOT BITUMINOUS WORK**

- 1) All necessary precautions should be taken to avoid fire.
- 2) Those working with bitumen and boilers must be trained in the action to take in the event of fire, and in first aid treatment and procedures for dealing with bitumen burns
- 3) Care to be taken when using and storing materials (matches, lighters)
- 4) Keep the hot work area clean, tidy and free from any combustible materials.
- 5) Bitumen is heated only to the temperature required for the particular application.
- 6) Suitable protective clothing, goggles, boots and gloves are supplied to and used by operation when handling hot bitumen.
- 7) Dust is suppressed and reduced to minimum.
- 8) Bitumen products and solvents are not spilt on to the ground or into ditches or into water courses.
- 9) Any bitumen products or solvents which are spilt are immediately removed with any contaminated soil etc.
- 10) Waste or over heated bitumen or solvents are not disposed off by burning.



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11) Because of the highly flammable nature of the solvent, great care is required when using rapid curing cutback bitumen.

• **SCAFFOLDING, LADDERS, FORMWORK AND OTHER EQUIPMENT**

- 1) Every scaffold should be securely supported and suspended and properly braced to ensure stability.
- 2) All scaffolds and working platforms should be securely fastened to the building or structure.
- 3) If scaffold are to be used to a great extent for long period of time, regular plank stairway wide enough to allow 2 people to pass, should be erected with handrails on both the sides.
- 4) All scaffolds should be erected and dismantled by workman a who is thoroughly experienced in the erection and dismantling of scaffolding.
- 5) All scaffolds should be inspected by a competent person at least every 3 days after erection and the results of inspections recorded and the records shall be kept available for checking by the employers representative.
- 6) All scaffolds shall be constructed of sound materials free from defects.
- 7) The use of barrels, boxers, loose tiles or other unsuitable material shall not be used as supports for working platforms.
- 8) All working platforms shall be fully boarded.
- 9) During dismantling of scaffolds necessary precautions should be taken to prevent injury to persons due to the fall of loose materials, bracings and other parts of scaffolds.
- 10) Care should be taken to see that no un-insulated electric wires exist within 3 meters.
- 11) All operators and supervisors of machines should be thoroughly trained in operating the machines and equipment's.
- 12) Ropes and connections should be thoroughly checked before use.

• **STORAGE OF MATERIALS**

Construction materials should be stored in such a manner as to prevent deterioration, mixing up with foreign matter and to ensure preservation of their quality.

- 1) Cement should be stored in damp proof place. The stock should not be more than 30 bags and at least 30 cm away from the work. Otherwise, cement is likely to form into lumps. Sand and aggregate should be stacked on firm ground and in bins. This will avoid soil and dust getting mixed with sand and aggregate.



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- 2) Bricks shall not be dumped at site. They should be stacked on level ground to minimize breakage. Height of stack should be limited to 1.5m.
- 3) Timbers plywood's should be stored separately in neat stacks. Adequate space should be left in between the stacks to avoid fire hazard. Smoking and open fires should be should be prohibited in timber yards and stores.
- 4) Petroleum products should be separately stored. Smoking and open fires should be strictly prohibited when these products are stored.
- 5) Adequate firefighting arrangements should be provided at site particularly in areas where petroleum products and timbers are stored.
- 6) Explosives must be stored in proper magazines and prescribed safety measures for handling and storage of explosives should be observed.
- 7) Steel reinforcement bars should be stacked section wise.

SAFETY CAMPAIGN

With increase in the number of accidents in the construction industry, it has become essential to educate people in regard to safety measures. It is the duty of management to provide a safe working environment to workers to safety measures. One way of making people aware of safety measures is to launch safety campaigns, in addition to providing preventive measures at the site of work.

Frequent exchange of ideas between labour and management would help in minimizing the accident rate. A continuing education programs using posters, booklets, films lectures and discussions with emphasis on Supervisory safety training will prove effective in reducing the accident rate.

Accidents results in loss of life, property and reputation of the construction agency. Accidents adversely affect the progress of work and have a demoralizing effect on construction team.

The compensation is provided if the employer shall have;

- The injury disabling the workers for a period more than 3 days.



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- Have an injury resulting in death caused by an accident, if the worker being not under the influence of drinks or drugs.
- No disobedience of the worker to the orders issued for the safety of the workers.
- No removal of any safeguard.

SAFETY THROUGH LEGISLATION

In construction industry the legislation is needed for-

- Improving the working condition.
- Determining the terms of employers and employees
- Providing social security i.e compensation
- Regulating the relationship between employers and employees
- Safe guarding the lives of workman for the welfare of worker.

