# BUREAU OF INDIAN STANDARDS

# AGENDA

**Panel for Sustainability, CED 46:P19 : Seventh Meeting**

**Thursday, 28 March 2024 : 1030 h**

**In Hybrid Mode from:**

**Auditorium, Bureau of Indian Standards, Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002**

**&**

**Online using:**

1) Meeting link:
https://bismanak.webex.com/bismanak/j.php?MTID=m2fc2c902ccc84ea409b706701f3f5385

2) Meeting number: 2517 663 3064

3) Password: Nbc@2025

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**Convener**: Dr. Monto Mani

**NBC Officer:** Shri Shubham Chaudhary
**Head (NBC Cell):** Shri Arunkumar S.

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**Item 0 OPENING REMARKS**

**Item 1 CONFIRMATION OF MINUTES OF THE LAST MEETING**

**1.1** The Minutes of the sixth meeting of the Panel held on 17 November 2015 in New Delhi, were circulated vide BIS DG letter No. CED 46:P19/A-2.6 dated 16 February 2016. No comments have been received.

The Panel may **CONFIRM** the Minutes.

**Item 2 COMPOSITION**

**2.1** The present composition of the Panel as reconstituted by the National Building Code Sectional Committee, CED 46 is given at **Annex 1 (P- 6)**.

The Panel may **CONSIDER**.

**2.2** Request for Co-option has been received from CSIR - SERC [nominating Dr. M. B. Anoop, Dr. A. Ramachandra and Mr. M. Aravindan] for representation on the panel.

The Panel may **CONSIDER**.

**2.3** Request for Co-option has been received from Indian Geotechnical Society [nominating Dr. Neelima Satyam (Professor), Er. Ravikiran Vaidya (Principle Engineer, Geodynamics) and Dr. Siddhartha Agarwal (Assistant Professor)] for representation on the panel.

The Panel may **CONSIDER**.

**2.4** Request for Co-option has been received from Schneider Electric for representation on the panel.

The Panel may **CONSIDER**.

**2.5** Request for Co-option has been received from Owens-Corning (India) Pvt. Ltd.in 2015 for representation on the panel.

The Panel may **CONSIDER**.

**2.6** Request for Co-option has been received from Ergo Energy LLP [from their Dr. Sonal Desai, Ph.D., Energy Consultant] for representation on the panel.

The Panel may **CONSIDER**.

**2.7** Request for Co-option has been received from International Copper Association India [from their Mr. Debdas Goswami, Sr. Advisor] for representation on the panel.

The Panel may **CONSIDER**.

**2.8** The Panel may also **NOTE** regarding the Structural Reforms in Standardization established by BIS to bring greater efficiency in standards formulation and revision work in BIS addressing speed, skill and scale. The same relates to aspect like:

a) technical committees of BIS having members with widely acknowledged domain area expertise and experience on the subjects
b) optimum size of the technical committee
c) review of membership with focus on continuity of participation including contribution by every member
d) holding periodic meetings (physical/virtual/hybrid)
e) decide on timelines to enable stage-wise development of the documents (draft standards)
f) resource centre to enable share the information and documents associated with the standardization work

**2.9** Further, BIS has established in place systems such as action research projects, R&D for standards development and provision for having short-term Consultants. Also, focus should be made w.r.t developments on the subject happening world-wide

including in technical events, literature, research publications, standard bodies, etc. Wherever possible research based inputs be generated including by associating with the various eminent institutions with whom BIS has entered into MoU with (List of MoU institutions is available at: https://www.bis.gov.in/partnership-with-technical-and-professional-institutions/ ).

The Panel may **NOTE**.

## Item 3 PROJECT OF REVISION OF NBC

**3.1** Under the project of Revision of NBC, various Parts/Sections of NBC 2016 [a list of which is given in **Annex 2 (P-8)**] are being comprehensively revised, to bring out a most modern and state-of-the-art revision of the Code.

The Panel may consider revising the chapter (**Part 11** on **Approach to Sustainability**) taking into cognizance the latest developments in the field. In the revision exercise, due consideration may be given to ensuring coherence among various chapters of the Code. Where required, suggestions for improvements in the other chapters of the code may also be provided.

The Panel may **NOTE**

**3.2** The Panel may therefore engage in a high-level review of the existing chapter covering 'Approach to Sustainability'. The contents of existing Part 11 'Approach to Sustainability' is given in **Annex 3 (P-10)**. This review may involve an examination of the structure, content, and alignment of the chapters with current industry standards and practices.

The Panel may **CONSIDER.**

**3.3** To facilitate the revision process, the following working draft has been prepared and circulated to the members for their comments vide our email dated 20 March 2024:

*Working Draft of National Building Code of India: Part 11 Approach to Sustainability, Doc: CED 46 (0280)WD*

Comments received on the draft would be circulated (separately) among the members and also discussed during the meeting.

The Panel may **CONSIDER.**

**3.4** The following were proposed for discussion by member of the Panel, Shri V Suresh:

- Discussions to incorporate the contents in revisions of Energy Conservation and Sustainable (ECSBC) 2024 (https://beeindia.gov.in/en/comments-on-draft-ecsbc-commercial-office-buildings-2024 ).
- Discussions on coverage of 2030 targets for SDG 2030 and India commitments for the climate change agenda.
- Discussions on coverage of Net Zero Energy, Water, Waste and Carbon.
- Discussions on quantified issues of Embodied Energy in Building Materials and related carbon footprint and reduction.

**Item 4 COMMENTS RECEIVED ON / INPUTS RELATED TO PART 11 'APPROACH TO SUSTAINABILITY' OF SP7 : 2016**

**4.1** In 2023, Dr. Sarang Savalekar, Director, Paramount Pest Consultants Pvt. Ltd., submitted various inputs related to establishing 'Environment-Friendly / Green Termite management practices'. These inputs are attached as **Annex 4 (P-11), Annex 5 (P-21), Annex 6(P-27), Annex 7(P-33), Annex 8(P-38), and Annex 9(P-60).**

The Panel may **CONSIDER.**

**4.2** The comments received on the above Chapter of NBC 2016 from M/s Ashok B. Lall Architects and Global Buildings Performance Network(GBPN) in their 'Draft White Paper: Healthy Affordable Housing in India' submitted to BIS are attached at **Annex 10(P-64).**

The Panel may **CONSIDER**.

**4.3** The comments received on the above Chapter of NBC 2016 from Dr. Sonal Desai, Ergo Energy LLP are attached at **Annex 11(P-66).**

The Panel may **CONSIDER**.

**Item 5 PROJECT OF PROMOTION OF USE OF NBC 2016 IN ALL STATES AND UTs OF INDIA**

**5.1** An ambitious Project for Promotion of use of National Building Code of India 2016 in all States and UTs of India was earlier taken up by BIS involving a comprehensive study and review of rules and regulations governing land development and building construction in various states and union territories of India. The Project involves preparing draft regulations which are aligned with provisions in National Building Code of India 2016 (NBC 2016), for use by the States and UTs in revising their existing regulatory documents in line with the revised state-of-the-art NBC 2016. The Project had 09 deliverables as below:

| Sl No. | Deliverable |
|---|---|
| 1 | Compilation and study of existing processes, rules and regulations as existing in various States and UTs which govern the land development and building construction, and other statutory provisions which have to be complied with currently, etc |

| | |
|---|---|
| | |
| 2 | Classification of the Provisions in various Rules and Regulations as mandatory/recommendatory, identification of commonalities/dissimilarities, conflicts, if any |
| 3 | Mapping the existing Rules, Regulations, Processes against provisions given in NBC 2016 |
| 4 | Identification of other best practices which may currently not be a part of the existing rules or of NBC 2016, which may be aspirational but will help further the Aim/Objective of this project |
| 5 | Preparation of a draft revised standardized/model Rules and Regulations aligned with the provisions of NBC 2016, for the consideration of the Bureau |
| 6 | Preparing State/UT-wise standardized/model regulatory documents, including such required documents for some metro/mega cities, which can be adopted by various authorities & obtaining approval of the Bureau as per scope of work |
| 7 | Creating pamphlets for an awareness campaign for general public |
| 8 | Creating a simplified booklet on using NBC which can be used by all stakeholders-academicians, students and professionals |
| 9 | Dissemination to designated States/UTs, the knowledge base created and presenting to them advantages of adopting the same through meetings and workshops |

With the support of an external consultant, the main deliverable namely Draft Development and Building Regulations for each of the States and UTs of India was prepared. Followed by 20 number of 2-day workshops covering all the States and UTs, the inputs received as part of such workshops, the finalized regulations were shared with the respective States & UTs.

In addition, a new special publication, **SP 73 : 2023 'Standardized Development and Building Regulations, 2023'** was also published and released, which is available for access (free download) from the BIS' website and from: https://standardsbis.bsbedge.com/

The Panel may **NOTE.**

**Item 6 DATE & PLACE OF THE NEXT MEETING**

**Item 7 ANY OTHER BUSINESS**

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**ANNEX 1**
(*Item* 2.1)

## COMPOSITION OF THE PANEL FOR SUSTAINABILITY, CED 46:P19

| Sl No. | NAME OF THE ORGANISATION | REPRESENTED BY |
|---|---|---|
| 1) | Indian Institute of Science, Bengaluru | Dr Monto Mani (Convener) |
| 2) | AECOM India Pvt Ltd, Noida | Ms Sanyukta Pande |
| 3) | Ankoor Sanghvi Architects, Rajkot | Shri Ankoor Sanghvi |
| 4) | Building Materials & Technology Promotion Council, New Delhi | Dr Shailash Kumar Agrawal<br>Shri J. K. Prasad (Alternate) |
| 5) | Bureau of Energy Efficiency, New Delhi | Shri Sanjay Seth |
| 6) | Central Public Works Department New Delhi | Chief Engineer (CSQ)<br>Superintending Engineer (TAS) (Alternate) |
| 7) | CEPT University, Ahmedabad | Shri Rajan Rawal |
| 8) | Confederation of Real Estate Developers' Association of India, New Delhi | Shri G. Yoganand<br>Shri Hemant Dattaji Naiknavare (Alternate) |
| 9) | CSIR - Central Building Research Institute, Roorkee | Dr R Pradeep Kumar<br>Dr S.R. Karade (Alternate I)<br>Shri Anup Kumar Prasad (Alternate II) |
| 10) | Delhi Development Authority, New Delhi | Shri Sanjay Kumar Khare<br>Shri Deepankar Singh (Alternate) |
| 11) | AEON Design and Development, New Delhi | Ms Sheetal Rakheja |
| 12) | Environmental Design Solutions, New Delhi | Shri Tanmay Tathagat |
| 13) | Indian Association of Structural New Delhi Engineers, | Shri Manoj K. Mittal<br>Dr T. Visalakshi (Alternate) |
| 14) | Indian Buildings Congress, New Delhi | Nomination Awaited |
| 15) | Integral Design International Studio Pvt Ltd, New Delhi | Shri Samir Mathur |
| 16) | Indian Green Building Council, Hyderabad | Shri Praveen Kumar Soma<br>Ms Pallavi Bhallamudi (Alternate) |
| 17) | Institute of Town Planners India, New Delhi | Dr S. K. Kulshrestha |
| 18) | International Institute of Information Technology, Hyderabad | Dr Vishal Garg<br>Dr Pradeep Kumar Ramancharla (Alternate) |
| 19) | Welspun Enterprises Ltd, Gurugram | Shri Amor Kool |
| 20) | Karan Grover & Associates, Vadodara | Shri Karan Grover |
| 21) | IEEMA (Elevator Division) /<br>Kone Elevator India Pvt Ltd, Chennai | Shri P. M. Tipnis<br>Shri J. Sivaraman (Alternate) |
| 22) | Larsen & Toubro Ltd, ECC Division Chennai | Shri Rajan Venkateswaran<br>Shri Sthaladipti Saha (Alternate) |
| 23) | Malviya National Institute of Technology, Jaipur | Dr Jyotirmay Mathur<br>Dr Sanjay Mathur (Alternate) |
| 24) | M/s Maple Engineering Design Services (India) Pvt Ltd, Bengaluru | Nomination Awaited |
| 25) | Military Engineer Services, Engineer-in-Chief's Branch, Army HQ, New Delhi | Smt S Gayatri Mukherjee<br>Shri Manish Gupta (Alternate) |

| | | |
|---|---|---|
| 26) | Ministry of New & Renewable Energy New Delhi | Dr Arun K. Tripathi |
| 27) | One Earth Consultant, Bengaluru | Shri S Srinivas |
| 28) | Panika, Ahmedabad | Nomination Awaited |
| 29) | Proion Consultants, New Delhi | Shri Sandeep Goel |
| 30) | School of Planning & Architecture, New Delhi | Prof Virendra Kumar Paul |
| 31) | Surat Municipal Corporation, Surat | Shri J. M. Patel<br>Shri J. S. Shah (Alternate) |
| 32) | Sustainable Urbanism International, Bangalore | Dr Jyoti Hosagrahar |
| 33) | The Energy and Resources Institute, New Delhi | Ms Mili Majumdar |
| 34) | The Indian Institute of Architects, Mumbai | Shri Tushar Sogani<br>Shri Sandeep Kumar Jha (Alternate)<br>Smt Roshni Vasanth Udyavar (Alternate II) |
| 35) | The Institution of Engineers (India), Kolkata | Prof Anil Kumar Choudhary<br>Shri Abhinendra Kumar (Alternate) |
| 36) | Town and Country Planning Organization, Ministry of Urban Development, New Delhi | Shri Paresh Duria<br>Dr Pawan Kumar (Alternate) |
| 37) | Underwriters Laboratories (India) P Ltd, Bengaluru | Shri V. Manjunath<br>Shri Puneet Randeo (Alternate) |
| 38) | In personal capacity, Mumbai | Shri Santosh Deodhar |
| 39) | In personal capacity, Thiruvananthapuram | Shri Jose Kurian |
| 40) | In personal capacity, Thiruvananthapuram | Shri V. Suresh |

**ANNEX 2**
(*Item* **3.1**)

***Details of Chapters of NBC 2016***

| *Part/Section* | | *Title* |
|---|---|---|
| 1 | **PART 0** | **INTEGRATED APPROACH – A PRE-REQUISITE FOR APPLYING THE PROVISIONS OF THE CODE** |
| 2……. | **PART 1** | **DEFINITIONS** |
| 3……..**PART 2** | | **ADMINISTRATION** |
| 4……..**PART 3** | | **DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS** |
| 5……..**PART 4** | | **FIRE AND LIFE SAFETY** |
| 6……..**PART 5** | | **BUILDING MATERIALS** |
| | **PART 6** | **STRUCTURAL DESIGN** |
| 7…… | Section 1 | Loads, Forces and Effects |
| 8…… | Section 2 | Soils and Foundations |
| | Section 3 | Timber and Bamboo |
| 9…… | 3A | Timber |
| 10…… | 3B | Bamboo |
| 11…… | Section 4 | Masonry |
| | Section 5 | Concrete |
| 12…… …… | 5A | Plain and Reinforced Concrete |
| 13…… …… | 5B | Prestressed Concrete |
| 14…….....Section 6 | | Steel |
| | Section 7 | Prefabrication and Systems Building and Mixed/Composite Construction |
| 15……7A | | Prefabricated Concrete |
| 16……7B | | Systems Building and Mixed/Composite Construction |
| 17..... Section 8 | | Glass and Glazing |
| 18…… | **PART 7** | **CONSTRUCTIONAL PRACTICES AND SAFETY** |
| | **PART 8** | **BUILDING SERVICES** |
| 19…… | Section 1 | Lighting and Ventilation |
| 20…… | Section 2 | Electrical and Allied Installations |
| 21…… | Section 3 | Air-conditioning, Heating and Mechanical Ventilation |
| 22…… | Section 4 | Acoustics, Sound Insulation and Noise Control |
| | Section 5 | Installation of Lifts and Escalators and Moving Walks |
| 23…….. | 5A | Lifts |
| 24……. | 5B | Escalators and Moving Walks |
| 25..... | Section 6 | Information and Communication Enabled Installations |

**ANNEX 3**
**(*Item* 3.2)**

## CONTENTS OF PART 11 'APPROACH TO SUSTAINABILITY' (OF NBC 2016)

**ANNEX 4**
**(*Item* 4.1)**

# Green' Termite Management

**About 'Green Building'**

**Green Construction or Construction of sustainable building** is the construction concept that refers to a structure and using a process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition.
This requires close cooperation of the design team, the architects, the engineers, associate contractors, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and environment-friendly approach.
Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective is that green buildings are designed to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution, and environmental degradation

**International Green Building Councils**

**World Green Building Council:**

Green Pest Management is considered very important in the US as well as all over the world. **World Green Building Council** is working seriously on all the aspects related to the environment, Sustainable buildings, and other green approaches to building. Pests' issues and their management practices are different based on the various issues viz. species of pests, environment, available /recommended pesticides and their dosages, etc. There are various government norms that are established based on the country's policies. The main object is sustainable pest control with an integrated approach.

