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Green Methods, Materials and Techniques

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Abstract: Green building methods, materials and techniques starts uses form very initial stage of construction of building, such as in site operation, foundation, structural frames, exterior finish of building, plumbing, electrical, energy saving appliances, Insulation, Windows, Heating ventilation and air conditioning (HVAC),Renewable energy and roofing, Natural heating and cooling, Indoor air quality and Flooring etc. But, all this method, materials and techniques which we can implement during construction of building gets skip as it is existing building, only those which can be apply with minimum changes and minimum cost to existing building.

Keywords: Green building, Heating ventilation and air conditioning, Insulation, Indoor air quality, existing building

I. GREEN METHODS, MATERIALS AND TECHNIQUES

As we know green building methods, materials and techniques starts uses form very initial stage of construction of building, such as in site operation, foundation, structural frames, exterior finish of building, plumbing, electrical, energy saving appliances, Insulation, Windows, Heating ventilation and air conditioning (HVAC),Renewable energy and roofing, Natural heating and cooling, Indoor air quality and Flooring etc.But, all this method, materials and techniques which we can implement during construction of building gets skip as it is existing building, only those which can be apply with minimum changes and minimum cost to existing building

A. Exterior finish

1) Use sustainable decking material and forest stewadship council (fSC) certified wood decking.

a) Description: In architecture, a deck is a flat surface capable of supporting weight, similar to a floor, but typically constructed outdoors, often elevated from the ground, and usually connected to a building. The term is a generalization of decks as found on ships.There are two types of recycled wood decking, plastic lumber and composite lumber. Plastic lumbers are made-up of only recycled plastic raisins but composite lumber consist of recycled plastic raisins and recycled wood fibers.FSC certified sustainably harvested lumber comes from forests managed in an environmentally and socially responsible manner.

Fig. 1 Wood Decking.

B. Applications

1) Composite lumber and plastic lumber can be used as old- growth redwood, cedar and pressure treated pine, these products accept screws and nails and cut like wood. And Follow manufactures recommendations closely regarding the amount of expansion that will occur when using plastic lumber.

2) FSC Certified lumber is for all exterior decking applications or as structural deck members in conjunctions with recycled content decking.

C. Benefits

1) These materials are durable than wood.
2) It is cost saving.
3) It is rot, crack or splinter proof.
4) It reduces pressure on old-growth forests.
5) FSC wood decking assures long-term availability of precious wood while preserving old-growth forests.

II. INSTALL HOUSE WRAP UNDER SLIDING

A. Description

House wrapshould be applied over all sheathing before exterior finish is installed with good drainage system. Special products have been developed for wrapping window and door openings and for stucco applications.

B. Applications

House wrap protects the sheathing from moisture and allow vapor from inside to escape. It Provide effective air infiltration barrier.

C. Benefits

1) It provides a continuous drainage plane that diverts water away from the stud cavity and provides an effective air infiltration barrier.

2) It reduces moisture build up in stud cavities by allowing water vapor to migrate through the material.

III. USE FIBER-CEMENT SIDING MATERIALS

A. Description

Fiber-cement siding is composed of cement, sand and cellulose fibers.

It is usually textured to look like wood siding or stucco finish.

B. Applications

It replace conventional wood siding or stucco finishes to fiber cement siding and It can be cut by carbide-tipped saw blade. Dust protection control is required during cutting.

C. Benefits

1) fiber-cement siding materials are more durable than wood.

2) Termite resistant and non-combustible.

D. Plumbing

1) Replace toilets with ultra low flush models.

a) Description: Approximately 30 to 40% of water used inside residential buildings is used for toilet flushing. Conventional toilets consume six litres of water per flush. Since toilets last approximately 15 to 20 years, the water savings over the lifetime of the fixture are substantial. In apartment buildings, about a 40% reduction in water use can be achieved through the use of 6 liter toilets. Although a 6 liter toilet looks like a conventional toilet, it has several unique features. Most 6 liter toilets use gravity to speed the course of water through the bowl and trap. The rim wash comes through an open slot rather than small holes. The bowl may have steep sides and a narrow trap opening. Six-litre flush toilets generally have a smaller pool or "water spot" than that in conventional toilets.

b) Applications: Replace existing toilets with new 6 liter models, no more than this and it performance well.

c) Benefits: It reduces amount of water usage.

