भारतीय मानक

भवनों में दीमक अवरोधक उपचार रीति संहिता

भाग 2 निर्माण से पूर्व रासायनिक उपचार

(दूसरा पुनरीक्षण)

Indian Standard

CODE OF PRACTICE FOR ANTI-TERMITE MEASURES IN BUILDINGS

PART 2 PRE-CONSTRUCTIONAL CHEMICAL TREATMENT MEASURES

(Second Revision)

ICS 91.12.01

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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FOREWORD

This Indian Standard (Part 2) (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Building Construction Practices Sectional Committee had been approved by the Civil Engineering Division Council.

This standard (Part 2) was first published in 1971 and subsequently revised in 1981. In view of comments received and further knowledge that has become available, the Committee responsible for formulation of this standard decided to take up its revision. Considerable assistance has been provided by Central Building Research Institute, Roorkee in revising this standard. In this revision, apart from other changes, Chlorpyrifos and Lindane have been recommended for anti-termite treatment. Part 1 of this standard deals with constructional measures and Part 3 deals with treatment for existing buildings.

Termite control in buildings is very important as the damage likely to be caused by the termites is huge. Wood is one of the cellulosic materials which termites damage, cellulose forming their basic nutrient. They also damage materials of organic origin with a cellulosic base, household articles like furniture, furnishings, clothings, stationery, etc. Termites are also known to damage non-cellulosic substances in their search for food. Rubber, leather, plastics, neoprene as well as lead coating used for covering of underground cables are damaged by termites. The widespread damage by termites, high constructional cost of buildings have necessitated evolving suitable measures for preventing access of termites to buildings.

On the basis of their habitat, termites are divided into two types, namely (a) Subterranean or ground nesting termites, and (b) Non-subterranean or wood nesting termites having no contact with soil (*see* Annex A). The subterranean termites are most destructive and are mainly responsible for the damage caused in buildings. Typically, they form nests or colonies underground in the soil, near ground level in a stump or in other suitable piece of timber, and some species may construct a conical or dome shaped mound. These colonies may persist for many years and, as they mature, contain a population running into millions. All attacks by subterranean termites originate from the nest but timber either lying on or buried in the ground may be reached by means of shelter tubes constructed within, or over such materials or else by the erection of an independent, free standing mud structure. Chemical barriers which prevent the termites from reaching the super-structure of the building will protect the building and its contents. Treating the soil beneath the building and around the foundations with a soil insecticide is a good preventing measure which is attracting attention throughout the world. The purpose of this treatment is to create a chemical barrier between the ground from where the termites come and woodwork, cellulosic materials and other contents of the buildings which may form food for the termites. Timber which is seasoned and is naturally durable in heartwood may be used in the building structure. However, non-durable timbers and sapwood of all timbers should be treated to withstand the attack of drywood termites (*see* IS 401 and IS 1141).

The composition of the Committee responsible for formulation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CODE OF PRACTICE FOR ANTI-TERMITE MEASURES IN BUILDINGS

PART 2 PRE-CONSTRUCTIONAL CHEMICAL TREATMENT MEASURES

(Second Revision)

1 SCOPE

This standard (Part 2) gives recommendations for the chemical treatment of soils for the protection of buildings from attack by subterranean termites. It includes reference to the chemicals to be used, lays down minimum rates of application for usage, and outlines procedures to be followed while the building is under construction.

2 REFERENCES

The Indian Standards given in Annex B contain provisions, which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Chemical Barrier

The layer of chemically treated soil in immediate contact with the foundation and floor structure of a building which kills or repels termites thus forming a barrier which is impervious to termite entry.

3.2 Soil Treatment

The application of chemicals (toxicants) to the soil adjacent to and under a building to form a chemical barrier which is lethal or repellent to termites.

3.3 Pre-Construction Soil Treatment

This is a process in which soil treatment is applied to a building during the early stages of its construction.

4 SITE PREPARATION

4.1 The removal of trees, stumps, logs or roots from a building site reduces the hazards from subterranean termites. Similarly, the sub floor area should be kept free from all debris in which new colonies of termites might be established. In order to ensure uniform distribution of the treating solution and to assist penetration, some site preparation, may be necessary. The information given in **4.1.1** to **4.1.4** is for guidance in preparing a building site for chemical treatment.

4.1.1 *Heavy Soils and Sloping Sites*

On clay and other heavy soils where penetration is likely to be slow and on sloping sites where run off of the treating solution is likely to occur, the surface of the soil should be scarified to a depth of at least 75 mm.

4.1.2 *Sandy or Porous Soils*

On loose, sandy or porous soils where loss of treating solution through piping or excessive percolation is likely to occur, preliminary moistening to fill the capillary spaces in the soil is recommended.