**LEED certification USA:**

LEED certified buildings save money, improve efficiency, lower carbon emissions and create healthier places for people. They are a critical part of addressing climate

change and meeting ESG goals, enhancing resilience, and supporting more equitable communities.

To achieve LEED certification, a project earns points by adhering to prerequisites and credits that address carbon, energy, water, waste, transportation, materials, health and indoor environmental quality.

**Status of Indian Green Building**

*Indian Green Building Council (IGBC):*
**Under the banner of 'Indian Green Building Council' (IGBC), the following standards and certifying rating system are developed which are available for the benefit of up-gradation of the industry:** (source: official website of IGBC)
IGBC Green Existing Buildings (O/M)
IGBC Green Homes
IGBC Green Townships
IGBC Green SEZ
IGBC Green Factory Building
IGBC Green Landscape Rating System
LEED® India for New Construction
LEED® India for Core and Shell
LEED India is a green building rating system that helps to guide and design high-performance commercial buildings in India. In an effort to strengthen consistency, the Green Building Certification Institute (GBCI) now manages the certification of projects to all LEED rating systems in India, including assuming responsibility for LEED India certification from the Indian Green Building Council (IGBC).

**National Green Tribunal 2010:**
An Act to provide for the establishment of a National Green Tribunal for the effective and expeditious disposal of cases, disposal of cases relating to environmental protection and conservation of forest and other natural resources. The Tribunal is tasked with providing effective and expeditious remedies in cases relating to environmental protection, conservation of forests and other natural resources, and enforcement of any legal right relating to the environment. The Tribunal's orders are binding and it has the power to grant relief in the form of compensation and damages to affected persons. It also includes pollution control, hazardous substances management, Environmental impact assessment, climate change management, conservation of forests, environmental impact management, and biological diversity management. **But it does not include environmental-friendly Pest Management Practices mainly Termite Management practices suitable for Green buildings.**

**NECESSITY OF GREEN PEST MANAGEMENT (GPM) PRACTICES**
Green pest management (GPM) means any pest management service that was performed only if it meets the standards and protocols of a recognized third-party certifying organization such as Pest Management Association, Green Shield Certified, or Eco-Wise Certified. Green pest management is also known as the

technologically advanced Integrated pest management and an integrated, multi-step approach that works on a different principle than the familiar chemically oriented pest control, which depends totally on the use of chemical applications that are sometimes toxic to people and their surroundings.
GPM can create a healthy environment and has its roots in Integrated Pest Management. In order to reduce the impacts on man and the environment, Environment friendly and less toxic pesticides can be used.
(REF. Science Progress 2019, Vol. 102(2) 141–152 © The Author(s) 2019 Article reuse guidelines: sagepub.com/journals-permissions DOI: 10.1177/0036850419842459 journals.sagepub.com/home/sci. Green pest management practices for sustainable buildings: Critical review Venkata Kanaka Srivani Maddala Department of Sciences and Humanities, Vignan's Foundation for Science, Technology and Research (Deemed to be University), Guntur, India

**'Environment Friendly/ Green Termite Management Practices' is the important aspect which is directly related to the environment, soil ultimately to the GREEN BUILDING concept.**

**Termite Management Activity is the mandatory activity and play a very important role in building construction and to fulfill the basic protocol/ requirement of Green Building Concept we need to establish the now norms for Termite Management.**
**Till now, there are no norms established for 'Environment Friendly/ Green Termite Management Practices' in a building that shall be added as checklist-protocol during the day-to-day termite management practices to get the positive rating in the certification system of Green Building Structure.**
'Termite Management Practice in Building' plays an important role in the environmental aspect:
The termite is one of nature's more accomplished builders, erecting the tallest structures on our planet (when measured against the size of the builder), and maintaining a constant temperature inside despite wide temperature swings outside. The structure of the termite mound and the construction of the nest fulfills the entire protocol of green building.
**Termite and the environment:** Termites serve an important ecological role in the decomposition of cellulose material. They decompose wood and other cellulose-based materials, physically redistributing soil material, modifying soil profiles, and recycling organic matter and nutrients.
Considering the heavy population and the production rate of termites, total eradication of termites is not possible but the existing infestation can be controlled at the same time the chemical barrier can restrict the proposed entry of termites into the building.
Termite management practices mainly include chemical treatment. The chemicals used for termite management activity are called Termiticides.
The use of termiticides with less knowledge and without knowing the risk factor can negatively affect the environment. From an environmental and safety point of view, it is necessary to establish the "Norms-Protocol " for 'Green Termite Management Practices.

How can we manage to fulfill and maintain the 'Green Building Norms' while during the Termite Management Treatment in Building During and After the Construction activity to maintain our buildings green?

Below mentioned aspects are mentioned in the literature of World Green Building Council –

There are a number of ways to make a building green which includes:

- Safeguarding water resources
- Minimizing waste and maximizing reuse
- Promoting health and wellbeing
- Keeping our environment green
- Creating resilient and flexible structures
- Connecting communities and people
- Considering all stages of a building's life-cycle


## Case Study:

**Pesticides in soft drinks and drinking water:**

Indian economy is based on agriculture. Due to the heavy use of pesticides for the control of agriculture pests all over the country, the groundwater and soil are getting poisoned every year. (Source: the laboratory results analyzed by a few N.G.O.) It is necessary to monitor the excess use of pesticides used for agriculture as well as for non-agricultural areas also.

Anti-termite treatment is mostly applied to buildings in urban areas. This treatment is provided for indoor and outdoor premises of the building structure. Extra care must be taken to ensure that termiticides (chemicals used for termite management) do not pose any risk to human health as well as the environment.
*The proposed new norms-protocols of 'Green Termite Management' includes the following Contents:*

- **Acceptable Termite Presence:**

  Termites can be beneficial because **they decompose dead plant matter and return nutrients to the ecosystem**, just like earthworms and fungi. Before the management of termites, it is necessary to understand the necessity of termite treatment and the possibility of proposed damage or the attack of termites on the structure and property. On the other hand, Termites are the most destructive Pests for the individual as well as for National Property. They can negatively impact human welfare by causing damage to the national property i.e. unprotected cellulose materials, timber, and other structures etc.

- **Goals of Green Termite Management practice :**

  a) To protect from Environment Pollution i.e. soil, water, and air

  b) Proper usage of water and energy

  c) To protect the health of human beings

d) Avoid excess usage of termiticides

e) Less wastage of chemicals in the treatment areas

f) Long-term performance of the treatment to avoid re-infestation for a longer period and to avoid the need for re-treatment.

g) Avoid the use of harmful termiticides which has residual effects on the Safety of the homeowner, construction site workers or staff, the pest control operator, and the environment.

## ❋ Steps for Going Green Termite Management practice :

1. **The Pest Control Agency shall become a registered and license holder Professional Pest Management Service Provider**
2. **The Pest Control Agency shall apply for the membership of any National-International Pest Management Association**
3. **The Pest Control Agency shall upgrade their knowledge by attending various certificate courses and educational programs time to time**
4. **The Pest Control Agency shall understand the importance of Safe and Environment-friendly practices and shall follow quality practices and shall maintain all the standards.**
5. **The Pest Control Agency shall use all the registered, recommended,safe and effective pesticides during their day-to-day practices.**
6. **The company shall met all Global Green standards and shall established their own green and safety norms.**

*Green Termite Management Practice*

Professional Practitioner of Termite Management shall provide suitable methodology recommended by Indian Standards 6313 part II & III 2022 (latest and revised ion the month of Feb. 2022) at appropriate stage for the respective foundations/structures to fulfill the basic protocol of Green Termite Management Practices.

Most of the times, Termite Management Professionals, unknowingly or due to the lack of knowledge of Environment friendly Termite Management practices provides the Termite Management service to the building which may negatively impact to the environment. At the same time, the client/concerned authorities are also no aware of the technical aspect of this activity and unintentionally/unknowingly mention the wrong/old method of treatment in the specifications, which are not recommended treatments by the Indian Standards 6313 part II & III 2022. It is the responsibility of a professional termite control agency to visit the site, study, plan, and understand the type of foundation and its section to identify the soil contact with the foundation and shall decide the proper methodology of creating chemical barriers. The proper methodology shall be discussed and finalized with the site authorities during the meeting.

**The green approach means the safe approach of termite management towards the environment. No termiticides (chemicals used for termite management) can be called as 'Green'. But now with the help of advanced search and technology, a few termiticides are developed with odorless technology/ with a less negative impact on the environment and are comparatively safe in comparison to the old molecules.**

## A green termite management practice includes:

- **Site inspection**

  **a)** Soil aspect: Before the execution of routine treatment, thepest control agency shall inspect the site first to study the soil and the surrounding areas. Special focus shall be given to the Soil Aspect to understand the classification of soil, and soil properties along with its percolation/absorption and tolerance of termiticides. The percolation/absorption and tolerance of termiticides vary depending upon the soil properties and the pest control agency shall consider the recommendations of the soil experts and shall apply the termiticides as per the required lateral OR vertical consumption of chemicals for the respective soil textures. The excessive use of termiticides may affect the environment negatively.

  **b)** Site Preparation: If the termite nest i.e. mound is located near the proposed foundation or structure, the pest control agency shall treat the mound first to reduce the population of termites. The termite baits may also be used for the management of termites in termite nests.

  **c)** During the site inspection, pest control agency shall identify the ground water sources as well as the proposed underground water tank areas and shall take extra precaution to avoid water contamination.

- **Preventive culture practices:** Traditionally, repellent termiticides are being used as a barrier for the proposed termite entry into the structures. The repellent termiticides act as a toxic barrier that restricts the entry of termites. In addition to this practice, and to avoid the use of toxic termiticides, some other precautions can also be taken as prevention i.e. use of Non –repellent termiticides.

- **Few Non Chemical measures:**

  **a)** Removing waste wood or cellulose material near the structure or house

  **b)** Avoid moisture within the structure and in the surrounding areas

  **c)** Avoid the use of wood or wooden material in termite-prone areas

**d)** Removal of the existing affected wooden part of the structure

**e)** Removal of affected soil during the construction activity

**f)** Preferably use sand in place of soil for filling within the foundation or within the plinth

**g)** Build structures with rich concrete and avoid masonry foundations or walls within the structure to avoid the entry of termites.

- **Monitoring:** Monitoring each activity of termite management to avoid environmental damage.

**a)** Transport of termiticide material,

**b)** Day to day usages of termiticide

**c)** Record keeping of issuing of material from stores as well as daily consumption

**d)** All the treatments shall be executed as per the specifications

**e)** Post treatment inspection is also recommended by monitoring infested areas

**f)** In the case of the re-appearing of termites, alternative measures shall be taken to avoid the further possibility of re infestation and use of more toxic termiticides.

- **Mechanical Control measures:** To restrict the entry of termites in the structure or the foundation, all the entry points shall be sealed by the steel mesh/plate (currently not available in India with a brand). The soil contact with the foundation, structure, and plinth shall be avoided and rubble soling, metalling or crushed sand can be used.
- **Use of appropriate Termiticides:** It is necessary to use effective and low toxic termiticides to avoid the reappearance of termite as well as the protection of the environment.

- **Reducing environmental impact:** The residual effect of termiticide may create a longer negative impact on the soil and on the environment. It is advisable to reduce the dose of termiticides with effective measures.

- **Structure design efficiency**: Before the execution of the treatment, the pest control agency shall study the plan and according to the foundation type, and section of the building, he shall prepare the treatment plan by showing the

treatments on the section plan of the building. This will help to avoid the wrong treatment. The agency shall identify the soil contact with the foundation and shall recommend a suitable treatment.

- **Energy efficiency**: Green termite management includes measures to reduce energy consumption – both the embodied energy required to extract, process, transport chemicals, etc. The nearest area to the site of execution shall be provided for the storage of termiticides by the client to avoid energy. In Indian standards, it is mentioned that the application of treatment shall be by pressure pumps or hand operative sprayers, or water cans with sprayers.

  To create an even chemical barrier on floor surfaces, a hand-operative manual pump OR Water Can is suitable. The use of chemicals with high-pressure pumps during the high wind pressure will be a waste of chemicals unnecessarily other than the target treatment areas.
  This may create unwanted –uneven coverage and wastage of solution which may be harmful to the pest control operators as well as the site staff and environment.
- **Water efficiency**: All the termiticides are used for pre constructional treatments are mainly water based. All termiticides have its own dilution ratio with the water based on the label of respective termiticide. Before the treatment, the agency shall calculate the approximate consumption of the termiticide as well as he shall calculate the total water required for the treatment. Sometimes during the treatment, extra solutions mixed with the water prepared for the treatment within the containers/barrels may go waste if it is unused. Sometime,a balance quantity of solution, mixed with water which is prepared in barrels/tin is used by the site labour/workers for the wrong purposes or empty the tin in the soil/surrounding site areas which is harmful.

  - The pest control agency shall consider all the underground water sources as well as he shall consider the storage of water at the site. He shall take maximum precautions to avoid condemnation of water.

  * The operator shall wear all the safety equipment i.e. gloves, mask shoes, etc. After the application is over, the operators usually waste extra water for their cleaning purpose. If he ware /use all the safety equipment, he may not require more water for the cleaning of his body parts and belongings.
  The equipment or machineries also shall be kept separately to avoid repeatedly cleaning.
- **Material efficiency**: The new termiticides with the less dose of dilution with the water shall prefer to avoid more usage of termiticides in the soil to avoid side effects and for the better results of termite management.

The leaflet or broacher of the termiticides shall be delivered to the house owner along with the M.S.D.S. of the termiticide.

- **Operations and maintenance optimization**: The pest control agency shall appoint the trained operators/workers to provide professional services for the client.

- **Use of alternative termite management practices**: The use of a Termite Bait or Bait Monitoring Station is the most integrated termite management measure which is most effective for the landscape area where we cannot apply the toxic termiticides as well as for indoor use.

- **Waste reduction**: The wastage of termiticides affects a severe negative effect on the environment as well as it is harmful to human beings and animals and also can affect the additional cost to the agency.
- **International frameworks:** In India more work shall be done for Green Pest Management Practices with the initiative and support from government. Whereas green pest management practices are the most popular measures for most of the projects as integrated practices.

Role of Architects and Consultants of the project towards 'Green Termite Management Practice':

,Still most of the technical specifications and BOQs recommends the same old toxic termiticides mentioned and recommend. Chlorpyrifos 20% E.C.

The applicators or pest control agencies are unable to convince their clients (contractors / Site Engineers) about the risk factor of using the harmful chemicals and they are compel to use the same harmful product which is already banned in several other countries due to the serious impact to the human beings and environment.

The Architects and Consultants shall accept all the inputs from the various sources as well as inputs given by the pest control agencies with a positive approach by understanding the technical /scientific aspect of the toxicity of chemicals.

They shall give a positive response to the new technics, methodologies, and termiticides and shall revise their methodology.

Role of Builders, Developers and the Homeowners towards "Green termite Management Practice'

When the pest control agencies are providing termite management practices under Developers/Builders and the first contractors, they need to prove the quality of treatment up to the satisfaction also with the less rates/cost of application.

The cost cutting practices doesn't allow agencies to provide the best quality treatment with the safety implementations. To secure the own profit of pest control agency, they (pest control agencies) may use low-quality material and follow wrong practices by using non-recommended termiticides in the wrong areas and sometimes fewer numbers treatments that don't suit the requirement of the particular section of the building.

The homeowners also negotiate their cost with the agency below the minimum cost of chemicals (based on rate analysis) and do not pay the rate (as per the rate

analysis) to the agency which indirectly affects the quality, safety, and environmental pollution aspect..

The pest control agency or applicator shall increase the awareness among homeowners, builders or developers about the minimum cost required for the treatment to achieve Green Termite Management Practices. Also clients should accept the recommendations, advices from the professional pest control agencies for their own safety. Clients shall give preference to the expert termite management professionals only and shall avoid the local uneducated /unprofessional agencies that provide low cost practices.

Role of Government towards “Green Termite Management Practice’

The Agriculture Department Authorities, all the related Government departments, Indian Standards and other experts shall take initiative to establish the Green Practices and shall compel to follow the same strictly to protect the environment and public health. The government authorities shall form the committee of Scientists and Experts and shall accept their inputs positively to establish the Green and Safe Policies for the effective and Safe Termite Management Practices.

Role of Pest Control Agencies towards “Green termite Management Practice’

As a result of increased interest in green building practices, the number of other organizations related to construction activity also have developed standards, codes and rating systems.

But the Termite Management activity, which is more related to the soil, water, and air, is still neglected. New ‘Green’ norms shall be created for the safe handling and use of toxic termiticides in the environment. Pest Control Agencies play an important role in the day to execution of various pest control treatments and they need to take the Environmental Pollution aspect very seriously and shall follow and establish their own environment-friendly norms to save natural resources.

During the use of pesticides, they shall carry M.S.D.S. (Material Safety Data Sheets) of all the pesticides with them along with the MTC (Material Test Report) for the safety aspect and quality assurance.

The pest control associations also have taken steps for the awareness of integrated approach towards pest control activities. Now it is the responsibility of pest control companies shall attend all the training and education programs conducted by the association to upgrade the knowledge of their own and their staff.