Some of the important ACTs are:

- 1) Payment wages act (1936)
- 2) Minimum wages act (1968)
- 3) Workmen compensation act (1923)
- 4) Industrial dispute act (1967)
- 5) Indian trade union act (1926)
- 6) Factories act (1948)

ETHICS

HUMAN VALUES AND PROFESSIONAL ETHICS

MORALS



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- Morals are the guiding principles that every citizen should hold. It is the foundational concepts defined at both at individual and society level. At the most basic level, morals are the knowledge of difference between right and wrong.
- Moral values are relative values that protect life and are respectful of the dual life value of others.
- The great moral values such as truth, freedom, charity, etc. have one thing common. When they are functioning correctly, they are life protecting or life enhancing for all.
- Moral reasons include respecting others and ourselves, respecting the right of others, keeping promises, avoiding unnecessary problems to others and cheating them and encourage them to work.

VALUES

- Values are comprised of personal concepts of responsibility, entitlement and respect.
- Values are shaped by personal experience, may change over the span of a lifetime and may be influenced by lessons learned.
- Values may vary accordingly to an individual's cultural, ethnic and or faith-based back ground. Integrity is one such value.
- The human values evolve because of the following factors:
 1. The impact of norms of the society on the fulfillment of the individual's needs or desires.
 2. Developed or modified by one's own awareness, choice, and judgment in fulfilling the needs.
 3. by the teachings and practice of Preceptors (Gurus) or Saviors or religious leaders.
 4. Fostered or modified by social leaders, rulers of kingdom, and by law (government)

ETHICS

The liberalization and globalization being sweep changes in the concept of doing business, but the major by-product like corruption, favoritism, deterioration of human values, series of scam in business, government policies and society are also produced in the 21st century. There is loss of faith in instruments of society.

Business houses are becoming big with control of large resources, human, financial and technical but their surviving purposes to society are always having doubtful values. Day by day innocent Indians are losing their faiths in laws, courts and government.



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- Ethics is a set of principles or standards of human conduct that govern the behavior of individuals or organizations.
- Using these ethical standards a person or a group of persons or an organization regulates their behavior to distinguish between what is right and what is wrong as perceived by others.

Aspects of Ethics:

- 1) The first involves the ability to discern right from wrong, good from evil and propriety from impropriety.
- 2) The second involves the commitment to do what is right, good and proper. Ethics entails action.

Ethics Definition:

- A system of moral principles, rules and standards of conduct.
- The branch of philosophy that defines what is good for the individual and for the society and establishes the nature of obligations, or duties, that people owe themselves and one another.
- It involves moral principles, rules and standards of conduct.
- Ethics is doing what is right to achieve what is good.

Benefits of ethics at work place

- Ethics at work brings discipline and order. It improves and strengthens relationships among superiors, sub ordinates.
- It supports employee growth
- It promotes team work and productivity as employees feel strong alignment between their values and those of the organization.
- Ethical programs help to avoid criminal acts of omission and lower penalties.
- They promote a strong public image as employees operate integrity and self-respect.
- Ethics at work place helps employees to maintain a moral course in the work place.

Ethical Value: A belief of principle rooted in moral behavior, based on a sense of what is right.

Unethical value: A belief of principle rooted in immoral or a moral behavior, based on a sense of what is wrong or at least of consciously disregarding what is right.

UNETHICAL BEHAVIOUR OF EMPLOYEES


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Employees may behave unethically due to following reasons:

1. Pressure from the government to complete the project in time.
2. Reduction in the budget because of natural calamity.
3. An inferior material may be used under pressure of time or budget.
4. Poor working environment.
5. Employees are tempted of bribes and corruption.

DIFFERENCE BETWEEN MORALS AND ETHICS: There is always an ambiguity when we talk about Morals and Ethics because their difference is subtle. Perhaps, these two defines a personality, attitude and behavior of a person. The word Morals is derived from a Greek word “MOs” which means custom. On the other hand, if we talk about Ethics, it is also derived from a Greek word “Ethios” which means character. Now let’s start learning the difference between Morals and Ethics.

Basis for Comparison	Morals	Ethics
Meaning	Morals are the beliefs of the individual or group as to what is right or wrong.	Ethics are the guiding principles which help the individual or group to decide what is good or bad.
Governed By	Social and cultural norms	Individual or Legal and Professional norms
Applicability in Business	No	Yes
Consistency	Morals may differ from society to society and culture to culture.	Ethics are generally uniform.
Expression	Morals are expressed in the form of general rules and statements.	Ethics are abstract.
Freedom to think and choose	No	Yes

INTEGRITY

Integrity is one of the core qualities that any professional should possess. It also refers to honesty and open mindedness either with oneself or others.

