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Construction Safety Management

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Abstract: Managing construction sites are difficult due to temporary work nature, changing work area, untrained workers, over time works etc., Most of the accidents occurred in construction activities like building structures, demolition, excavation, roof work, alteration, scaffolding, painting etc,. In typical construction works about 1500 people are killed in Britain and 25,000-30,000 more are seriously injured. The accident statistics represent not only serious human tragedies but also substantial economical losses due to accidents which cause damage to plant and equipment, loss of productive time, loss of morale among workers, increased compensation and loss of image and reputation for the industry.
The key to a successful construction project is to identify vulnerable hazards and eliminate or minimize them. To avoid accidents, the causes of accidents and reliability of the statistics are to be analyzed. Various construction regulations should be followed. The safety policy should be framed. Workers are to be trained in safe methods of work. Safe physical conditions should be provided in the construction sites. Sufficient and suitable personal protective equipments be provided and insisted. Supervision of work area are to be ensured. This paper deals with the various construction activities, hazards and their prevention methods, statutory requirements are discussed. Responsibilities of construction management on safety are also dealt with.
Keywords: safety, accident, construction, safety management, policy etc.

I. INTRODUCTION

Construction work is recognized as a dangerous occupation. In United States, each year, more than 1,000 construction workers are killed on the job. It was1,190 in the year 1999. In addition to fatal accidents, more than 1,00,000 construction workers are affected with work-related accidents each year..
The main causes of accidents are, falls, stepping on or striking against objects, lifting and material handling, over exertion, machinery, electricity, transport , fire and explosions.
The job requirements and physical capabilities necessary to perform construction work are demanding. Construction workers often lift, push, pull, and carry heavy objects. This increases the risk of suffering a work-related musculoskeletal (or neck and back injury). In addition, some of the equipment used the construction industry, such as jackhammers, causes intense .

A. Today there is need of accident prevention programmed in every project in order to reduce the cost of construction in terms of:-
1) Human lives sacrificed.
2) Injuries to workers of any extent.
3) Loss of damage to equipment.
4) Loss of time during and after construction accidents.
5) Compensation, insurance cost to workers if expire at work site, during construction period.

II. TYPE OF ACCIDENTS

A. According To Causes
1) Uncontrolled contact between men and equipment.
2) Failure of temporary structure.
3) Inherent engineering hazards such as use of explosives, toxic gas etc.
4) Personal hazards resulting carelessness of workers.

B. According To Provision Of Factories Act;1948
1) *Minor accidents:* Accidents which make the workers disabled for less than 48 hours comes under this categories.
2) *Reportable accidents:* If an accident causes worker disabled such that he can not work for More than 48 hours, the accident is classified as Reportable accidents.
3) *Fatal accidents:* Result in death of a worker.

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4) Accidents which cause poisoning.
5) Dangerous occurrence.

III. CAUSES OF CONSTRUCTION ACCIDENTS

There are many causes for construction site accidents, including negligent and dangerous construction site practices, such as :-

- Inadequate supervision
- Unsafe condition
- Unsafe Act
- Defective equipment
- Negligent blasting and tunneling procedures
- Wall and roof collapses
- Dropped loads
- Crane and aerial lift overturns
- Scaffolding and staging collapses
- Unprotected holes, floor openings, and open stairways
- Exposure to radiation
- Underground mine blasts
- Unsafe design or construction
- Unskilled or untrained operatives
- Lack of co-operation between different trades
- Lack of safety devices
- Improper scaffolding procedureI
- Improperly maintained access areas
- Insufficient fall protection systems
- Insufficient bracing or support of concrete structures
- Badly installed electrification
- fire and explosion risks associated with flammable and combustible materials
- Bad ventilation
- Defects in equipment
- Inadequate instructions from supervisor
- Inadequate examination of equipment

IV.HAZARDS OF CONSTRUCTION :-

A. Physical Injuri Hazards
1) Excavation
2) Scaffolding
3) False work
4) Ladders
5) Roof work
6) Tunneling
7) Explosive
8) Cranes

