

SECTION - 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & QUANTITIES

1.1.0 SCOPE

1.1.1 The scope of work under this specification is Balance civil works of Site Levelling Work of 765kV/400kV Jeerat Substation, being executed by BHEL on turnkey basis. The Customer is M/s PMJTL and Consultant is M/s Powergrid Corporation of India Limited.

1.1.2 The Civil Works shall generally include, *but not limited to*, following:
(i) Site Levelling works
(ii) Any other work required for the project.

1.1.3 The works to be performed in the above construction including taking over of land from BHEL/Customer by locating boundary wall coordinates, level of earth using total station if required and verification of input data provided by BHEL/customer at site plus the execution of the work including providing of all labour, supervision, materials, scaffolding, power, fuel, construction equipment like hydraulic excavator, dozer, tipper, Power roller, Vibratory roller etc, tools and plants, supplies, transportation, all incidental items necessary for successful completion of the work including contractor's supervision and in strict accordance with the drawings and specifications and with inspection and testing standards. The nature of work shall include excavation & filling in all types of soil in open areas/nallas/ channels, to the required slopes, shapes, levels, elevations and profile, including trimming of bottom and slopes of excavation, loading/unloading, transporting excavated material, stacking serviceable material, disposal of unserviceable material in disposal areas, filling in low lying areas, bailing out rain (dewatering), pumping, removal of slush, preparing embankments/marginal banks, loosening, dressing, spreading material in layers, verification of contouring data/level of entire area/plot, excavation in all type of soil including dewatering, shoring, strutting, and filling under and around structures, backfilling with available excavated earth around completed structures, transportation & leveling and compaction of surplus earth in low lying area including clearing the land for development from plants & bush vegetation, removal of roots of trees & plants, disposal of unserviceable soil etc all complete as per detailed specification, drawings and directions of Engineer-in-charge.

Before starting of work, bidder has to remove of surface grass, vegetation, brushes etc and disposed it to nearby area. After removal of unusable earth bidder is advised to take contouring of yard for recording earth level. No separate payment shall be made to bidder on account of this and same shall also be deemed to be included in the work. Bidder has to start the cutting of earth from future area by lowering down the earth level and filling the earth in present area to raise the ground level as per drawing and direction of Engineer-In-Charge. Site is already having number of civil contractor working at site and Site levelling work has to be completed simultaneously, hence proper co-ordination shall be made at site to avoid conflict for interfacing/front availability issues.

In addition to this Bidder is advised to visit the site and understand the quantum and nature of work to fully aware the condition of site.

1.2.0 SPECIFIC TECHNICAL REQUIREMENT

1.2.1 All technical requirements shall be as per POWERGRID Technical Specification (Refer SECTION 3)/CPWD specification/IS Codes.

1.3.0 BILL OF QUANTITIES

1.3.1 The Bill of Quantity shall be as per page 3.

1.3.2 The quantities indicated in the 'Bill of Quantity' are indicative and can vary to any extent. Contractor shall not be entitled for any claim for any such variation in the quantities.

1.3.3 The provision of Bill of Quantity, specifications and drawings shall be read in conjunction with each other and in case of conflict amongst them, the clarification shall be obtained from the Engineer-in-charge whose decision shall be final and binding.

1.3.4 Method of measurement:

The mode of measurement for other items shall be as per POWERGRID Technical Specification (Refer SECTION 3).

For other items, unless otherwise described in method of measurement as described in 'Method of Measurement of Building and Civil Engineering Works'- IS 1200 (Part I to XXV) latest edition of BIS shall be followed.

BILL OF QUANTITY CUM PRICE SCHEDULE

Name of Project: 765/400kV Sub-Station, Jeerat (West Bengal)

Name of Work: Civil Works for Land Development Work at Jeerat in West Bengal

Sl. No.	Description of Item	Quantity	Unit	Unit Rate (Rs)	Amount (Rs)
1	LEVELING AND FILLING IN PRESENT SCOPE AREA BY CUTTING OF EARTH FROM FUTURE AREAS INCLUDING MOVEMENT AND MAKING ARRANGEMENT OF APPROACH FOR MOVEMENT OF T&P FROM FUTURE AREA TO PRESENT SCOPE AREA FOR LEVELLING WORK INCLUDING ALL ACTIVITIES TO COMPLETE THE WORK : Earthwork in excavation and filling in all types of soil and soft and disintegrated rock in open areas/nallahs/channels to the required slopes , shapes , levels, elevations and profile including trimming of bottom and slopes of excavation , bailing out rainwater (dewatering), pumping, removal of slush,preparing embankment/marginal banks, loosening, dressing,spreading materials in layers not exceeding 200mm, cutting of grass, brushes, tree as per direction of Engineer-in-charge, water flooding,compacting to achieve 95% consolidation at optimum moisture content ,finishing etc all complete, for all leads and lifts,including disposal of surplus earth and stacking of unsuitable material as per designated location with in customer premises, withall labour , material,tools,tackles and equipment,safeguards and incidentals, taxes etc.as necessary , as per drawings, specifications and direction of the Engineer-In-Charge (only excavation/cutting will be measured for payment purpose).	125000	cum	126.61	15826250.00
TOTAL AMOUNT					15826250.00

SECTION -2

STANDARD TECHNICAL SPECIFICATION

N.A

SECTION -3

ENCLOSURES TO THE SPECIFICATION

- (a) Customer Specification: Technical Specification, Section: Civil Works-ERSS-XVIII
- (b) Standard Technical Specification for Site Levelling
- (c) Standard Field Quality Plan

SECTION: CIVIL

1.0 GENERAL

The intent of this technical specification covers the following

All civil works shall be carried out as per design/drawings provided by the Employer / Contractor and as per these specification provided by the Employer. In case any item is not covered under specification then the same shall be carried out as per CPWD specification and applicable Standards and Codes. Any item for which specification is not provided herein and is not covered under CPWD specification shall be executed as per manufacture guidelines. All materials shall be of best quality conforming to relevant Indian Standards and Codes. In case of any conflict between Standards/ Codes and technical Specification, the provisions of Technical Specification shall prevail.

The Contractor shall furnish all labour, tools, equipment, materials, temporary works, constructional plant and machinery, fuel supply, transportation and all other incidental items not shown or specified but as may be required for complete performance of the Works in accordance with drawings, specifications and direction of Employer.

All materials including cement, reinforcement steel and structural steel etc. shall be arranged by the Contractor. All testing required shall be arranged by the Contractor at his own cost. The Contractor shall execute the work as per latest field quality plan available on POWERGRID website.