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**ANNEX 5**
**(*Item* 4.1)**

**Green Termite Management Practices during Construction i.e. Pre-Construction Anti Termite Treatment for as under-construction buildings: RECOMMENDED NORMS FOR PRE-CONSTRUCTION ANTI TERMITE TREATMENTS FOR VARIOUS BUILDING SECTIONS AS PER I.S. 6313 part II 2022. (Revised and Latest)**

**During the pre-construction anti-termite treatment, for any building section, the treatments shall start at the immediate soil contact with the structure. Wrong treatment may cause the additional consumption of chemicals in the soil and may affect the environment.**

**The professional Termite Management Practitioner shall adopt all the treatments mentioned in the I.S. Code 6313 2022 part II & III (established norms and recommendations) during day-to-day practice to avoid any negative impact on the environment.**
**Pre-construction anti termite treatment as per I.S. Code 6313 2022 part II**

**OPTION A: TREATMENT FOR MASONRY FOUNDATION STRUCTURE**

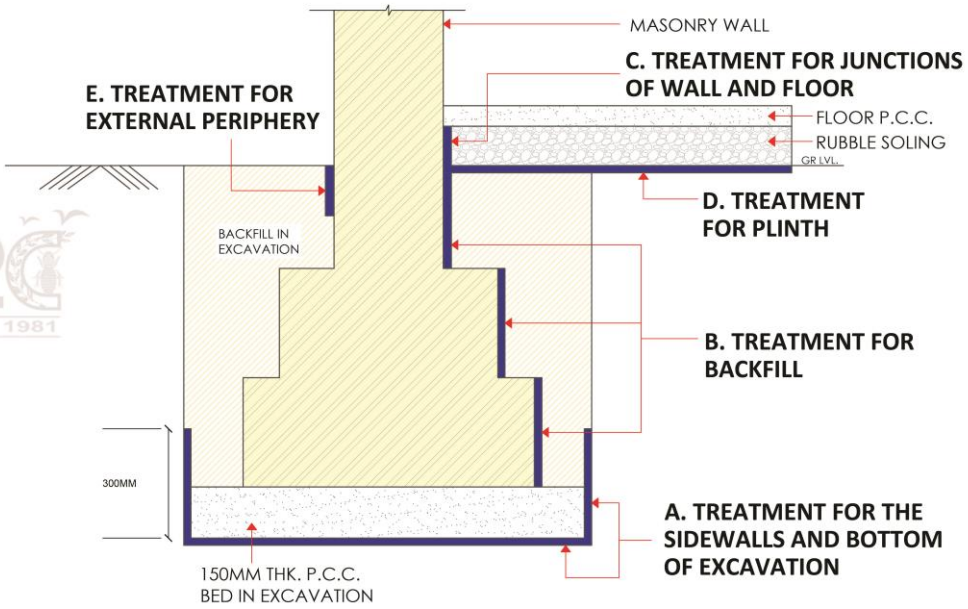
**Ist TREARMENT**: **i. After Excavation in foundation pits:** Providing and applying chemical emulsion and creating a chemical barrier under and around the column pits,wall trenches , basement excavation etc. In foundation pits to treat the bottom and the sides to a height of about 30 cms. At the rate of 5 Lt. Per Seq.Mtr.
ii. After the masonry foundations and the retaining wall of the basement come up, the backfill in immediate contact with the foundation structure shall be treated at the rate of 7.5 Lt. Per Seq.Mtr.

**IInd TREATMENT: JUNCTIONS OF WALL AND FLOOR:** To Achieve the continuity of barrier, vertical treatment upto the plinth is recommended especially for the masonry structures

**IIIrd TREATMENT: TREATMENT FOR PLINTH**
Treatment for the top surface of plinth filling between plinth by treating the chemical at the rate of 5 lt. Per Seq.mtr. by injecting and spraying method.

**IVth TREATMENT: TREATMENT FOR EXTERNAL PERIPHERY**
After the building is complete, the earth along the external perimeter of the building Should be rodded at intervals of 150mm and to a depth of 300mm.And treat the chemical at the rate of 7.5 lt. Per Sqm of vertical surface.

## TREATMENT FOR MASONRY FOUNDATION




**OPTION- B: TREATMENT FOR R.C.C. FOUNDATION STRUCTURE**

**Ist TREARMENT: TREATMENT FOR BACKFILL AROUND COLUMNS**

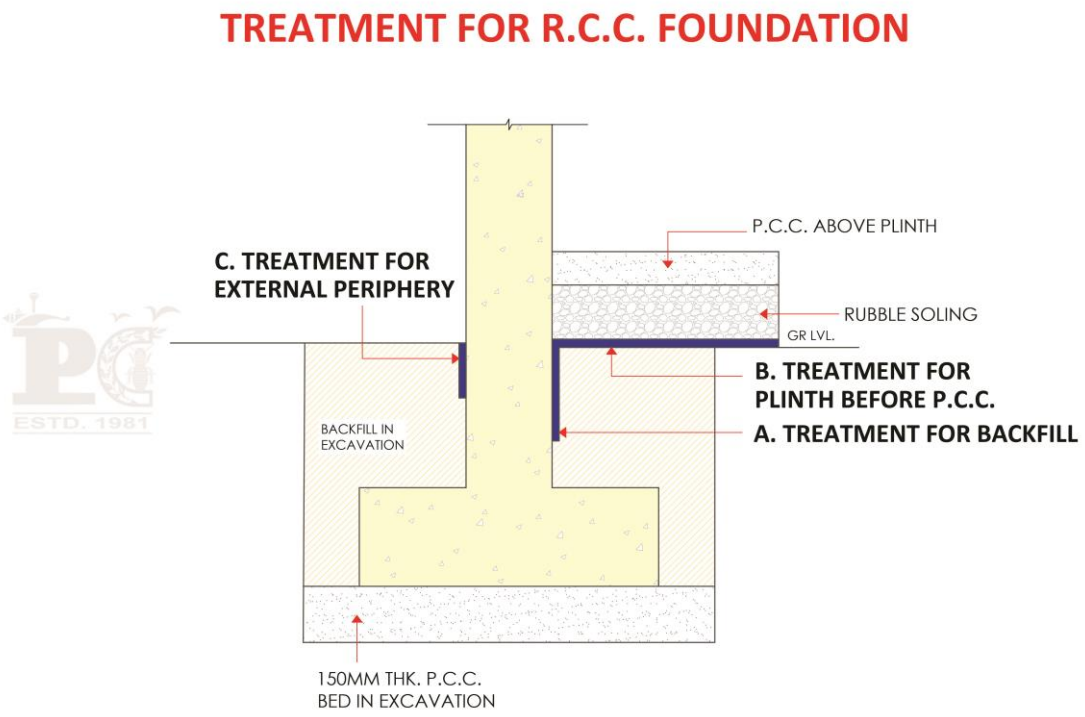
In the case of R.C.C. Foundations, the concrete is dence being minimum1:2:4 mix or richer, the termites are unable to penetrate it. It is therefore, unnecessary to start the treatment from the bottom of excavation. Treat the surrounding filled soil of r.c.c. foundations (columns) 500 mm below earth level i.e. vertical surface of the r.c.c. foundations shall be treated with the chemical at the rate of 7.5 lt per Sqm.

**IInd TREATMENT: TREATMENT FOR PLINTH**

Treatment for the top surface of plinth filling between plinth by treating the chemical at the rate of 5 lt. Per Seq.mtr. by injecting and spraying method.

**IIIrd TREATMENT: TREATMENT FOR EXTERNAL PERIPHERY**

**After the building is complete, the earth along the external perimeter of the building Should be rodded at intervals of 150mm and to a depth of 300mm.And treat the chemical at the rate of 7.5 lt. Per Sqm of vertical surface.**




**OPTION- C: TREATMENT FOR BASEMENT WITH THE BACKFILL ABOVE RAFT:**

**Ist TREARMENT**: **VERTICAL TREATMENT AROUND COLUMNS**

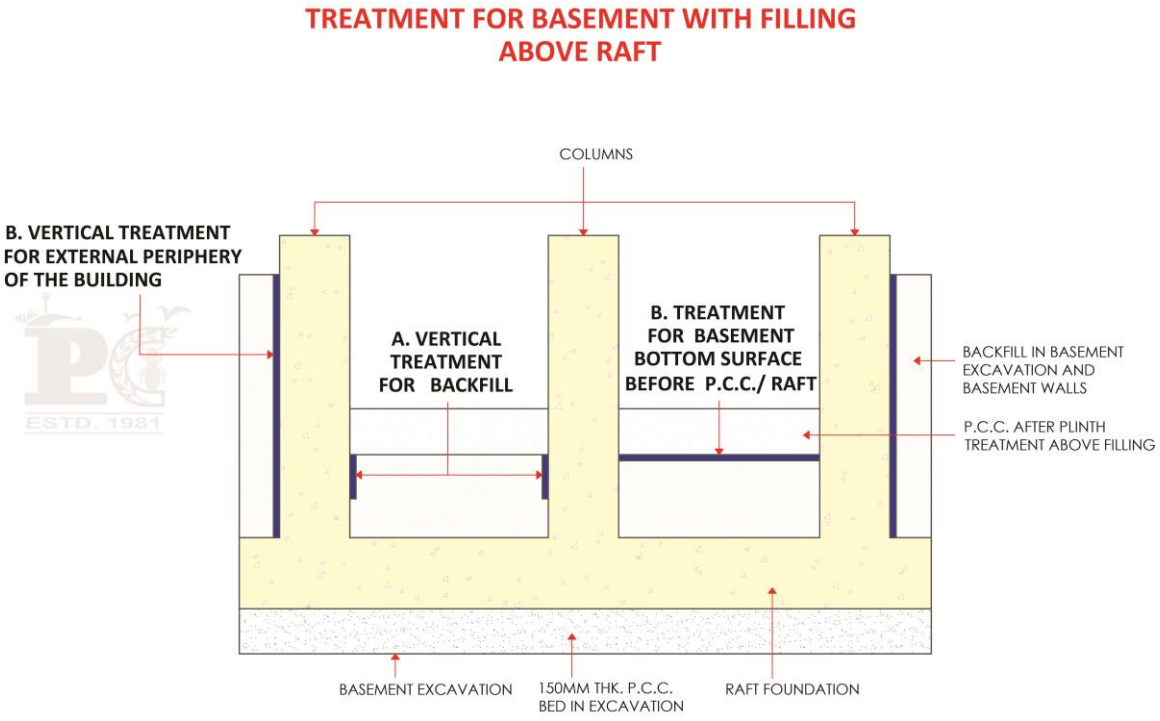
In case of basement with the backfill above the raft around columns/footings with foreign soil, the treatment shall start after the backfill and compaction is done i.e. backfill soil, we need to create the chemical barrier vertically around columns upto the depth of 500mm. The chemical shall be poured at entire backfill area around R.C.C foundation/columns @ 7.5 lt per Seq. mtr. of vertical surface.

**IInd TREARMENT**: **TREATMENT FOR FINISH FLOOR FILLED SURFACE**

To create a continuous and undisturbed chemical barrier at entire filled soil within the basement walls i.e. plinth filling, the chemical shall be treated horizontally to restrict the proposed entry of termite from the filled soil surface. After the compaction and watering is completed the entire plinth surface before soling/ p.c.c./ trimix shall be treated with chemical @ 5 liter per sq.m.

**IIIrd TREATMENT**: **TREATMENT FOR EXTERNAL PERIPHERY**

**After the building is complete, the earth along the external perimeter of the building Should be rodded at intervals of 150mm and to a depth of 300mm.And treat the chemical at the rate of 7.5 lt. Per Sqm of vertical surface.**




**OPTION- D: TREATMENT FOR BASEMENT WITH NO BACK ABOVE RAFT I.,E. TREATMENT WILL START AFTER EXCAVATION FOR BASEMENT:**

**Ist TREARMENT**: **HORIZONTAL TREATMENT FOR PLINTH/ BASEMENT / FINISH FLOOR FILLED SURFACE**

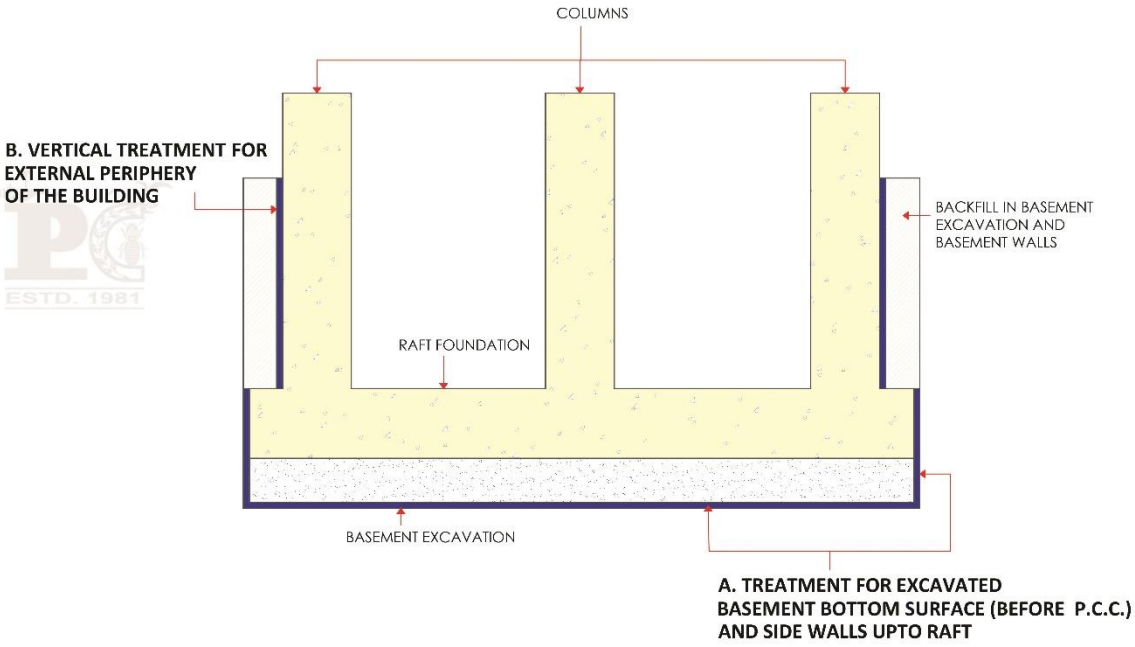
To create a continuous and undisturbed chemical barrier at entire filled soil within the basement walls i.e. plinth filling, the chemical shall be treated horizontally to restrict the proposed entry of termite from the filled soil surface. After the compaction and watering is completed the entire plinth surface before soling/ p.c.c./ trimix shall be treated with chemical @ 5 liter per sq.m.

**IInd TREARMENT**: Same surface treatment for all the sidewalls upto minimum 300mm height or upto the height of raft @ 5 liter per Smt.

