भारतीय मानक

भवनों में दीमक अवरोधक उपचार हेतु रीति संहिता

भाग 3 पूर्व निर्मित भवनों का उपचार

(दूसरा पुनरीक्षण)

Indian Standard

CODE OF PRACTICE FOR ANTI-TERMITE MEASURES IN BUILDINGS

PART 3 TREATMENT FOR EXISTING BUILDINGS

(Second Revision)

ICS 91.12.01

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

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Price Group 4

FOREWORD

This Indian Standard (Part 3) (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 3) 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 rendered by Central Building Research Institute, Roorkee in revising the standard. In this revision, apart from other modifications, Chlorpyrifos and Lindane have been included as an anti-termite chemical. Part 1 of this standard deals with constructional measures and Part 2 deals with pre-constructional chemical treatment measures.

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, clothing, 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).

Whenever termite infestation is detected in a building, appropriate steps as given in this Part of the standard should be adopted for their extermination. Once the termites have an ingress into the building, they keep on multiplying and destroy the wooden and cellulosic materials, and as such it becomes essential to take measures for protection against termites. Periodic inspection and control measures are the most important steps in checking termite damage to buildings. Often, the damage may be slight and the removal of affected material and breaking off the shelter tubes constructed by termites may suffice to protect the property. In other cases these simple remedies may have to be supplemented by the application of chemical toxicants. The chemical treatment to soil gives good results if it is carried out properly. The success of the treatment depends largely on the extent to which the prescribed methods of treatment are feasible in a particular building. This again depends upon the type of construction of the building, the amount of woodwork in it and the manner in which the woodwork is installed. If there are signs of reinfestation after treatment, it may be necessary to repeat appropriate treatment depending upon the termite infestation. This standard provides guidance for the chemical treatment measures to be provided in an existing building for protection from attack by subterranean termites.

The Composition of the Committee responsible for the formulation of this standard is given in Annex E.

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 3 TREATMENT FOR EXISTING BUILDINGS

(Second Revision)

1 SCOPE

This standard (Part 3) covers measures for the eradication and control of subterranean termites in existing buildings using chemicals. It includes reference to the chemicals to be used, lays down minimum rates of application for usage, and outline procedures to be followed.

2 REFERENCES

The standards given in Annex B contain provisions which through reference in this text, constitute provisions 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 in Annex B.

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 Post Construction Treatment

The application of chemical insecticides to buildings to eliminate existing termite infestation and to make them resistant to termite attack.

3.3 Soil Treatment

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

3.4 Wood Treatment

The application of chemical termiticides to woodwork and wood-based materials to eliminate existing termite infestation and to make it resistant to termite attack.

4 CHEMICALS

4.1 Any one of the following chemicals conforming to relevant Indian Standard in water emulsion may be used for the soil treatment in order to protect a building from termite attack.

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 is to be regarded as 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 treatments 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.

4.1.1 Oil or kerosene based solution of chlorpyrifos 20 EC or Lindane 20 EC 1.0 percent (by weight) concentration is useful for treatment of wood.

5 POST CONSTRUCTION TREATMENT

5.1 Inspection

Before undertaking any type of treatment, a thorough inspection shall be made of the infestation in the building with a view to determine the extent to which it has spread, and the routes of entry of termites into the building. A study of structure of the foundation and the ground floor helps in finding out the routes of entry of termites from the soil and also in deciding the mode of treatment. For guidance, a note on termite detection in buildings is given in Annex D.

5.2 Extermination of Termites in Building

After making a study of the infestation in the building, the next step is to exterminate the termites located inside the building. This operation shall be carried out in a thorough manner, seeking the termites in their

hideouts, such as ceilings behind wooden panellings, inside electrical wiring battens, conduits, switch-boards and similar locations. Recourse shall be taken to inject chemicals as given in **5.3**. All traces of termite tubes shall be removed so that any fresh infestation which might occur at a later date may be easily detected.

5.3 Preventive Measures

5.3.1 *Soil Treatment*

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 given in **4.1** shall be used in soil treatment and applied uniformly at the prescribed rate.

