TERMITES

- Termites are also known as white ants.
- Termite proofing is the treatment given to a building, to control or prevent the termite growth in the building.
- The termites enter into buildings through cracks, walls, pipes and floor joints etc.
- Once termites developed in the building area, it is very difficult and costly to finish.
- Termite control in buildings is very important as the damage likely to be caused by the termites is huge.
- Wood is one of the cellulosic materials which termites damage, cellulose forming their basic nutrient.
- They also damage materials of organic origin with a cellulosic base, household articles like furniture, furnishings, clothings, stationery, etc. Termites are also known to darnage non-cellulosic substances in their search for food.
- Rubber, leather, plastics, neoprene as well as lead coating used for covering of underground cables are damaged by termites.
- The widespread damage by termites, high constructional cost of buildings have necessitated evolving suitable measures for preventing access of termites to buildings.

Types of Termites

Based on the habitat, termites are of two types -

1) Ground-nesting termites:

- These are also known as subterranean termites, found in places with adequate moisture.

- They found in all regions of India and always maintain a connection with the soil and form soil tubes, or tunnels, through which they make a route into buildings.

- They form secondary nests in the wood and eat all cellulosic materials like paper, cardboard and clothes along with wood.

2) **Drywood termites:** These termites need humid conditions and live on wood without maintaining any connection with the soil. They live in small colonies and mostly found in coastal regions of South India.

Principles of Termite Proofing

The general principles should be observed while constructing a building termite-proof is as follows:

- Suitable treatment of termite-proofing should be given to the building during the construction itself.
- Ensure adequate site drainage by providing impervious slab (concrete/stone) below the rainwater pipes to drain away rainwater.
- Provide Flagging concrete around the building.
- The filling material used for foundation gap and plinth should be treated with termite-proof chemicals.
- Make floor joints termite proof with the use of suitable joint fillers or metal strips.
- Proper care should be taken to avoid a gap or bridge between any part of the building and untreated soil.

However, many of these chemicals are now banned under IS code, and the following emulsifiable chemicals are recommended:

- Heptachlor concentrate: 0.5% by weight
- Chlorpyrifos concentrate: 1.0% by weight
- Chlordane concentrate: 1.0% by weight
- Endosulfan Or Aldrin or Aldrex 30 E.C : 0.5% by weight

Out of the above chemicals and several other chemicals, Aldrex 30 E.C. has proved to be the most effective.

It has the following advantages:

- It is highly toxic to termites.
- It can easily be applied after dilution with water.
- It is insoluble in water. In other words, this chemical will not dissolve in subsoil water and disappear quickly from the site.
- It is effective even many years after application.
- One part of 'Aldrex' 30 E.C. is diluted with 59 parts of water. This provides an emulsion containing .5% of aldrin.

Physical structural barriers:

- Impenetrable physical structural barriers may be provided continuously at plinth level to prevent entry to termites through walls.
- These barriers may be in the form of concrete layer or metal layer.

- Cement concrete layers should be 5 to 7.5 cm thick and should preferably be kept at projecting about 5 to 7.5 cm internally and externally.
- Metal barrier may consist of noncorrodible sheets of copper or galvanized iron of 0.8 mm thick.
- These sheets are likely to be damaged; in that case, they become ineffective against termites movement.

Pre – construction treatment:

- Pre-construction treatment is the kind of anti-termite treatment carried out right from the stage of initiating the construction activities for the building. The various stages involved in this treatment are described below. Site preparation.
- Soil treatment & Physical barriers.

Site preparation

Stage 1 - This consists in removing stumps, roots, logs, waste-wood etc. from the site where the building is to be constructed. In case the termites mound are discovered within the plinth area of the building they should be destroyed by use of insecticide solution.

Stage 2 - Bottom and sides of trenches up to a height of 300 mm should be treated with Durmet solution at the rate of 5 litres per square metre of surface area.

Stage 3 - The refilled earth in contact with walls and columns should be treated with anti-termite chemicals for a width of 300 mm & and depth of 45cm approximately About 3 to 5 litres per linear metre of the vertical surface should be used.

Stage 4 - After filling the earth up to plinth level for flooring, 50 to 70 mm deep holes should be drilled at 150 mm grid pattern. Treat these holes with the chemical solution at the rate of about 5 litres per square metre area.

Stage 5 - The junction of walls and floors should be treated at the rate of 15 litres per square metre of the wall surface.

Stage 6 - After the completion of construction, holes 300 mm deep should be drilled along the external perimeter of the building at an interval of 150 mm. The holes should be filled with chemicals at the rate of 5 litres per metre length.