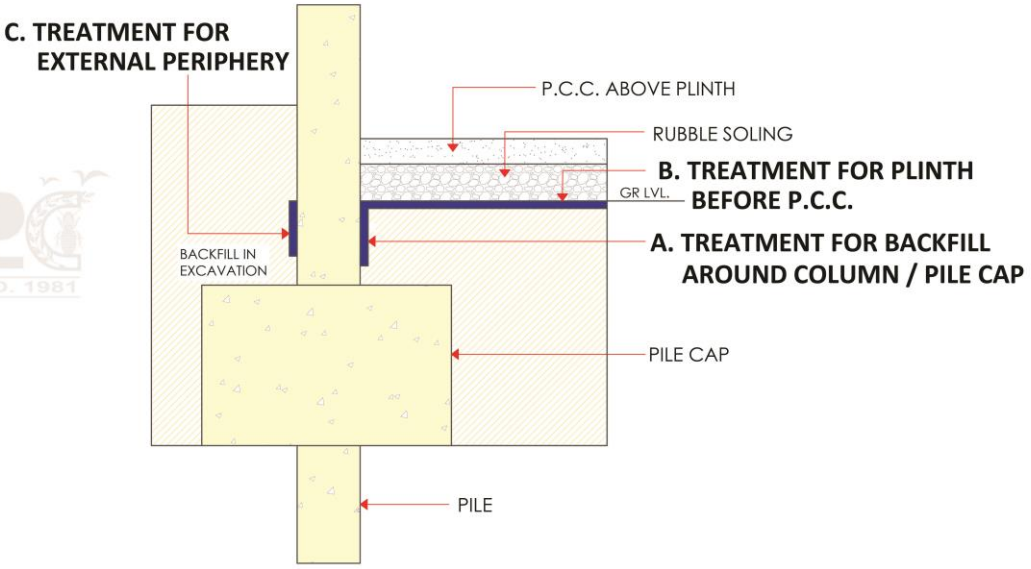
**IIIrd TREATMENT**: **TREATMENT FOR EXTERNAL PERIPHERY**

**After the building is complete, the earth along the external perimeter of the building Should be rodded at intervals of 150mm and to a depth of 300mm.And treat the chemical at the rate of 7.5 lt. Per Sqm of vertical surface.**

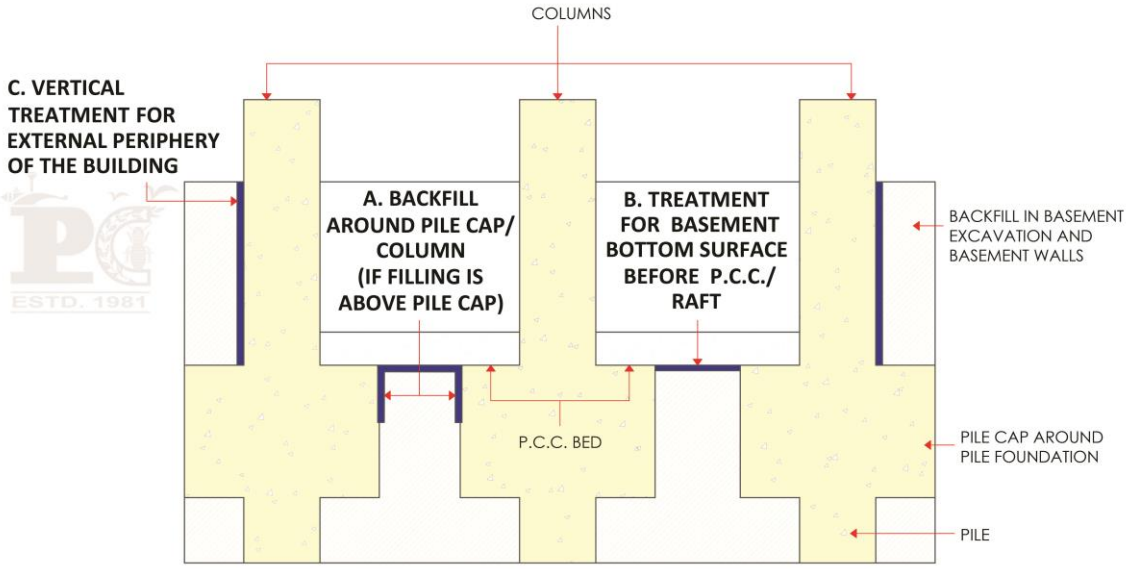
## TREATMENT FOR RAFT FOUNDATION IN BASEMENT




## TREATMENT FOR PILE FOUNDATION



## TREATMENT FOR BASEMENT WITH PILE FOUNDATION

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**ANNEX 6**
**(*Item* 4.1)**

## Green Building Part II

## Green Termite Management Practices i.e. Post-Construction Anti Termite Treatment for the existing structures or old structures (also includes heritage structures)

## Skillful and Green termite management practices for the existing structures: Post-construction anti termite treatment as per I.S. Code 6313 2022 part II

**Action plan during the treatment:**

## Step 1. Inspection and identification:

Inspection is carried out to estimate the magnitude of the spread of the termite 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 the ground, walls, columns, areas having damp or humid conditions like bathrooms, lavatories, leaking pipes or drains, etc., and places where woodwork is embedded in the floor or wall.

The inspection will be helpful to avoid unnecessary chemical applications and it will be easier for the Professional Termite Management Agency to focus on the specific infested areas.

**Safety: The safety aspect always plays an important role in termite management practices and shall be implemented by the professionals as GREEN TERMITE MANAGEMENT protocol.**

(Safety Mask, Hand Gloves, Sunglasses, Screw Driver, Magnifying Glass, Camera/Smartphone, Measuring tape, Torch, Glass Tubes for sample collection)


**Inspecti**

## Step- 2. Control Measures with GREEN APPROACH

After the thorough inspection, the termite professionals shall start the control measures with the GREEN APPROACH i.e. with the below-mentioned environment-friendly methodology.

This operation shall be carried out in a thorough manner, seeking the termites in their hideouts, such as ceilings behind wooden paneling, inside electrical wiring battens, conduits, switchboards and similar locations. All traces of termite tubes shall be removed so that any fresh infestation which might occur at a later date may be easily detected.

**A. Treatment for the Entry Points:** The post treatment shall initiate from the soil contacts with the structures at ground floor or at basement level. Along with all the hideouts, the opening of concealed plumbing and electrification shall also get inspected and treated. Subterranean termite creates shelter tubes during foraging activity. With the help of visible shelter tubes on the surfaces, it is easier for the agency/technician to identify the presence of termite in the structure. Preliminary treatment for the visible infestation as well as for the identified shelter tubes is necessary. All the shelter tubes shall remove first and at the same time applicator shall reach up to the entry point of termite with the help of shelter tube signs. The object of soil treatment is to establish chemical (toxic) barrier between the termites in

the soil and the building to be protected. Basically, it consists of treating the soil adjacent to or under the building with a chemical toxicant which kills or repels termites. Water emulsions of one of the chemicals shall be used in soil treatment and applied uniformly at the prescribed rate.

**B. Treatment of soil under floors**: The points where the termites are likely to seek entry through the floor are the cracks at the following locations:

**i. In the case of Infestation in the Basement:**

If the basement is infested, it is not advisable to drill the holes inside the finished basement floor, and basement retaining walls finished with waterproofing treatment. Most of the time, due to the presence of severe dampness and moisture in the basement, subterranean termite presence is located. To treat the infested areas in the basement, the entire floor as well as basement walls shall be treated with a repeated spraying application. At the same time entire outside backfill soil around external peripheral area of the basement walls shall be treated vertically by drilling the holes and treat the vertical filled soil by pouring the chemical inside at the rate of 7.5 liters per Seq. Mtr. to achieve the chemical contact upto the infested areas below basement.

**ii. Treatment for Ground floor with no PCC:**

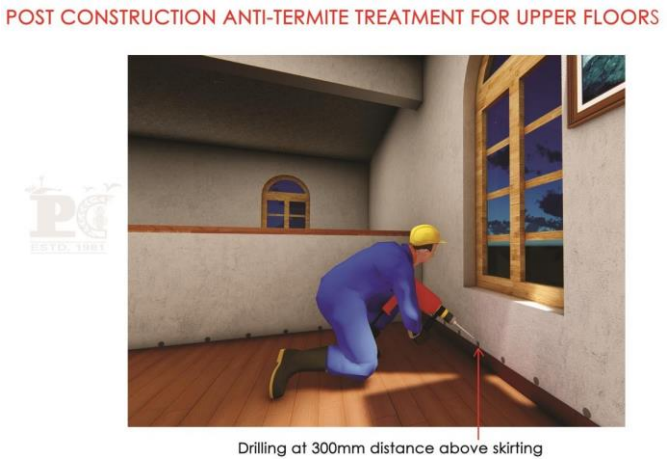

In the case of the ground floor of old/existing/infested structure where new flooring is planned, then before the new floor P.C.C./ new tiling , penetrate the solution inside

the soil or filled/rammed plinth by punching or injecting the holes inside the soil or the solution and may create the chemical barrier.

**iii. Treatment for the ground floor with no PCC is completed on the floor:**

If the infested area is on the ground floor then it is possible to drill the entire floor area as well as the flooring tiles can also be removed and the chemical can penetrate inside the holes at the floor level. But in the case of upper floors, the applicator cannot drill the holes in the floor slab. Entire internal periphery of the infested area/floor shall be drilled at the junctions of wall and floor or at above the skirting tile by drilling 6mm holes at a distance of 300mm and by the pressure pump inject the chemical inside the holes at minimum 1 liter per hole to create the chemical barrier. In the case of P.C.C. work is over at the ground floor, the holes shall be drilled in the plinth minimum 1-meter center to center vertically up to the depth of a minimum 300mm. The entire external peripheral area of plinth or the structure shall be drilled at a distance of 150mm up to a depth of 300mm.

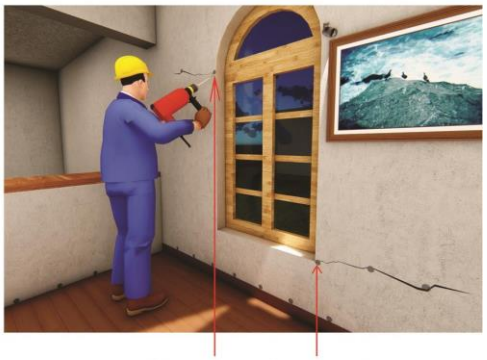

**C. Treatment for the Junctions of wall and floor**: In the case of r.c.c. slab/finish floor, is not possible to drill the holes vertically in the floor and a barrier shall be created at all the junctions of the wall and floor. The entire internal peripheral area of the building (ground or upper floors) shall be treated by drilling the holes at 45 degrees below the skirtings/junctions and chemicals shall be penetrated in the holes until refill, repeatedly.




**D. Treatment to voids in masonry**: If the voids are developed within the walls through the finish plastered surface especially in the old structures; there will be a easy entry for termite to penetrate inside the walls. Sometimes, ‘Plaster of Paris’ lair is also applied on the surface of walls for the extra smooth finish, but the strength of the plaster lair is comparatively weak and termite can penetrate inside the walls. Treatment shall be provided within the plinth area of the ground floor wherever such cracks are noticed, by drilling vertically 12 mm holes at the junction of floor and walls,

constructional and expansion joints mentioned above at 300 mm interval to reach the soil below. Chemical emulsion shall be squirted into these holes using a hand operated pressure pump until refusal or to a maximum of one litre per hole.

TREATMENT FOR VOIDS AND CRACKS IN THE WALL



Drilling holes at voids and cracks

**E. Treatment at points of contact of woodwork**:

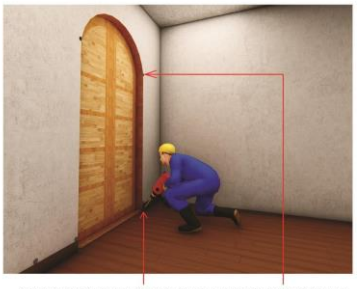
All damaged woodwork which does not need replacement shall be treated.

i. All existing woodwork in the building which is in contact with the ceiling, floor or walls and which is in contact with the structure which is infested by termites, shall be treated by spraying at the points of contacts with the adjoining masonry with the chemical emulsion of concentration by drilling 6 mm holes at a downward angle of about 45° at the junction of woodwork and masonry and squirting chemical emulsion into these holes till refusal or to a maximum of half a litre per hole. The treated holes shall than be sealed.

ii. The interior work includes wooden flooring and wooden cladding to the walls need special precautions. All the points of wooden contact shall be treated with the surface treatment.

iii. Infested woodwork in CHAUKATS, shelves, joints, purlins, etc. in contact with the floor or the walls shall be protected by providing suitable treatment with drilling holes of about 3 mm diameter with a downward slant to the core of the woodwork on the inconspicuous surface of the frame.

TREATMENT FOR WOODEN DOOR FRAMES



Drilling holes for door frame and contact with wall and floor


Water shall not be used for any wood treatment which will again create moisture inside the wood. For all kind of wood treatments, oil based formulation shall be used.

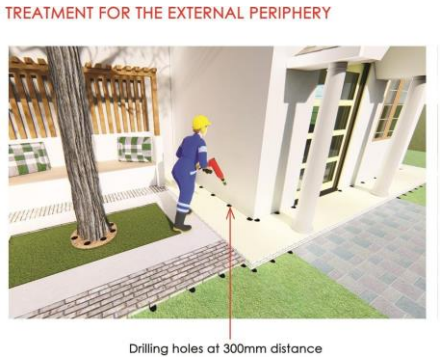
**F. Treatment of Electrical Fixtures**: If infestation in electrical fixture (like switch boxes in the wall) is noticed, the covers of the switch boxes shall be removed and shall be treated from inside liberally with 5 percent Chloropyrifos dust or any termiticide with WP formulation. The covers of the switch boxes shall be refixed after dusting.

**G. Treatment around buildings:**

**i. EXTERNAL PERIPHERAL TREATMENT OF THE BUILDING**: Drilling 8 to 10 mm holes at the intervals of 300 mm vertically (45 ) to reach the chemical inside properly by creating a chemical barrier. Chemical emulsion shall be poured inside the holes by hand operative pressure pumps until refusal the holes shall then be sealed after completion of the entire treatment.

**ii. TREATMENT FOR THE NON GARDEN BUILDING APRON AND OPEN SOIL SURFACE NEAR THE BUIDING:** Entire OPEN PLOT i.e. NON GARDEN soil surface area shall be treated by creating chemical barrier near the building which is infested by injecting and spraying treatment. The holes shall be taken at 300mm center to center and pour the chemical inside until refill, repeatedly.

**I. TREATMENT FOR THE AFFECTED TRESS, PLANTATION AREA AND FLOWER BED :**




i. Spraying treatment for existing exposed soil,

ii. Injecting the holes at 1 feet center to center of about 1” diameter and flooding the chemical for all the entire backfilled soil within the landscape area.

iii. Applying of Termiticide Dust for the existing soil lair of entire plot area.

iv. Injecting the holes around all the affected trees if any and pouring the chemical inside the holes as well as spraying the chemical on the surface of all the affected trees.


## Step-3 IMPORTANCE OF CHECK-UP TREATMENTS:

In the case of Post Construction Anti Termite Treatment, to avoid re-infestation/re-entry of termites either from the treated areas OR from the new hidden areas two-three check-up treatments shall be given after the first Major treatment. Some termiticides include contact poison and termites immediately get affected after having contact with the termiticides is called repellent ttermiticides But to eradicate the total termite colony, Non-Repellent Termiticides are used termites indirectly carry this chemical up to the nest and feed the chemical to other family members un-knowingly. No check-up treatment is required if the treatment is given for the non-infested structures as precautionary measure. But in the case of Post Treatment is given for the infested areas, check-up treatment is mandatory.

**ANNEX 7**
**(*Item* 4.1)**

**Harmful Chemicals: Chemicals recommended for Termite Management practices with reference to Green Building:**

'Termite Management' practices are directly related to the environmental aspect:

**Termite and the environment:** Termites serve an important ecological role in the decomposition of cellulose material. They decompose wood and other cellulose-based materials, physically redistribute soil material modifying soil profiles and recycle organic matter and nutrients.

Considering the heavy population and the production rate of termite, total eradication of termite is not possible but the existing infestation can be controlled at the same time the chemical barrier can restrict the proposed entry of termite in the building.

Termite management practices mainly include chemical treatment. The chemical used for termite management activity is called Termiticides.

Use of termiticides with the less knowledge can negatively affect the environment. From environment and safety point of view, it is necessary to establish Green Termite Management Practices.

**Insecticide Act 1968 and Insecticide (Amendment) Rules, 2006:**

With reference to Insecticide Act. 1968 and the Insecticides (Amendment) Rules, 2006, the Structural Pest Control Industry has not considered as a separate Industry which is involved in Non Agricultureal pest Control Activity as well as Non Fumigators or Non Users of Restricted Pesticides. The result of which there is a lack of recommendations for different insecticides mainly termiticides for its usages as well as there is no ready directions have established in Pest Control Industry.

There are different termiticides registered with C.I.B (Central Insecticide Board) and available in market for effective termite management but there is lack in details on the Label and Labelling of those Termiticides when we consider the mode of action, direction of usages as well as the safety aspect of those termiticides.The New Rules will understand the active ingredients of the respective Termiticides and the dosages as well as the effectivity for termite control. Study the mode of action of termiticide, its residual effect and the repellence before the use. Termiticide means the molecule or insecticide useful and recommend mainly for Termite Control. Label of termiticide includes the dose of termiticide, formulation with the base, safety of it etc, Study the instructions and information of Label is necessary before any application or establishment of rules of termite management,

**The Environment Protection Act. 1986:**

**According to the Section 2 (a) of the Indian Environment Protection Act, 1986, the term "environment" includes Water, Air and Land, and the interrelationship which exists among and between water, Air and Land and Human Beings, Other Living Creatures, Plants, Micro-Organisms and Property.**

Environmental pollution may be defined as "an undesirable change in the physical, chemical or biological characteristics of our Air, Water, and Land that may or will harmfully affect human life, the lives of the desirable species, our industrial processes, living conditions, and cultural assets, or that may or will waste or deteriorate or raw material resources.

Environmental pollution is "an addition or excessive addition of certain materials to the physical environment (Water, Air, and Lands), making it less fit or unfit for life.

The purpose of adding this topic in the inputs of Green termite Management Practices is to mainly focus on the harmful effect of Pesticides mainly Termiticides (molecules used for Termite Management) on the environment. The excessive use of the non-recommended dosages of Termitticides with the wrong practice may become the cause of Environmental Pollution.

To absorb the recommendations of advanced Termiticides with their use in soil for termite management.

**Water Pollution:** Excess use of Termiticides in the soil may affect the groundwater i.e. drinking water as well as storage water for agriculture. This research will help to establish the required dosages of Termiticide for Termite Management and will avoid Water Pollution.

**Soil Pollution:** My research-based inputs cover the detailed study of soil properties, soil percolation, or the absorption of termiticides depending on the soil texture. It can help to avoid the misuse of Termiticides.