B. Electrical Hazards
1) Faulty equipment
2) Improper repair

C. Chemical Hazards
1) Dust and fumes
2) Volatile liquid and solid
3) Dampness
4) Compressed air work
5) Laser
6) Ionising radiation
7) Excessive noise vibration
8) Industrial dermatitis
9) Spontaneous fire
10) Abnormalities of air pressure, temperature, humidity

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11) Mineral dusts

D. SAFETY IN EXCAVATIONS

1) Hazards Associated With Excavation

a) Collapse of the sides burying or partially burying
b) Materials falling into the trench
c) People falling into the excavation

E. Limitations

1) working space is very confine
2) collapse occurs very quickly

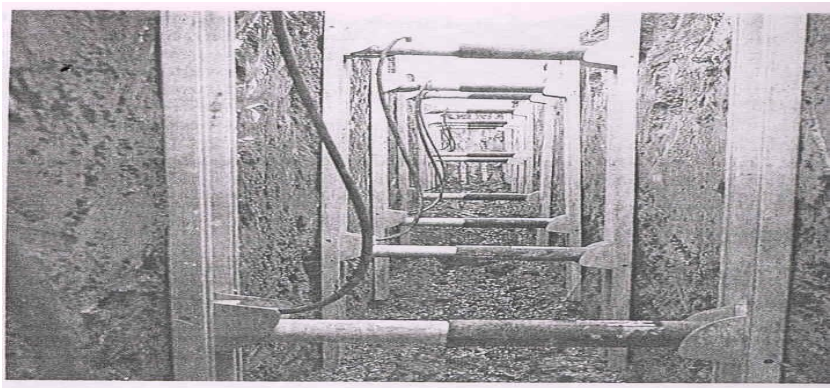

Fig. 4.3. Vertical shoring system for use in ground not requiring close sh
hydraulic cylinders are pressurised by a hand pump (courtesy Shorco)

F. Causes Of Trench Collapse

1) mechanical failure of soil
2) breakdown strength of the lack by the ingress of water
3) vibration and weight of vehicles and plant
4) storage of materials near the trench
5) variations in nature of ground
6) previously excavated ground
7) the sides of the trench being struck by heavy loads

G. Safe Methods

1) timbering or shoring, i.e. supporting the sides(the provisions of physical support for each side of the trench)
2) Battering the sides to a safe angle.
3) Ladder access should be provides at reasonable intervals within a part of the trench.
4) Use the respiratory equipment to safeguard from the dangerous atmospheres like oxygen deficiency, carbon dioxide, carbon monoxide, nitrous fumes & methane gas.

H. Safety In Scaffolding

1) Hazards In Scaffolding

2) People falling from the scaffolding
3) People below the working platform being struck by material fall or being thrown from it
4) The scaffold or part of it, collapsing ie, crushing people under it or nearby at ground level.
5) The collapsed scaffold causing damage to adjacent property or to the structure associated with the scaffold.

I. Causes Of Collapse

1) Overloading

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2) Ties

J. Safe Methods

1) Provide toe board and guard rails on a scaffold will generally prevent a fall to a lower level should a worker lose balance.
2) Areas that slippery after spillages should be immediately cleaned and sanded if necessary.
3) Chipping and dusts from materials should be swept up and not allowed to accumulate
4) Clear passage way should be maintained between material and edge of the platform
5) The surface of the platform should be even and without excessive sag caused by the self weight of the board
6) each board should be supported by atleast three putlogs
7) board ends do not overhang by more than four times the thickness of the board and no gap between the boards
8) proper ties are used
9) No overloading

K. Safety In Ladders

1) Causes
a) ladders slip
b) When defective ladders are used they fracture under the weight of the user.