Stage 7 - Expansion joints and perimeters of pipes and conduits should also be treated with anti-termite chemicals.

Stage 8 - Before installing windows and doors in contact with masonry should be coated with two layers of paint.

Before laying the floor, the entire leveled surface is to be treated at the rate of 5 liters of emulsion per square meter.

1. The soil must be treated and ensured at the following places,
2. Wall trenches, column pits and basements,
3. Top surface of plinth filling,
4. Junctions of the wall and floor,
5. Soil along external periphery of building &
6. Expansion joints.

Post Construction Treatment for Termite-Proofing

If termite growth is found in any building, post-construction treatment is required for termite-proofing. Pressure pumps are used to ensure proper chemical penetration, and the procedures are described below:

1. **Outside walls around the building:**

    - If flagging concrete is present around the building, then holes of diameter 12 mm are drilled at distances of 300 mm and a chemical solution is pumped inside the holes.
    - If there is no flagging concrete, then 500 mm deep holes are drilled at distances of 150 mm using iron rods and filled with chemicals.

2. **Soil under floor:**
    - For treating floor, walls, construction joints, cracks, etc.., holes of diameter 12mm are made 300 mm apart.
    - These holes are pumped into soak the soil with a chemical solution of about 1 litre.
3. **Treatment at plinth level:**

- The holes are drilled on both sides of the wall at plinth level at an angle of 45¬° and a distance of 300 mm from the centre.
- The chemical solution is pumped in and after they are sealed with cement mortar in proportion 1:2.
- For better protection from termites, structural barriers can be provided with concrete or with metal sheets. Concrete barriers are more durable than metal barriers as they are likely to fail due to corrosion or other damage.

- Concrete barriers can be of 50-75 mm thick concrete extending about 50-75 mm on both sides of the plinth.

Termites have the potential to damage your building significantly. So, termite-proofing services are highly essential for any building to eliminate and dismantle termites attack and protect the wood interiors of the building.

Treatment of voids in masonry:

- To prevent the entry of the termites through voids in masonry, 12 mm diameter holes at 300 mm centre to center are drilled at downward angle of about 450 from both sides of walls at plinth level.
- Then chemical emulsion is pumped into the holes until masonry gets fully saturated with the chemical emulsion.
- The holes are then sealed & this treatment is carried out for all walls (both internal as well as external) having foundation in soil.

Treatment of wood work:

- Wood work which is badly damaged by termites should be replaced by new timber which is adequately brushed or dipped in oil or kerosene based chemical emulsion.
- The infected wood work for door and window frames, etc. should be given protective treatment by drilling 6 mm diameter holes at 150 mm center to center at a downward angle of 45o to cover the entire framework and thereafter pumping oil based chemical emulsion into the holes.
- The wood work which is not attacked by termites should be sprayed over with chemical emulsion to prevent possible attack.

TERMITE INSPECTION:

- Inspection is essentially carried out to estimate the magnitude of spread of the termite's infestation in the building and also to detect the root of the entry of termites and the zones in the building, which are attacked.
- The portion of the building in contact with or adjacent to the earth should be inspected first.
- This includes basements, ground floor, steps leading from ground, walls, columns, areas having damp or humid conditions like bathrooms, lavatories, leaking pipes or drains etc. and the places where wood work is embedded in the floor or wall.
- The ceilings, wooden paneling, battens for wiring conduits, switch boards are other locations which serve as hide-out for the termites and need careful inspection.

- In case of multi-storied buildings, lift wells, casings covering electrical wiring, telephone cable, water supply and soil pipes which serve as convenient and well protected zones for termite's infestation should also be inspected carefully.
- Wherever the mud walled shelter tubes or the termites runways are detected, they should be removed.
- Wherever possible, oil or kerosene based chemical emulsion should be injected over the attacked areas of wood work and masonry.
- At times, structural additions may become necessary to ensure elimination of all direct contacts between the soil and the affected portion of the structures.