The bidder shall fully apprise himself of the prevailing conditions at the Proposed site. Climatic conditions including monsoon patterns, local Conditions and site specific parameters, soil parameters, availability of construction material and shall include for all such conditions and contingent measures in the bid, including those which may not have been specifically brought out in the specifications.

Employer has standardized its technical specification for various items/ works. Specification for items which are covered in the scope and as defined in Section project & BPS need only be referred.

2.0 GEOTECHNICAL INVESTIGATION

- 2.1 The Contractor shall perform a detailed soil investigation to arrive at sufficiently accurate conclusion regarding general as well as specific information about the soil profile and the necessary soil parameters of the site, in order to design and construct the foundation of the various structures safely and rationally.

Power Grid Corporation Of India Ltd
(A Government of India Enterprise)

STANDARD TECHNICAL SPECIFICATION FOR SITE LEVELLING

1.0 GENERAL

1.1 Introduction

These Specifications shall apply to all such works as are required to be executed under the Contract or otherwise directed by the Engineer-in-Charge. In every case the work shall be carried out to the satisfaction of the Engineer-in-Charge and conform to the location, lines, grades and cross-sections shown on the drawings or as indicated by the Engineer-in-Charge. The quality of work and materials shall comply with the requirements set forth in the succeeding sections. Where the drawings and Specifications describe a portion of the work only in general terms, and not in complete details, it shall be understood that only the best general practice is to prevail, materials and workmanship of the best quality are to be employed and the instructions of the Engineer-in-Charge are to be fully complied with.

1.2 Scope of Work

The scope of work covered under this specification is as follows:

- (i) Site Clearance
- (ii) Site levelling;

The work to be performed under these specifications consists of providing all labour, supervision, materials, planking and strutting, power, fuel, construction equipments, tools and plants, supplies, transportation, storage, insurance, royalty and all incidental items not shown or specified by reasonably implied or necessary for successful completion of work including contractor's supervision and in strict accordance with drawing and specifications.

The scope may however vary based on the specific requirement of various works/site, which shall be specified by the Owner in the form of addendum/modifications.

1.3 Definition:

The words like Contract, Contractor, Engineer-in-Charge, Drawings, Corporation, works, Site used in these Specifications shall be considered to have the meaning as understood from the definition of these terms included in the General Conditions of Contract.

1.4 General Rules for the measurement of works for payment

All measurements shall be made in the metric system. Different items of work shall be measured in accordance with the procedures set forth in the relevant sections read in conjunction with the General Conditions of Contract.

All measurements and computations, unless otherwise indicated, shall be carried nearest to the following limits:

(i) Length and breadth	...	10 mm
(ii) Height, depth or thickness of work.	...	5 mm
(iii) Areas	...	0.01 Sq. metres.
(iv) Cubic contents.	..	0.01 Cu. metres.

In recording dimensions of work the sequence of length, width and height or depth or thickness shall be followed.

1.5 Scope of Rates for Different Items of Work:

The contract unit rates for different items of work shall be for payment in full for completing the work to the requirements of the Specifications including full compensation for all the operations detailed in the relevant sections of these Specifications under 'Rates'. The rates are to be considered as the full inclusive rate for finished work covering all labour, tools, equipments, materials, wastage, temporary work, plant, overhead charges and profit as well as the general liabilities, obligations and risks arising out of the General Conditions of Contract.

2.0 SITE CLEARANCE:

2.1 Jungle Clearance (Clearing and Grubbing)

2.1.1 Description:

The work shall consist of numbering of trees, removing and disposing of all materials such as trees, bushes, woods, shrubs, grass, stumps, rubbish, rank vegetation, roots, foreign materials, etc., which in the opinion of the Engineer-in-Charge are unsuitable for incorporation in the works, from within the limits and areas as may be specified on the drawings or directed by the Engineer-in-Charge. Clearing and grubbing item is

payable for the location not covered under the area of earth work in excavation and filling as decided by the Engineer In-Charge in accordance with the requirements of these Specifications.

2.2 Cutting of Trees:

All trees up to a girth (perimeter) of 30 cm measured at one metre above the ground level shall also be cut and useful portion of the trees so cut shall be stacked at a suitable place as directed by the Engineer-in-Charge and shall be considered incidental to clearing and grubbing operations. Trees having girth above 30 cm are also to be cut and stacked separately as directed by Engineer-in-charge

The roots of trees shall be dug up to 60 cm below the ground level or 15 cm below formation level whichever is lower and after removal of all vegetable and organic matter from the holes so formed by removal of the roots, holes and hollows shall be filled with good earth in layer of 20 cm, well rammed, consolidated and levelled.

Where roots still exists at 60 cm depth, the same shall be excavated and further removed completely as directed by the Engineer-in-Charge. The serviceable and unserviceable materials obtained from the site clearance shall be removed from the area and disposed of to a place as per the directions of the Engineer-in-Charge. All unserviceable and serviceable materials obtained from the site clearance shall be the property of Power Grid.

Trees of girth larger than 30 cm shall be numbered with white paint on a black background and the number shall be such that the trees are easily identifiable. After the numbering, the Engineer-in-Charge shall indicate the trees which are to be cut and removed. After the written approval of the Engineer-in-Charge, all such trees which are required to be felled shall be cut by using suitable instruments and the trees so cut shall be stacked at suitable locations as directed by the Engineer-in-Charge. The roots of the trees cut shall be completely removed. This item shall include removal of roots up to 100 cm below the ground level or 50 cm below the formation level whichever is lower. After the trees are cut and roots are taken out, holes and hollows shall be cleaned of all organic and vegetable matter and shall be filled with good earth in layers of 20 cm well rammed, consolidated and levelled. The trunk and branches of trees shall be cut into suitable pieces and removed to stack at suitable locations as directed by the Engineer-in-Charge.

2.3 Preservation of Property/Amenity:

Trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all facilities within or adjacent to the works being carried out which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own expenses, suitable safeguards approved by the Engineer-in-Charge for this purpose.

2.4 Methods, Tools, and Plants:

Only such methods, tools and plants as are approved by the Engineer-in-Charge and will not effect the property to be preserved shall be adopted for the work. All trees, stumps, etc. falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 0.5 metre of the ground level. Also, all vegetation such as roots, undergrowth, grass and other deleterious matter unsuitable for incorporation in the filling shall be removed between fill lines to the satisfaction of the Engineer-in-Charge. On areas beyond these limits, trees and stumps required to be removed shall be cut down to below ground level so that these do not present on unsightly appearance.

All excavations below the general ground level arising out of the removal of trees, stumps, etc. shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding area.

2.5 Disposal of Materials:

All materials arising from clearing and grubbing operation shall be the property of Power Grid and be disposed of by the Contractor as hereinafter provided or directed by the Engineer-in-Charge within a lead of 1000 m beyond the periphery of area cleared.

