# PARTICULAR SPECIFICATION

## EARTH WORK & ANTI-TERMITE TREATEMENT

1.0 **INDIAN STANDARDS:**

1.1 Work shall be carried out to Indian Standards and Code of Practices. In absence, International Standards shall be followed. These shall be latest issue. List given hereunder is not to be considered as conclusive and is for reference and guidance only. Any discrepancies / conflict noticed shall be directed to the EIC for his direction/approval. However, as a general rule more stringent specification shall take precedence.

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2.1 SCOPE
This part of the specification deals with general requirements for earthwork in excavation in different materials, site grading, filling in area shown in drawings, filing back around foundations, plinths and approach ramps, conveyance and disposal of excavated soil and stacking them properly as shown on the drawings or as directed by the Engineer and all operations covered within the intent and purpose of the specifications. The excavation in rock by blasting is not permitted.

2.2 Classification of Earth:
For purpose of earthwork soil shall be classified as under:
Loose/soft soil: Any soil which generally yields to the application of picks and shovels, phawras, rakes or any such ordinary excavating implements or organic soil, gravel, silt sand, turf loam, lay, peat etc. fall under this category.

Dense/Hard Soil: Any soil which generally requires the close application of picks, or jumpers or scarifiers to loosen it. Stiff clay, gravel and cobble stone etc fall under this category (Note: Cobble stone is the rock fragment usually rounded or semi-rounded having maximum diameter in any one direction between 80 and 300mm)

Mud: Mud is mixture of ordinary soft soil and water in fluid or weak solid state.
Soft/Disintegrated rock: (Not requiring blasting). This shall include the type of rock and boulders which may be quarried or split with crow-bars. Laterite and hard conglomerate also come under this category.

Hard Rock: (Requiring blasting): This shall include the type of rock or boulder which for quarrying or splitting requires the use of mechanical plant or blasting.
(Note: Boulder is rock fragment usually rounded by weathering, disintegration and explosion or abrasion by water or ice having a maximum dimension in any direction of more than 600mm).

Hard Rock: (Requiring blasting but where blasting is prohibited) under this category shall fall hard rocks which though normally require blasting for their removal but blasting is prohibited and excavation has to be done by chiseling, wedging or other suitable method.

3.0 **GENERAL:**

3.1 The Contractor shall furnish all tools, plants, instruments, qualified supervisory staff, labour, materials, any temporary works, consumables and everything necessary, whether or not such items are specifically stated herein, for completion of the job in accordance with the specification requirements.
3.2 The contractor shall carry out the surveys of the site before excavation and set out properly all lines and establish levels for various works such as earthwork in excavation for grading, foundations, plinth filling, road drains, cable trenches, pipelines, culverts, retaining walls etc. Such surveys shall be carried out taking accurately cross sections of the area perpendicular to the grid lines at intervals determined by the Engineer depending on the ground profiles. These will be checked by the Engineer or his representative and thereafter properly recorded.

3.3 The excavation shall bed one to correct lines and levels. This shall include where required, proper shoring to maintain excavation and also the furnishing, erection and maintaining of substantial barricades around excavations and warning lamps at night for safety purposes.

3.4 The rates quoted shall include for dumping of excavated material in regular heaps, bunds, rip rap with regular slopes as directed by the Engineer within the lead specified and leveling the same so as to provide natural drainage. Rock/soil excavation shall be properly stacked as directed by the Engineer. As and more resistant materials, forming the casing on the sides and the top. Rock shall be stacked separately.
4.0 CLEARING
The area to be excavated/filled shall be cleared of all fences, trees, plant logs, stumps, bush, vegetation, rubbish, slush etc. and other objectionably matter. If any roots or stumps of trees are met during excavation, they shall be removed. The material so removed shall be disposed off as directed by the Engineer.
Where earthfill is intended, the area shall be cleared of all matter/material before filling commences. No separate payment shall be made for such clearing works.

5.0 PRECIOUS OBJECTS, RELICS, OBJECTS OF ANTIQUITES ETC.
All gold, silver, oil, minerals, archaeological and other findings of importance or other materials of any description and all precious stones, coins, treasure troves, relics, antiquities and similar things which may be found in or upon the site shall be the property of CIDCO and the Contractor shall duly preserve the same to the satisfaction of the Engineer and from time to time deliver the same to him.