Preventions:

1. To prevent the growth of termites, it is essential to use superior quality of material and good workmanship.
2. The building site should be cleared off all old tree stumps and dead wood etc.
3. The wooden material like door frames etc. should properly be treated
4. By using anti termite material destroy the nests of termite
5. Avoid Sources of moisture because termites will attract towards the moisture resulting blockage of water supply pipes
6. Seal cracks on the walls so that they will no access to termites to enter into the building
7. Clean the kitchen & bathroom water openings, they should be no leakage from the pipes

Precautions:

1. Keys to termite prevention include minimizing moisture, minimizing food sources, and making your home easier to inspect.
2. Eliminate wood-to-ground contact.
3. Remove wooden debris such as lumber and branches from property.
4. Stack firewood away from your home or any structure you want to protect.
5. Keep an inspection space of at least 6 inches from the bottom of wall sidings and the soil.
6. Inspection spaces allow termite tubes to be detected.
7. Ensure that water runs from the structure, not toward it.
8. Direct drainage lines away from your house.
9. Fix leaks.

10. Direct irrigation heads away from walls.
11. Install gutters to manage the flow of water away from your home.
12. Do not place or store items like rain barrels, compost bins, or other items that hold moisture at ground level within 2 feet of the foundation of your home.
13. Place landscape plants at least 2 feet away from exterior walls.
14. Avoid using wooden landscape timbers for edging.
15. Trim tree and shrub branches away from walls and roofs.

Lighting:

1. Lighting or illumination is the deliberate use of light to achieve practical or aesthetic effects.
2. Lighting includes the use of both artificial light sources like lamps and light fixtures, as well as natural illumination by capturing daylight.
3. Daylighting (using windows, skylights, or light shelves) is \sometimes used as the main source of light during daytime in buildings.
4. This can save energy in place of using artificial lighting, which represents a major component of energy consumption in buildings.
5. Proper lighting can enhance task performance, improve the appearance of an area, or have positive psychological effects on occupants. Bottom of Form.

Task lighting:

Task lighting refers to lighting that is designed to provide focused illumination for a specific activity or task. The primary purpose of task lighting is to enhance visibility and reduce eyestrain when performing activities that require a higher level of concentration or precision. This type of lighting is often used in workspaces, study areas, kitchens, and other places where specific tasks are performed.

Characteristics of task lighting include:

1. **Directionality:** Task lights are typically directional, focusing the light on a specific area rather than providing general illumination for an entire room.

2. **Intensity:** Task lighting fixtures are designed to be bright enough to illuminate the task at hand effectively. This helps in reducing shadows and providing clear visibility.

3. **Adjustability**: Many task lights are adjustable, allowing users to direct the light where it is needed most. Adjustable arms, swivel heads, or flexible necks are common features.

4. **Placement**: Task lighting is strategically placed to provide optimal illumination for a particular activity. For example, a desk lamp for reading or a pendant light over a kitchen counter for food preparation.

Common examples of task lighting include:

• **Desk Lamps**: Used for reading, writing, or working at a desk.

• **Under-Cabinet Lighting:** Installed beneath kitchen cabinets to illuminate countertops for food preparation.

• **Reading Lamps**: Positioned near seating areas for reading.

• **Task Lighting in Workspaces**: In offices or workshops, task lighting may be used to illuminate specific work areas such as drafting tables or workbenches.

Task lighting is an important aspect of overall lighting design, complementing ambient and accent lighting to create a well-balanced and functional lighting scheme in a space. The goal is to provide the right amount and quality of light for specific tasks while contributing to the overall aesthetics of the environment.

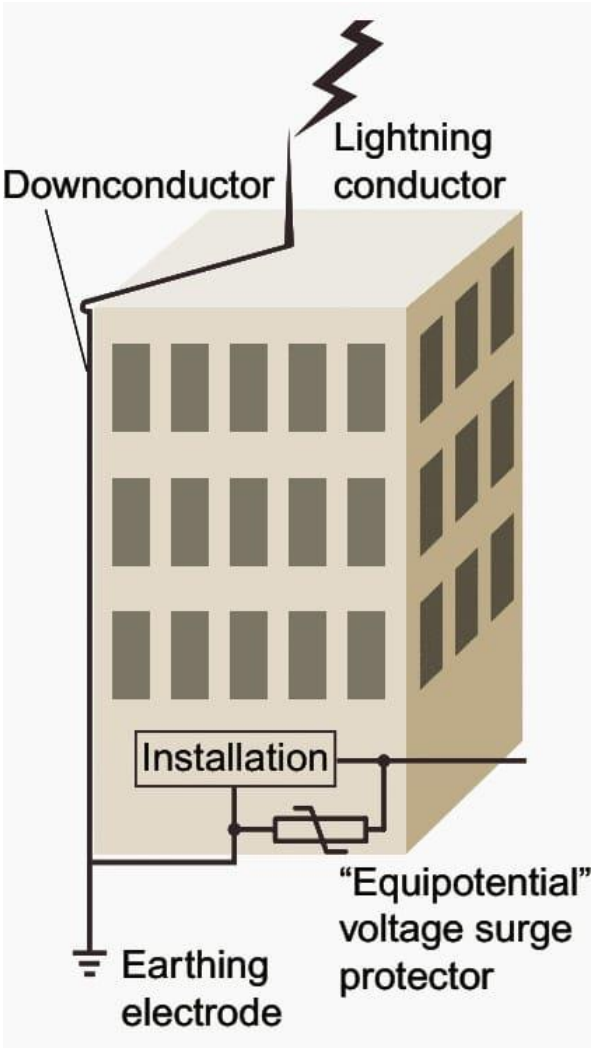
Accent lighting: Accent lighting focuses light on a particular area or object. It is often used to highlight art or other artifacts. Common types of accent lights include