Most integrity involves the discovery of truth and its communication.

Integrity is one of the self-direction virtues on commitment and putting understanding to action.



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With the help of integrity, the virtues of self-respect and pride in the job can be made possible.

- Integrity prevents the attitude among the individuals that they are not responsible for their wrong doing in the job.
- It creates enthusiasm among the individuals for achieving excellent performance in their job and also makes them to ensure that the job is well done.
- Maintaining integrity is somewhat difficult and complicated because a few jobs are designed to have a perfect mesh between personal ideas and work activities of someone.
- Maintaining or practicing integrity needs courage. This courage is obtained when wisdom and integrity join hands.
- This value will help the engineers to gain confidence from management and help him to move up the ladder. All the organizations are looking for this value in employees.

The integrity of the engineers is most essential in following works:

- i. Engineering research and testing
- ii. In the use of intellectual property
- iii. Client professional and confidentiality
- iv. Expert testimonials
- v. Failure to inform the public

TRUSTWORTHINESS

Trustworthiness is a human quality and virtue. Trustworthiness enables others to believe in us and to rely on us without reservation of fear. The following values or qualities help us develop trustworthiness: honesty, integrity, reliability and loyalty.

Honesty is a value that helps us convey the truth as best as we know it. Honesty help us to avoid communication that is misleading or deceiving. There are different ways to build honesty, these are:

- Truthfulness
- Sincerity
- Candor

WORK ETHICS


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Work ethic is set of values based on hard work and diligence. It is also a belief I the moral benefit of work and its ability to enhance character. A work ethic may include being reliable, having initiative, or pursuing new skills or maintain social skills. Work ethics is defined as a set of attitudes concerned with the value of work, which forms the motivational orientation

In general, employees need some jobs and wages, but they also desire to be treated humanely with dignity. Moreover, they look for a workplace which is safe and healthy, that respects their privacy, and provides meaningful work, and offers some security during retirement periods.

Workers exhibiting a good work ethic in theory should be selected for better positions, more responsibility and ultimately promotion. Workers who fail to exhibit a good work ethic may be regarded as failing to provide fair value for the wage the employer is paying them and should not be promoted or placed in positions of greater responsibility. Work ethic is not just hard work but also a set of accompanying virtues, whose crucial role in the development and sustaining of free markets.

The philosophy of work ethics is most popular among professional workers including doctor, professor, engineers and accountants as they get positive returns out of that and corporate governance promotes this type of work culture.

A good work ethics creates a work culture in the organization and increases the productivity. This value helps the engineer to work hard, discipline and build team in an organization.

PROFESSIONAL ETHICS

- Professional ethics is a set of standards adapted by professionals as they see themselves acting as professionals.
- It's not what you do, it's how you do
- Professional ethics is necessary to reveal, sustain and enhance certain basic human values.
- These values are kindness, care and compassion, trust and reliability, truthfulness and honesty, justice and fairness.
- Professional ethics is a codified formal system or set of rules which are adopted by a goup of people.
- It encompasses how professionals should behave in their professional work and how they conduct themselves.



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Main characteristics of professional ethics

1. Professional ethics is based on certain ethical values and norms which a professional is supposed to follow.
2. Professional ethics speaks about managing values and conflict among professional.
3. Most of the ethical dilemmas laced by managers in the workplace are highly complx. Professional ethics gives a programmatic approach to solve ethical problems.

ENGINEERING ETHICS

- The term professional ethics is interchangeable with engineering ethics. Engineering ethics deals with the moral issues and decisions confronting individual or organizations engaged with engineering.
- The questions about the moral ideals, character, policies and relationships of people and corporations involved in technological activities.
- Engineering ethics is the activity and discipline aimed at understanding the moral values that may used to guide engineering practice, resolving moral issues in engineering and justifying moral judgments concerning engineering.

Why study Engineering Ethics?

Engineering ethics is not only teaching moral behavior but also increasing the ability of engineers and other professionals to face boldly with the moral problems arising from technological and advancement change and other related activities.

Approaches to Engineering Ethics

There are 2 approaches to engineering ethics

- i. Micro Ethics
- ii. Macro ethics

Micro Ethics: This approach addresses typical, everyday problems that the engineers face in their professional life. In other words, micro ethics describes ethical issues that may affect an engineer's personal and professional life.