**Indian Standards 6313 Part II and Part III 1971,1981, 2001, 2013 & 2022.**

The 'Bureau Of Indian Standards' (BIS) formerly called 'Indian Standards Institutions' has published the first publication 'Code of Practice for Anti Termite Measures in Buildings' in the year 1971. It was revised for the first time in the year 1981 with some rectifications of terms i.e. words misprinted or for the clarification of the methodology. In the year 2001, it was published again with the second revision by adding new termiticide (insecticides) in place of old termiticide which was banned in the year 1992-93 and then it was revised in 2013 and now the latest publication is 2022.

**The objective of inputs shared to establish the Green Norms /practices during Termite Management in Building:**

- To establish the dosages of Termiticides as per the classification of soil.
- To avoid Water as well as Soil Pollution from misuse of Termiticides.
- To highlight the safety aspect for pest management workers.
- To identify the soil contact with the different types of foundations.
- To identify the entry point of termites in the structures.
- The purpose of this research is to create a better practice of Termite Management in New as well as Old Buildings.
- The revision of old methodology is must for the common interest of the society and the construction industry.
- To improve and develop Termite Management Skills and create New Revised Rules of termite Management Activity.
- By attending various Workshops, Conferences, Training programmes, Seminars regularly on this subject and upgraded my knowledge on the subject of Termite and its Entry in building as well as damage to the property.

- To Educate the society and construction industry by exclusive power point presentation in which I have mentioned all the building sections and have shown the correct methodology of termite treatment.
- To highlight the formula of calculation of total termiticide required per stage in termite management will help to avoid misuse of termiticide as well as it will be helpful to create proper chemical barrier with required termiticide.
- The above research will definitely be helpful to me for my own progress as well as it will be beneficial to the society.

**Pesticides in soft drinks and drinking water:**

Indian economy is based on agriculture and due to the heavy use of pesticides for the control of agriculture pests all over the country, every year the ground water as well as soil is getting poisoned. (Source: the laboratory results analysed by few N.G.O.) It is necessary to monitor the excess use of pesticides used for agriculture as well as for non-agricultural areas also.
The total requirement of termite management (soil treatment) activity is more in the urban areas. The treatments are provided for indoor and outdoor premises of the building structure and to protect the health of human beings and animals from the chemical hazards, additional precautions are necessary during the applications.

**Traditionally usage of harmful and restricted pesticides in India:**
In the year 1992-93, the termiticides Aldrine/ Heptachlor/ Chlordane were banned due to their health hazard. All those were earlier recommended and mentioned in I.S. Code 6313 part II & III.
But in the year 1992-93 Chloropyrifos 20% and Linden was recommended and in the revised I.S. Code it was mentioned the same. Now recently Linden is also banned due to the reason of health hazards.
Few years before Bifenthrin and Imidacloprid, two termiticides were recommended for effective termite management. Both molecules are safe for the use of outdoor and indoor termite management as a safe termiticide. The Dose of both the termiticides is also less in comparison to the dose of Chlorpyrifos 20%.
**Chlorpyrifos 20% EC which is still in the list of recommended termiticides in the I.S. Code 6313 part II and III is already banned in most of countries as a harmful molecule for human beings and animals as well as the most hazardous for the environment. (International reports are available on the internet)**
**Adoption of new molecules i.e. termiticides with the recommended dose and proper usage is a very important protocol of Green Termite Management.**

## Recommend Chemicals for Anti-termite Treatment

| l No. | hemical | evant ıdian tandard | Concentration by lass, Percent Active Ingredient) | Dosage |
|---|---|---|---|---|
| i) | hlorpyrifos 20 percent mulsifiable Concentrate EC) | ; 8944 | .0 | 50 ml in 5 litre water<br>0 ml in 1 litre water |
| ii) | nidacloprid 30.50 ercent Suspension oncentrate (SC) | ; 16131 | .075 | 0.5 ml in 5 litre water<br>.1 ml in 1 litre water |
| iii) | ifenthrin 2.5 percent Emulsifiable Concentrate (EC) | *ee* Note 3 | .05 | .00 ml in 5 litre water<br>20 ml in 1 litre water |

- **The application of chemicals shall be strictly as per the recommendation of manufacturer's recommendations and dosages as per the I.S. Code.**
- **Before the application, the MSDS of the chemical shall be shared by the applicator.**
- **The applicator shall check the expiry date of the chemical before the application and shall not use any chemical beyond the expiry date.**

**ANNEX 8**
**(*Item* 4.1)**

# SOIL TOLERANCE AND ABSORPTION OF TERMITICIDES

**The purpose of including this research-based topic is to understand the Soil Pollution aspect by studying the Soil Tolerance and Absorption of termiticides in the soil in various soils.**

## 1. Classification of Soil on the Basis of Its Properties

**Soil Samples were collected from different regions to establish the dose of Termiticide required for different soil based on the percolation or absorption limit.**

## *Experiment No.1*

These soil samples are analysed in the laboratory of 'Kharland Research Station' (KLRS) at Panvel, under Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra for mechanical analysis.

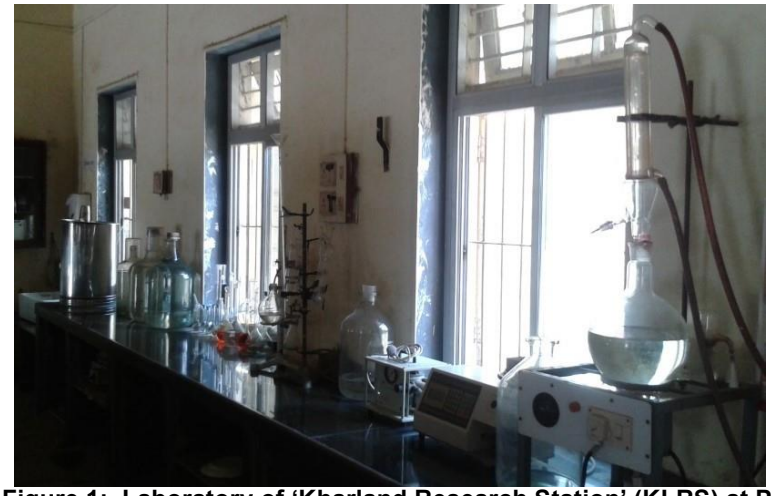


**Figure 1: Laboratory of 'Kharland Research Station' (KLRS) at Panvel, under Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli, Maharashtra**

**Particle Size Analysis of Soil by Bouyoucos Hydrometer Method**

**Figure 2: Hydrometer**

***Bouyoucos Hydrometer method for particle size analysis:***

**Figure 3: Particle size analysis in the laboratory**

## Principle

**The hydrometer method is based on the principle that the density of the soil and water suspension at a given depth decreases as an initially homogenous dispersed suspension settles. The rate of decreases in density at any given depth is related to the setting velocities of the particles, which, in turn, are related to their sizes. The time required by the particles of a given size to settle can be calculated by using stoke`s law.**

**It states that resistant offered by the liquids to the fall of particles varies with radius of sphere.**

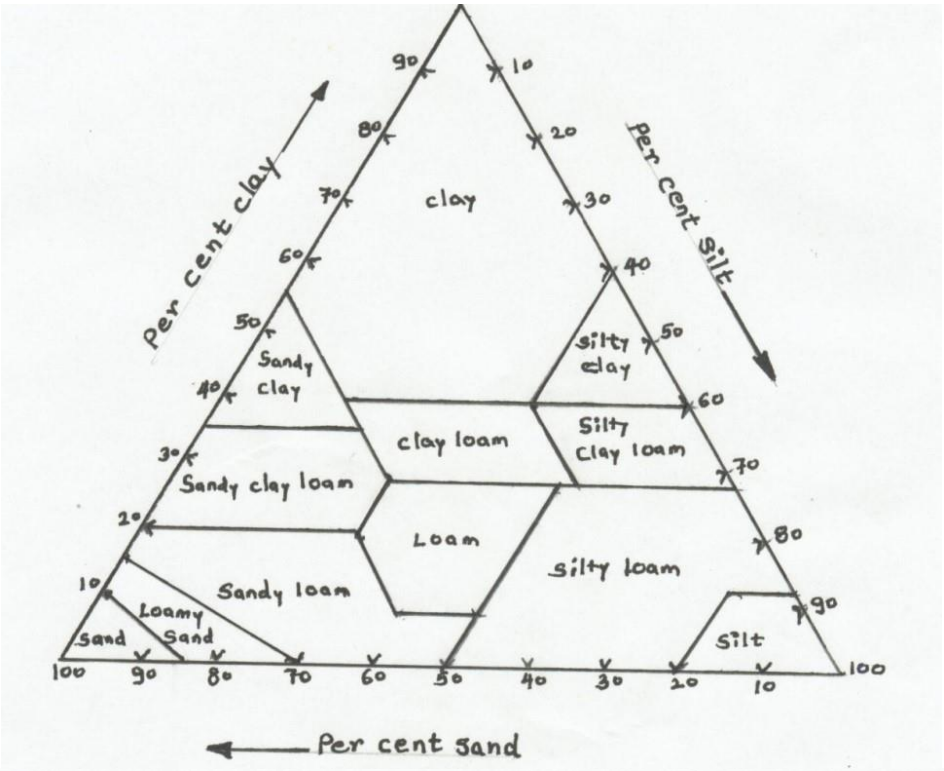
## Apparatus and Equipment:

*i.* Dispersing machine – Machanical Stirrer

*ii.* 1000ml measuring cylinders without spout withrubber stoppers/spout

*iii.* Thermometer (Fahrenheit Scale)
*iv.* 600ml dispersing beaker with cover
*v.* Wash Bottle
*vi.* Bouyoucos Hydrometer
*vii.* Watch Glass
*viii.* Chemical blance
*ix.* Oven

**Reagent:- Hydrogen peroxide, dispersing agent = calgon solution (Sodium hexametaphosphate) Methodology for Soil Absorption or soil Tolerance**




Triangular diagram for locating textural class of soil:

**Reference:**

· Manual for introductory course in Soil (1979) by Khanna S.S. and Yadav D.V….p.p. 33-34.

· Soil and Plant analysis (1966) by Piper C.S.