1. wall sconces, floodlights, recessed lights, torchère lamps, or track lighting. The brighter light from the accent lamp creates visual interest to a room.
2. Accent lights may also be used in practical applications to shine light on a stairway, such as in movie theaters, or to light walkways.
3. Some accent lights aren't made to shine on a particular object, but are themselves a piece of art with a self-contained light source. Often made with Tiffany glass, these serve as a piece of functional decor for a home.
4. Accent lights can also be used outdoors as guides for pathways or to spotlight garden art.
5. Accent lighting is mainly decorative, intended to highlight pictures, plants, or other elements of interior design or landscaping.

General lighting:

1. General lighting (sometimes referred to as ambient light) fills in between the two and is intended for general illumination of an area.
2. Indoors, this would be a basic lamp on a table or floor, or a fixture on the ceiling. Outdoors, general lighting for a parking lot may be as low as 10-20 lux (1-2 footcandles) since pedestrians and motorists already used to the dark will need little light for crossing the area

Lightning Protection System Of The Building:



1. The building situated in exposed situations, where lightning can occur or their heights are large compared to the surrounding places, should be provided with lightning-protection systems.
2. The lightning-protection system consists of an unbroken chain of conductors from the roof of a building to the ground.
3. which will provide an easy path for the large quantity of electricity released by the lightning to discharge to the earth in the shortest possible time.
4. It is very important that the down conductors should follow the most direct path possible between the top air terminal and the bottom earth terminal without sharp bends, Kinks, etc.
5. Joints should be avoided as far as possible and the conductors should be of pure copper.

6. The area of influence of a lightning conductor is assumed to be a cone with the top most point of the conductor as the apex and a radius related to the height of the apex.
7. This radius has been reported to be up to 3.5 times the height but a value of radius equal to the height of the conductor can be taken as a very safe value.

VI. Design principles for various openings:

1. Make all doors and windows openings in walls simultaneously as far as possible when brick work is in progress.
2. Keep opening in external walls not more than 45% of the area of wall whereas opening in internal walls should not be more than 30 % of the area of wall.
3. Do not let the brick work between two openings become a column by definition.
4. If the space between two openings remain less than 18 " then RCC column should be provided in the space for the safety of the building.
5. Provide all openings in masonry with RCC lintel.
6. Avoid dismantling of brick work for making openings.
7. Openings should be vertical rectangles
8. Entrance should be easy to enter and exist
9. A circular and semi circular windows should be used as feature windows
10. The circular window should be 0.8 times of a width of a rectangular window
11. In a room they will be number of openings
12. Internal doors of residential buildings should not be less than 0.9 m x 2 m.
13. Size of doors leading to bathrooms can be reduced to 0.75 m x 2 m.
14. It should be aimed that two persons walking shoulder to shoulder should conveniently pass through the door.
15. A size of 1.0 m x 2.0 m would be an average recommendation standard.
16. Doors in public places should be of larger size and their height increased accordingly.
17. A common criterion for the sizes of doors used in India is: Width = (0.4 to 0.6) height
18. Doors of garages should be not less than 2.5 m x 2.25 m.
19. Breadth of window = 1 (Width of room + height of room)8

20. There should be one square meter of window space for every 30 to 40 cubic meter of inside content of the room.
21. Glass area in the windows should be at least 15% of the floor area of the room. However, it is a good practice to provide 20% of the floor area as the total glass area of the windows, Continuous sash or one large opening in a room provides better distribution of light than a number of small windows.

Fire Protection measures:

1. Provide adequate means of escape

The first rule of fire management requires sufficient escape routes out of the building, in accordance with its scale and occupancy. The number, size and location of exits are specified in the National Building Code (NBC) 2005, a detailed set of guidelines for constructing, maintaining and operating buildings of all types. Office occupiers must additionally ensure that staircases, stairwells and corridors are well-maintained, ventilated and free of obstacles in order to be effective in an emergency.

