



V2-S2&S3&S4-1
ATTACHMENT-1 EARTHWORK IN
EXCAVATION, GRADING
AND BACKFILLING

EARTH WORK IN EXCAVATION, GRADING AND BACK FILLING

1. SCOPE

This specification covers the general requirements of earthwork in excavation in different materials, site grading, filling in areas as shown in drawing, filling back around foundations and in plinths, conveyance and disposal of surplus soils or stacking them properly as shown on the drawings and as directed by the Engineer and all operations covered within the intent and purpose of this specification.

2. APPLICABLE CODES

The following Indian Standard Codes, unless otherwise specified herein, will be applicable. In all cases, the latest revision of the codes will be referred to.

1. IS 783 - Code of practice for laying of concrete pipes.
2. IS 1200- Method of measurement of building and civil engineering works
 - (Part 1) Part 1 Earthwork
 - (Part 27) Earthwork done by mechanical appliances.
3. IS 3764 - Excavation work-code of safety.
4. IS 2720 - Methods of test for soils:
 - (Part 1) - Part 1 Preparation of dry soil samples for various tests.
 - (Part 2) - Part 2 Determination of water content.
 - (Part 4)- - Part 4 Grain size analysis.
 - (Part 5) - Part 5 Determination of liquid and plastic limit.
 - (Part 7) - Part 7 Determination of water content-dry density relation using light compaction.
 - Part (9) - Part 9 Determination of dry density - moisture content relation by constant weight of soil method.
 - (Part 14) -Part 14 Determination of density index (relative density) of cohesion less soils.
 - (Part 28) -Part 28 Determination of dry density of soils in place, by the sand replacement method.



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| (Part 33) | -Part 33 Determination of the density in place by the ring and water replacement method. |
| (Part 34) | -Part 34 Determination of density of soil in place by rubber balloon method. |
| (Part 38) | - Part 38 Compaction control test (Hilf Method). |

3. DRAWINGS

The enclosed contract drawing shows areas to be excavated/ filled to the specified grade level.

4. GENERAL

- 4.1. The BIDDER will furnish all tools, plants, instruments, qualified supervisory personnel, labour, materials any temporary works, consumables, any and everything necessary, whether or not such items are specifically stated herein for completion of the job in accordance with the specification requirements.
- 4.2. The excavation will be done to correct lines and levels. This will also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas and warning lamps at night for ensuring safety.
- 4.3. Dumping of excavated materials will be in regular heaps, bunds, riprap with regular slopes as directed by the Engineer, within the lead specified and levelling the same so as to provide natural drainage. Rock/ soil excavated will be stacked properly as directed by the Engineer. As a rule, all softer material will be laid along the centre of heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Rock will be stacked separately.

5. CLEARING

- 5.1. The site will be cleared of all trees, stumps, roots, brushwood, bushes, blown sand and other objectionable materials. Useful and saleable material, if any, will be the property of the owner and will be stacked properly as directed by the Engineer. The areas to be covered with embankments will be stripped of topsoil to required depths to expose acceptable founding strata. Topsoil unsuitable for use in embankment

construction and other fills will be disposed off as directed. All combustible materials will be stacked and burnt in locations sufficiently remote to eliminate all danger of fire hazards. All old concrete, brick works and drains which interfere with construction works will be dismantled with the approval of the Engineer taking all necessary precautions prescribed in safety specification. Topsoil, which is suitable for use in construction work will be stockpiled for later use. Surplus earth and other objectionable materials such as loose sand, blown sand, trash, debris, stones, brick, broken concrete, scrap metal etc will be disposed off within a lead of 5kms all as directed by the Engineer

6. **PRECIOUS OBJECTS, RELICS, OBJECTS OF ANTIQUITY, ETC.**

All gold, silver, oil, minerals, archaeological and other findings of importance, trees cut or other materials of any description and all precious stones, coins, treasures, relics, antiquities and other similar things which may be found in or upon the site will be the property of the Owner and the BIDDER will duly preserve the same to the satisfaction of the Owner and from time to time deliver the same to such person or persons as the Owner may from time to time authorise or appoint to receive the same.