Trunks and branches of trees shall be cleaned of limbs and tops and stacked neatly at places as indicated by the Engineer-in-Charge. Also boulders, stones and other materials usable shall be neatly stacked.

All products of clearing and grubbing which in the opinion of the Engineer-in-Charge cannot be used or auctioned shall be cleared away to waste areas and burnt, if so desired, at locations away within a lead of 1000 m beyond the periphery of area cleared in a manner as directed by the Engineer-in-Charge. Care shall be taken to see that unsuitable waste materials are disposed of in such a manner that there is no likelihood of these getting mixed up with the materials meant for

filling.

2.6 Measurement for Payment:

Clearing and Grubbing as described above, includes removal of trees up to a girth of 30 cm, bushes, woods, shrubs, grass, stumps, rubbish, rank vegetation, roots, other organic matter, etc. The unit of measurement shall be in Sq. m. Cutting of trees equal to or less than 30 cm in girth shall be considered incidental to the clearing and grubbing operations.

Cutting of trees above 30 cm in girth shall be paid for in terms of number according to the girth sizes given below:

- (i) Above 30 cm to 60 cm
- (ii) Above 60 cm; to 120 cm
- (iii) Above 120 cm to 240 cm
- (iv) Above 240 cm.

For this purpose, the girth shall be measured at a height of one metre above the ground level. The useful portion of the trees so cut shall be stacked at a suitable place as directed by the Engineer-in-Charge.

2.7.0 Rates:

2.7.1 The contract unit rates for the various items of clearing and grubbing Shall be paid in full for carrying out the required operations including Cutting of trees with a girth up to 30 cm, removal and stacking at a Place as directed by the Engineer-in-Charge, full compensation for all Labour, materials, tools, equipment and incidentals necessary to Complete the work. These will also include excavation and Backfilling of holes so formed for removal of roots wherever Necessary, and for handling, salvaging, piling and disposing of the Cleared materials within all lifts and up to a lead of 1000 metres Beyond the area under clearing and grubbing.

2.7.2 The trees above 30 cm in girth shall be enumerated girth wise under 4 Categories mentioned above in Para 2.6. The contract unit rate for cutting, removal and stacking of trees above 30 cm in girth shall Includes removal of stumps as well.

3.0 SITE LEVELLING WORK:

3.1 Description:

Before the earth work is started, the area coming under cutting and filling shall be cleared of shrubs, rank vegetation, grass, bush, wood, tress and sapling of girth up to 30 cm at a height of one meter above ground level, stacking of trees/saplins cut and rubbish removed up to 1000 meter beyond levelling boundary, the roots of trees and saplings shall be removed and the holes and hollows filled up with the earth, rammed and levelled. The aforesaid activities shall be deemed to be included in the item of earth work and nothing extra shall be payable on this account. Site levelling work shall consist of excavation, filling and other levelling operations, removal and satisfactory disposal of all materials necessary for achieving desired formation level, if required, in accordance with the requirements of these specifications and the lines, grades and cross-sections shown in the drawings or indicated by the Engineer-in-Charge. The work shall include the hauling and stacking of or the hauling to levelling site, of suitable materials as required, as also the disposal of unsuitable materials in specified manner; and the trimming and finishing of works.

The work to be performed under the specification consist of providing all labour, supervision, materials, planking and strutting, power, fuel, mechanical implements, tools and plants, supplies, transportation, storage, insurance, royalty,taxes and all incidental items not shown or specified but reasonably implied or necessarily implied for successful completion of the work, and in strict accordance with the drawings and specifications. The nature of work shall generally involve clearance of site, excavation in all kinds of soils, soft/disintegrated rock, hard rock, dewatering, transporting of excavated earth, filling, consolidation of earth, levelling benching, giving slopes and making formations as per drawings and instructions of the Engineer-in-Charge. This work also includes cutting of diversion channel to prevent the area from flooding and construction of kuchcha surface drains for drainage of the area. The drawing attached to the tender document provides a general idea about the work to be performed under the scope of this contract. This is a preliminary drawing for tender purpose only and is by no means the final drawings or show the full range of the work under the scope. The work shall be executed according to "Released for Construction", drawings with additions, alterations and modifications made from time to time as required or approved by the Engineer-in-Charge and also according to any other drawings that would be supplied to the Contractor progressively during the execution of the Contract.

3.2 Classification of Excavated Materials:

All materials involved in excavation shall be classified by the Engineer-in-Charge in the following groups:

3.2.1 All kind of Soils and soft/disintegrated rock

The material which can be quarried/ excavated with pick , shovel, jumpers, scarifiers, crowbars and other mechanical implements. All materials involved under this classification are as below:

All kind of soils : It includes various types of soils, plain concrete below ground level, shingle and river or nallah bed boulders, soling of road, paths and hard core, macadam surface of any description, stone masonry below the ground level, soft conglomerate and laterite stone which can be detached from the matrix with picks and shovel.

Soft/disintegrated Rock (Not requiring blasting): Rock and boulders which may be quarried and split with crow bars and other mechanical implements etc. It includes lime stone, sand stone, hard conglomerate.

3.2.2 Hard Rock:

All kind of rocks which can be excavated by machines and requires blasting chiselling in edging or in another agreed method. This can be classified under the following categories:

(a) Hard Rock (Requiring Blasting)

This shall comprise:

- (i) Any rock for the excavation of which the use of mechanical plant *or* blasting is required;
- (ii) Reinforced cement concrete (reinforcement cut through but not separated from the concrete) below ground; and
- (iii) Boulder requiring blasting.

(b) Hard Rock (Blasting Prohibited)

Hard rock requiring blasting as described under (a) above but where blasting is prohibited for any reason and excavation has to be carried out by chiselling, wedging *or* any other agreed method.

3.3 Authority for Classification:

The classification of excavation shall be decided by the Engineer-in-Charge and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer-in-Charge. All the excavated material shall be the property of the Power Grid.

3.4 Site Levelling Operations:

3.4.1 Setting out and marking profiles.

After the site has been cleared, the limits of site levelling shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer-in-Charge. The Contractor shall provide all labour, survey instruments and materials such as strings, pegs, nails, bamboos, stones, lime, mortar, concrete, etc., required in connection with the setting out of works and establishment of bench marks. A grid system of co-ordinates shall be established by the Contractor at the site. The Contractor shall be responsible for the maintenance of permanent reference pillars, bench marks and other marks and stakes as long as in the opinion of the Engineer-in-Charge they are required for the work. All such marks/pillars shall be removed by the Contractor at his own cost as soon as the purpose is over.