***Sample Diagram***

**Diagram 1: Research methodology for soil classification**

**Sample B-1**

**Soil Location**: Rajasthan, India

**Type: 'B-1' Desert Soil "Chikni Pathrili Mitti",**


**Figure -4: Soil Sample 1**

*Triangular diagram for locating textural class of soil:*

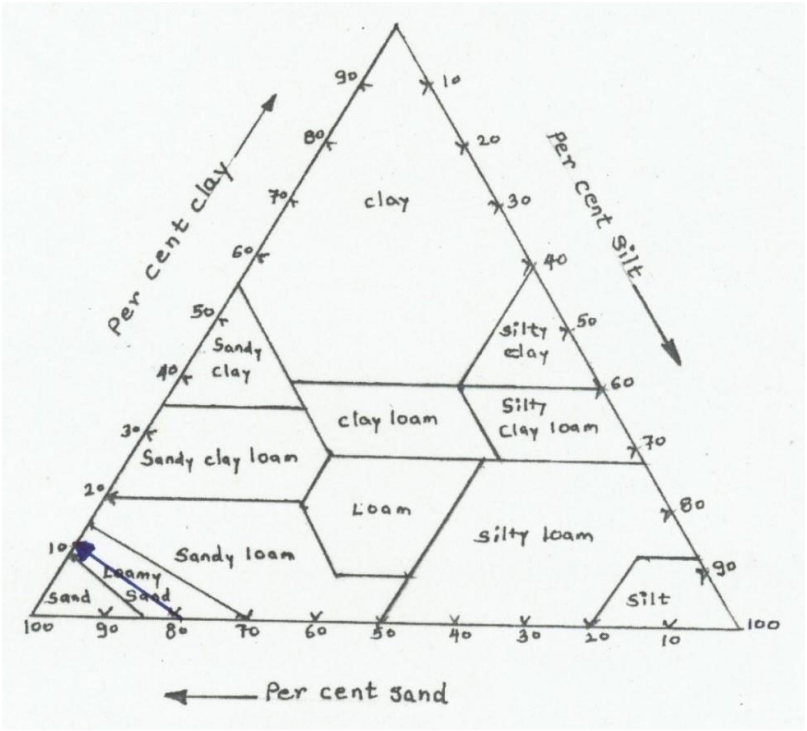



**Diagram 2: Loamy sand is the textural class for sample B-1**

## Sample B-2

**Soil Location**: Rajasthan, India

**Type: 'B-2' Desert Soil, "Maidani Mitti"**


**Figure 4: Soil sample 2**

*Triangular diagram for locating textural class of soil*

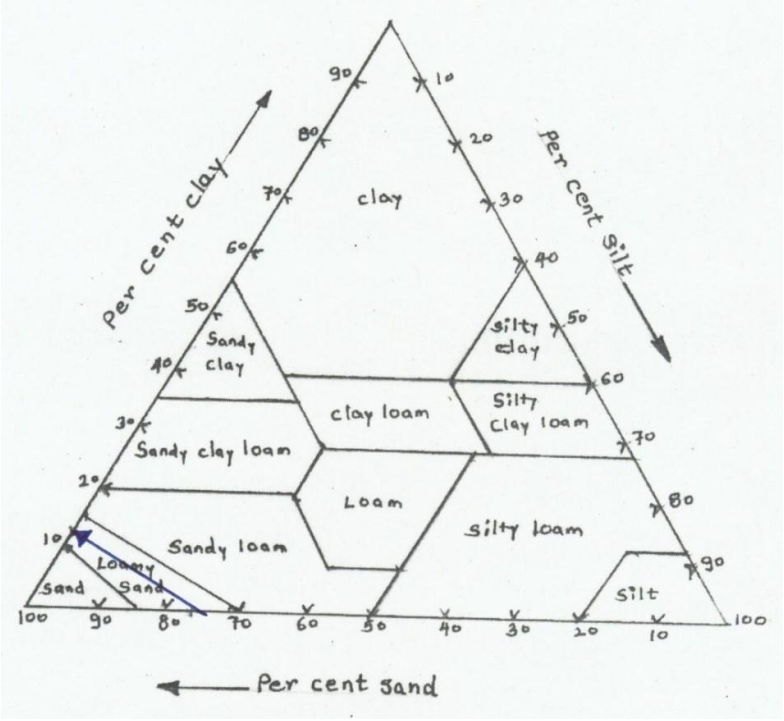



**Diagram : 3**

**Result : Sample B-2 is having loamy sand as textural class**

**Sample B-3**

**Soil Location:** Rajasthan, India

**Type: 'B-3'Desert Soil, 'Marusthaliya Mitti'**


**Figure 5: Soil Sample 3**

*Triangular diagram for locating textural class of soil:*

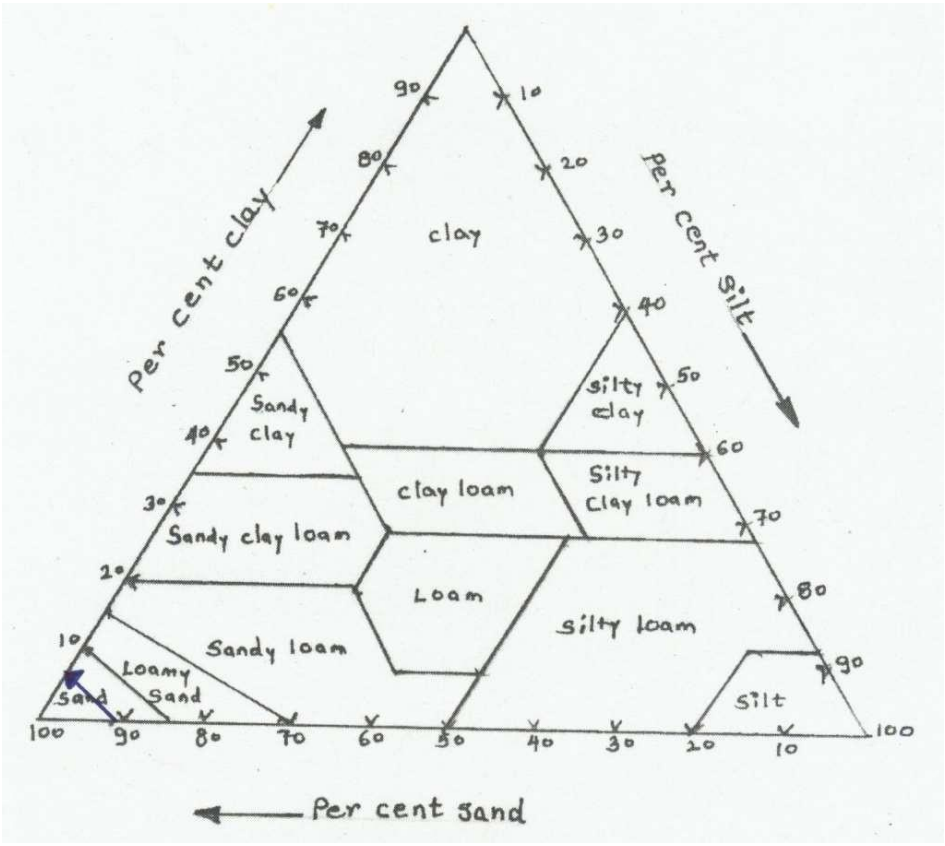



**Diagram: 4**

**Result : Sand is the textural class for sample 3**

**Sample- M**

**Soil Location:** Maharashtra, India

**Type: 'M' Red Soil from Hill Area, Satara District**


**Figure 6: Soil Sample M**

*Triangular diagram for locating textural class of soil:*

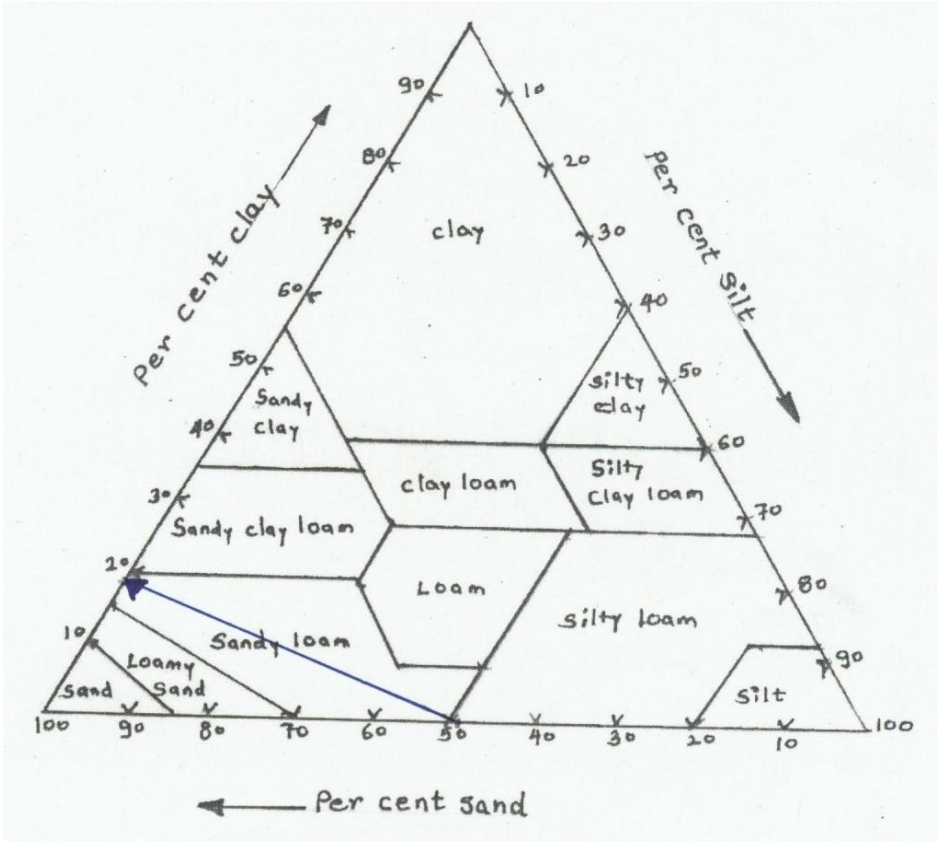



**Diagram: 5**
**Result : Sample M is having sandy loam as textural class**

*Sample- W*

**Soil Location:** Maharashtra, India

**Type: 'W' Black Clay Soil, Satara District**


**Figure 7: Soil Sample 'W'**

*Triangular diagram for locating textural class of soil:*

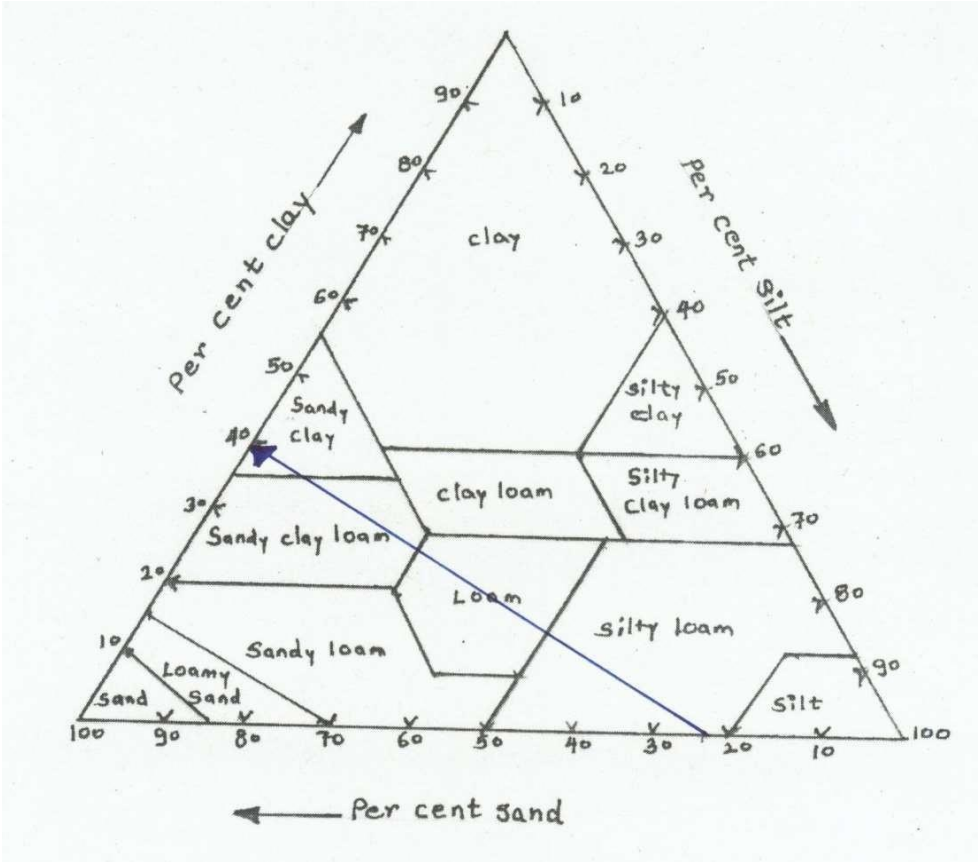



**Diagram: 6**

**Result : Sandy clay is the textural class for sample - W**

**Sample: 'P-C'**

**Soil Location**: Maharashtra, India

**Type:** 'P-C' Coastal Area, Raigadh District

***Triangular diagram for locating textural class of soil:***

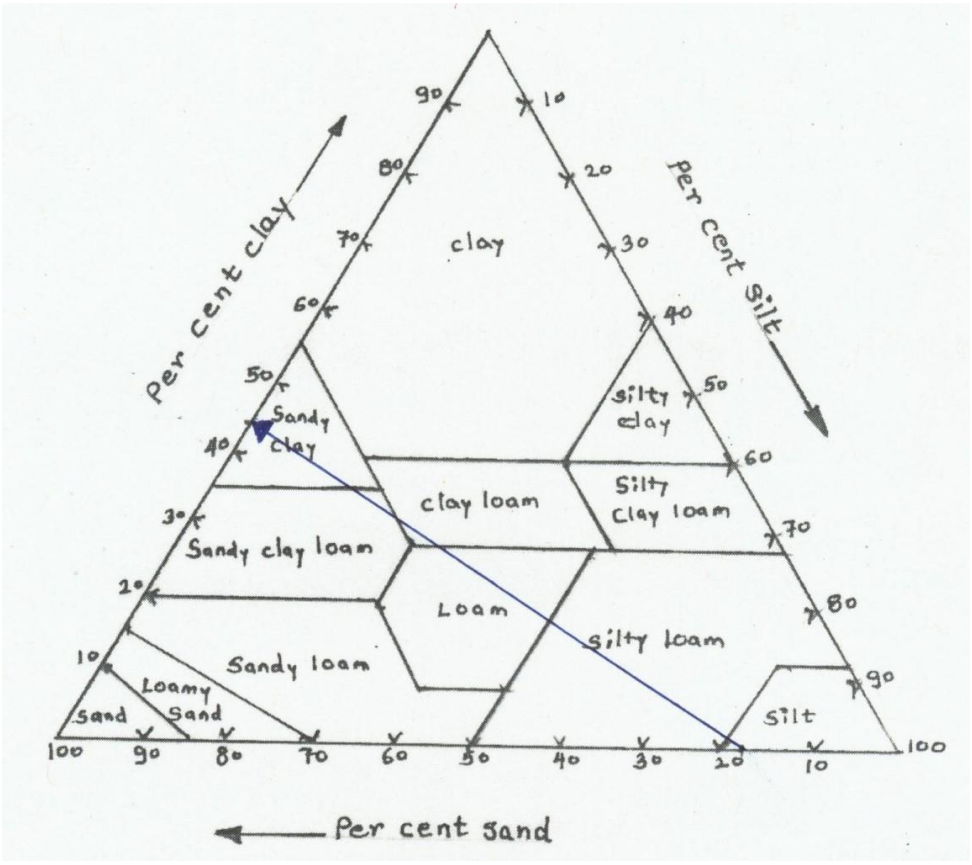



**Diagram: 7**

**Result : Sandy clay is the textural class for sample 'P-C'**

**Table 1: Classification of soil depending on its texture:**

| Sample No. | % Sand | % Silt | % Clay | Textural Class |
|---|---|---|---|---|
| **B-1**<br>Desert Soil of Rajasthan 'ChikniPathriliMitti' | 78.24 | 10.00 | 11,76 | Loamy Sand |
| **B-2**<br>Desert Soil of Rajasthan 'MaidaniMitti' | 77.52 | 10.72 | 11.76 | Loamy Sand |
| **B-3**<br>Desert Soil of Rajasthan 'MarusthaliyaMitti' | 92.80 | 01.44 | 05.76 | Sand |
| **M**<br>Red Soil Sample from Hilly Area | 49.52 | 32.72 | 17.76 | Sandy Loam |
| **W**<br>Black Cotton, Clay soil | 24.80 | 35.28 | 39.92 | Silty Clay Loam |
| **P-C**<br>Soil from Coastal area | 18.22 | 38.46 | 43.34 | Clayey |

**DEPT. OF SOIL SCIENCE & AGRICULTURAL CHEMISTRY**
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Head,
Department of Soil Science and
Agricultural Chemistry,
College of Agriculture, Dapoli.

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Mob: 9423297957
Fax :02358-282074

E-mail:headacss@rediffmail.com

No.ACD/SSAC/278 /2019 Date: 7 MAY 2019

To,
**Mr. Sarang Savalekar,**
136- Narayan peth,
Sitaphal Boug,
Behind Mati Ganpati,
Pune - 411030.

**Subject:-** Mechanical analysis of soil samples….

Sir,

Six (6) soil samples received from you on 19th June, 2012 have been analyzed in our **Soil testing laboratory** for **Mechanical composition** by **Bouyucos Hydrometer Method** and a table of mechanical composition of soil samples is separately attached.

This is for your information.

7/5/19

**Head**
Dept of Soil Science and
Agricultural Chemistry,
Dr. B. S. Konkan Krishi
Vidyapeeth

## Mechanical Analysis Report

| Sample No. | % Sand | % Silt | % Clay |
|---|---|---|---|
| B-1<br>Desert Soil of Rajasthan<br>'Chikni Pathrili Mitti' | 78.24 | 10.00 | 11,76 |
| B-2<br>Desert Soil of Rajasthan<br>'Maidani Mitti' | 77.52 | 10.72 | 11.76 |
| B-3<br>Desert Soil of Rajasthan<br>'Marusthaliya Mitti' | 92.80 | 01.44 | 05.76 |
| M<br>Red Soil Sample from Hilly Area | 49.52 | 32.72 | 17.76 |
| W<br>Black Cotton, Clay soil | 24.80 | 35.28 | 39.92 |
| P-C<br>Soil from Coastal area | 18.20 | 38.46 | 43.34 |

Head
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Dr.B.S.Konkan Krishi Vidyapeeth
Dapoli,Dist.Ratnagiri.

## *Experiment No.2*

***Absorption/Percolation of Termiticides in different Soils Samples***

**Reference:** IS 6313 (Part-2): 2001 i.e. Code of practice for Anti Termite Measures in Buildings, Part -2 PRE CONSTRUCTIONAL CHEMICAL TREATMENT MEASURES

**(Second Revision) ICS 91.12.01**

**Clause**: 7 - TREATMENT

**Sub clause: 7.2.2, 7.3, 7.5, 7.6, 7.8 (Page 2 & 3)**

**The anti-termite measures cover all the 'immediate soil contacts to the foundations/ structures', 'All the surface areas of filled soil' as well as all the 'Vertical areas of Backfill within the structures'.**

**The term 'anti-termite measures' includes chemical treatment i.e. use of ready solution (termiticide with water).**

**The chapter 'Soil Absorption' or 'Soil Tolerance' contents the absorption of termiticide (Solution) in different texture/class of soils. In India, considering the geography of different regions, the soil texture as well as class also varies. During the construction, variety of soil is been used for the backfill purpose.**

**The termite control measures means applying and creating a chemical barrier under and around the building based on IS specifications. The IS code have specifically specified the methods and the dosages for each treatment based on the type of foundation. Unfortunately, the dose is fix for all kinds of class and textures of soils.**

**The experiment of soil absorption will prove the absorption of different class /textures of soils from different regions and will established the required dosages of each soil category. This will avoid the excess dose in soil which may become the cause of soil or water pollution in ground.**

**The percolation is mainly depend upon the sand or clay texture in the soil and after the laboratory examination of few samples, it is identified that in some samples the percentage of sand and clay is more or less.**

**It was necessary of examine and identify the exact limit of percolation or the absorption of termiticides t avoid the mass use of excess termiticides in soil.**

**With the help of practical experiment of different soil samples collected from different regions and different weather conditions, it will be possible to establish the new recommendations of**

**dosages of consumption of termiticides for different soil of different textures.**

*Research Methodology*

***Recommendation of I.S. Code 6313 part-2:***

**For the treatment of all the backfill area is @ 7.5 Litres per square meter of vertical surfaces. If there is a R.C.C. foundation the vertical treatment i.e. up to the depth of 500mm (0.5mtrs) is required around all the Columns or R.C.C. foundation as well as if there is a Masonry foundation, entire backfill around masonry wall shall be treated @ 7.5 liters per square meter. To calculate the treatment area entire vertical surface area shall be considered as a treatment area:**

**In the case of R.C.C. Foundation:**

**Column periphery × 0.5 meter (500mm) depth × 7.5 Liters per**

**Square meter. In the case of masonry foundation:**

**Masonry wall length × 0.5 meter (500mm) depth × 7.5 Liters per Square meter.**

**Site Experiment: In the case of R.C.C. Foundation type construction**

**For Example:**

a) The average size of excavation pit is 1.5 meter (length) X 1.5 meter (width)X 1.5 meter deep,
b) The average size of column is 500mm X 200mm

*Calculation of areas as per the Research Recommendations based on I.S. Code recommendations are:*

**Column periphery × 0.5 meter (500mm) depth × 7.5 Liters per Square meter=total consumption of termiticide required.**

**i.e. = Column periphery: 500mm (+) 500mm (+) 200mm (+) 200mm = 1400mm**

**= 1400mm × 0.5 (500mm) × 7.5 Liters per square meter**

**= 0.7 Square meter × 7.5 Liters per square meter = 5.25 liters will be the consumption for the treatment around 1 column of 500mm × 200mm in size.**

**For the Experiment in Laboratory:** Considering the laboratory experiment the size is reduced by 10 i.e.1:10

$$\frac{\text{Column periphery} \times 0.5 \text{ meter (500mm) depth} \times 7.5 \text{ Liters per Square meter}}{10} = \text{total consumption of termiticide (diluted with water) required.}$$

The result of experiment will be 10 times less as per the factor.

= Column periphery: 50mm (+) 50mm (+) 20mm (+) 20mm = 140mm

$$= \frac{140\text{mm} \times 0.05 \text{ (50mm)} \times 750 \text{ ml. per square meter}}{10}$$

$$= \frac{0.07 \text{ Square meter X } 750 \text{ ml per square meter}}{10}$$

= 52.5 ml. will be the consumption for the treatment around 1 column of 50mm × 20mm in size.

In the above example there is a difference of size of all the factors by 10

i.e. the ratio 1:10.

If we consider the average size of excavation pit for R.C.C. foundation:

1.5 meter length (1500mm) × 1.5 meter width (1500mm)

The laboratory experiment size will be 10 times less and the size of experiment pit will be of 150mm × 150mm.

The column also will be less:

i.e. instead of 500mm length × 200mm width

It will be assumed that the size of column will be:50mm length × 20mm width.

Ultimately the size of water for experiment (termiticide of solution) will also be less by 10 times considering the factor 1:10

i.e. instead of 1 liter i.e.1000ml : size of water will be 100ml

**Absorption/Percolation of Termiticides in different Soils Samples**

Reference: IS 6313 (Part-2): 2001 i.e. Code of practice for Anti Termite Measures in Buildings, Part -2 PRE CONSTRUCTIONAL CHEMICAL TREATMENT MEASURES
(Second Revision) ICS 91.12.01

Clause: 7 - TREATMENT

Sub clause: 7.2.2, 7.3, 7.5, 7.6, 7.8 (Page 2 & 3)

The anti-termite measures covers all the 'immediate soil contacts to the foundations/ structures', 'All the surface areas of filled soil' as well as all the 'Vertical areas of Backfill within the structures'.