6.0 EXCAVATION FOR STRUCTURES
6.1 Description
Excavation for structures shall consist of removal of materials for the construction of foundations of columns, footings, walls and other similar structures in accordance with the requirements of this specification and the lines and dimensions shown on the drawings or
as indicated by the Engineer. The work shall include all necessary sheeting, shoring, bracing, draining and pumping; the removal of all logs, stumps, shrubs and other deleterious matter and obstruction necessary for placing the foundations, trimming bottoms of excavation; backfilling, cleaning up the site and disposal of all surplus materials.

6.2 **Setting out:**
After the site has been cleared as per clause No. 4.0 above, the limits of excavation shall be set out true to lines, curves, slopes, grades and sections shown on the drawings or as directed by the Engineer. The Contractor shall provide all labour, survey instruments and materials such as string, pegs, nails, bamboos, stones, lime, mortar, concrete etc. required in connection with the setting out the works and establishment of bench marks. The Contractor shall be responsible for the maintenance of bench marks and other marks and stakes as long as they are required for the work in the opinion of the Engineer.

6.3 **Excavation**
a) Excavation shall be taken to the width of the lowest step of footing or the pile caps and the sides shall be left plumb where the nature of the soil allow it. Where the nature of the soil, or the depth of the excavated trench/pit does not permit
vertical sides, the Contractor at his own expense shall put up necessary shoring, strutting and planking or cut slopes to a safe angle or both with due regard to the safety of personnel and the works and to the satisfaction of the Engineer.

b) The depth to which the excavation is to be carried out shall be as shown on the drawings unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer.

c) If the Contractor prefers for mass excavation of building, he may do so with the prior permission of Engineer. The payment of excavation and disposal shall be restricted only to minimum excavation allowed as per mode of payment. Excavation shall be fully protected against the slide and slopes.

d) The material suitable for backfilling shall be stacked separately.

6.3.1 **Excavation in all types of soil except rock:**

Shall mean excavation in vegetation soil, turf, loam, clay, mud blck-cotton soil, earth murum (hard or soft) shingle and generally any material which requires close application of picks or scarifies to loosen and not affording much resistance to digging.
6.3.2 **Excavation in rock not requiring blasting:**
Shall mean excavation in lime stone, sand stone, laterite, hard conglomerate or other rock which can be quarried or split with crow bars or wedges, This shall include unblasted boulders.

6.3.3 **Excavation in rock requiring blasting:**
Shall mean excavation in hard rock requiring blasting encountered places of excavations.

The Contractor shall obtain license from District/Public authorities for carrying out blasting work as well as for obtaining transporting and storing explosives as per “Explosive Rules 1940” or as amended. He shall purchase the explosives, fuses, detonators etc. only from a licensed dealer. He shall maintain the account of explosives etc. purchased and used by him. He shall be responsible for safe custody and proper accounting of explosive materials. Contractor will be fully responsible for any breach of the aforesaid Act.

Blasting shall normally be done with gun powder. Dynamite, Gelatin or any other high explosive shall only be used in special cases with written permission of the Architect and District authorities concerned under “Explosive Rules”.

Blasting operations shall be carried out under supervision of a responsible representative of the Contractor during certain hours, preferably during lunch break as approved in writing by the Architect. The representative shall be conversant with the rules of blasting.
Proper precautions for safety of persons shall be taken. Red flags shall be prominently displayed around the area to be blasted and all people on work except those who actually light the fuse shall be withdrawn to safe distance of not less than 100 meters from the blast. Blasting shall not be done within 100 meters of an existing masonry or any other kind of structure unless special precautions are taken by heavy blanketing etc. The Contractor shall be responsible for any damage to the person and/or property either directly or incidental to such blasting including his employees.

Where blasting is not practical or is prohibited, excavation shall be done by wedging or chiseling and it shall be restricted to the quantity required to enable the necessary foundation to be put in. The item also covers bailing out subsoil water or rainwater including pumping at any stage of the work, shoring strutting etc.

6.4 Dewatering and Protection:
Where water is et with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures such as bailing, pumping, construction of diversion of channel, drainage channels, bunds, cofferdams and other necessary works to keep the foundation trenches/pits dry when so required and to keep the green concrete/masonry against damage by erosion or sudden rise of water level. The method to be adopted in this regard and other details thereof shall be left to the choice of the
Contractor but subject to the approval of the Engineer. Approval of the Engineer shall, however, not relieve the Contractor of his responsibility for the adequacy of dewatering and protection arrangements and the safety of the works.

Where cofferdams are required, these shall be carried to adequate depths and heights, be safely designed and constructed and be made as watertight as is necessary for facilitating construction to be carried out inside them. The interior dimensions of the cofferdams shall be such as to give sufficient clearance for construction and inspection and to permit installation of pumping machinery inside the enclosed area.