L. Safe Methods

1) No overloading
2) Don't use defective ladders
3) Adequately secure at bottom to prevent movement
4) Rungs are clean and free from slippery
5) The ladder should extend beyond the place of landing by a meter
6) Placed an angle of 75° to the horizontal
7) Metal ladders and timber ladders with metal reinforcements should never be used in the vicinity of electrical apparatus

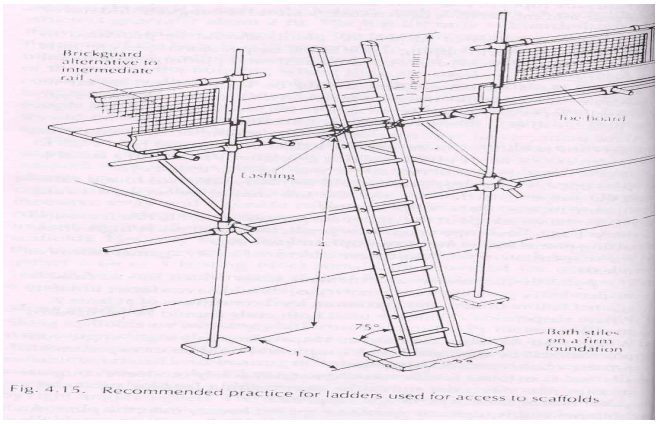

Fig. 4.15. Recommended practice for ladders used for access to scaffolds

M. Safety In False work

The totals or partial collapse of false work may lead to serious accidents for those on the structure who are thrown from or fall from their place of work. The collapse of false work can be attributed to inadequate design, poor construction or combination of the two.

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N. Safe Methods

1) All the Loads applied to the structure are calculated.
2) Secured foundations
3) Proper materials to be used
4) Required stability to prevent movement towards a collapse condition
5) No excessive twisting or bending in the structural elements
6) Allow vehicular traffic tp pass through the false work structure

O. Safety In Roof Work

Hazards during working at height

- Falls from roof
- Roof edge
- Roof opening
- Skylights
- Through roof surface
- Falls from ladder
- Scaffold
- Girders or structural steel
- Lifts
- Wall openings

P. Safety Measure

1) Providing safe access and egress
2) Safe walking practice
3) Using safety net
4) Fall arrest system
5) Guard rail system
6) Good house keeping
7) Safe foot wear
8) Safe surfaces and platforms on which to walk
9) Employers should provide fall protection in one of three ways before work begins:
10) Placing guardrails around the hazard area,
11) Install safety nets

Q. Fall Protection Equipment

1) SAFETY NETTING
2) SAFETY BELT
3) SAFETY HARNESS

Protects workers from falls and stops injuries and damage from dangerous falling debris. Personnel safety nets are tested to withstand over 17,500 pounds.

R. General construction safety net systems

1) Saves lives - stops deadly worker falls
2) Improves jobsite safety and morale
3) Protection against damage and injury from falling debris

S. Scaffold safety netting

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- Replaces troublesome sidewalk sheds and platforms
- Prevents workers from falling off scaffolding
- Allows unrestricted access with jobsite safety
- Gives workers peace of mind
- Prevents equipment and debris from falling

T. Vertical debris safety netting

- Protection for personnel and the public
- Fire retardant, high strength debris netting
- Movable from floor to floor
- Complies with OSHA regulations

U. Safety In Tunneling

1) Work in confined area
2) Burial from ground collapse
3) Falls form platforms and the danger from falling material
4) Atmospheric pollution
5) Compressed air hazards

V. Safe Methods

1) use personnel protective equipment
2) work permit system or confined space entry system to be adopted
3) rescue team readily available
4)

W. Afety In Demolition

Demolition is one of the high risk activities of the construction industry with a fatal and major injury accident incidence rate about 17 times that for the whole of the construction industry. Approximately 10% of all fatal accidents each year in the construction field occur in the demolition sector.