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Macro Ethics: this approach deals with all societal problems that engineers encounter during their carrier. In other words, macro-ethics discusses ethical issues concerning all societal problems that engineers might encounter.

HUMAN RIGHTS

These should be possessed by engineers by being people or moral agents. These rights include the basic rights to pursue legitimate personal interests, right to make a living and right to privacy.

PROFESSIONAL RIGHTS

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

Professional rights involve:

- The right to engage in the activities of professional societies.
- The right to form and express ones professional judgment freely.
- The right to protect the clients and the public from dangers that might arise from ones work.
- The right to professional recognition of ones services.
- The right to refuse to carry out illegal and unethical activity.

PROFESSION is defined as any occupation/job/vocation that requires advanced expertise (skills and knowledge), self-regulation and concentrated service to the public good. It brings a high status, socially and economically. The characteristics of profession are:

PROFESSIONAL relates to a person or any work that a person does on a profession and which requires expertise (skills and knowledge), self-regulation and results in public good. The term professional means a ‘person’ as well as a ‘status’.

PROFESSIONALISM: It is the status of a professional which implies certain attitudes or typical qualities that are expected of a professional. It is defined as the services related to achieving the public good, in addition to the practices of the knowledge of moral ideals.

The criteria for achieving and sustaining professional status or professionalism are:


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- **Advanced expertise:** The expertise includes sophisticated skills and theoretical knowledge in exercising judgment. This means a professional should analyze the problem in specific known area, in an objective manner.
- **Self-regulation:** One should analyze the problem independent of self-interest and direct to a decision towards the best interest of the clients/customers. An autonomous judgment (unbiased and on merits only) is expected. In such situations, the codes of conduct of professional societies are followed as guidance.
- **Public good:** One should not be a mere paid employee of an individual or a teaching college or manufacturing organization, to execute whatever the employer wants one to do. The job should be recognized by the public. The concerted efforts in the job should be towards promotion of the welfare, safety, and health of the public.

CONFLICT OF INTEREST

- Conflict of interests has been a subject of extreme importance in which employees, agents, and professionals failed to exercise proper judgment on behalf of their principals.
- Conflict of interest is the situations where professionals have self-interest.
- Employees are not allowed to engage, either within or outside working hours, in any other employment or any form of business activity, unless prior approval is obtained from the managing director or HR department
- A **conflict of interest (COI)** is a situation in which a person or organization is involved in multiple interests, financial or otherwise, and serving one interest could involve working against another. Typically, this relates to situations in which the personal interest of an individual or organization might adversely affect a duty owed to make decisions for the benefit of a third party.

A widely used definition is: "A conflict of interest is a set of circumstances that creates a risk that professional judgment or actions regarding a primary interest will be unduly influenced by a secondary interest." *Primary interest* refers to the principal goals of the profession or activity, such as the protection of clients, the health of patients, the integrity of research, and the duties of public officer. *Secondary interest* includes personal benefit and is not limited to only financial gain but also such motives as the desire for professional advancement, or the wish to do favors for family and friends. These secondary interests are not treated as wrong in and of themselves, but become objectionable when


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they are believed to have greater weight than the primary interests. Conflict of interest rules in the public sphere mainly focus on financial relationships since they are relatively more objective, fungible, and quantifiable, and usually involve the political, legal, and medical fields.

CONFIDENTIALITY

Confidential information is the information which is desirable to keep secret in a government department or a private company. Engineers and the employees are expected to keep information 'Confidential'. Keeping confidence or confidentiality is the most important duty of any professional. Confidentiality is an ethical principle associated with several professions.

Lawyers must keep clients' information confidential. Doctors must keep information about their patients confidential. Teachers must keep personal information about their students confidential.

Similarly, employed engineers must keep information about their company's and clients confidential. They are expected not to leak out any confidential information to unauthorized people both inside and outside the company.

Confidentiality or confidential information with respect to business includes:

- Any information that the employer or the client would like to have kept secret in order to compete effectively against business rivals. i.e., data concerning to company's business or technical process.
- Most information about how a business is run, its products and its suppliers, directly affects the company's ability to compete in the market place.
- Test results and data.
- Information about upcoming unreleased products.
- Design or formulas for products.
- The number of employees working on project the identify of suppliers
- Marketing strategies
- Production costs.
- Production yields

There are 2 terms that are related to confidentiality

- i. Privileged information



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ii. Proprietary information

- Privileged information- Information available only on the basis of special privilege such as granted to an employee working on special assignment. It covers information that has not yet become public or widely known within an organization.
- Proprietary information – This is the information that company owns. It is the information owned by the proprietary in a legal sense. Also called Trade Secret. 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 about designs and technical processes and so on.