Masonry pillars shall be erected at suitable places in the area to serve as bench marks for the execution of the work. These bench marks shall be connected with G.T.S. of any other permanent bench mark approved by the Engineer-in-Charge. Necessary profiles with pegs, bamboos and strings or "*Burgeis*" shall be made to show the correct formation levels before the work is started and the same shall be approved by the Engineer-in-Charge. The contractor shall supply all labour, tools, equipment, materials, safeguards and incidentals necessary for setting out and making profiles and *burgeis* & pillars for the work at his own cost. The profiles and *burgeis* shall be maintained during the execution of the work.

Marks/pillars shall invariably be diagonal unless other wise directed, and should be such that their average height is representative of average depths. Payments will be made on the basis of volume measurement after with-holding the amount corresponding to 5% of the volume of earth work on account of non-removal of marks/pillars. The Contractor shall have to remove the marks/pillars and utilise the earth spoils as per the directions of the Engineer-in-Charge. The withheld amount as stated in the above paragraph may be paid after

certification of the Engineer-in-Charge; regarding his full satisfaction and to the effect that the mark/pillars, etc. have been removed and soils/earth thereof has been utilised as directed by him.

If the contractor fails to remove, partly or fully the marks/pillars in the manner and within the period as aforesaid double the amount spent by the owner for removal of marks/pillars will be recovered from dues payable to the contractor.

3.4.2 Excavation and Filling -General

All excavations shall be carried out in conformity with the directions laid Here in under and in a manner approved by the Engineer-in-Charge. The work shall be so done that the suitable materials available from excavation are satisfactorily utilised as decided upon before disposal.

While planning or executing excavation, the Contractor shall take all adequate precautions against soil erosion, water pollution, air pollution etc.

The excavations shall conform to the lines, grades, side slopes and levels shown on the drawings or directed by the Engineer-in-Charge. The Contractor shall not excavate outside the slopes or below the established grade or loosen any material outside the limits of excavation. Subject to the permitted tolerances, any excess depth excavated below the specified levels shall be made good at the cost of the Contractor with suitable material of similar characteristics and compacted to the required density and to the satisfaction of the Engineer-in-Charge.

All debris and loose material on the slopes of cuttings shall be removed.

Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be allowed. Final surface shall be neatly dressed. The earth from cutting shall be directly used for filling and no extra claim for double handling of earth shall be admissible to the contractor.

All cutting shall be done to the required slopes/shapes, levels and profiles as indicated in the construction drawing with a negative tolerance of 100 mm. If cutting be taken deeper, it shall be brought to the required level as per the instructions of the Engineer-in-Charge, by filling in with the earth and duly Consolidating at the Contractor's cost.

Filling shall be done in regular horizontal layers not exceeding 20 cm. in

depth. The earth shall be free from all roots, grass, rubbish and humps and clods exceeding 80mm in any direction shall be broken. Each layer shall be consolidated by breaking clods and Compacting each layer with wooden /steel rammer or movement of dozers, trucks or 8/10 tonne power road rollers, sheep foot roller and vibratory compactors etc. so that compaction of 95% of the maximum dry density is achieved at optimum moisture content. The surface finished shall be neatly dressed to the required formation levels with tolerance of (\pm) 100 mm.

Tests for Compaction are to be performed as per the procedures laid down in the relevant I.S. Codes of practice and Standard Field Quality Plan of Power Grid. In cases of compaction below the stipulated percentage, the contractor shall adopt proper techniques as directed by the Engineer in-Charge and to his satisfaction to ensure the specified degree of compaction. The cost of tests to be performed shall be borne by the Contractor.

During the execution of work, natural drainage of the area shall be maintained by the contractor.

3.4.3 Hard Rock Excavation.

Hard Rock, when encountered during excavation, shall be removed up to the finished ground level *or* as indicated on the drawings. In all cases, the excavation operations shall be so carried out that at no point on cut formation the rock protrudes above the specified levels, provided, however, that a negative tolerance of 150 mm shall be permissible.

Slopes in rock cutting shall be finished to uniform lines corresponding to slope lines shown on the drawings *or* as directed by the Engineer-in-Charge. Notwithstanding the foregoing, all loose pieces of rock on excavated slope surface which move when prised by a crowbar shall be removed.

Blasting shall be carried out as per clause 3.9 and all precautions indicated therein to be observed.

3.4.4 Dewatering

If water is met with in the excavation due to stream flows, springs, seepage, rain or other causes, it shall be removed by suitable diversions, pumping or bailing out and other excavation kept dry whenever so required or directed by the Engineer-in-Charge, Care shall be taken to so discharge the drained water as not to cause damage to the works, crops or any other property. No extra payment

shall be admissible to the contractor on this account.

3.4.5 Disposal of excavated Materials.

All the excavated materials shall be the property of Power Grid. Where the excavated material is directed to be used in the filling area, it shall be directly deposited at the required location complying with the total requirements. All disposed material other than hard material shall be spread in layers at the places within specified leads. All hard materials, such as hard moorum, rubble, etc., not intended for use in the filling, shall be stacked neatly on Corporation land as directed by the Engineer-in-Charge within the lead specified for the item, for future use such as pitching. Unsuitable and surplus materials not intended for use in any part of the works shall be disposed of as directed by the Engineer-in-Charge.

3.4.6 Plying of Construction Traffic.

Construction traffic shall not use the levelled area without prior permission of the Engineer-in-Charge. Any damage arising out of such use shall be made good by the Contractor at his own expense.

3.4.7 Preservation of Property

The Contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing roadside trees, drains, sewers or other subsurface drains, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which in the opinion of the Engineer-in-Charge shall be continued in use without any change. Safeguards taken by the Contractor in this respect, shall be got approved by him from the Engineer-in-Charge. However, if any of these objects is damaged by reason of the Contractor's negligence, it shall be replaced or restored to the original condition at his expense.

3.4.8 Finishing Operations.

Finishing operations shall include the work of properly shaping and dressing all excavated surfaces. When completed, no point on the slopes shall vary from the designated slopes by more than 150 mm measured at right angles to the slope, except where excavation is in rock where no point shall vary more than 600 mm from the designated slope. In no case shall any portion of the slope encroach on the road way.

3.5 Earth Fill

3.5.1 Suitable Material

The borrowed earth used in filling shall be free from all roots, grass, shrubs, rank vegetation, brush wood, tree sapling and rubbish.

3.5.2 Unsuitable Material

Unsuitable material shall mean materials unsuitable for placing as fill in the works and shall comprise:

- (1) Material from swamps, marshes and bogs;
- (2) Peat, logs, stumps and perishable materials;
- (3) Material susceptible to spontaneous combustion;
- (4) Any natural material or industrial and domestic produce which will adversely affect other materials in the work;
- (5) Clay with liquid limit exceeding 80% and/or plasticity index exceeding 5570.