Standard for Demolition : BS 6187:1982 Code of practice for demolition

Pre-survey inspection: This should be carried out to ascertain

1) *The type of construction:-* If structure is damage one due to earthquake, fire etc.,bracing and shoring will have to be provided to accidental collapse.
2) *The location of structure:* Normally no demolition work should be done in the night especially if structure to be demolished is located in inhabited areas.
3) *The Need For Temporary Support:* Adequate support centering should be provided prior to removal of floor.
4) *The Position Of Services Such As Electrical, Gas And Water Services:*All water, gas, electricity lines must be shut off before the start of demolition work.

X. Safety In The Use Of Explosives

1) Explosives should not be stored, transported, handled or used excep
2) under conditions prescribed by national laws or regulation
3) By a competent person, who should take all necessary steps to ensure that workers and other persons are not exposed to risk of injury.

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4) Blasting caps, safety fuses, wiring and other blasting equipment
5) Should Conform to specifications laid down in national laws or regulations.
6) As far as practicable, blasting should be done off shift or during breaks in the work.
7) As far as practicable, blasting above ground should be done in daylight.
8) Conspicuous notices should be posted at points around the area of operations.
9) Smoking and open flames should not be allowed in the loading area.
10) Detonators should be stored or transported separately from the explosives.
11) Different types of explosives should not be transported in the same container.
12) Explosives should be permanently stored only in magazines which should be at a safe distance from occupied buildings or areas;
13) Only flameproof electric lighting equipment should be allowed in explosives magazines.

Y. Safety In Crane Operation
1) The overturning of a crane or the structural failure of one of its elements
2) The dropping of the suspended load or part of it
3) Electrocution
4) Trapping of people
5) Incorrect erection and dismantling procedures.These hazards are considered in respect of mobile, tower and derric cranes, which are the types most commonly used on construction sites.

Z. Safety Measures
1) Automatic safe load indicators.
2) Load radius indicators.
3) Do not stand under suspended load.
4) Testing and examination of crane as per the statutory requirements.

AA. Construction Health Hazards:
1) Dust and fumes
2) Industrial dermatitis
3) Vibration-induced white finger
4) Ionising radiations
5) Lasers
6) Compressed air work

BB. Importance Of Safety
The construction industry employing largest labour force in the country, has accounted for about 11%of all occupational injuries and 20% of all deaths resulting from occupational accidents.The cost of accidents is expensive. However economic cost is not the only reason for which the contractor should be conscious of safety.The reasons for considering safety include:
1) *Humanitarian Concern:*When an accident happens, the resulting suffering of the injured workers and their families is difficult to quantify in economic terms. The contractor should never ignore this even if he has insurance against accidents.
2) *Economic Reasons:*Even if contractor has insurance, he will find out the cost of accidents will come out of his own pocket through an increase in insurance premiums.The directs costs are :-Medical expenses
a) compensation cost
b) Insurance premium increases
c) Fees for legal counsel
d) Facilities repair and clean up

3) *Laws And Regulations:* As per different acts and laws, the employer should look after the safety of the employee.
4) *Organisational image:*A good safety produce higher productivity and stronger employee loyalty.It will also improve company's public image.

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V. REGULATIONS FOR SAFETY MANAGEMENT

A. Regulations That Only Apply To Construction In Uk

Regulations made under the HSW act or made previously and enforced under it as existing statutory provisions which only apply to construction are the

Construction (Lifting operations)Regulations 1961
Construction (Head protection) regulations 1989
Construction (Design and Management) Regulations 1994
Construction (Health, Safety and Welfare) regulations 1996

B. Regulations That Only Apply To Construction In Usa:

Occupational Safety & Health Act related to construction

C. Regulations That Apply To Construction In India

Framed in 1996 and not came into enforcement

D. Safety Management

A good construction safety management has the following:

a) safety policy
b) safety training
c) Safety representatives and safety committee
d) administrative control
e) enforcement
f) conducting safety audit and implementing its recommendations
g) safety survey and investigation
h) Reporting of accidents and accident investigation
i) safety appraisal
j) permits to work
k) competent person