7. **CLASSIFICATION**

The contract drawing enclosed shows the type of soil strata and is enclosed for reference only. The rates considered by the bidder will be based irrespective of the type of classification.

8. **EXCAVATION**

- 8.1. All excavation work will be carried out by mechanical equipment unless, in the opinion of the Engineer, the work involved and time schedule permit manual work.
- 8.2. Excavation for permanent work will be taken out to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as may be specified by the Engineer. Rough excavation will be carried out to a depth 150 mm above the final level. The balance will be excavated with special care. Soft pockets will be removed even below the final level and extra excavation filled up as directed by the Engineer.



The final excavation if so instructed by the Engineer, should be carried out just prior to laying the mud-mat.

- 8.3. The BIDDER may, for facility of work or similar other reasons excavate, and also backfill later, if so, approved by the Engineer, at his own cost outside the lines shown on the drawings or directed by the Engineer. Should any excavation be taken below the specified elevations, the BIDDER will fill it up, with concrete of the same class as in the foundation resting thereon, upto the required elevation. No extra will be claimed by the BIDDER on this account.
- 8.4. All excavation will be done to the minimum dimensions as required for safety and working facility. Prior approval of the Engineer will be obtained by the BIDDER in each individual case, for the method he proposes to adopt for the excavation, including dimensions, side slopes, dewatering, disposal, etc. This approval, however, will not in any way relieve the BIDDER of his responsibility for any consequent loss or damage. The excavation must be carried out in the most expeditious and efficient manner. Side slopes will be as steep as will stand safely for the actual soil conditions encountered. Every precaution will be taken to prevent slips. Should slips occur, the slipped material will be removed, and the slope dressed to a modified stable slope
- 8.5. Excavation will be carried out with such tools, tackles and equipment as described here in before. Blasting or other methods may be resorted to in the case of hard rock however not without the specific permission of the Engineer.

9. **STRIPPING LOOSE ROCK**

- 9.1. All loose boulders, semi-detached rocks (along with earthy stuff which might move therewith) not directly in the excavation but so close to the area to be excavated as to be liable, in the opinion of the Engineer, to fall or otherwise endanger the workmen, equipment, or the work, etc., will be stripped off and removed away from the area of the excavation. The method used will be such as not to shatter or render unstable or unsafe the portion which was originally sound and safe.



9.2. Safety of existing work

Before taking up any construction adjoining other property or existing work, the BIDDER will take all steps necessary for the safety and protection of such property or work at no extra cost to the owner.

9.3. Protection of existing services

The BIDDER will take all precautions necessary to prevent damage to or interference with underground or over ground services such as cables, drains, piping or piles, whether shown on drawings or not. Equipment etc., mounted in position will be protected against falling debris etc, by means of tarpaulin or such other material at no extra cost to the owner.

10. **FILL, BACK FILLING AND SITE GRADING**

10.1. General

All fill material will be subject to the Engineer's approval. If any material is rejected by the Engineer, the BIDDER will remove the same forthwith from the site at no extra cost to the Owner. Surplus fill material will be deposited/ disposed of as directed by the Engineer after the fill work is completed.

No earth fill will commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by the Engineer.

10.2. Material

To the extent available, selected surplus soils from excavated materials will be used as backfill. Fill material will be free from clods, salts, sulphates, organic or other foreign material. All clods of earth will be broken or removed. Where excavated material is mostly rock, the boulders will be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of moorum or earth to fill up the voids and the mixture used for filling.