Pumping from inside of any foundation enclosures shall be done in such a manner as to preclude the possibility for the movement of water through any freshly placed concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a watertight wall or similar means. At the discretion of the Contractor shall take all precautions in diverting channels and in discharging the drained water so as to cause damage to the works or to the adjoining property.
6.5 **Preparation of Foundation:**

The bottom of the foundation shall be leveled both longitudinally and transversally or stepped as directed by the Engineer. Before the footing is laid, the surface shall be slightly watered and rammed. In the event of the excavation having been made deeper than that shown on the drawing or as otherwise ordered by the Engineer, the extra depth shall be made up with concrete or masonry of the foundation grade at the cost of the Contractor. Ordinary filling shall not be used for the purpose to bring the foundation to level.

When rock or other hard strata is encountered, it shall be freed of all loose and soft materials, cleaned and cut to a firm surface either level, stepped, or serrated as directed by the Engineer. All seems shall be cleaned out and filled with cement mortar or grout to the satisfaction of the Engineer.

6.6 **Slips and blows:**

If there are any slips or blows in the excavation, these shall be removed by the Contractor at his own cost.

6.7 **Backfilling:**

To the extent available, selected surplus soil from the excavation shall be used as backfill. Fill materials shall be free from clods, salts, sulphates, organic or other foreign materials. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces no larger than 250 mm size mixed with properly graded fine materials consisting of murum or earth to fill up the voids and the mixture used for filling.
If any selected fill material is required to be borrowed, the Contractor shall make his own arrangement for bringing the material from outside borrow pits. The material source shall be subject to the prior approval of the Engineer. The Contractor shall make necessary access roads to such borrow areas at his own cost, if such access road do not exist. The Contractor shall make necessary payment of royalty charges with the concern Authority for obtaining quarry permit.

The selected fill material shall be approved quality murum having liquid limit not more than 40 and plasticity index not more than 20 and minimum dry density not less than 1700 kg per cu.m.

Backfilling of the foundation trenches / pits shall be done as soon as the foundation work has been completed to the satisfaction of the Engineer and measured but not earlier than the full setting of the concrete or masonry as not to cause undue thrust on any part of the structure. Backfilling shall be done in space around the foundations after clearing it of all debris and in layers of 250 mm loose thickness, watered and compacted to the satisfaction of the Engineer and upto the original surface.

**6.8 Disposal of Surplus Excavated Materials:**

All the excavated materials shall be the property of the CIDCO where the excavated material is directed to be used in the
construction of the works for the general grading, plinth filling or embankments, the operations shall be arranged in such a manner that the capacity for cutting, haulage and compaction are nearly the same.

All hard materials such has hard murum, rubble etc. not intended for filling in foundations, plinth or embankment shall be stacked neatly for future use as directed by the Engineer within the lead specified. Unsuitable or surplus materials not intended for use in part of the works or for reuse shall be disposed of as directed by the Engineer.

**7.0 MEASUREMENT AND RATES:**

The measurement shall be generally conforming to IS:1200, Part-I unless otherwise specified. Measurement for excavation of foundations and footing shall be as required for the exact width, length and depth as shown or figured on the drawings or as may be directed by the Engineer. If taken out to a greater width, length or depth than shown or required, the extra work occasioned thereby shall be done at the Contractor’s expense.

The dimensions of the trenches and pits shall be measured correct to the nearest cm. and cubical contents worked out in cubic meters, correct to two places of decimal.
Measurements of filling excavated earth or sand in plinth or under floors: depth of consolidated earth filings, shall be measured for the purpose of payments. The dimensions of the fillings shall be measured correct to the nearest cm. and cubical contents worked out in cubic meters correct to the two places of decimal.

Rate for earth work shall include the following:

a) Excavation and disposing of all excavated materials as specified.

b) Setting out works, profiles etc.

c) Site clearance such as cleaning of rank vegetation, shrubs, brushwood.

d) Forming (or leveling) “dead mean” or “tell tales” and their removals after measurements.

e) Bailing out water in excavation from rains, sub-soil water etc.

f) Protection and temporarily supporting of existing services of pipes, water mains, cables etc. met within the course of excavation. Care shall be taken not to disturb electric and communication cables. Removal of such cables, if necessary, shall be arranged by the Engineer.

g) Forming (or leaving) steps in sides of deep trenches and their removal.

h) Removing slips or falls in excavation including necessary shoring & strutting.
i) Fencing and/or other suitable measures for protection against risk of accidents as approved by the Engineer.

j) Excavation for insertion of planking and strutting where required, and

k) Backfilling the trenches foundations (sides of footings) with selected excavated materials.

l) Payment of necessary royalty charges for excavation and contractor’s materials brought from outside.