E. Install water filtration units.

1) Description: A water filter removes impurities by minimizing contamination of water using a fine physical barrier, a chemical process or a biological process. It is installing at every individual fixture to avoided chemicals and particulates from water stream.

Filters cleanse water to different extents for purposes such as providing agricultural irrigation, accessible drinking water, public and private aquaria, and the safe use of ponds and swimming pools.

Filters use sieving, adsorption, ion exchanges and other processes to remove unwanted substances from water. Unlike a sieve or screen, a filter can potentially remove particles much smaller than the holes through which its water passes.

Fig. 2 Water filtration units.

2) Applications

a) It installs between the cold water line and the main drinking water faucets and to every fixtures in building.

3) Benefits

a) To get clean water.

b) It avoids contaminates in water.

F. Electrical

1) Install compact florescent light bulbs (CFLs)

a) Description: A compact fluorescent lamp (CFL), also called compact fluorescent light, energy-saving light, and compact fluorescent tube, is a fluorescent lamp designed to replace an incandescent light bulb; some types fit into light fixtures designed for incandescent bulbs. The lamps use a tube which is curved or folded to fit into the space of an incandescent bulb, and a compact electronic lamp. Compared to general-service incandescent lamps giving the same amount of visible light, CFLs use one-fifth to one-third the electric power, and last eight to fifteen times longer. A CFL has a higher purchase price than an incandescent lamp, but can save over five times its purchase price in electricity costs over the lamp's lifetime.

b) Applications

i) Replace incandescent bulbs by compact florescent light bulbs (CFLs)

c) Benefits

i) Compact florescent light bulbs (CFLs) are profitable investment.

ii) Reduced electricity bills.

iii) Compact florescent light bulbs (CFLs) has Life is more than incandescent bulbs.

F. Install lighting control system

1) Description: A lighting control system is an intelligent network based lighting control solution that incorporates communication between various system inputs and outputs related to lighting control with the use of one or more central computing devices.

Lighting control systems are widely used on both indoor and outdoor lighting of commercial, industrial, and residential spaces. Lighting control systems serve to provide the right amount of light where and when it is needed. Lighting control systems are employed to maximize the energy savings from the lighting system, satisfy building codes, or comply with green building and energy conservation programs. Lighting control systems are often referred to under the term Smart Lighting.Lighting control use dimmers, sensor and timers to turn lights off in unused areas or during times when lighting is not needed.

Fig. 3. Lighting control system

1) Applications

a) Install lighting control either at specific locations or for whole system.

b) Lighting control are specially use for external uses.

2) Benefits

a) It reduces consumption of energy.

b) Install lighting control system right amount of light.

G. Install high efficiency ceiling fans with CFLs.

1) Description: Ceiling fans improves interior comfort by circulating cold and warm air. They can be adjusted to either draw warm air upward during summer months or push it downwards in winters. high efficiency ceiling fans with CFLs works very efficiently in less consumption of energy as compaired to conventional ceiling fans.

Fig. 4. High efficiency ceiling fans with CFLs

2) Applications: It Increase the flow of air in a given direction and largely as a result of the first, de-stratify the air in a room.

3) Benefits

a) Ceiling fans can reduce the need for air conditioning.

H. Upgrade walls and ceiling insulation

1) Description: Insulating can cut the cost of heating and cooling by over 40%. Insulating the ceiling of a house has the potential to save 20-30% on heating and cooling bills. Heating and air conditioning units don't have to run as hard or as long to achieve the desired temperature in the building.Upgrading walls and ceiling can reduce the demand for air conditioning and heating and make buildings more comfortable.Nsulation is an excellent sound absorber and can assist in reducing noise transmission through walls, ceilings and floors making the home or work environment quiete Nsulation is an acknowledged way to reduce the consumption of fossil fuels which add to the greenhouse effect. Golden Fleece insulation products are environmentally friendly.

1) Applications

a) *Wall insulation:* Insulate walls of existing wood frame houses to the capacity of the wall cavity; it reduces the temperature by 20 % than external.