The term 'anti-termite measures' includes, use of chemicals i.e. ready solution (termiticide with water).

The chapter 'Soil Absorption' or 'Soil Tolerance' contents the absorption of termiticide (Solution) in different texture/class of soils. In India, considering the geography of different regions, the soil texture as well as class also varies. During the construction, variety of soil is been used for the backfill purpose. The termite control measures means applying and creating a chemical barrier under and around the building based on IS specifications. The IS code have specifically specified the methods and the dosages for each treatment based on the type of foundation. Unfortunately, the dose is fix for all kinds of class and textures of soils.

The experiment of soil absorption will prove the absorption of different class /textures of soils from different regions and will established the required dosages of each soil category. This will avoid the excess dose in soil which may become the cause of soil or water pollution in ground.

The percolation is mainly depend upon the sand or clay texture in the soil and after the laboratory examination of few samples, it is identified that in some samples the percentage of sand and clay is more or less. It was necessary of examine and identify the exact limit of percolation or the absorption of termiticides t avoid the mass use of excess termiticides in soil.

With the help of practical experiment of different soil samples collected from different regions and different weather conditions, it will be possible to establish the new recommendations of dosages of consumption of termiticides for different soil of different textures.

**Research Methodology: Recommendation of I.S. Code 63313 part-2:**

For the treatment of all the backfill area is @ 7.5 Litres per square meter of vertical surfaces. If there is a R.C.C. foundation the vertical treatment i.e. up to the depth of 500mm (0.5mtrs) is required around all the Columns or R.C.C. foundation as well as if there is a Masonry foundation, entire backfill around masonry wall shall be treated @ 7.5 liters per square meter. To calculate the treatment area entire vertical surface area shall be considered as a treatment area:

In the case of R.C.C. Foundation:

Column periphery × 0.5 meter (500mm) depth × 7.5 Liters per

Square meter. In the case of masonry foundation:

Masonry wall length × 0.5 meter (500mm) depth × 7.5 Liters per Square meter.

**Site Experiment: In the case of R.C.C. Foundation type construction**

For Example: a. The average size of excavation pit is 1.5 meter (length) × 1.5 meter (width) × 1.5 meter deep,

b. The average size of column is 500mm × 200mm I.S. Code recommendations are:

**Column periphery × 0.5 meter (500mm) depth × 7.5 Liters per Square meter = total consumption of termiticide required.**

= Column periphery: 500mm (+) 500mm (+) 200mm (+) 200mm = 1400mm

= 1400mm × 0.5 (500mm) × 7.5 Liters per square meter

= 0.7 Square meter × 7.5 Liters per square meter = 5.25 liters will be the consumption for the treatment around 1 column of 500mm × 200mm in size.

**<u>For the Experiment in Laboratory</u>: Considering the laboratory experiment the size is reduced by 10 i.e.1:10**

$$\frac{\text{Column periphery} \times 0.5 \text{ meter (500mm) depth} \times 7.5 \text{ Liters per Square meter}}{10}$$

=total consumption of termiticide (diluted with water) required. The result of experiment will be 10 times less as per the factor.

= Column periphery: 50mm (+) 50mm (+) 20mm (+) 20mm = 140mm

$$= \frac{140\text{mm} \times 0.05 \text{ (50mm)} \times 750 \text{ ml. per square meter}}{10}$$

$$= \frac{0.07 \text{ Square meter} \times 750 \text{ ml per square meter}}{10}$$

= 52.5 ml. will be the consumption for the treatment around 1 column of 50mm

× 20mm in size.

In the above example there is a difference of size of all the factors by 10 i.e. the ratio 1:10.

If we consider the average size of excavation pit for R.C.C. foundation:

1.5 meter length (1500mm) × 1.5 meter width (1500mm)

The laboratory experiment size will be 10 times less and the size of experiment pit will be of 150mm × 150mm.

The column also will be less:

i.e. instead of 500mm length × 200mm width

It will be assumed that the size of

column will be: 50mm length × 20mm

width.

Ultimately the size of water for experiment (termiticide of solution) will also be less by 10 times considering the factor 1:10

i.e. instead of 1 liter i.e.1000ml : size of water will be 100ml

## 2. Experimental Results

**1] Desert soil sample No. B-1 (Desert Soil from Rajasthan called "ChikniPathriliMitti"**

The size of column in excavated pit is 50mm × 20mm and termiticide 53ml is applied up to the depth of 50mm. The depth as per the I.S. code is expected is 50mm but during the laboratory experiment for Sample B-1 was 60.6mm deep i.e. 10.6mm more.

The percolation or absorption of termiticide in sample B-1 is 21%more than the I.S. recommendations.

**2] Desert soil sample No. B-2 (Desert Soil from Rajasthan called "Maidani Mitti"**

The size of column in excavated pit is 50mm × 20mm and termiticide 53ml is applied up to the depth of 50mm. The depth as per the I.S. code is expected is 50mm but during the laboratory experiment for Sample B-2 was 60mm deep i.e. 10mm more.

The percolation or absorption of termiticide in sample B-2 is 20% more than the I.S. recommendations.

**3] Desert soil sample No. B-3 (Desert Soil from Rajasthan called 'Marusthaliya Mitti'**

The size of column in excavated pit is 50mm × 20mm and termiticide 53ml is applied up to the depth of 50mm. The depth as per the I.S. code is expected is 50mm but during the laboratory experiment for Sample B-3 was 69.75mm deep i.e. 19.75mm more.

The percolation or absorption of termiticide in sample B-1 is 39.55% more than B.I.S. Recommendations.

**4] Sample No. W (Black Clay Soil from Maharashtra)**

The size of column in excavated pit is 50mm × 20mm and termiticide 53ml is applied up to the depth of 50mm. The depth as per the I.S. code is expected is 50mm but during the laboratory experiment for Sample –W was 33mm deep i.e.17mm less.

The percolation or absorption of termiticide in Sample-W is 66% less than the I.S. recommendations.

**5] Sample No. P-C i.e. Coastal Areas (Panvel, Raigadh District of Maharasthra)**

The size of column in excavated pit is 50mm × 20mm and termiticide 53ml is applied up to the depth of 50mm. The depth as per the I.S. code is expected is 50mm but during the laboratory experiment for Sample P-C was 27mm deep i.e. 23mm less.

The percolation or absorption of termiticide in sample P-C is 46% less than the I.S. recommendations.

**6] Sample No. M (Red Soil from Hill Area, Mahabaleshwar, Satara District of Maharashtra)**

The size of column in excavated pit is 50mm × 20mm and termiticide 53ml is applied up to the depth of 50mm. The depth as per the I.S. code is expected is 50mm but during the laboratory experiment for Sample-M was 52mm deep i.e. approx. exact depth recommended by I.S. 2mm more.

The percolation or absorption of termiticide of Sample-'M' is found as per the Indian Standards requirement.

## Percolation / Absorption of Termiticides in various Soil Samples

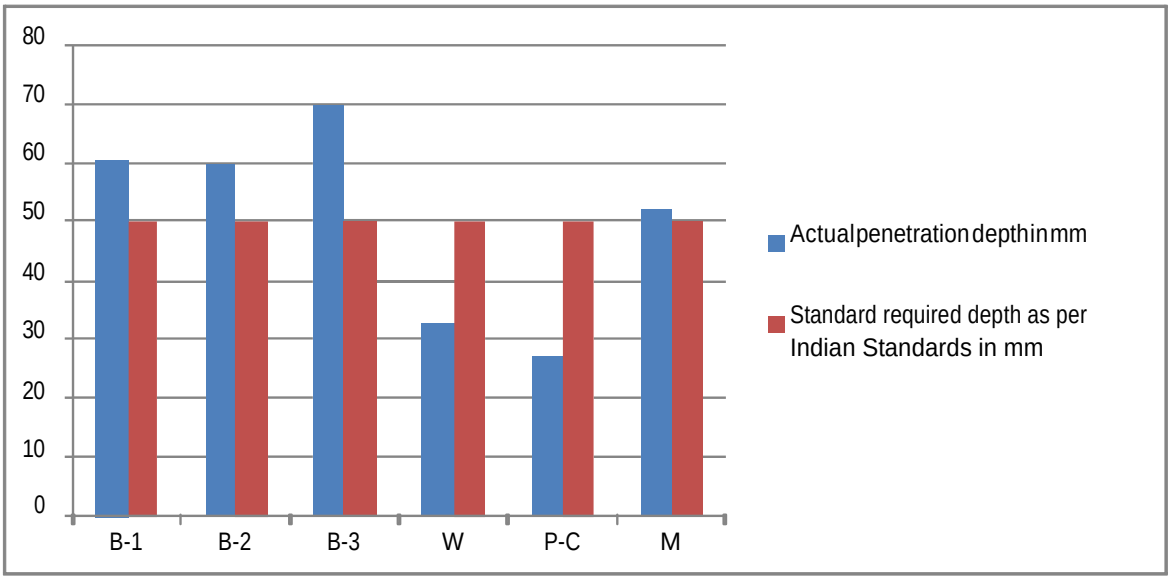


**Chart 1: Absorption of Termiticides in various Soil**

The Indian territory has various regions with various geographical conditions. Considering the laboratory results of various soils during experiments, it was observed that the percolation of different types of soils varies due to the soil properties.

***

***Total no. of diagrams, figures and tables in this chapter:***

*Chart: 1 no., Diagram: 7 nos., Figures: 7 nos. Tables: 1 nos.*

**ANNEX 9**
**(*Item* 4.1)**

# Safety during Termite Management

**Green Termite Management Practices also includes the Safety aspect:**

- Training to the operators: Time to time training should be arranged for the technicians/ operators which includes the detail information about all the treatments, chemicals and about the safety. Untrained operators may misuse the pesticides. Safety induction to the technicians either by client's safety engineer or by the pest control agency shall be provided by maintaining valid documentation.

- Maintenance of documents: To keep proper control on day to day use of termiticides all the necessary documentation is very much necessary to avoid misuse of termiticides. The technician shall maintain the actual record of daily consumption of chemical in the notebook and shall keep the up to date record of balance material at stores.

- Training to the customers: He shall time to time make awareness to the customer about the toxicity of termiticide, residual effects, dosages of dilution of chemical and also about anti-dote in case of any accident.

**Safety aspect is divided into following categories:**

- Clients point of view: Safety of the entire site staff and other labours.

- Environment point of view: The treatment pre-construction treatment shall be carried out with all precautions to protect nearby trees, underground water, bore well etc. i.e. safety of environment - ground water, soil and air..

- Operators point of view : The operator who is actually involved in day to day termite management shall take all the safety precautions. He is the person who is in contact with concentrated termiticides during the dilution or mixing as well as at the time of application of the chemical. He shall ware all the personal protection equipment (PPE) during mixing and applying operations.

**Personal Protective Equipment (PPE)**

**A.** Suit Wear

Some pesticide labeling requires "coverall worn over short-sleeved shirt and short pants." The phrase “short-sleeved shirt and shorts" does not refer to undergarments. For a list of acceptable PPE to wear when this and other statements are found on pesticide labeling.

Figure-1

Figure-1

**B. Coveralls and chemical resistant suit**: The worker safety regulations contain two quite different standards for employer-provided body protection. The requirement for coveralls requires body covering of tightly woven cloth, or equivalent, extending from the neck to wrists to ankles.

The desire for disposable or limited use clothing that meets this more stringent chemical-resistant requirement caused to evaluate specialty fabrics that might meet this requirement.

**C. Eyewear and closed systems:** Eye protection must be worn when preparing to use closed systems, such as loading pesticides from a rig to the application equipment (the aircraft), when opening containers and inserting probes.

Protective eyewear is also required when using closed systems that operate under positive pressure. When using a closed system, protective eyewear must be available on site.

**D. Gloves :**

The use of glove liners is allowed only when the following conditions are met:

• Pesticide product labeling does not prohibit the use of glove liners.

• Glove liners must be separable from the chemical-resistant glove.

• Liners may not extend outside of the chemical-resistant gloves.

• Liners must be replaced immediately if directly contacted by a pesticide.

• Liners must be discarded at the end of each workday.

• Contaminated liners must be disposed of in accordance with federal, state or local regulations.

**E. Respirators:**

The employer shall assure that employees are using approved respiratory protection equipment when pesticide product labeling or regulations require
respiratory protection or when respiratory protection is needed to maintain employee exposure below an applicable exposure standard.

The intent of this section is to regulate respiratory protection for employees required to wear it by labeling or regulation. Therefore, an employer is not required to comply with the cited regulations if the employee chooses to supply and wear a respirator when it is *not* required by labeling or regulation.

**KEEP Material Safety Data Sheet (M.S.D.S.) at storage area:**

The M.S.D.S. of Termiticide includes the active ingredients, group of termiticide, mode of action, contents with its percentage, dose, anti-dote, precautions etc.

**Safety PPE (personal protection equipment) of operators and supervisors/ attendants:**

1. **Coveralls and chemical resistant suit**: The worker safety regulations contain two quite different standards for employer-provided body protection. The requirement for coveralls requires body covering of tightly woven cloth, or equivalent, extending from the neck to wrists to ankles.
2. **Eyewear and closed systems:** Eye protection must be worn when preparing to use closed systems, such as loading pesticides from a rig to the application equipment (the aircraft), when opening containers and inserting probes.
   Protective eyewear is also required when using closed systems that operate under positive pressure. When using a closed system, protective eyewear must be available on site.
3. **Gloves:** Wearing chemical-resistant gloves when operator applies pesticides. The gloves must be kept in an enclosed container that prevents contamination.
4. **Respirators:** The employer shall assure that employees use approved respiratory protection equipment when respiratory protection is needed to maintain employee exposure below an applicable exposure standard.

5. **Shoes** : The operator shall wear recommended approved Shoes to protect from Termiticide contact with the foot as well as protect foot at constructional sites from the various accidents.

**Preparation of Records and Documentations:**

- It is necessary to maintain the records of inspection as your observation report.
- Calculation of areas is also necessary for the estimation of pest control scope.
- While during the pest control operation, operator shall maintain the pesticide consumption record.
- The record includes number of visits at site, treated areas (quantity) as well as the name of the structures treated.

The applicator shall keep and maintain all the records time to time to safeguard and to protect him from all the liabilities. Record of training to the operators with safety equipment is also necessary for audit purpose.

**ANNEX 10**
**(*Item* 4.2)**

| | DETERMINANTS OF HEALTH | ACTIONS FOR HEALTHY BUILDINGS AND NEIGHBOURHOODS | NATIONAL BUILDING CODE (NBC) | | |
|---|---|---|---|---|---|
| | | | Proposed Recommendations | Existing Provisions | |
| **A** | **PHYSICAL HEALTH** | | | | |
| 1 | **Thermal Comfort** | Optimise the integration of climate-responsive passive design strategies and low-energy devices | Adherence to Eco Niwas Samhita (ENS) Energy Conservation Building Code (ECBC) (R) for thermal comfort – this could be made prescriptive, giving standard solutions for walling, windows, external shading and roofing, for ease of implementation. | PART 11, NBC 2016 | **3.2** This process emphasises the requirement of **bottom up approach** which invariably considers microclimatic and cultural conditions around.<br><br>The bottom up approach concentrates more on how little is consumed; pursue deep understanding of sustainability; uses low technology innovations, materials and practices; recognizes performance to be more important than intent; and necessitates the use of common knowledge and common sense in design decisions. |
| | | | | PART 11, NBC 2016 | **11.2** Solar passive techniques that can be adopted in different climate zones of India are:<br>a) landscaping (to reduce heat island effect);<br>b) optimum building orientation;<br>c) arrangement and shape of buildings;<br>d) effective surface to volume ratio;<br>e) location and size of openings on building facade and other elevation;<br>f) glazing type and performance; and<br>g) shading devices on windows and judicious selection of building materials. |
| | | | Mandating roof construction with reflective coating and high insulation (Cool roof) | PART 11, NBC 2016 | **8.1.2** The overall thermal transmittance from the exposed roof should be kept as minimum as possible and under normal conditions, the desirable value should not exceed **0.58 W/(m2°C).** The ceiling surface of floors which are not to be air conditioned may be suitably insulated to give an overall thermal transmittance not exceeding **1.16 W/(m2°C)** |
| | | | Provision for roof mounted Solar PV as a resilience measure | PART 11, NBC 2016 | **8.3.2** Building integrated photovoltaic (BIPV) system is the integration of photovoltaic (PV) and the building envelope. The PV modules can be designed and installed to serve the double purpose of both power generation and that of the building skin replacing conventional building envelope materials. By avoiding the cost of conventional materials, the incremental cost of photovoltaic is reduced and its life cycle cost is lower. |
| 3 | **Protection from Diseases and Pollutants** | Ensure drainage of all exterior surfaces to avoid waterlogging. | Design of on-site drainage for no stagnant water. | PART 11, NBC 2016 | **10.4.2** a waste-water disposal, hence, the arrangements have to be made within the construction site. It is imperative that the opportunities are identified to reduce the water consumption and re-use treated waste-water. In the absence of appropriate waste-water disposal facilities, unhygienic and unsightly conditions may prevail which may cause water borne diseases and act as breeding ground for mosquitoes and develops unhealthy environment with bad odour and flies. |
| | | Indoor spaces will be protected from mosquitoes with netting. | Protection of homes from mosquitoes and vermin | PART 11, NBC 2016 | **8.1.3** Sliding/roller insect screens to allow fresh air without the inlet of mosquitoes and other insects through openable windows. |

| | DETERMINANTS OF HEALTH | ACTIONS FOR HEALTHY BUILDINGS AND NEIGHBOURHOODS | NATIONAL BUILDING CODE (NBC) | | |
|---|---|---|---|---|---|
| | | | Proposed Recommendations | Existing Provisions | |
| 8 | **Access to nature** | Integrate positive open green and provide places, terraces and balconies for growing and tending plants by residents. | | PART 11, NBC 2016 | **7.4** 1) More than **50** percent of the total paved area shall have pervious paving/open grid pavement/grass pavers, or<br>2) A minimum **50** percent of the total paved area (including parking) shall have shading by vegetated roof/pergola with planters, or<br>3) A minimum **50** percent of the total impervious paving area (including parking) shall be topped with finish having solar reflectance of 0.5 or higher. |
| **D** | **RESILIENCE AGAINST CLIMATE CHANGE AND PANDEMIC** | | | | |
| 10 | **Protection against extreme events and pandemics** | Additional measures in design and additional facilities at the neighborhood level for resilience during periods of extreme events and contagious epidemics. | Provision of sheltered resilience centres<br>Provision for roof mounted Solar PV as a resilience measure | | |
| 11 | **Protection of habitable space and essential services from disasters** | Ensure protection of habitable spaces and essential services against flooding and contamination of drinking water during extreme rainfall events. | | | |
| 12 | **Provision of facilities for disasters preparedness** | Provide a reserve store of drinking water to meet essential needs during periods of drought. | Provision of emergency water storage at the community level | PART 11, NBC 2016 | **10.20.4** Rainwater can be harvested by adopting the following means:<br>a) Storing rainwater for ready use, in containers above or below ground.<br>b) Charging rainwater into the soil (groundwater recharging) to improve the underground water table. This needs to be critically planned as recharge is governed by stratification, groundwater table level and groundwater quality. |