E. Safety Policy

Policy statements are prepared and issued by employers to comply with the acts should be in terms of that can be clearly understood by their employees. Any arrangements the company has made for the establishment of safety committees and for consultation with safety representatives should be covered in the policy statement. The health & safety statement should therefore contain the following basic elements:

1) That the company has a legal duty, as far as is reasonably practicable, to provide safe and healthy working conditions for ite employees
2) The health and safety of others, besides that of its employees, is not adversely affected.
3) The employees are cooperate with company and that of other employees and any one who might be affected to their activities at work in preserving their own safety & health.
4) That an organization and chain of authority in matters of safety has been set up.
5) That safety information, instruction, training and supervision will be provided for all employees as and when necessary.
6) That the company will encourage the work of a safety committee and cooperate with safety representatives if that is the employees wish.

F. Duties Of Management

It is common practice in organisations of more than about 50 employees for the chief executive to appoint a safety director to take special responsibility for safety. The management committee must make adequate financial provision for safety, health and welfare of employees to maintain the safety organization and provide information and training.

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G. Safety Organization Of A Contractor:

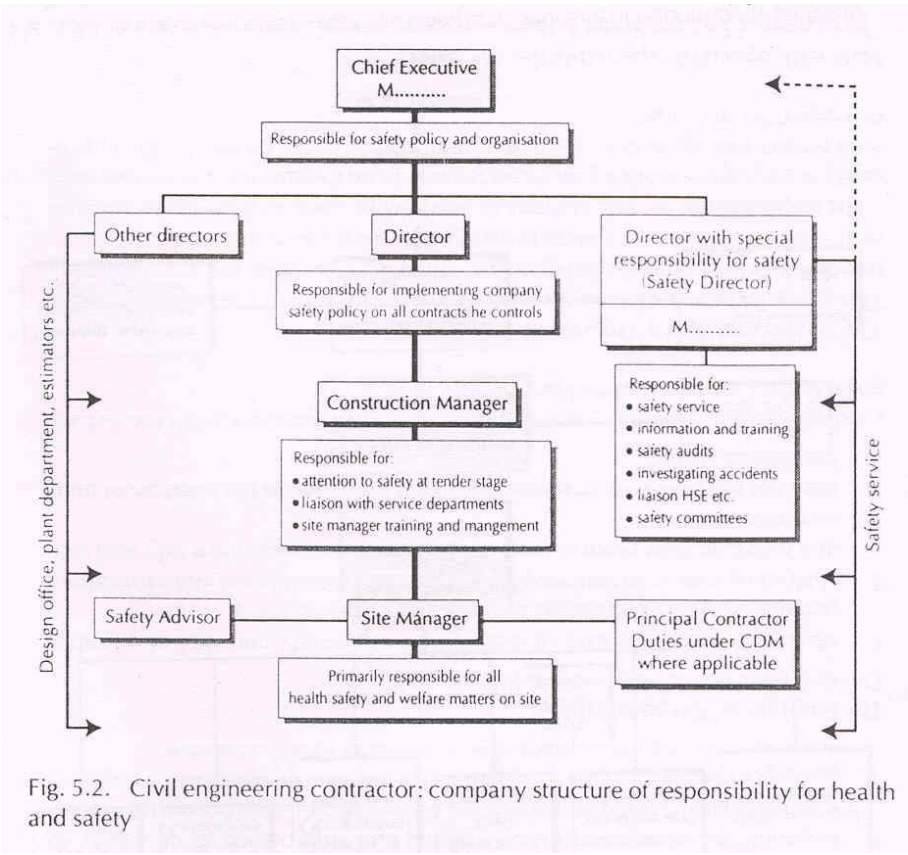

Fig. 5.2. Civil engineering contractor: company structure of responsibility for health and safety

VI. CONCLUSION

In the construction management safety is given a due consideration to safeguard people and material and cost involved in the case of injury. As far as India is considered, there is no such regulations though the construction act has been framed but it should be enforced to avoid future accidents. As from the discussion we conclude that Safety Management are very much needed to construction industries to maximize productivity.