4.1.3 *Levelling, Excavations and Filling*

All sub floor levelling and grading should be completed; all cuttings, trenches and excavations should be completed with backfilling in place, borrowed fill must be free from organic debris and should be well compacted. If this is not done supplementary treatments should be made to complete the barrier.

4.1.4 *Concrete Formwork*

All concrete formwork, levelling pegs, timber off-cuts and other builder's debris should be removed from the area to be treated.

5 CHEMICALS AND RATE OF APPLICATION

5.1 Basic Principle

Chemical toxic to subterranean termites may be used effectively to check termite infestation in the soil. These are useful in the treatment of new building sites and may also be used to eradicate existing infestation in buildings and to prevent reinfestation. The effectiveness and/or residual activity depend upon the choice of the chemicals, the dosages adopted and the thoroughness of application. The chemical solutions or emulsions are required to be dispersed uniformly in

the soil and of the required strength so as to form an effective chemical barrier which is lethal and repellent to termites.

5.2 Mound Treatment

If termite mounds are found within the plinth area of the buildings these should be destroyed by means of insecticides in the form of water suspension or emulsion which should be poured into the mounds at several places after breaking open the earthen structure and making holes with crow-bars. The quantity to be used will depend upon the size of the mound. For a mound volume of about 1 m^3, 4 litres of an emulsion in water of one percent Chlorpyrifos 20 EC or Lindane 20 EC may be used.

5.3 Soil Treatment

Treating the soil beneath the building and around the foundations with a soil insecticide is a preventive measure. The purpose of the treatment is to create a chemical barrier between the ground from where termites come and woodwork or other cellulosic materials in the buildings. The following chemicals conforming to relevant Indian Standard in water emulsion are effective when applied uniformly over the area to be treated.

Chemical	*Relevant Indian Standard*	*Concentration by Weight, percent (active ingredient)*
Chlorpyrifos 20 EC	IS 8944	1.0
Lindane 20 EC	IS 632	1.0

NOTE — The chemicals described in this code are insecticides with a persistent action and are regarded highly poisonous. These chemicals can have an adverse effect upon health when absorbed through the skin, inhaled as vapours or spray-mists or swallowed. Detailed precautions for the safe handling of these chemicals are given in Annex C. Persons carrying out chemical soil treatment in accordance with this code should familiarize themselves for these precautions and exercise due care when handling the chemical whether in concentrate or in diluted form. The use of the chemical should be avoided where there is any risk of wells or other water supplies becoming contaminated.

6 ESSENTIAL REQUIREMENTS FOR BARRIER AND METHOD OF APPLICATION

6.1 Conditions of Formation

Barrier shall be complete and continuous under the whole of the structure to be protected. All foundations shall be fully surrounded by and in close contact with the barrier or treated soil. Each part of the area treated shall receive the prescribed dosage of chemical.

6.2 Time of Application

Soil treatment should start when foundation trenches and pits are ready to take mass concrete in foundations. Laying of mass concrete should start when the chemical emulsion has been absorbed by the soil and the surface is quite dry. Treatment should not be carried out when it is raining or when the soil is wet with rain or sub-soil water. The foregoing requirements applies also in the case of treatment to the filled earth surface within the plinth area before laying the sub-grade for the floor.

6.3 Disturbance

Once formed, treated soil barriers shall not be disturbed. If, by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

7 TREATMENT

7.1 Soil Treatment

The chemical emulsions described in **5.3** shall be applied uniformly at the prescribed rate in all the stages of the treatment. A suitable hand operated compressed air sprayer or watering can should be used to facilitate uniform disposal of the chemical emulsion. On large jobs, a power sprayer may be used to save labour and time.

7.1.1 In the event of waterlogging of foundation, the water shall be pumped out and the chemical emulsion applied when the soil is absorbent.

7.2 Treatment for Masonry Foundations and Basements

7.2.1 The bottom surface and the sides (upto a height of about 300 mm) of the excavations made from masonry foundations and basements shall be treated with the chemical at the rate of 5 l/m^2 surface area (*see* Fig. 1).

7.2.2 After the masonry foundations and the retaining wall of the basements come up, the backfill in immediate contact with the foundation structure shall be treated at the rate of 7.5 l/m^2 of the vertical surface of the sub-structure for each side. If water is used for ramming the earth fill, the chemical treatment shall be carried out after the ramming operation is done by rodding the earth at 150 mm centres close to parallel to the wall surface and spraying the chemical emulsion at the above dosage. After the treatment, the soil should be tamped in place. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the masonry surfaces so that the earth in contact with these surfaces is well treated with the chemical (*see* Fig. 2 and 3).