Fig. 5Wall insulation

b) *Ceiling insulation*: Ceiling and reduced negative environmental impact. It improved thermal performance of buildings, lower energy consumption ultimatly money savingsand thus less harmful gases emitted into the atmosphere. The buildings can maintain a constant temperature throughout the year, the less energy you will have to waste on additionally cooling or heating the space.Ceiling are under the direct influence of the weather conditions including rain and all the water that can build up it taks care of moisture problems. Ceiling insulation will take care of the moisture problems from that point on, since it will keep the house protected from mould and mildew by allowing all the excessive moisture to escape out, instead of building up underneath the roof. It is generally installed intended to be in ceiling below attic space, with appropriate ventilation.

Fig. 6 Ceiling insulation

2) Benefit

a) Both improve comfort decrease heating and cooling requirements.

b) Saves money.

c) Makes the home quieter.

I. Install recycled content and fiberglass insulation with no added formaldehyde.

1) Description: Many fiberglass insulation products include recycled glass and no asphalt adhesive or colored dyes.

2) Applications

a) When using fiberglass insulation, specify recycled- content and no formaldehyde.

b) This type of fiber glass insulation is installed exactly as traditional fiberglass.

3) Benefit

a) It improves indoor air quality as it contains 30 % recycled glass.

J. Use advanced infiltration reduction practices

1) Description: Infiltration practices use temporary surface or underground storage to allow incomming stormwater runoff to exfiltrate in to underlaying soils. Runoff first passes through multipul pretretment mechanisums to trap sediment and organic matter it reaches to the practices. As storm water will reach to the sub soil. It have capability reduction in filtration Expanding foam and caulk are used to prevent infiltration where wood connections are made or framing is drilled to provide plumbing and electric runs.

Fig. 7 Infiltration reduction practices

2) Applications

a) It is especially important when fiberglass insulation is installed.

b) To seal holes between floors to seal cavities around wire runs.

c) It is filler to top and bottom plates on all floors.

3) Benefit

a) Reduction in infiltration.

K. Install energy efficient windows and overhang or awning over south facing windows

Windows play a big role in the energy efficiency of home.In summer, they can allow unwanted head in to the house, and in thewinter, windows can account for as much as 25% of the heat loss.Energy-efficient windows would be a great improvement, but replacement can be very expensive.Overhang or awning over south facing windows are important component of passive solar heating and natural cooling.It helps to keep the heat of the sun from entering the home of the sun in summer And allow heat inside in winter.Double glazing insulates almost twice as well as single glazing. Single –paned windows should be replacing to double paned windows as it makes home more comfortable during all seasons, while saving energy and money.Low Emissivity (Low-E)

windows have Low- E coating, virtually unnoticeable to eye, are installed inside the air space of a double –paned window and it helps to prevent heat from escaping through the glass in winter and block heat from entering the home during summer.

1) Applications

a) It reflects heat and makes the home more comfortable during summer and cold weather.

b) Overhang or awning over south facing windows is applied above south windows

2) Benefits

a) It makes passive solar heating and natural cooling.

b) Low cost.

c) Lower electricity bills.

d) Make more comfortable in summer.

L. Install Low conductivity frames and low solar heat gain coefficient (SHGC) window film on single glazing.

1) Description: Most window frames are made up of wood, vinyl, and fiberglass or aluminum, wood, vinyl, and fiberglass insulate better than aluminum frames. SHGC windows film reduces solar heat gain through glass, while still transferring light and visibility.

2) Applications

a) Considering wood windows as standard window packages.

b) Reflective film should only be used on single –paned windows.

3) Benefits

a) Wood windows create greater comfort and better energy efficiency and are environmentally preferable material.

b) It reduces overheating

c) Improves comfort.

d) Lower the need of additional cooling.

M. Heating, ventilation, and air conditioning.

1) Description: Leaks in the joints between ductworks allow conditioned air to escape into attics and basement.Nationally, leaks at the joins between ductwork connections allow, on average, 25% of the conditioned air to escape into attics and basement. Duct tape loses its effectiveness in 3-5 years mastic maintains the seal for decades.

Duct in exterior walls, attics and in uninsulated space lose a significant amount of heated or cooled air capacity. Debris and dust from construction can cause allergic reaction in occupants. Solar attic fan exhaust heat from attic space in summer and clear condensation in the winter. Soffit/eave ventilation and gable/continuous ridge ventilation exhaust excess heat and moisture from attic space by natural convection.