3.5.3 Spreading and Compaction of Filling.

For the earth works contractor shall satisfy the Engineer-in-Charge that the entire specified requirement regarding compaction can be achieved.

The Final formation shall be correct in level and profile after compaction.

In the case of earth work consolidated under optimum moisture conditions, each layer of earth shall be carefully moistened to give field moisture content of about + 1% to - 2% of the optimum moisture content (OMC). The OMC shall be determined according to IS: 2720 (Pt.VII &VIII) Methods of Tests for Soils.

Each layer shall then be compacted by rolling with wooden/ steel rammer or movement of dozers, trucks, 8/10 tonnes power road roller, sheep foot roller and vibratory compactors . The required amount of water shall be added during consolidation to keep the moisture content of the soil at the optimum as per test. The density to be achieved for each layer of the material shall not be less than 95% of the density obtained in the laboratory (Proctor Method).

Control on compaction in the field shall be exercised through frequent moisture content and density determinations. A systematic record of these shall be maintained. At all times during construction the top of the embankment shall be maintained at such cross fall as will shed water and prevent pounding.

3.6 Testing shall be carried out as per standard field quality plan of Power--Grid.

3.7 Measurement for Payment.

The ground levels shall be taken at every 5 metres distance and at closer distances where pits, undulations, etc. are met with. The ground level shall be recorded in field book, plotted on plans and shall be signed by contractor and the Engineer-in-Charge before the earth work is started.

The levels of the area after excavation shall be recorded in the field book duly signed by the Engineer-in-Charge and contractor. The labour, materials, tools, equipment, safeguards and incidentals required for taking levels shall be supplied by the contractor at his own cost.

In case of filling with borrowed earth, the measurement shall be based on levels of area under filling only.

3.7.1 Earth work in Excavation and filling.

The quantity of excavation in all types of soil and soft/disintegrated rock shall be worked out by using initial and final levels. No void deduction shall be made to calculate net quantity of earth work. Only Excavation/cutting will be measured for payment purpose. The unit of measurement shall be in cubic metre.

In case hard rock is encountered during excavation, the level of rock surface before start and completion of rock excavation shall be recorded for calculating the quantity of excavation of hard rock. The volume of hard rock shall be computed on the basis of stacks of excavated rubble after making 50 % deduction for voids. The item of excavation in hard rock shall be payable separately.

The quantity of earth work in excavation in all kinds of soil & soft/disintegrated rock shall be arrived by reducing quantity of hard rock from the gross excavated quantity.

The unit rate shall include all lifts and all leads within levelling boundary. It also includes disposal of surplus earth and stacking of unusable material up the lead of 1000 meters beyond the levelling boundary

3.7.2 Earth work in excavation in all types of Soils and Soft /disintegrated rocks, Hard Rocks and disposal.

Quantity of excavation in all type of soils and soft/disintegrated rocks shall be worked out based on initial level before start of excavation and final levels after excavation. No void deduction shall be made to calculate net quantity of earth work in excavation. The excavated soil and soft/disintegrated rock shall be used for filling in lower areas of the substation. The unit rate shall include disposal of excavated material for leads up to 1000 meters beyond the levelling boundary.

For hard rock excavation, the volume of hard rock shall be computed on the basis of stacks of excavated rubble after making 50 per cent deduction for voids. The unit of measurement shall be in cubic meter. The unit rate shall include stacking, disposal of excavated material for leads up to 1000 meters beyond the levelling boundary.

Where soil, soft/disintegrated rock and hard rock are mixed, The quantity of earth work in excavation in all kinds of soil & soft/disintegrated rock shall be arrived by reducing quantity of hard rock from the gross excavated quantity.

3.7.3 Filling using earth borrowed from outside the substation land.

The quantity of earth shall be worked out based on initial and final levels of levelling area. No void deduction shall be made to calculate net quantity of earth work. The unit of measurement shall be in cubic meter. The rate shall include arrangement of borrow area, payment of royalty, transportation, laying compaction, all leads and lifts etc.

3.8 Rate:

Rate for each item shall include all operations specified in the respective clause of technical specification of Site Levelling Work.

3.9 Blasting Operations.

3.9.1 General.

Blasting shall be carried out only with the written permission of the Engineer-in-Charge. All the statutory laws, regulations, rules, Indian Standards, etc., pertaining to the acquisition, transport, storage,

handling and use of explosives shall be strictly followed.

The Contractor may adopt any method or methods of blasting consistent with the safety and job requirements, after approval from the Engineer-in-Charge and shall muffle the blasting adequately to the satisfaction of the Engineer-in-Charge. Blasting should be carried out as far as possible with the help of Ammonium Nitrate mixed with proper proportions of fuel oil which is a safer method. However, in the event of its non-availability the convenient practice of using gelatine with detonators can be resorted to.

The magazine for the storage of explosives shall be built to the designs and specifications of the Explosives Department concerned and located at the approved site. No unauthorised person shall be admitted into the magazine which when not in use shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The magazine shall have an effective lightning conductor. The following shall be hung in the lobby of the magazine.

- (a) A copy of the relevant rules regarding safe storage both in English and in the language with which the workers concerned are familiar.
- (b) A statement of up to date stock in the magazine.
- (c) A certificate showing the last date of testing of the lightning conductor, (d) A notice that smoking is strictly prohibited.

In addition to these, the Contractor shall also observe the instructions in following clauses and any further additional instructions which may be given by the Engineer-in-Charge and shall be responsible for damage to property and any accident which may occur to workmen or the public or the materials on account of any operations and blasting. The Engineer-in-Charge shall frequently check the Contractor's compliance with these precautions.

3.9.2 Materials, tools and Equipment.

All the materials, tools and equipment used for blasting operations shall be of approved type and shall be arranged by the contractor from any authorised dealer of such approved material. Necessary assistance in the form of approval for procurement of the material shall be given by the Corporation. The contractor shall be fully responsible for entering into the agreement with any authorised magazine contractor in respect of rates, regularity of supply, etc. the Engineer-in-Charge may specify the type of explosives to be allowed in special cases. The fuse to be used in wet locations shall be sufficiently water-resistant as to be unaffected when immersed in water for 30 minutes.

The rate of burning of the fuse shall be uniform and definitely known to permit such a safe length being cut as will permit sufficient time to the firer to reach safety before explosion takes place. Detonators shall be capable of giving effective blasting of the explosives. The blasting powder, explosives, detonators fuses, etc., shall be fresh and not damaged due to damp, moisture or any other cause. They shall be inspected before use and damaged articles shall be discarded totally and removed immediately.