BRIBE

A bribe is a substantial amount of money or goods offered beyond a stated business contract with the aim of winning an advantage in gaining or keeping the contract, and where the advantage is illegal or otherwise unethical. Bribes are illegal or immoral because they are substantial enough to threaten fairness in competitive situations.

Here ‘substantial’ means that which is sufficient to distort the judgment of a typical person. Bribes are generally given in secret. Since bribes can bias judgments, companies have given elaborate guidelines for their employees, illustrating acceptable and unacceptable gifts. But in some companies officials are prohibited by law from accepting anything of value.

GIFTS

Gifts are not bribes as long as they are small gratuities offered in the normal conduct of business. A gift one believes is given in friendship rather than for influence. Often companies give gifts to employees of government agencies or partners in trade.

Engineers should not accept money directly or indirectly from contractors, or their agents in connection with the work. If one receives gifts which will cause an embarrassing consequence for the company when made public, then the gift is considered as a bribe. Entertainment, travel and other social functions give rise to special difficulties. Many companies

WHISTLE BLOWING


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A whistle blower is a person who exposes any kind of information or activity that is deemed illegal, unethical, or not correct within an organization that is either private or public.

Exposing misconduct, illegal, or dishonest activity is a big fear for public employees because they feel they are going against their government and country. These laws were enacted to help prevent corruption and encourage people to expose misconduct, illegal, or dishonest activity for the good of society. Whistle blowing is truly an entirely ethical decision, and action.

The reasons for whistle blowing may be:

- Violation of company policy/ rules, law, regulation
- Treat to public interest
- Treat to national security
- Fraud and corruption

Types of Whistle blowing:

- i. Internal Whistle blowing
- ii. External whistle blowing

Internal Whistle blowing – Internally, a whistle blower can bring his/her accusations to the attention of other people within the accused organization. Individuals who expose information regarding wrong doing, fraud, corruption or mismanagement and report such acts inside an organization.

External whistle blowing- Individuals who report of such wrong doings or misconduct outside of the organization i.e to the media, law enforcement agencies, etc. are called as external whistle blowers. Whistle blower can reach out to the media, government, law enforcement etc

PRICE FIXING

Price fixing is 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 supply and demand.

The intent of price fixing may be to push the price of a product as high as possible, generally leading to profits for all sellers but may also have the goal to fix, peg, discount, or stabilize prices. The defining characteristic of price fixing is any agreement regarding price, whether expressed or implied.


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Price fixing requires a conspiracy between sellers or buyers. The purpose is to coordinate pricing for mutual benefit of the traders. For example, manufacturers and retailers may conspire to sell at a common "retail" price; set a common minimum sales price, where sellers agree not to discount the sales price below the agreed-to minimum price; buy the product from a supplier at a specified maximum price; adhere to a price book or list price; engage in cooperative price advertising; standardize credit terms offered to purchasers; use uniform trade-in allowances; limit discounts; discontinue a free service or fix the price of one component of an overall service; adhere uniformly to previously-announced prices and terms of sale; establish uniform costs and markups; impose mandatory surcharges; purposefully reduce output or sales in order to charge higher prices; or purposefully share or pool markets, territories, or customers.

Price fixing is permitted in some markets but not others; where allowed, it is often known as *resale price maintenance* or *retail price maintenance*.

In neo-classical economics, price fixing is inefficient. The anti-competitive agreement by producers to fix prices above the market price transfers some of the surplus to those producers and also results in a deadweight loss.

REVIEW QUESTIONS:

- 1) Define quality in construction. Explain the process of project quality management.
- 2) Explain quality assurance and quality control
- 3) Describe cost of quality in construction.
- 4) Brief about concept of Total Quality Management.
- 5) Explain concepts of HSE as applicable to construction.
- 6) List safety measures to be taken during, excavation, explosives, drilling and blasting.
- 7) How safety achieved through legislation.
- 8) Explain safety campaign.
- 9) Define Ethics, Morals and values.
- 10) Why engineering ethics needed.
- 11) Explain professional duties, professional and individual rights.
- 12) Describe confidential and proprietary information.
- 13) How conflict of Interest arises. What are the different types of conflict of interest?



DEPARTMENT OF CIVIL ENGINEERING

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- 14) Explain confidentiality.
- 15) Differentiate between gifts and bribes.
- 16) Write short note on whistle blowing.
- 17) Define accident.
- 18) What are the effects of accidents in construction industry?