7.3 Treatment for RCC Foundations and Basement

7.3.1 The treatment described in **7.2.1** and **7.2.2** applies essentially to masonry foundations where there are voids in the joints through which termites are able to seek entry into buildings. Hence the

foundations require to be completely enveloped by a chemical barrier. In the case of RCC foundations, the concrete is dense being a 1:2:4 (cement: fine aggregates: coarse aggregates, by volume) mix or richer, the termites are unable to penetrate it, it is therefore, unnecessary to start the treatment from the bottom of excavations. The treatment shall start at a depth of 500 mm below the ground level except when such ground level is raised or lowered by filling or cutting after the foundations have been cast. In such cases, the depth of 500 mm shall be determined from the new soil level resulting from the filling or cutting mentioned above, and soil in immediate contact with the vertical surfaces of RCC foundations shall be treated at the rate of 7.5 l/m^2. The other details shall be as laid down in **7.2.2** (*see* Fig. 4).

7.4 Treatment of Top Surface of Plinth Filling

The top surface of the consolidated earth within plinth walls shall be treated with chemical emulsion at the rate of 5 l/m^2 of the surface before the sand bed or sub-grade is laid. If the filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes up to 50 to 75 mm deep at 150 mm centres both ways may be made with 12 mm diameter mild steel rod on the surface to facilitate saturation of the soil with the chemical emulsion.

7.5 Treatment at Junction of the Wall and the Floor

Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall surface from ground level (where it had stopped with the treatment described in **7.2.2**) up to the level of the filled earth surface. To achieve this, a small channel 30 mm × 30 mm shall be made at all the junctions of wall and columns with the floor (before laying the sub-grade) the rod holes made in the channel up to the ground level 150 mm apart and the iron rod moved backward and forward to break up the earth and chemical emulsion poured along the wall at the rate of 7.5 l/m^2 of vertical wall or column surface so as to soak the soil right to the bottom. The soil should be tamped back into place after the operation.

7.6 Treatment of Soil Along External Perimeter of Building

After the building is complete, the earth along the external perimeter of the building should be rodded at intervals of 150 mm and to a depth of 300 mm. The rods should be moved backward and forward parallel to the wall to break up the earth and chemical emulsion poured along the wall at the rate of 7.5 l/m^2 of vertical surfaces. After the treatment, the earth should be tamped back into place. Should the earth outside the building be graded on completion of building, this treatment should be carried out on completion of such grading.

7.6.1 In the event of filling being more than 300 mm, the external perimeter treatment shall extend to the full depth of filling upto the ground level so as to ensure continuity of the chemical barrier.

7.7 Treatment of Soil Under Apron Along External Perimeter of Building

Top surface of the consolidated earth over which the apron is to be laid shall be treated with chemical emulsion at the rate of 5 l/m^2 of the surface before the apron is laid. If consolidated earth does not allow emulsion to seep through, holes up to 50 to 75 mm deep at 150 mm centres both ways may be made with 12 mm diameter mild steel rod on the surface to facilitate saturation of the soil with the chemical emulsion (*see* Fig. 3).

7.8 Treatment of Walls Retaining Soil Above Floor Level

Retaining walls like the basement walls or outer walls above the floor level retaining soil need to be protected by providing chemical barrier by treatment of retained soil in the immediate vicinity of the wall, so as to prevent entry of termites through the voids in masonry, cracks and crevices, etc above the floor level. The soil retained by the walls shall be treated at the rate of 7.5 l/m^2 of the vertical surface so as to effect a continuous outer chemical barrier, in continuation with that of the one formed under **7.2**.

7.9 Treatment of Soil Surrounding Pipes, Wastes and Conduits

When pipes, wastes and conduits enter the soil inside the area of the foundations, soil surrounding the point of entry shall be loosened around each such pipe, waste or conduit for a distance of 150 mm and to a depth of 75 mm before treatment is commenced. When they enter the soil external to the foundations, they shall be similarly treated at a distance of over 300 mm unless they stand clear of the walls of the building by about 75 mm.

7.10 Treatment for Expansion Joints

Expansion joints at ground floor level are one of the biggest hazards for termite infestation. The soil beneath these joints should receive special attention when the treatment under **7.4** is carried out. This treatment should be supplemented by treating through the expansion joint after the sub-grade has been laid, at the rate of 2 litres per linear metre.