3.9.3 Personnel

The blasting operation shall remain in the charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the details of handling explosives and blasting operations.

3.9.4 Blasting Operations.

The blasting shall be carried out during fixed hours of the day preferably during the mid-day lunch hour or at the close of the work as ordered in writing by the Engineer-in-Charge. The hours shall be made known to the people in the vicinity. All the charges shall be prepared by the man in charge only. Proper precautions for safety of persons and property shall be taken.

Red danger flags shall be displayed prominently in all directions during the blasting operations. People, except those who actually light the fuse shall be prohibited from entering this area. The flags shall be planted 200 metres from the blasting site in all directions and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning whistle being sounded for the purpose.

The charge holes shall be drilled to required depths and in suitable places. Blasting should be as light as possible consistent with thorough breakage of the material necessary for economic loading and hauling. Any method of blasting which leads to overshooting shall be discontinued.

When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and the powder dropped in. The powder shall be gently tamped with copper rods with rounded ends. The explosive powder shall then be covered with tamping material which shall be tamped lightly but firmly.

At a time, not more than 10 such charges will be prepared and fired. The man in charge shall blow a whistle in a recognised manner for cautioning the people. All the people shall then be required to move to safe distances. The charges shall be lighted by the man in charge only. The man in charge shall count the number of explosions. He shall

satisfy himself that all the charges have been exploded before allowing the workmen to go back to the work site.

When blasting is to be carried out in the proximity of other existing structures, sand/earth bags, etc. shall be used on the top of the blast holes to prevent the rock fragment from causing damage to the structures.

However, when blasting is prohibited for any reasons the excavation shall be carried out by chiselling, wedging or any other agreed method.

3.9.5 Misfire

In case of misfire, the following procedure shall be observed: (i) Sufficient time shall be allowed to account for the delayed blast. The man in charge shall inspect all the charges and determine the missed charges, (ii) If it is the blasting powder charge it shall be completely flooded with water. A new hole shall be drilled at about 45 cm. from the old hole and fired. This should blast the old charge. Should it not blast the old, the procedure shall be repeated till the old charge is blasted. If a misfire has been found to be due to defective detonator, the whole quantity in the box from which defective article was taken must be sent to the authority directed by the Engineer-in-Charge for inspection to ascertain whether all the remaining materials in the box are also defective.

3.9.6 Account.

A careful and day to day account of the explosives shall be maintained by the Contractor in an approved register and manner which shall be open to inspection by the Engineer-in-Charge at all times.

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					Agency	Extent		
1.	Detailed Soil Investigation	a) Bore log	1. Depth of bore log 2. SPT Test 3. Collection of samples	As per POWERGRID Specification	Contractor	100% at Field	To witness 20% at Field	Site Engineer
		b) Tests on samples	As per tech. Specs.	As per POWERGRID Specification	Contractor (Testing in POWERGRID accepted Lab)	100% by testing lab (Reports to be signed by Testing person & Checking person)	Review of lab test results (All soil reports to have signature of POWERGRID executive reviewing the report)	Site In-charge based on the guide line issued by CC Engg. as Annex-6
2.	Earth Work (site leveling)							
		1. Mandatory testing for filling						
			1. Proctor compaction test for maximum dry density	IS:2720(part-7) & Specification	Contractor from Powergrid approved Lab.	One sample per 25000 Cu. m. for each type & source of filling material.	100% review of lab test results	Site In charge
			2. Optimum Moisture Content	do	Contractor/ From Powergrid approved Lab.	do	do	do
		2. Field Compaction Test	1. Field dry density & Moisture content test for each layer of compaction.	IS:2720 (part-29), & POWERGRID Specification	Contractor Field lab./ Powergrid approved Lab.	One sample for every 2500 sqm. or part there of for compacted soil for each compacted layer.	do	do

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					Agency	Agency		
3.	Checking of foundation Material							
	A. Materials	1. Cement	1. Brand approval	Cement of approved brands according to the COV in POWERGRID web site may be procured.	Contractor	As proposed by Contractor	Any new brand cement proposed by Contractor shall be assessed by RHQ-FQA and approved by Regional Head. After approval, details shall be forwarded to CC-QA&I for uploading in COV.	FQA-RHQ
			2. Physical tests	As per document at Annexure-I of this FQP	Contractor Samples to be taken jointly with POWERGRID and tested at POWERGRID accepted lab	Review of 100% MTC's and one sample for every Batch No. of Manufacturer.	100% review of lab test results and MTC. Test results shall be sent by the Lab, by E mail directly to POWERGRID; further, hard Copy of Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address.	Site in charge
			3. Chemical Tests Chemical composition of Cement	-do-	Contractor to submit MTC	Review of all MTC's	100% review of MTC results	Site In charge
		2. a) Reinforcement Steel	1. Source approval	May be procured either from main producers directly or through the authorized dealers who can produce MTC from main producers with traceability. Refer COV in POWERGRID web site, for List of Main Producers of Re-enforcement Steel.	Contractor	As proposed by contractor.	Material shall be supplied from Main producers / authorized dealers.	Site in charge.

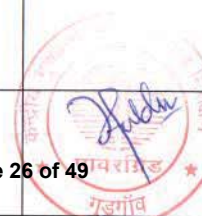
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			2. Physical and Chemical analysis test	As per annexure-2 of this FQP	Contractor to submit MTC	100% MTC's One sample* / 500 MT / Manufacturer shall be jointly sealed by POWERGRID and tested at POWERGRID approved Lab. *Note: All sizes of 10mm and above shall be taken for testing in every 500MT.	100% review of MTC, and embossing. 1) Review of lab test results. Test results shall be sent by the Lab, by E mail directly to POWERGRID; further, hard Copy of Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address. 2) Unit weight of three samples to be witnessed.##	site In charge Site Engineer
## Three samples of each size of Reinforcement steel (all sizes of 10mm & above) out of 100MT steel Lot need to be physically weight at site in presence of POWERGRID to ascertain their acceptance as per technical specification. The weighted samples at site may be kept under custody for three months for further examination by any auditing authority (if required).								
		2. b) Miscellaneous structural steel excluding cable trench, transformer & reactor fdn.	Source to be proposed by contractor.	Source with material meeting POWERGRID Specification	contractor	As proposed by contractor	To verify documents.	site In charge
			1. Dimensional check 2. Visual check for damages rusting pitting etc	POWERGRID specification and approved drawing	Contractor	100%	random	Site Engr
		2.c) Structural steel used in cable trenches, transformer	Source to be proposed by contractor.	POWERGRID Specification	Contractor	As proposed by contractor	To verify documents.	