**ANNEX 11**
**(*Item* 4.3)**

# Suggestions for Approach to sustainability - Part 11

2023

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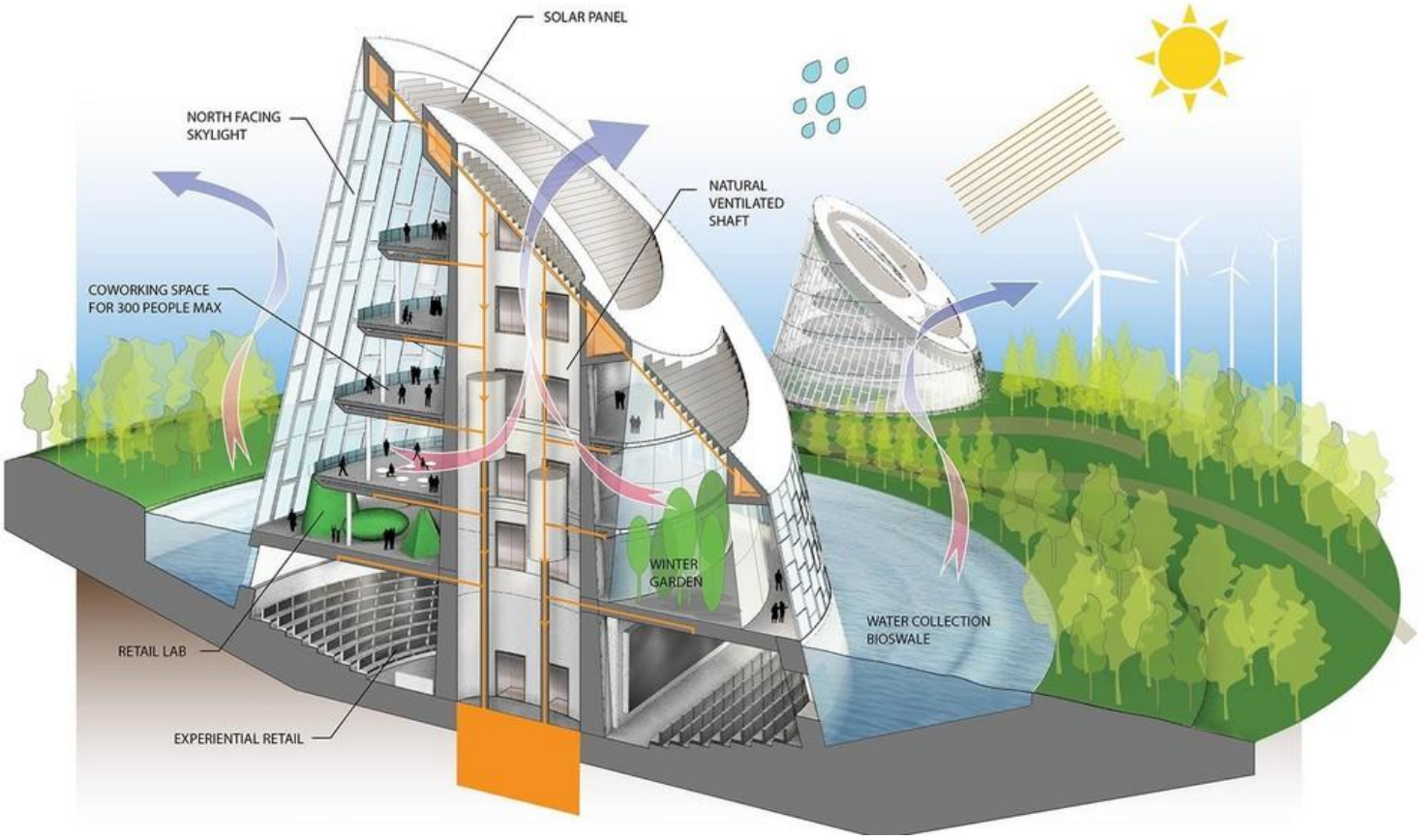
**Energy & Sustainability Consultant**



# CONTENT

- Life expectancy of existing buildings and retrofitting
- Sustainable Building Incentive and Funding
- Utilize public purchasing power.
- Benchmarking and labelling buildings
- Mandatory installation of solar panels
- Whole building simulation
- Other Suggestions

**Concept**

Life expectancy of existing buildings and retrofitting

**Action**

Existing buildings will have a life expectancy of 30 to 50 years, depending on their age and condition. To achieve net-zero and climate-resilient buildings, we must focus on both new and recently built structures. It requires codes and standards to guide climate-resilient retrofitting, focusing more on switching on renewables, reducing electricity for HVAC, and adopting sustainable water management practises as major goals. Government and public sector buildings may adopt this change for existing buildings. Targets may be set to achieve like 50% reduction in energy consumption or an 80% reduction in GHG gas emissions with these retrofits within a stipulated timeframe.

**Concept**

Sustainable Building Incentive and Funding

**Action**

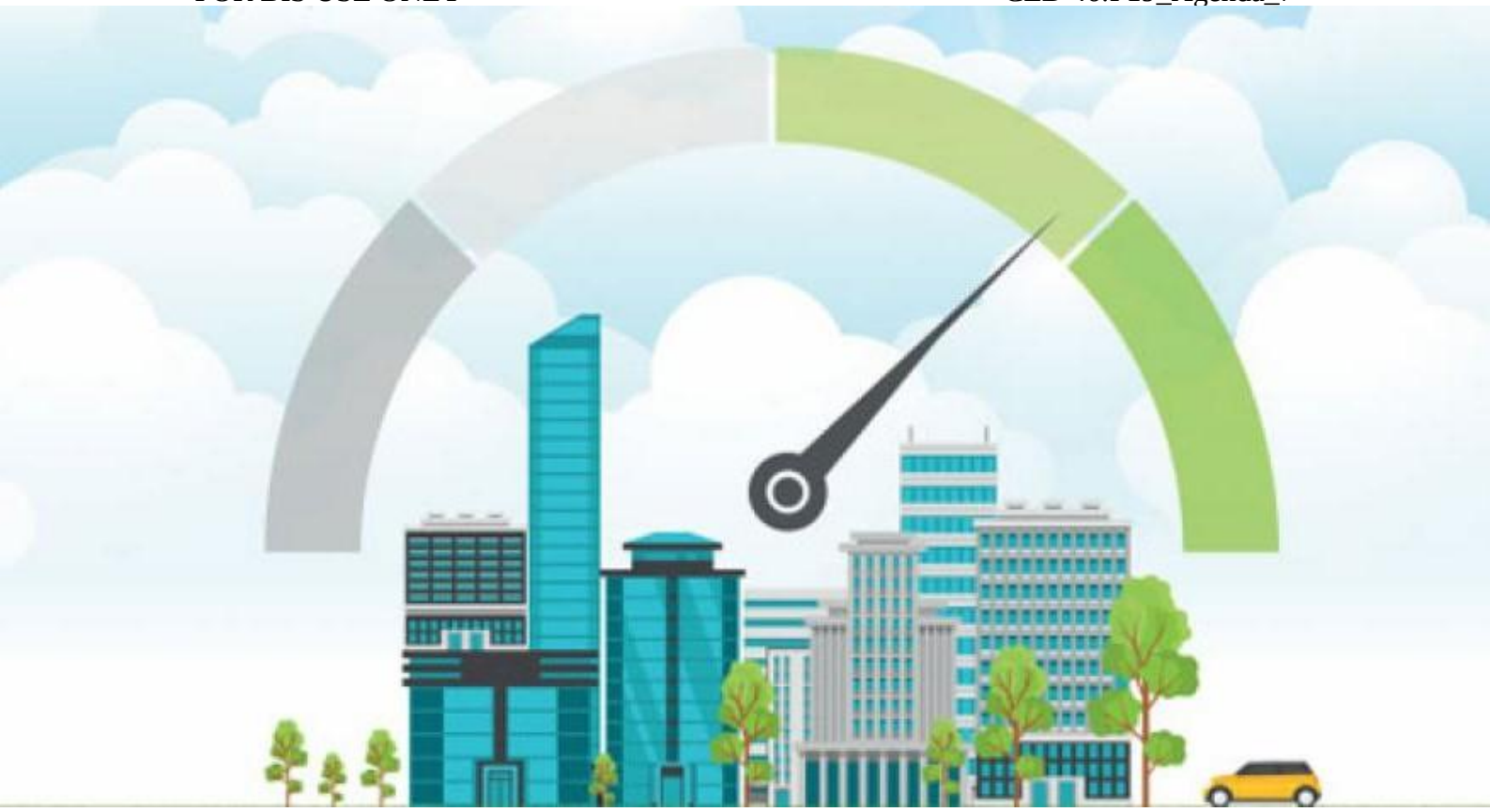
For a new building or an existing one, setting up an incentive / tax rebate / tariff rebate / funding initiative can encourage and accelerate the deeper propagation of sustainable buildings. The benefits of bulk purchasing and the prequalification of suppliers are also recommended.

**Concept**

Utilize public purchasing power.

**Action**

Transform the market towards greener and sustainable products by promoting made-in-India, low-carbon footprint products using the power of public purchasing. As we know, traditional buildings built with locally available materials and having natural ventilation are more sustainable than contemporary buildings. Promoting locally available material to increase thermal mass effect and reduce the load on HVAC systems using public purchasing power can accelerate the process of making buildings net zero.



**Concept**

Benchmarking and labelling buildings

**Action**

Just like the Bureau of Energy Efficiency's star rating and labelling programme for products, the government needs to develop a methodology for labelling and rating different segments of buildings, in particular small buildings. Authorities, state government, municipal corporations, and real estate agents need to work together for widespread adoption of building benchmarking, rating, and labelling processes.

**Concept**

Mandatory installation of solar panels

**Action**

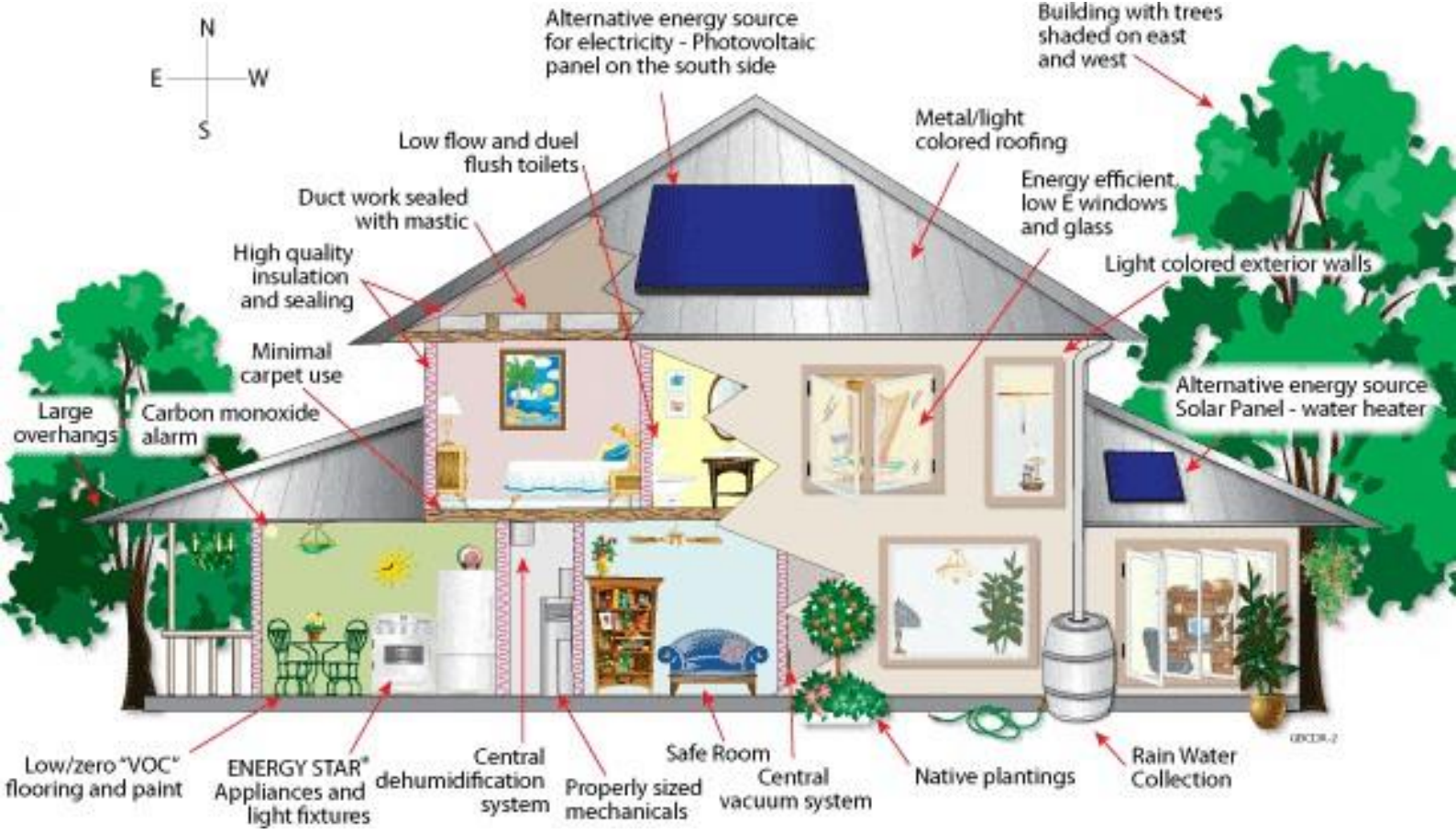
To reduce emissions from buildings and shift from conventional to renewable energy usage, new commercial buildings and homes may be mandated to instal solar panels. To apply this mandate, a ceiling may be set based on the use of HVAC systems of a certain capacity, the overall built area, or the connected load. Different categories of buildings, like schools, universities, commercial complexes, hotels, hospitals, PSU buildings, government buildings, residential apartments, may fall into this category. Apart from making the building energy independent, it will have the benefit of reduced operating costs.

## Concept

Whole building simulation

## Action

Building energy simulation at the design stage brings holistic insight into passive strategies and architectural features at an early stage, and if the generated results are followed honestly, they may lead to energy and emission optimization changes before the building is constructed. As a part of ECBC compliance, it is mandatory to go for whole building simulation; if the spread of this is enlarged to include maximum buildings, we can meet our net zero building targets smoothly and efficiently. The outcomes of whole building simulations like changes in plan ratio, modifications in building fabric, air change rates, etc. can help a lot to achieve a set goal of sustainability.




**Other Suggestions**

- It's a need of time to develop Indigenous Life Cycle Assessment tool with library of all made in India material and products.
- Promote start-ups and innovation labs for low carbon building materials.
- There is a need to educate the work force to adopt low carbon building materials.
- To meet the trained workforce growth, we need to develop a skill training center all across the country.

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