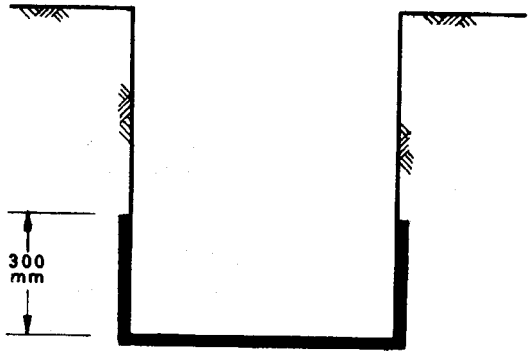
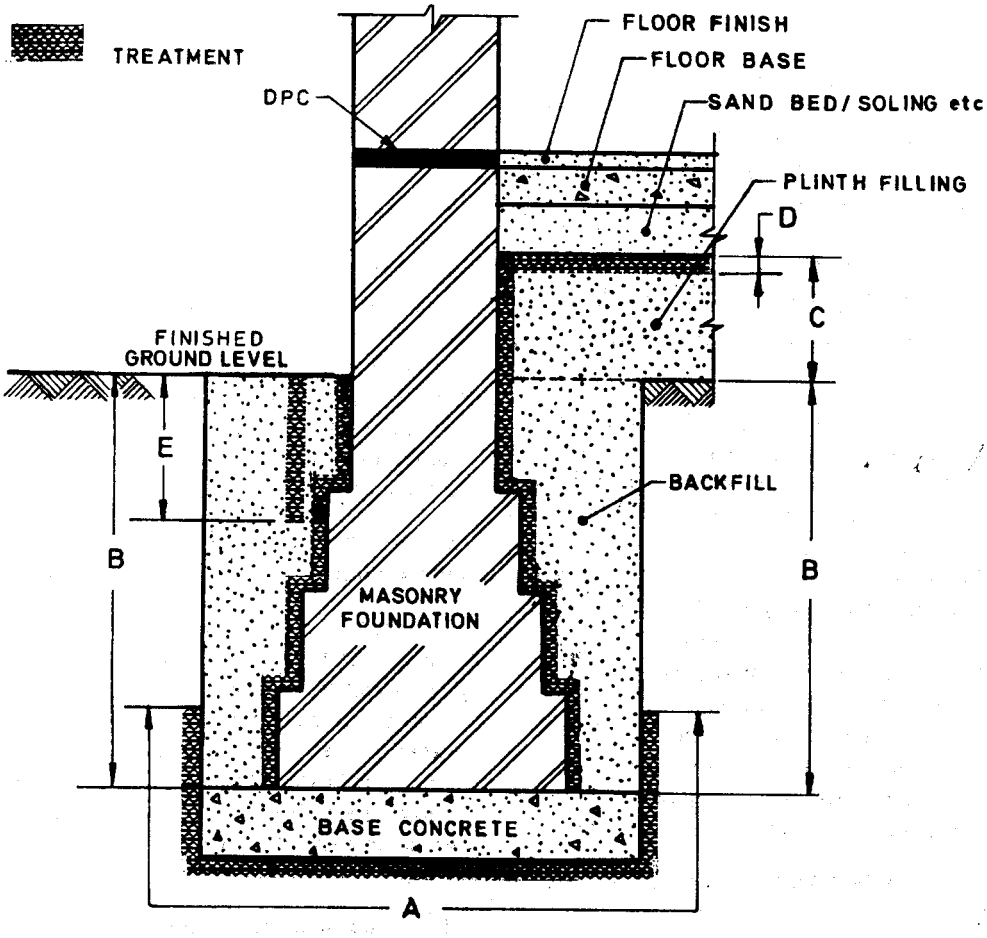