Open spaces in buildings play a crucial role in fire management. As P.D. Karguppikar, joint chief fire officer of the Mumbai Fire Brigade, remarked after the terrorist attacks on 26/11: “The atrium in the old wing of the Taj (hotel) allowed heat to dissipate, and prevented collateral damage to other floors from the fire on the sixth floor."

2. Outline clear pathways to exit doors

Getting to exits is as important as providing enough exits. NBC guidelines specify the maximum distance a person must travel in order to access a fire exit, and the importance of photoluminescent signage to enable evacuation at night. Refuge areas such as terraces are critical for high-rises where people can safely congregate, when asked to leave the building in phases.

3. Install smoke detection systems

The first few minutes of a fire are crucial in containing it. Automatic fire alarm systems such as smoke and heat detectors are mandatory elements in international building codes, and particularly useful in spotting fires during times when occupancy in the building is low.

4. Maintain smoke suppression systems

Fire extinguishers are only useful if they work, so check them regularly. High-rise buildings, which are harder to access and evacuate, should consider installing automatic sprinkler systems. The National Fire Protection Association (NFPA), a US-based non-profit body, estimates that automatic suppression systems lower the cost of damage by 60%. Karguppikar endorses their use, admitting that “the fire in one of the rooms on the 18th floor of the Oberoi was extinguished by its sprinkler system and it was an eye-opener for all of us".

5. Conduct regular fire drills

Preventing panic in an emergency is as important as staying away from flames and fumes. Regular fire drills familiarize people with emergency evacuation methods at little cost. Nominate a fire safety officer in every building to ensure that this becomes standard operating procedure.

6. Use flame-retardant materials in interiors

Materials used in the interiors can save or endanger lives. The combination of wood, paper and textiles makes workstations highly combustible. Fabrics can be made flame-retardant, however, so that they self-extinguish when lit. An increasing number of companies, especially multinationals, request such fabrics despite their price premium, according to data from Indian office furniture manufacturer BP Ergo. Stringent fire regulations abroad make it

necessary for US furniture makers such as Herman Miller to provide only fire-tested fabrics.

Doors are also assigned a fire-resistance rating, measuring how long they can remain resistant to excessive temperatures and flames without collapsing. Karguppikar lauds the construction of the fire-treated doors in the Taj, which allowed several rooms to stay insulated for hours despite a raging fire just outside.

7. Make your office accessible to firefighters

Grilled windows are a widespread urban phenomenon, and Jairaj Phatak, commissioner, Brihanmumbai Municipal Corporation (BMC), wittily observes that “residents who have grills on their windows presume that only thieves are kept out, and not firefighters". Occupants of offices in residential buildings with few exits should be wary of locking themselves into confined spaces.

8. Keep the building plans handy

The tragedy at the Taj was heightened by the lack of buildings plans to guide rescue agencies. It is imperative to make multiple copies of your building plan available, especially during an emergency.

9. Ask the local fire brigade to assess safety

Fire departments, for a nominal fee, will independently assess your building’s level of fire safety. Storage of hazardous or inflammable materials, old and unstable structures, inadequate escape routes or electricity overloads are potential death traps that are best assessed by professionals.

Fire safety requirements in a building:

IS:1641-1988 recommends that the buildings should conform to the following requirements in order to minimize fire hazards. These are-

- All multi-storeyed buildings should be provided with liberally designed and safe fire-proof exits or escapes.
- All exits should be placed in such a way that they provide immediate access and should be capable of taking all the persons on that floor as alternative escape routes may be hindered due to fire.
- Escape routes should be well-ventilated.
- Fire-proof doors shall conform rigidly to the fire safety requirements.
- Electrical or mechanical lifts which are used under normal conditions may not be always relied on during a fire outbreak as the electrical supply to the door may be cut off or interrupted.

- Ceilings of the buildings(e.g, false ceiling) shall be so constructed as to prevent either total or early collapse in the fire so that persons underneath are not fatally trapped before they have the time to reach the exits.
- The floors are required to withstand the effect of fire. The design of floors should be such that it shall obviate any replacement.
- Roofs for the various fire grades of buildings shall be designed and constructed to withstand the effect of fire for the maximum period.

- Fire resistance of basement shall conform to the highest order and all columns for supporting the upper structure shall have a grading not less than laid down types 1 to 3.