8.0 **EARTH FILING:**

General: Filling shall be done with good earth, murum, stone chips or disintegrated building debris. It shall be free from salts, organic matter, black cotton soil or slushed earth and combustible material. All clods shall be broken.

a) **Filling in Plinth:**

Filling shall be done in layer not exceeding 20 cm, watered and consolidated by ramming with iron or wooden rammers weighing 7 to 8 kg, and having base 20 cm. square or 20 cm. diameter. When the filling reaches the finished level, surface shall be kept flooded with water for at least 24 hours, allowed to dry and then rammed and consolidated, after making good any settlement in order to avoid settlement at a later stage. Special care shall be taken to pack earth under plinth beams and columns corners.
Finished level of filling shall be kept to a slope intended to be given to the floor.

b) **Filling for Plot Development**

Filling shall be done in layer of 30 cm when filling reaches the required level, top layer shall be dressed to proper section, grade and camber and rolled by 8 to 10 tons. Power roller and adequately watered to aid compaction.

9.0 **DRY RUBBLE PACKING:**

Ground shall first be leveled up and thoroughly consolidated by means of heavy log hammer or frog rams. Rubble of specified thickness shall be laid and set with hand. It shall be consolidated either by hand roller or wooden log hammer; free use of water being made during consolidation. All hollows and interstices after consolidation shall be filled with quarry spalls, stone chips etc. and the packing blinded with stone grit and watered and consolidated by log hammer.

10.0 **LEVELLING COURSE:**

It shall be M-20 grade either plain cement concrete as stipulated in the relevant items and placed in position conforming line and level shown on the drawing and compacted by approved means and cured adequately.
11.0 **ANTI-TERMITE TREATMENT**

11.1 Indian Standards

Indian Standards to be followed are

1) **IS 4015(Part I & II)** Guide for handling cases of pesticide poisoning

2) **IS 6313 (Part I)** Code of practice for Anti-termite measures in buildings constructional measures

3) **IS 6313 (Part II)** Code of practice for anti-termite measures in Building (pre-constructional chemical treatment)

4) **IS 8499** Specification for Chloropyrifos Emulsified concentrates

5) **IS 632** Specification for Lindane

11.2 **Materials**

One of the following chemicals in water emulsion shall be used

11.2.1 For mound treatment

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<th>Chemical</th>
<th>Relevant Indian Standard</th>
<th>Concentration by Volume</th>
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<tr>
<td>a. Cholopyrifos emulsifiable</td>
<td>IS : 8944</td>
<td>1.0%</td>
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11.2.2 For soil treatment

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11.3.0 WORKMANSHIP

11.3.1 Conditions of formation

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

11.3.2 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 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 applies also in the case of treatment to the filled earth surface within the plinth area before laying the sub-grade for the floor.
11.3.3 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 barriers-system.

11.4 Termite mound treatment

If termite mounds are found within the plinth area, these shall be destroyed by pouring into the mounds at several places, after breaking open the earthen structure, and making holes with crow-bars at the rate of approximately 4 litres of emulsion per cubic meter of mound.

11.5 Soil Treatment

11.5.1 Treatment of columns pits foundation, trenches and basement excavations:

The bottom surface and the sides (upto a height of 300 mm above concrete foundation level) of the excavations made for columns pits, wall trenches and basements shall be treated with the chemical at the rate of 5 litres per sq.m of surface area. After the column foundation and retaining walls of the basement come up, the back fill in immediate contract with the foundation structure shall be treated at the rate of 15 litres per sqm 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 ramming operation is done by rodding the earth at 150 mm centres close to wall surface and spraying the chemical with the above dose. As earth is filled in layers the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete for masonry surfaces of the columns and walls so that earth in contact with these surfaces is well treated with the chemicals. In the case of RCC framed structures with columns and plinth beams and RCC basements, the treatment shall start at the depth of 500 mm below ground level except when such ground level is raised or lowered by filing or cutting after the foundations have been cast. In such cases, the depth 500mm shall be determined from the new soil level resulting from filling or cutting mentioned above. From this depth the back fill around the columns beams and RCC basement wall shall be treated at the rate of 15 liters per sqm of vertical surface. The other details of treatment shall be as detailed below:

11.5.2 Termite Proof Course or DPC in Plinth:

a) If there is provision of a Damp Proof Course in the Construction, it should be located just below the level of the filled earth, in the plinth area although this acts as an effective barrier impervious to termite entry the DPC surface should be treated at 5 litres per sqm immediately after the course is laid and the concrete is green.
b) If there is provision of a Damp Proof Course, the top surface of the masonry course just below the level of plinth filling mentioned above should be soaked with the chemical emulsion at the rate of 5 litres per sqm of the surface. This application should be carried out slowly to enable the masonry surface to absorb the emulsion properly. Both steps (a) and (b) above help in creating a barrier which is impervious to termite entry.

11.5.3 **Treatment of Top surface of Plinth Filling**

a) The top surface of the consolidated earth within plinth walls shall be treated with chemical emulsion at the rate of 5 liters per Sqm 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 upto 50 to 75 m deep at 150 mm centres both ways be made with 12 mm diameter mild steel rod on the surface to facilitate saturation of the soil with the chemical emulsion.

b) For buildings where construction has advanced already for facility of construction, the treatment could also be done effectively, over the base concrete (lean mix) under the floor taking care that the emulsion, at the rate of 5 litres per sqm soak fully into the concrete.
11.5.4 **Treatment at junction of walls and floor:**

Rodding shall be carried out along the junction of walls and earth filling at 15 cm intervals down to or slightly lower than the DPC or the chemical barrier described above. Emulsion shall be sprayed along the wall junction at 7.5 litre per square meter of the vertical wall or column surface so that it mixes intimately with the broken up soil and seeps to the DPC level or chemical barrier thus establishing continuity of the antitermite layer. The disturbed earth is then tamped back in place.

11.5.5 **Treatment of soil along external perimeter:**

Finally the earth around the external perimeter of the building upto a depth of 30 cm shall be treated at the rate of 7.5 litres per square meter of the vertical surfaces. To facilitate this treatment solid MS rods should be driven into the soil as close possible to the plinth wall at intervals of 15 cm, and upto a depth of 30 cm, and the rods moved backwards and forwards in a direction parallel to the wall to break up the earth so that the emulsion mixes intimately with the soil.

In the event of filling being more than 300 mm, the external perimeter treatment shall extend to full depth of filling upto the ground level 30 as to ensure continuity of the Chemical barrier.

11.5.6 **Treatment of soil surrounding pipes, wastes and conduits:**

When pipes, wastes and conduits enter the soil inside the area of the foundation, the soil surrounding the points of entry shall be loosened
around each such pipe, waste or conduits for a distance of 15 cm and upto a depth of 7.5 cm before the treatment is commenced. When they enter the soil external to the foundations, they shall be similarly treated unless than stand clear of the walls of the building by about 7.5 cm for a distance over 30 cm.

11.5.7 **Treatment of 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 para 12.5.6 is carried out. This treatment should be supplemented by treating though the expansion joint after the sub-grade has been laid at the rate of 2 litres per linear meter.

11.6.0 **Spraying Equipment:**
A pressure pump shall be used to carry out spraying operations to facilitate uniform spraying and penetration of chemical into the earth. The chemicals, concentration and dosage for horizontal and vertical surfaces are based on IS code of practice for Anti-termite measures in Building IS 6313 (Part-II)

11.7.0 **Safety Precautions**
All chemicals specified are poisonous and hazardous to health. Persons handling or using should be warned and trained to take
precautions as detailed by manufacturer and laid down in IS. Also persons working should be educated to take 1st aid as per IS 4015 part(I) and Part(II).

11.8.0 **Measurement:**
Measurement for payment in case of preconstruction treatment as detailed above shall be for actual area covered by building at ground level in plan in sq.m.

11.9.0 **Free Service Guarantee**
The contractor shall note that termite proofing work, is subject to a free service guarantee from the date of completion of the treatment. The contractor shall give an undertaking in writing to the effect that during the guarantee period any infestation of subterranean termites will be eradicated and necessary treatment carried out to prevent re-infestation, free of cost to the employer. The guarantee shall allow a minimum period of 5 (five) years for pre-constructional treatment.

Tenderers must ensure that the work will be done through the professional Pest Control operator. They should be members of National Pest Control Association of US, or Indian Pest Control Association or any other recognized professional body. They should furnish a list of Termite control jobs carried out by them successfully for Government Department, Statutory bodies or large private organizations to prove that they are capable of handling anti termite work.