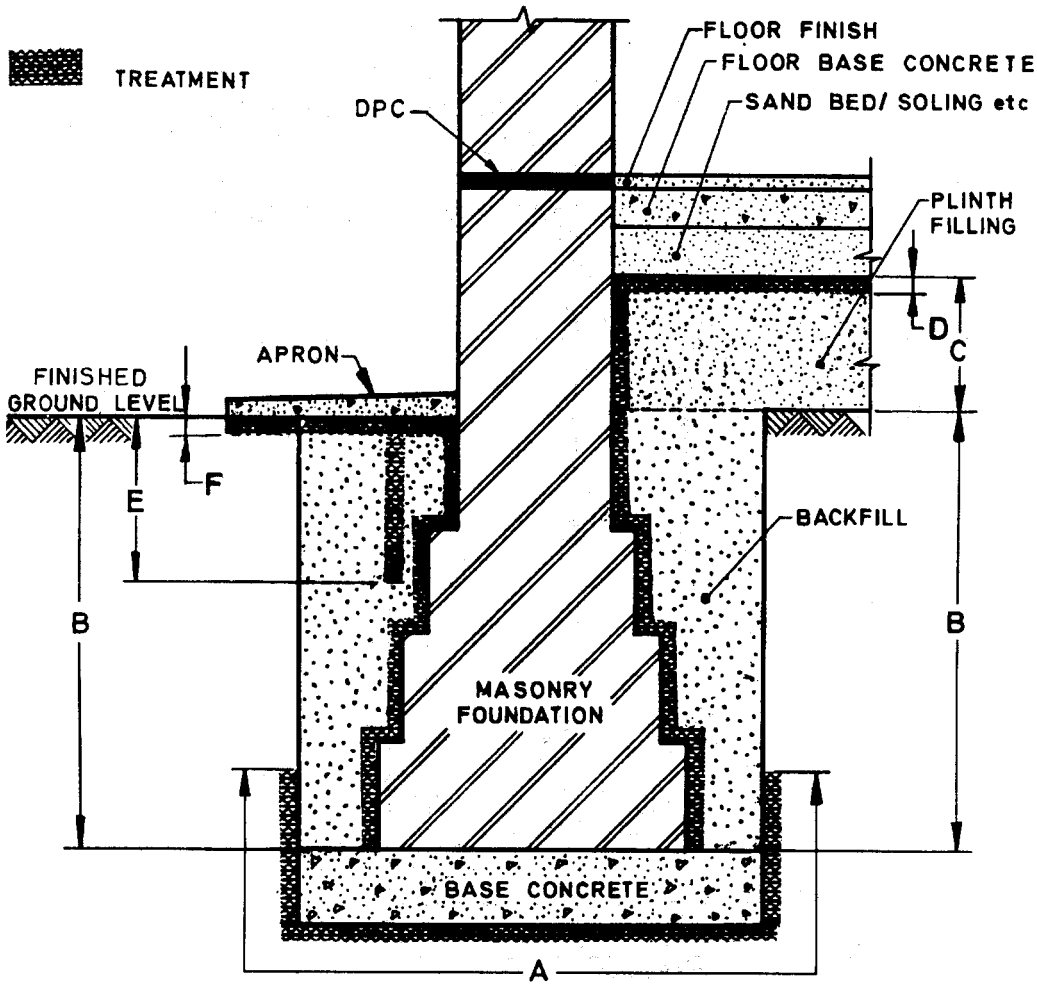
FIG. 1 TREATMENT OF TRENCH BOTTOM AND SIDES



Stages of Treatment

A – Bottom and Sides of Trenches (*see* **7.2.1**)
B – Backfill in Immediate Contact with Foundation Walls (*see* **7.2.2**)
C – Junction of Wall and Floor (*see* **7.5**)
D – Top Surface of Plinth Filling (*see* **7.4**)
E – External Perimeter of Building (*see* **7.6**)