- 10.3. If any selected fill material is required to be borrowed, the BIDDER will make his own arrangements at no additional cost for bringing such material from outside borrow pits. The material and source will be subject to prior approval of the Engineer. The approved borrow pit area will be cleared of all bushes, roots of trees, plants, rubbish etc. topsoil containing salts/ sulphate and other foreign material will be removed. The materials so removed will be burnt or disposed off as directed by the Engineer. The BIDDER will make necessary access roads to borrow areas and maintain the same, if such access road does not exist, at his cost.
- 10.4. Filling in pits and trenches around foundations of structures, walls etc. As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches etc. will be cleared of all debris, and filled with earth in layers not exceeding 15 cm., each layer being watered, rammed and properly consolidated, before the succeeding one is laid. Each layer will be consolidated to the satisfaction of the Engineer. Filling around foundation will be compacted to achieve 85% Proctor density. Earth will be rammed with approved mechanical compaction machines. Usually no manual compaction will be allowed unless the Engineer is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface will be trimmed and levelled to proper profile as directed by the Engineer or indicated on the drawings.
- 10.5. Plinth filling
- Plinth filling will be carried out with approved material as described herein before in layers not exceeding 15 cm, watered and compacted with mechanical compaction machines. The Engineer may however permit manual compaction by hand tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level, the surface will be flooded with water, unless otherwise directed, for at least 24 hours allowed to dry and then the surface again compacted as specified above to avoid settlements at a later stage.

The finished level of the filling will be trimmed to the level/ slope specified. In case of compaction of granular material such as sands and gravel, vibratory rollers will be used. A smaller weight roller may be used only if permitted by the Engineer. As rolling proceeds water sprinkling will be done to assist consolidation. Water will not be sprinkled in case of sandy fill.

The thickness of each unconsolidated fill layer can in this case be up to a maximum of 300 mm. The Engineer will determine the thickness of the layers in which fill has to be consolidated depending on the fill material and equipment used.

Rolling will commence from the outer edge and progress towards the centre and continue until compaction is to the satisfaction of the Engineer, but in no case less than 10 passes of the roller will be accepted for each layer.

The compacted surface will be properly shaped, trimmed and consolidated to an even and uniform gradient. All soft spots will be excavated and filled and consolidated.

At some locations/ areas it may not be possible to use rollers because of space restrictions etc. The BIDDER will then be permitted to use pneumatic tampers, rammers etc. and he will ensure proper compaction.

10.6. Sand filling in plinth and other places

At places backfilling will be carried out with local sand if directed by the Engineer. The sand used will be clean, medium grained and free from impurities. The filled-in-sand will be kept flooded with water for 24 hours to ensure maximum consolidation. Any temporary work required to contain sand under flooded condition will be to the BIDDER's account. The surface of the consolidated sand will be dressed to required level or slope. Construction of floors or other structures on sand fill will not be started until the Engineer has inspected and approved the fill.

10.7. Filling in trenches

Filling in trenches for pipes and drains will be commenced as soon as the joints of pipes and drains have been tested and passed. The backfilling material will be properly consolidated by watering and ramming, taking due care that no damage is caused to the pipes. Where the trenches are excavated in soil, the filling from the bottom of the trench to the level of the centreline of the pipe will be done by hand compaction with selected approved earth in layers not exceeding 8 cm; backfilling above the level of the centreline of the pipe will be done with selected earth by hand compaction or other approved means in layers not exceeding 15 cm. Filling of the trenches will be carried simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.

11. GENERAL SITE GRADING

- 11.1. Site grading will be carried out as indicated in the drawings and as directed by the Engineer. Excavation will be carried out as specified in the specification. Filling and compaction will be carried out as specified under Clause 10.0 and elsewhere unless otherwise indicated below.
- 11.2. If the fill has to be compacted, it will be placed in layers not exceeding 150mm and levelled uniformly and compacted as indicated in Clause 10.0 before the next layer is deposited.
- 11.3. To ensure that the fill has been compacted as specified, field and laboratory tests will be carried out by the BIDDER at his cost.
- 11.4. Field compaction test will be carried out at different stages of filling and also after the fill to the entire height has been completed. This will hold good for embankments as well.
- 11.5. The BIDDER will protect the earth fill from being washed away by rain damaged in any other way. Should any slip occur, the BIDDER will remove the affected material and make good the slip at his cost.
- 11.6. The fill will be carried out to such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.