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		Items to be Checked			Agency	Extent		
			1. Dimensional check	POWERGRID specification and approved drawing	Contractor	100%	random	Site Engr
			2. Visual check for damages rusting pitting etc.	POWERGRID specification and approved drawing	Contractor	100%	random	Site Engr
			3. Visual check for welding defects primer coating and painting/ galvanizing as applicable	POWERGRID specification and approved drawing	Contractor	100%	Random	Site Engr
			4. Physical properties of Structural steel	IS:2062 POWERGRID specification and approved drawing	Contractor	1 sample per lot of 40MT or part thereof for tensile tests and 1 sample per lot of 20MT or part thereof for bend test of each size.	Review of lab test results by POWERGRID.	Site Engr
		3. Coarse Aggregates	1. Source approval	Source meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry & based on the test results of Joint samples tested in POWERGRID accepted lab	To review the proposal based on the documents	Site In-charge. Once approved, the particular source shall be used for all the running contracts under various Packages.

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					Agency	Extent		
			2. Physical tests	As per document at Annexure-3 of this FQP	Samples to be taken jointly and tested in POWERGRID accepted lab	One sample per 500 cum or part thereof per source, Samples to be tested by Contractor in POWERGRID accepted lab.	100% review of lab test results. Out of these 100% samples, POWERGRID shall witness at TPL, 5 samples selected at random, spread during the overall execution period of contract .	Site In charge
		4. Fine aggregate	1. Source approval	Source meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry and based on the results of Joint samples tested in POWERGRID accepted lab.	To review the proposal based on the documents.	Site In-charge. Once approved, the particular source shall be used for all the running contracts under various Packages.
			2. Physical test	As per Annexure-4 of this FQP	Samples to be taken jointly and tested in POWERGRID accepted lab	One sample per 500cum or part thereof per source, Samples to be tested by Contractor in POWERGRID accepted lab.	100% review of lab test results. Out of these 100% samples, POWERGRID shall witness at TPL, 5 samples selected at random, spread during the overall execution period of contract.	Site In charge
		5. Water	1. Cleanliness	POWERGRID Specification (Water shall be fresh and clean)	Contractor	100% visual check at Field	Verification at random	Site Engineer

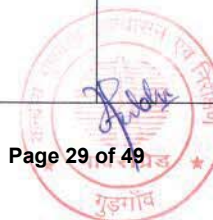
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			2. PH Value	- do -	Contractor	One sample per source	100% review of the test results Ph value not less than 6	Site Engineer
		6.Finishing materials of building	Physical verification of Different items as per specification	As per Spec.	Contractor	100%	MTC/Manufacturer catalogue To be reviewed by POWERGRID.	Site In charge.
	B. Concrete Works a)Before concreting							
		1. Dimensions of excavation	Dimension & Depth of foundation	Appd. Drgs.	Contractor	100% at Field	100% check by POWERGRID	Site. Engr.
		2. Stub setting/Setting of Foundation Bolts, Embedments etc.	1) Centre Line	-do-	-do-	-do-	-do-	*.-do-
			2) Diagonals	-do-	-do-	-do-	-do-	*.-do-
			3) Level of stubs./ Foundation bolts	-do-	-do-	-do-	-do-	*.-do-



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		3. Reinforcement steel	Placement	Bar bending schedule	-do-	-do-	-do-	-do *-At least 5% locations shall be cross verified by immediate Reporting officer/ Site In charge, at Random with respect to stub setting and reinforcement steel placement
	b) During concreting	1. Workability	Slump test	Range 25 mm to 75 mm refer document at Annexure-5 of this FQP	Contractor	Minimum 01 sample per day	20% check at random	Site Engr.



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		2. Concrete Strength	Cubes Comp Strength	CPWD SPEC as referred in document at annexure-5 of this FQP	<p>Contractor</p> <p>Casting of cubes at site.</p> <p>Cubes to be tested for 28 days strength at POWERGRID appd. Lab /POWERGRID Lab/At site (if testing machine installed by contractor is duly calibrated by NABL Lab.)</p> <p>Cubes at 100% location are to be taken in presence of POWERGRID officials.</p>	<p>One sample of 3 cubes for every 20 Cum or part thereof. (Mini. Qty. required for testing is 5 cu. m. for each day of concrete).</p>	<p>100% review of Lab test results. Cubes at 100% location are to be taken in presence of POWERGRID officials. Normally testing shall be carried out at the Cube Testing Facility installed at POWERGRID premises, in the witness of POWERGRID. Alternatively, samples shall be tested at POWERGRID approved Labs.</p> <p>In this case, test results shall be sent by the Lab, by E mail directly to POWERGRID; Further, hard Copy of Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address. Further, POWERGRID to witness testing on 20% samples and also to review 100% test results.</p>	<p>Site Engineer.</p> <p>10% samples to be witnessed at TPL by POWERGRID Site Engineer and at least 5% samples at random, shall be witnessed by Site In-charge. In-case of Site / POWERGRID Lab, 100% witnessed by POWERGRID representative.</p>
	c) Backfilling	Watering & Ramming for compaction	a) Visual	POWERGRID Spec	Contractor	100%	Random	Site Engr.

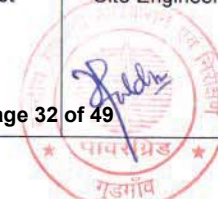
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			b) Compaction Test	POWERGRID Spec	Contractor At Site/ Power grid Accepted Lab	a) One Sample of three specimen for 50% of tower location b) One Sample of three specimen for 20% of Equipment Foundation location c) 3 Samples (three specimen for one sample) for every Building (The depth of sampling and the locations shall be decided by Site Engineer)	Physically at Random & 100% review of Test results	Site In charge
4.	Pile foundations	REFER SFQP OF SWITCHYARD PILE WORK						
5.	Brick Masonry							
		a) BRICKS	1.Dimensional tolerance	POWERGRID Specification/enclosed annexure 6	Contractor (samples to be taken jointly and tested in POWERGRID accepted lab)	Enclosed Annexure 6	Review 100% of test results	Site Engineer