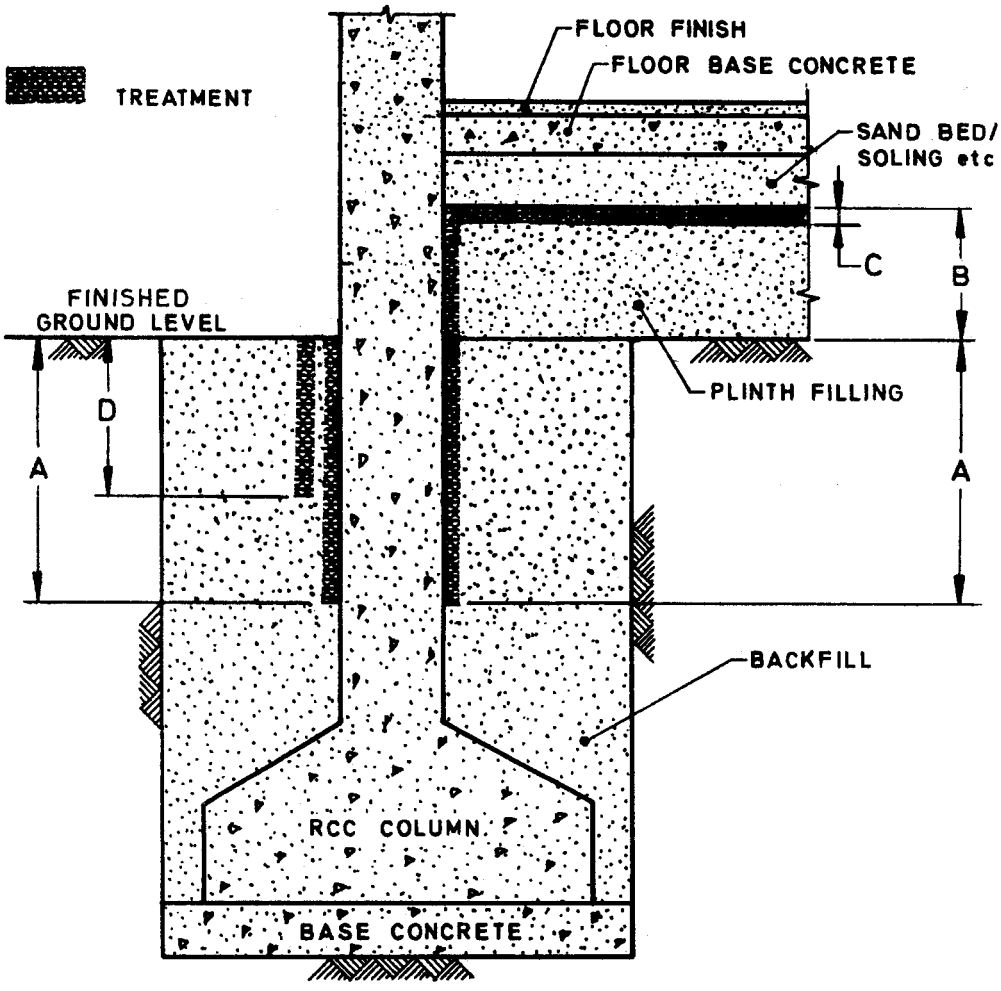
FIG. 2 TREATMENT FOR MASONRY FOUNDATIONS WITHOUT APRON



Stages of Treatment

A – Bottom and Sides of Trenches (*see* **7.2.1**)
B – Backfill in Immediate Contact with Foundation Walls (*see* **7.2.2**)
C – Junction of Wall and Floor (*see* **7.5**)
D – Top Surface of Plinth Filling (*see* **7.4**)
E – External Perimeter of Building (*see* **7.6**)
F – Soil Below Apron (*see* **7.7**)

FIG. 3 TREATMENT FOR MASONRY FOUNDATIONS WITH APRON ALONG EXTERNAL PERIMETER



Stages of Treatment

A – Backfill in Immediate Contact with Foundation Structure (*see* **7.2.3**)
B – Junction of Wall and Floor (*see* **7.5**)
C – Top Surface of Plinth Filling (*see* **7.4**)
D – External Perimeter of Building (*see* **7.6**)

FIG. 4 TREATMENT FOR RCC FOUNDATIONS

ANNEX A

(*Foreword*)

A SHORT NOTE ON TERMITES

A-1 CLASSIFICATION

A-1.1 Termites constitute a separate order of insects called 'ISEPTORA'. Although, they are commonly called white ants, they are not related to ants. The front pair of wings of the ants are longer than their hind pair whereas in termites, both pairs are equal. There are over 2 300 species of termites of which about 220 are found in India. All these species are not considered to be serious pests.

A-1.2 According to their habits, termites can be divided into two well defined groups·

a) Subterranean or ground nesting termites which build nests in the soil and live in them, and
b) Non-subterranean or wood nesting termites which live in wood with no contact with soil.

A-1.3 Subterranean termites require moisture to sustain their life. They normally need access to ground at all times. They build tunnels between their nest and source of food through covered runways. These covered tunnels provide humidity conditions thus preventing desiccation and protection against predators, darkness necessary for their movement and for maintaining contact with earth. The subterranean termites enter a building from ground level, under the foundation, working their way upwards through floors, destroying all before them. So little is seen of these termite operations that sometimes the structural member attacked is found to be merely a shell with the inside completely riddled and eaten away.

A-1.4 The wood nesting species comprise drywood and dampwood termites. Drywood termites which predominate are able to live even in fairly drywood and with no contact with soil. These frequently construct nests within large dimensional timbers such as rafters, posts, door and window frames, etc, which they destroy, if not speedily exterminated. However, they are not as prevalent and common as subterranean termites, and are generally confined to coastal regions and interiors of eastern India.

A-1.5 A termite colony consists of a pair of reproductives, the so-called king and queen and a large number of sterile workers, soldiers, and nymphs. If, however, the queen is lost or destroyed, her place taken by a number of supplementary reproductive in some group of termites; thus by removing the queen, the colony will not be destroyed. All the work of the colony is carried out by the workers. Guarding the colony is the work of the soldiers. The adult workers and soldiers are wingless. The workers are generally greyish white in colour. The soldiers are generally darker than the workers and have a large head and longer mandibles. There are, however, other types of soldiers whose mandibles are small, degenerated and functionless; instead the frontal part of the head is prolonged to form a long nasus; they dispel the enemy by squirting out white poisonous fluid through the nasus. The reproductives, that is, the flying adults, have brown or black bodies and are provided with two pairs of long wings of almost equal size in contrast to the reproductives of ants which have two pair of wings of unequal size.