5.3.1.1 *Treatment along outside of foundations*

The soil in contact with the external wall of the building shall be treated with chemical emulsion at the rate of 7.5 l/m^2 of the vertical surface of the sub-structure to a depth of 300 mm. To facilitate this treatment a shallow channel shall be excavated along and close to the wall at 1.75 litres per running metre of the channel. Rodding with 12 mm diameter mild steel rods at 150 mm apart shall be done in the channel if necessary for uniform dispersal of the chemical to 300 mm depth from the ground level. The balance chemical of 0.5 litre per running metre shall then be used to treat the backfill earth as it is returned to the channel directing the spray toward the wall surface. If there is a concrete or masonry apron around the building, approximately 12 mm diameter holes shall be drilled as close as possible to the plinth wall at 300 mm apart, deep enough to reach the soil below, and the chemical emulsion pumped into these holes to soak the soil below at a rate of 2.25 litres per linear metre.

NOTE — In soils which do not allow percolation of chemicals to the desired depth, the uniform dispersal of the chemical to a depth of 300 mm shall be obtained by suitably modifying the mode of treatment depending on the site condition.The dosage of 2.25 litres per linear metre shall however remain the same.

5.3.1.2 The treatment described in **5.3.1.1** applies to masonry foundations. In the case of RCC foundation, the soil (backfill earth) in contact with the column sides and plinth beams along the external perimeter of the building shall be treated with chemical emulsion at the rate of 7.5 l/m^2 of the vertical surfaces of the structure. To facilitate this treatment, trenches shall be excavated equal to the width of a shovel exposing the sides of the column and plinth beams up to a depth of 300 mm or up to the bottoms of the plinth beam if this level is less than 300 mm. The chemical emulsion shall be sprayed on the backfill earth as it is returned into the trench directing the spray against the concrete surface of the beam of column as the case may be. If there is a concrete or masonry apron around the building, approximately 12 mm diameter holes shall be drilled as close as possible to the plinth wall about 300 mm apart, deep enough to reach the soil below and the chemical emulsion pumped into these holes to soak the soil below at a rate of 2.25 litres per linear metre.

5.3.1.3 *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:

a) At the junction of the floor and walls as a result of shrinkage or the concrete;
b) On the floor surface owing to construction defects;
c) At construction joints in a concrete floor, cast in sections; and
d) Expansion joints in the floor.

5.3.1.4 Chemical treatment should be provided within the plinth area of the ground floor of the structure 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. The holes shall be sealed. In general, the idea is to change the soil below the floor at the locations of cracks with toxicants so that termites in the soil are denied access through such cracks and openings in the floor.

5.3.1.5 *Treatment to voids in masonry*

Termites are known to seek entry into masonry foundations and work their way up through voids in the masonry and enter the building at ground and upper floors. The movement of the termites through the masonry walls may be arrested by drilling holes in the masonry wall at plinth level and squirting chemical emulsion into the holes to soak the masonry. The holes shall be drilled at a downward angle of about 45° preferably from both sides of the plinth wall at approximately 300 mm intervals and emulsion squirted through these holes to soak the masonry using a hand operated pressure pump. This treatment shall also be extended to internal walls having foundations in the soil. Holes shall also be drilled at critical points, such as wall corners and where door and window frames are embedded in the masonry or floor at ground. Emulsion shall be squirted through the holes till

refusal or to a maximum of one litre per hole. The treated holes shall then be sealed.

5.3.1.6 *Treatment at points of contact of woodwork*

All existing woodwork in the building which is in contact with the floor or walls and which is in contact with the floor or walls and 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 given in **3.1** 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.

5.3.2 *Treatment of Woodwork*

For the purpose of treatment, woodwork may be classified as follows:

a) Which is damaged by termites beyond repair and need replacements, and

b) Which is damaged slightly by termites and does not need replacement.

5.3.2.1 The woodwork which has already been damaged beyond repairs by termites shall be replaced. The new timber should be dipped or liberally brushed at least twice with chemicals in oil or kerosene as in **4.1.1**. All damaged woodwork which does not need replacement shall be treated as indicated in **5.3.2.2**.

5.3.2.2 Infested woodwork in CHAUKATS, shelves, joints, purlins, etc, in contact with the floor or the walls shall be provided with protective treatment by drilling holes of about 3 mm diameter with a downward slant to the core of the woodwork on the inconspicuous surface of the frame. These holes should be atleast 150 mm centre-to-centre and should cover the entire framework. One of the chemicals given in **4.1** shall be liberally infused in these holes. If the wood is not protected by paint or varnish two coats of the chemicals given in **4.1** shall be given on all the surfaces and crevices adjoining the masonry.

5.3.3 *Treatment of Electrical Fixtures*

If infestation in electrical fixture (like switch boxes in the wall) is noticed, covers of the switch boxes shall be removed and inside of such boxes shall be treated liberally with 5 percent Malathion dusting powder. The covers of the switch boxes shall be refixed after dusting.