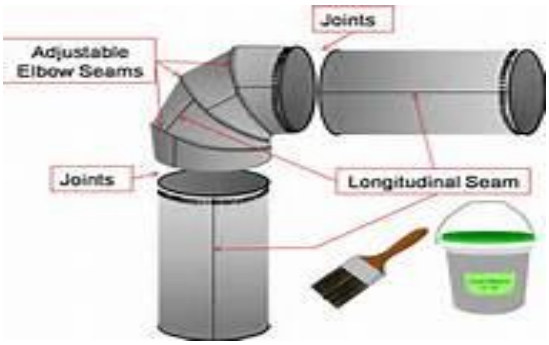

Fig. 8 Duct Joints

2) Application

a) Install mastic at every metal duct joint and around the bends in elbow.It is important for all ducts to be sealed. Professional testing for a duct leakage rate of 10% can be helpful in determining success. All ductwork for heating or cooling should be run through conditioned space inside the insulated envelope.

b) Ducts run through attics space can be buried under new loose fill insulation Cover or seal all ductwork in work space during construction.Clean or vacuum all ductwork before occupancy to eliminate dust.Clean ducts before carpet is laid and finished are applied Solar attic fans are powered by the sun and are most effective when placed on the southern side of the roof and centered between the roof rafters.

c) Avoid installing under overhanging trees or other structure creating shade. Install equal amounts of ventilation between the soffit/eaves and the gables/ridges.The code requirement of 1 square feet of net free area of attic floor area should be doubled.Keep insulation from blocking the soffit/eave vents

3) Benefit

a) Leaky air ducts can cause negative pressure in the house which can allow carbon monoxide from gas water heaters and furnaces into the home.Well-sealed ductwork also keep the house more comfortable.

b) Locating ducts in the conditioned space significantly reduces energy loss and improves occupant comfort. Children are especially sensitive to micro particulates like drywall dust.Cleaning and vacuuming ductwork reduces dust around the house after occupancy.

c) In the summer, attics can reach up to 150degreeF.That heat migrates into the home and increases the temperature inside.A solar attic fan removes much of this hot air and reduces the burden on the air conditioning system.

d) Attics can reach up to 150 degree F on hot summer day.That heat migrates into the house, exchanging air with the living space.Eave and soffit venting increases comfort, reduces problem associated with excess attic moisture.

N. Replace wall-mounted electric and gas heaters with through the wall heat pumps and Retrofit wood burning fireplaces.

1) Description: It has exterior compressor and interior air handle that blows conditioned air through the home. The burning of wood in fireplaces is a major source of air pollution during the winter months. Retrofitting wood burning fireplaces with airtight doors and working dampers reduces down drafting, heat loss and the amount of oxygen drawn from the house for combustion purposes.

2) Application

a) Replace any wall mounted heater with a heater with a heat pump.

b) Another option is to use the water heater as the heat sources using fan coil in each room to distribute heat in the home.

3) Benefit

a) It is safe, energy efficient

O. Renewable energy and Roofing.

1) Install photovoltaic (PV) system for Natural heating and cooling.

a) Description: A photovoltaic system, also PV system or solar power system is a power system designed to supply usable solar power by means of photovoltaics. It consists of an arrangement of several components, including solar panels to absorb and convert sunlight into electricity, a solar inverter to change the electric current from DC to AC, as well as mounting, cabling and other electrical accessories to set up a working system. It may also use a solar tracking system to improve the system's overall performance and include an integrated battery solution, as prices for storage devices are expected to decline. Strictly speaking, a solar array only encompasses the ensemble of solar panels, the visible part of the PV system, and does not include all the other hardware, often summarized as balance of system .Moreover, PV systems convert light directly into electricity and shouldn't be confused with other technologies, such as concentrated solar power or solar thermal, used for heating and cooling.PV panels contain hundreds of small cells that suns energy and convert it in to electricity.Excess electricity can be sent back in to the

utility grid for a credit on electric bills. The collected energy can also be stored in large batteries to meet the needs of nighttime energy requirement. Passive solar systems provide heat to the structure through south facing windows in conjunction with internal thermal mass.

b) Application

i) Typical PV installation include flat roof, slope roof, building integrated PV and ground mount.

ii) The house must incorporate windows that face with in 30 degree of due south and have the ability to store excess heat in massive elements such as slab floor or stone fireplace.