A-1.6 The food of the termite is cellulosic material like timber, grass, stumps of dead trees, droppings of herbivorous animals, paper, etc. Once termites have found a suitable foot-hold in or near a building, they start spreading slowly from a central nest through underground and over-ground galleries in the case of subterranean termites, and galleries within the structural member. Once they get direct access to them in the case of drywood termites. In their search for food they by pass any obstacle like concrete or resistant timber to get a suitable food many metres away.

A-1.7 In subterranean termite colony, the workers feed the reproductives, soldiers, winged adults and young nymphs. One of the habits of the termites which is of interest is the trophallaxis by means of which food and other material remain in circulation among different members of the colony. Workers are also in the habit of licking the secretions of exudating glands of the physogastric queen.

A-2 DEVELOPMENT OF TERMITE COLONY

A-2.1 At certain periods of the year, particularly after a few warm days followed by rain, emergence of winged adults on colonizing flights, occurs. This swarming, also called the nuptial flight, may take place any time during the monsoon or post-monsoon period, The fight is short and most of the adults perish due to one reason or the other. The surviving termites soon find their mates, shed their wings and establish a colony if circumstances are favourable. The female of the pair or queen produces a few eggs in the first year. The first batch of the brood comprises only of workers. The rate of reproduction however, increases rapidly after 2 to 3 years. Although a colony may increase in size comparatively rapidly, very little damage may occur in a period less than 8 to 10 years. Any serious damage that may occur in a short time is perhaps due to heavy infestation in the initial stages due to large

population of termites existing in the soil before the building is constructed.

A-3 RECOGNIZING THE PRESENCE OF TERMITE INFESTATION IN BUILDING

A-3.1 Swarms of winged reproductives flying from the soil or wood are the first indication of termite infestation in a building. Often the actual flight may not be observed but the presence of wings discarded by them will be a positive indication of a well established termite colony nearby. Termite damage is not always evident from the exterior in the case of subterranean termites, since they do not reduce wood to a powdery mass of particles like some of the wood borers or drywood termites. These termites are also recognized by the presence of earth-like shelter tubes which afford them the runways between soil and their food.

A-3.2 Drywood termites on the contrary may be recognized by their pellets of excreta. Non-subterranean termites excrete pellets of partly digested wood. These may be found in tunnels or on the floor underneath the member which they have attacked. These termites may further be noticed by blisters on wood surfaces due to their forming chambers close to the surface by eating away the wood and leaving only a thin film of wood on the surface. Also the hollow sound on tapping structural timber will indicate their destructive activity inside.

ANNEX B

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
401 : 1982	Code of practice for preservation of timber (*third revision*)	2568 : 1978	Malathion dusting powder (*second revision*)
632 : 1978	Gamma — BHC (Lindane) emulsifiable concentrates (*fourth revision*)	4015 : 1998	Guide for handling cases of pesticides poisoning: Part 1 First aid measures (*first revision*)
1141 : 1993	Seasoning of timber — Code of practice (*second revision*)	8944 : 1978	Chlorpyrifos emulsifiable concentrates

ANNEX C

(*Clause* 5.3)

SAFETY PRECAUTIONS

C-1 PRECAUTIONS FOR HEALTH HAZARDS AND SAFETY MEASURES

C-1.1 All the chemicals mentioned in **5.3** are poisonous and hazardous to health. These chemicals can have an adverse affect upon health when absorbed through the skin, inhaled as vapours or spray mists or swallowed. Persons handling or using these chemicals should be warned of these dangers and advised that absorption through the skin is the most likely sources of accidental poisoning. They should be cautioned to observe carefully the safety precautions given in **C-1.2** to **C-1.5** particularly when handling these chemicals in the form of concentrates.

C-1.2 These chemicals are brought to the site in the form of emulsifiable concentrates. The containers should be clearly labelled and should be stored carefully so that children and pets cannot get at them. They should be kept securely closed.

C-1-3 Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided. Workers should wear clean clothing and should wash thoroughly with soap and water specially before eating and smoking. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemicals splash into the eyes they shall be flushed with plenty of soap and water and immediate medical attention should be sought.

C-1.4 The concentrates are oil solutions and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed during mixing.

C-1.5 Care should be taken in the application of soil toxicants to see that they are not allowed to contaminate wells or springs which serve as sources of drinking water.

C-1.6 In case of poisoning, suitable measures shall be taken for protection in accordance with IS 4015.