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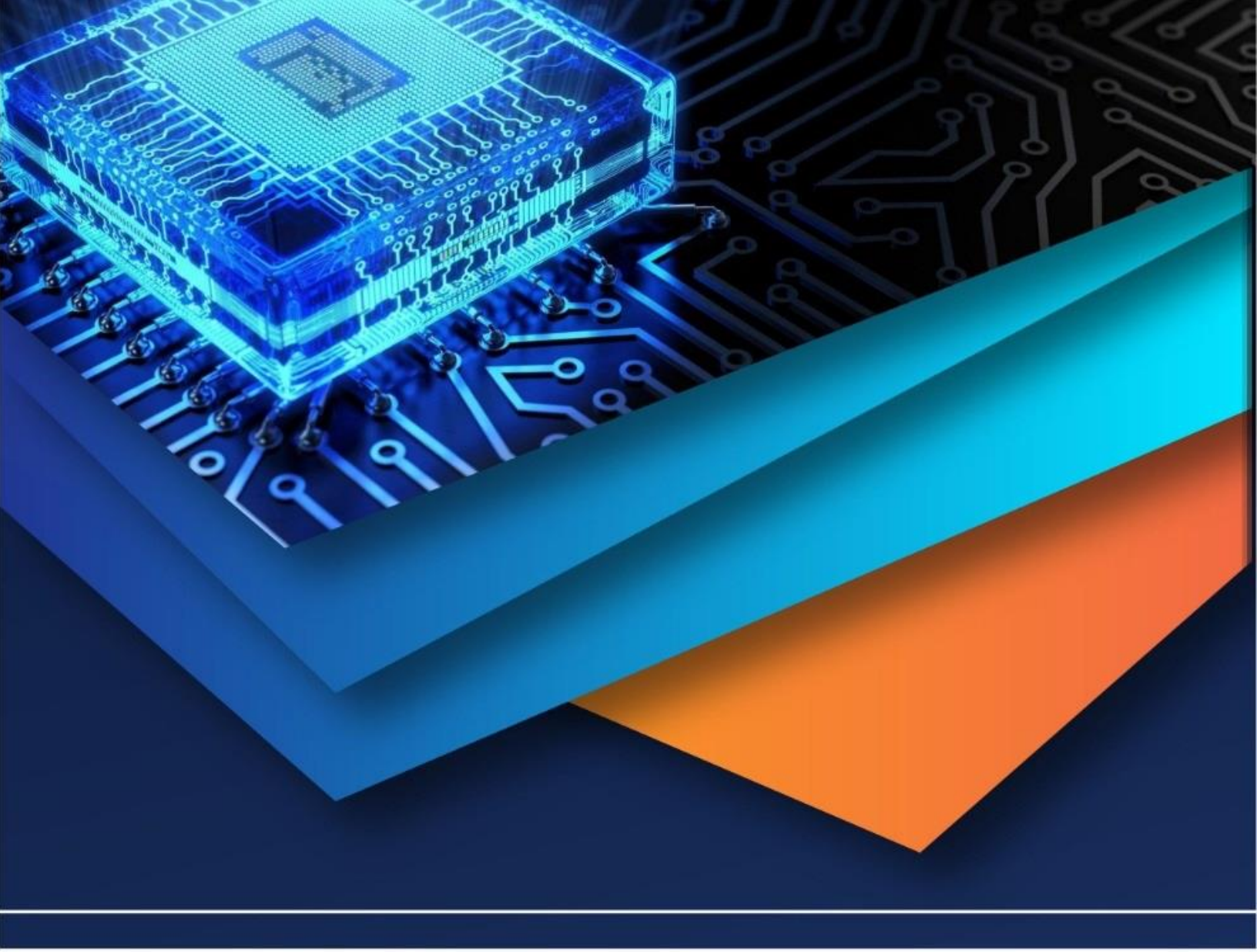

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