Fig. 9 A photovoltaic system

c) Benefit

i) PV panels decreases need of conventional power.

ii) Reduce our impact to the environment by reducing CO2 emissions into the atmosphere.

iii) Photovoltaic panels constitute a reliable, industrially matured, green technology for the exploitation of solar energy.

iv) Photovoltaic panels can be ideal for distributed power generation as they are highly suitable for remote applications, such as in a remote farmhouse.

v) Natural heating reduces heating requirements by 30 to 50 %.

vi) Saving energy.

vii) Saving money.

P. Plant deciduous shade trees on the west and south sides

1) Description: During summer months, sun shines on the south and west sides of the home causing the home to heat up. Trees offer best solution for keeping out low angle sunshine.

Fig. 11 Trees Shade

2) Application: Plant or trees shade on the west and south sides of the building to provide shade and summer cooling.

3) Benefit

a) IT reduces air conditioning cost up to 25 to 40 % in summer.

b) Additional benefit to environment.

c) Adding aesthetic beauty.

d) It reduces surround areas temperature up to 15%.

Q. Use low/no VOC paint and Use low VOCs water –based wood finishes.

1) Description: Most paint releases volatile organic compounds (VOCs).a major indoor air pollutant, into the home.And these VOSs react with pollutants which produces ground level ozone that also effect human health.Conventional solvent based wood finishes can off gas for months, and can be harmful to children.Low VOC finishes, such as water-borne urethane and acrylic, are lower in toxic compounds compared to conventional solvent- based finishes while providing similar durability.

2) Application

a) It reduces the emission of VOCs in to the home.

b) Improves indoor air quality.

c) And reduces the formulation of urban smog.

d) It is used in most application where solvent-based finishes are typically used.

3) Benefit

a) Paint with low/no VOCs are available from major manufacturers and is applied like traditional paint products. High wash ability should be specified for bathrooms, kitchens and children's bedroom, every finish and most colors are available.

b) Reducing off gassing on to home.

c) Improving indoor quality.

R. Use salvages building material for interior finish and Use exterior grade plywood for interior uses.

1) Description: Salvage building material are selectively and carefully removed from building foe reuse.Many salvage material are superior to the products available today such as old growth, non structural beams, flooring and interior trim.Exterior plywood uses phenolic resins that off one tenth as much as interior plywood and it exhaust off gases from building.

2) Application

a) Salvage building material are used same way conventional building material.

b) Substitute interior plywood with exterior plywood for custom cabinets and shelving.

3) Benefit

a) Using salvaged building materials keeps valuable resources out of landfills.

b) Reduces pressure on the landfills as well as offering the homeowner inexpensive and unique material for the home.

c) Formaldehyde is suspected human carcinogen and should be avoided whenever possible.

S. Flooring

1) Select forest stewardship council (FSC) certified andrapidly renewable flooring material wood flooring

a) Description: Bamboo and crock flooring are alternatives to hardwood flooring and fast growing grass that can be harvested in three to five years.It comes from forest that is managed in accordance with sustainable forest practices.This type of products available in wide range in domestic and exotic species.

b) Application

i) Use FSC certified wood in place of conventional hardwood flooring.

ii) Use these alternative flooring materials in place of conventional hard wood. It is important to specify a durable finish.

c) Benefit

i) Protects ancient, old growth forests.

ii) Durable.

iii) Fast growing

iv) Rapidly renewable floor.

v) Moisture resistant.

vi) Well sound absorbing.

T. Use Recycled- content ceramic tile or exposed concrete as finished floor

1) Description: Use Recycled- content ceramic tile contain up to 70 % recycled material and Very durable and wear well in residential applications. Exposed concrete as finished floor can be polished and finished with expansion joints. And this is radiant in floor heating system.

2) Application

a) Install recycled content tiles wherever conventional tiles are specified.

b) Use this approaches for finished basements or additional on slab construction. Finish must be designed and constructed when slab is being poured.

3) Benefit

a) Recycled- content ceramic tile are Easier to maintain and it is dense.

b) Exposed concrete as finished floor Durable and Easy to clean.