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

Building Construction Practices Sectional Committee, CED 13

Organization	*Representative(s)*
In personal capacity (*D-6 Sector 55, Noida 201301*)	SHRI A.K. SARKAR (***Chairman***)
Bhabha Atomic Reseach Centre, Mumbai,	SHRI K. S. CHAUHAN SHRI K. B. MEHRA (*Alternate*)
Builders Association of India, Chennai	SHRI M. KARTHIKEYAN
Building Materials & Technology Promotion Council, New Delhi	SHRI J. K. PRASAD SHRI S. K. GUPTA (*Alternate*)
Central Building Research Institute, Roorkee	SHRI M. P. JAISINGH
Central Public Works Department, New Delhi	CHIEF ENGINEER (CDO) SUPERINTENDING ENGINEER (CDO) (*Alternate*)
Central Road Research Institute, New Delhi	SHRI DEEP CHANDRA
Central Vigilance Commission, New Delhi	SHRI R. A. ARUMUGAM
Delhi Development Authority, New Delhi	SHRI S. M. MADAN SHRI S. C. AGGARWAL (*Alternate*)
Engineer-in-Chief's Branch, New Delhi	SHRI SURESH CHANDER SHRI DINESH AGARWAL (*Alternate*)
Engineers India Limited, New Delhi	SHRI R. S. GARG SHRI A. K. TANDON (*Alternate*)
Forest Research Institute, Dehra Dun	SCIENTIST-SF RESEARCH OFFICER (*Alternate*)
Hindustan Prefab Ltd, New Delhi	SHRI S. MUKHERJEE SHRI M. KUNDU (*Alternate*)
Hindustan Steel Works Construction Ltd, Kolkata	SHRI N. K. MAJUMDAR SHRI V. K. GUPTA (*Alternate*)
Housing & Urban Development Corporation, New Delhi	SHRI K. C. BATRA SHRI K. C. DHARMARAJAN (*Alternate*)
Indian Institute of Architects, Mumbai	SHRI P. C. DHAIRYAWAN SHRI J. R. BHALLA (*Alternate*)
Indian Oil Corporation, Mathura	SHRI D. A. FRANCIS SHRI S. V. LALWANI (*Alternate*)
Indian Pest Control Association, New Delhi	SHRI H. S. VYAS
Life Insurance Corporation of India, New Delhi	CHIEF ENGINEER DEPUTY CHIEF ENGINEER (*Alternate*)
Ministry of Railways, Lucknow	DEPUTY CHIEF ENGINEER (CONSTRUCTION) EXECUTIVE ENGINEER (CONSTRUCTION) (*Alternate*)
National Buildings Construction Corporation Ltd, New Delhi	SHRI DALJIT SINGH
National Industrial Development Corporation Ltd, New Delhi	SHRI G. B. JAHAGIRDAR SHRI Y. N. SHARMA (*Alternate*)
National Project Construction Corporation, New Delhi	SHRI K. N. TANEJA SHRI S. V. PATWARDHAN (*Alternate*)
Public Works Department, Government of Arunachal Pradesh, Itanagar	CHIEF ENGINEER (WEST ZONE)
Public Works Department, Government of Maharashtra, Mumbai	SHRI A. B. PAWAR SHRI V. B. BORGE (*Alternate*)
Public Works Department, Government of Punjab, Patiala	CHIEF ENGINEER (BUILDING) DIRECTOR (R & D) (*Alternate*)
Public Works Department, Government of Rajasthan, Jaipur	SHRI P. K. LAURIA SHRI K. L. BAIRWA (*Alternate*)
Public Works Department, Government of Tamil Nadu, Chennai	CHIEF ENGINEER (BUILDING) SUPERINTENDING ENGINEER (BUILDING) (*Alternate*)
• State Bank of India, New Delhi	SHRI P. L. PATHAK SHRI G. V. CHANANA (*Alternate*)
Structural Engineering Research Centre, Chennai	SHRI K. MANI SHRI H. G. SREENATH (*Alternate*)
BIS Directorate General	SHRI S. K. JAIN, Director (Civ Engg) [Representing Director General *(Ex-officio)*]

Member-Secretary
SHRIMATI RACHNA SEHGAL
Deputy Director (Civ Engg), BIS

(*Continued on page* 10)

(*Continued from page* 9)

Timber Engineering Subcommittee, CED 13 : 4

Organization	*Representative(s)*
In personal capacity (*C 4 E - 78 Janakpuri, New Delhi 110058*)	DR H. N. MISHRA (***Convener***)
Central Building Research Institute, Roorkee	SHRI S. K. MITTAL DR Y. SINGH (*Alternate*)
Central Public Works Department, New Delhi	SUPERINTENDING ENGINEER (S&S) SUPERINTENDING ENGINEER (TADC) (*Alternate*)
DENOCIL, Mumbai	SHRI MANOJ SHARMA SHRI P. NATARAJAN (*Alternate*)
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