6 INSPECTION

Periodical inspection and vigilance are necessary after carrying out the preventive treatment measured described in **5.3**. It is essential that follow up action be maintained during subsequent humid and hot seasons if termites appear.

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. These 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 interior 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 pairs 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

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 BUILDINGS

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 woodborers 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* 4.1)

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

(*Clause* 5.1)

GUIDE FOR TERMITE DETECTION

D-1 TERMITE DETECTION IN BUILDINGS

D-1.1 A termite control operator must be able to find out the existence or termites in a building. A certain amount of technical knowledge and experience is necessary to determine if there is termite infestation in a building, particularly in the early stages when the attack has just started or it is confined to remote locations in the building. The operator should know the habits of termites in general, the manner in which they work, the places where they are likely to be found and the signs which go to show that they are present.

D-1.2 A bright light is essential for termite inspection. A bright electric bulb protected by a wire-cage and an extension cord would be useful. If this is not available, a flashlight may be used. The operator should also carry with him a knife with a sharp pointed blade to probe into woodwork.

D-1.3 As subterranean termites emerge from the soil to seek entry into a building, the portions of the building in contact with or adjacent to the soil should be the first to be inspected. These would include the basement, ground floor, steps leading from the ground, columns, porches, etc. Locations where there is dampness or where humid conditions prevail, such as bathrooms, lavatories, or other places where there are leaky pipes or drains are likely places of termite infestation. Woodwork at basement or ground floor level, particularly in damp locations, should be examined. The places which demand careful scrutiny are the points where woodwork is embedded in the floor or in the wall as termites seek entry through crevices in the concrete or brickwork in which the wooden frames are fixed.

D-1.4 The signs of presence of termites in a building are the tell-tale shelter tubes which are termites runways. As termites have soft bodies which cannot withstand the drying effects of air, they move about in sheltered mud tubes which they build when they have to cross open spaces which are exposed to the air. These are, therefore, not easily noticed and may go undetected except to the trained eye of an experienced termite control operator.

D-1.5 Termites work inside timber without breaking the surface. They are known to eat away a board completely leaving only the film of paint on the surface. If they break open the surface at any point accidentally, they quickly seal it up, and their activity continues beneath the surface without detection.

D-1.6 Woodwork in the vulnerable locations mentioned in **D-1.3** should be carefully examined to find out if termites have attacked the wood. In the absence of any external signs of damage, the woodwork should be tapped to see if it is hollow having been eaten up from inside. A sharp pointed instrument or the sharp end of a pen-knife may be used to pierce the woodwork to determine if there are cavities in the wood.

D-1.7 There is nothing as certain as termite runways to establish that infestation exists. However, an operator should be able to distinguish between old runways and new ones. The old runways are brittle and break away easily while the new ones will be moist and stronger. It is not advisable to remove or destroy termite runways during inspection.

D-1.8 If termite activity is noticed in any one location of a building, it becomes necessary to make a thorough search in the entire building. In a multi-storeyed building, if infestation has occurred at the ground floor, all the upper floors must be subjected to thorough scrutiny. There have been instance where termite activity was noticed in one of the upper floors, with no visible signs of attack in the lower floors except perhaps the ground floor. This is explained by the fact that the termites had travelled from floor to floor under cover through lift wells or casings covering electric wiring, telephone cables, utility pipes, etc. Such covered conduits should, therefore, be examined carefully as they are ideal routes for termites. Other places which should be examined are woodwork, wooden paneling on staircases and walls, are behind picture frames huge on walls, false ceiling, special attention being paid to locations where dampness prevails, such as bathrooms, toilets and kitchen sinks.

ANNEX E

(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(BLDGS) 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 Tamilnadu, Chennai	CHIEF ENGINEER (BLDG) SUPERINTENDING ENGINEER (BLDG) (*Alternate*)

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Organization	*Representative(s)*
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 & Head (Civ Engg) [Representing Director General (*Ex- Officio Member*)]

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

Timber Engineering Subcommittee, CED 13:4

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Engineer-in-Chief's Branch, New Delhi	SHRI N. HARIHARAN SHRI K. K. MITRA (*Alternate*)
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Indian Institute of Technology, Chennai	DR M. S. MATHEWS
Indian Plywood Industries Research & Training Institute, Bangalore	DIRECTOR DR H. N. JAGADEESH (*Alternate*)
Institution of Surveyors, New Delhi	SHRI K. S. KHARB SHRI K. L. PRUTHI (*Alternate*)
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