IV. CONCLUSION

Application of all green building methods and material to existing building, without increasing minimum cost and resources explained briefly. It highlights the economic, environmental, and social benefits of implementing green practices in existing buildings. Many benefits of utilizing green practices in existing buildings are such indoor air quality and thermal comfort creates a barrier in realizing a building's maximum potential.

V. ACKNOWLEDGEMENT

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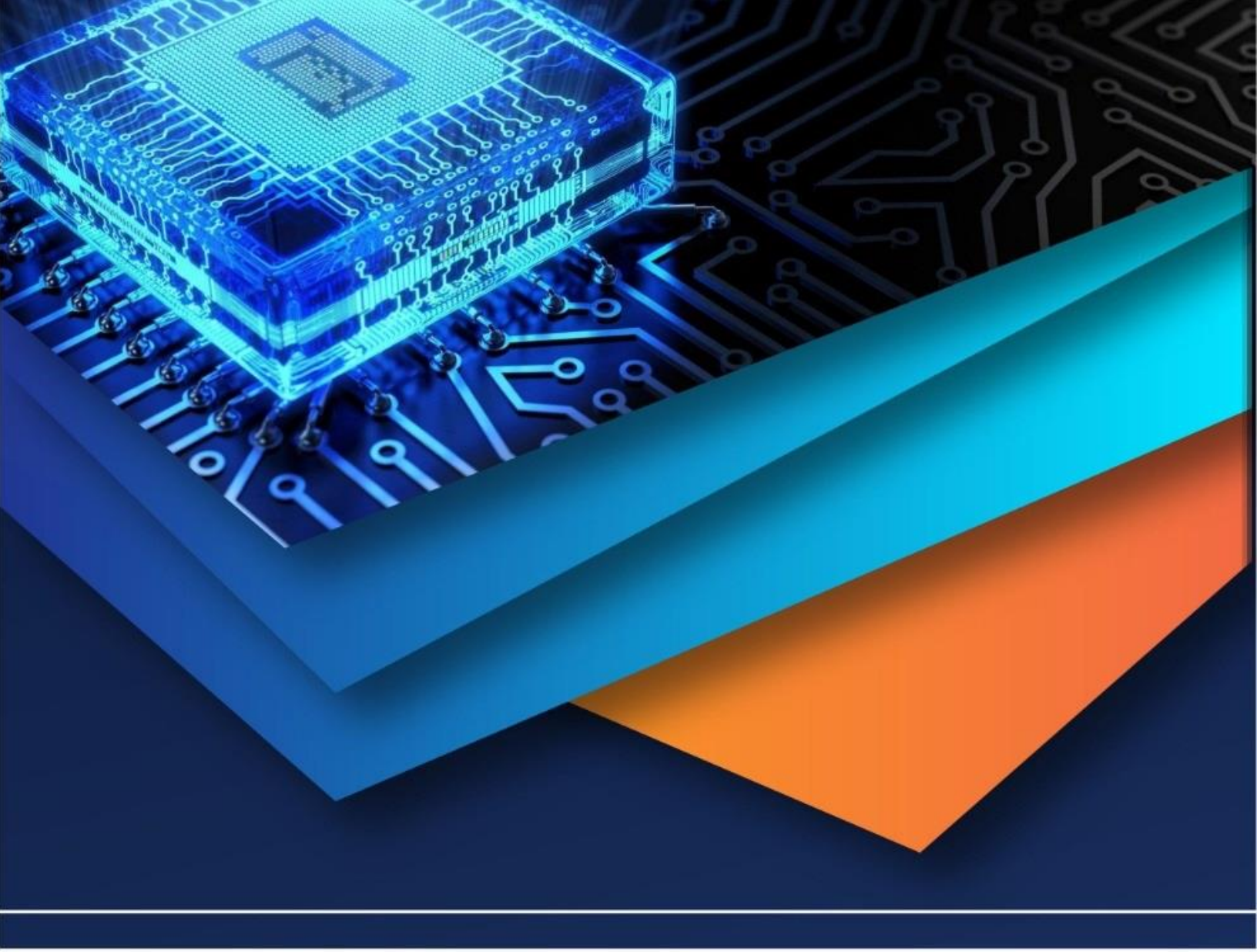

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