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					Agency	Extent		
			2.Compressive strength	POWERGRID Specification/enclosed annexure 6	-Do-	-Do-	-do-	Site Engineer
			3.Water Absorption	POWERGRID Specification/enclosed annexure 6	-Do-	-Do-	-do-	Site Engineer
			4.Efflorescence	POWERGRID Specification/enclosed annexure 6	-Do-	-Do-	-do-	Site Engineer
		b) Mortar Mix	Cement sand Proportion	As per POWERGRID Spec	Contractor	100%	random	Site Engr
6.	P.C.C	Grade , thickness, plan dimension	completeness	IS:456 and POWERGRID approved foundation drawings & specification	Joint Inspection by POWERGRID and CONTRACTOR	For all locations	Joint Inspection by POWERGRID and CONTRACTOR	Site Engr.
7.	PLASTERING							
		1.Plastering	thickness and evenness	As per POWERGRID Spec.	Contractor	100%	Random	Site Engr
		2. ingredients	Mortar Mix/Proportion	As per POWERGRID Spec.	Contractor	100%	Random	Site Engr
8.	Switchyard earthing							
		1. Check for dimension of earth mat	Physical check	POWERGRID spec & approved drawings	contractor	100%	Random	Site Engr

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		2. Depth of excavation	Physical check	POWERGRID spec & approved drawings	Contractor	100%	Random	Site Engr
		3. Check for weld joints and anti corrosion treatment	Physical check	POWERGRID spec & approved drawings	Contractor	100%	Random	Site Engr
9.	Site surfacing							
		1.Leveling, Level & Height & evenness	Physical Check	POWERGRID spec & approved drawings	Contractor	100%	Random	Site Engr
		2. Soil sterilization : spraying of chemicals	Physical Check	POWERGRID spec & manufacturers recommendations	Contractor	100%	random	Site engineer
		'3.P.C.C (Grade, thickness & Size) 'a) PCC 1:5:10 (1 cement:5 coarse/fine sand:10 burnt brick aggregates) -Burnt brick aggregate of nominal size 40 mm	Completeness	POWERGRID specifications	Joint Inspection by POWERGRID and Contractor	100%	Random	Site Engr
			Grading	As per Annexure-8	Samples to be taken jointly & tested in POWERGRID accepted lab	1 sample per 500 cu.mtr	100% review of lab test results	Site In-charge
		4. 20/40mm stone aggregate	Grading	IS 383, IS 2386 and POWERGRID Speci. The grading shall be as per single sized nominal size	Contractor (POWERGRID accepted lab)	1 sample per lot of 500 Cubic Meter or part thereof from each source for each size.	100% review of test report	Site Engineer

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		5. Resistivity of 20/40mm stone aggregate.	Electrical Check	POWERGRID Technical Specification. (resistivity of the stone for spreading over the ground shall be minimum 3000 ohm-m under wet condition)	Contractor	1 sample of stone from each source (in case stones are supplied from more than one source)	100% review of test report.	Site Engineer
		6. Compacted thickness of 20/40mm stone layers as applicable	Physical	POWERGRID spec & approved drawings	Contractor	100%	Random	Site Engineer
10	Road (WBM layers)							
		1. Alignment & Level	Physical check	Power grid spec & approved drawings	Contractor	100%	100%	Site In charge
	Material	A. Coarse Aggregates	1. Source approval	Source with materials meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry and based on the test results of Joint samples tested in POWERGRID accepted lab	To review the proposal based on the documents	Site In charge
			2. Physical tests	As per document at Annexure-7 of this FQP	Samples to be taken jointly and tested in POWERGRID approved lab	One sample per lot of 200 cum or part thereof per source	100% review of lab test results	Site In charge



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					Agency	Extent		
		B) Stone Screening						
			1. Source approval	Source with materials meeting POWERGRID Specification	Contractor	Proposed by the Contractor, indicating the location of the quarry and based on the test results of Joint samples tested in POWERGRID accepted lab	To review the proposal based on the documents	Site In charge
			2. Grading	As per document at Annexure-7 of this FQP	Samples to be taken jointly and tested in POWERGRID accepted lab	One sample per lot of 200 cum or part thereof	100% review of lab test results	Site In charge
		C) Binding Material	Plasticity index	As per document at Annexure-7 of this FQP	Contractor	One sample per lot of 25 cum or part thereof	100% review of lab test results	Site In charge
		D) Laying of sub base Course	Physical check	As per CPWD spec clause 17.7.2	Contractor	100%	Random	Site Engr
		E) Laying of base Course	Physical check	As per CPWD spec clause 17.8.1	Contractor	100%	Random	Site Engr
11	Drain	Alignment and invert level	Physical	POWERGRID spec and approved drawing	Contractor	100%	Random	Site Engr

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ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR CEMENT

ORDINARY PORTLAND CEMENT					
S. No.	Name of the test	Ordinary Portland Cement 33 grade as per IS 269	Ordinary Portland Cement 43 grade as per IS 8112	Ordinary Portland Cement 53 grade as per IS 12269	Remarks
a)	Physical tests				To be conducted in Appd. Lab
(i)	Fineness	Specific surface area shall not be less than 225 sq.m. per Kg. or 2250 Cm ² /gm.	Specific surface area shall not be less than 225 sq.m. per Kg. or 2250 Cm ² /gm.	Specific surface area shall not be less than 225 sq.m. per Kg. or 2250 Cm ² /gm.	Blaine's air permeability method as per IS 4031 (Part-2) / Sieve analysis as per IS 4031 (part-3)
(ii)	Compressive strength	72 ± 1 hour : Not less than 16 Mpa (16 N/mm ²) 168 ± 2 hour : Not less than 22 Mpa (22 N/mm ²) 672 ± 4 hour : Not less than 33 Mpa (33 N/mm ²)	72 ± 1 hour : Not less than 23 Mpa (23 N/mm ²) 168 ± 2 hour : Not less than 33 Mpa (33 N/mm ²) 672 ± 4 hour : Not less than 43 Mpa (43 N/mm ²)	72 ± 1 hour : Not less than 27 Mpa (27 N/mm ²) 168 ± 1 hour : Not less than 37 Mpa (37 N/mm ²) 672 ± 1 hour : Not less than 53 Mpa (53 N/mm ²)	As per IS 4031 (Part-6)
(iii)	Initial & Final setting time	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes	As per IS 4031 (Part-5) -do-
(iv)	Soundness	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test.	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test.	Le Chatlier and Autoclave test as per IS 4031 (Part-3)



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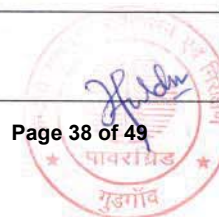
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S. No.	Name of the test	Ordinary Portland Cement 33 grade as per IS 269	Ordinary Portland Cement 43 grade as per IS 8112	Ordinary Portland Cement 53 grade as per IS 12269	Remarks
b)	Chemical composition tests				Review of MTC only
		a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.66 to 1.02	a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.66 to 1.02	a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.80 to 1.02%	
		b) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	a) Ratio of percentage of alumina to that of iron oxide Minimum 0.66	a) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	
		c) Insoluble residue, percentage by mass Max. 4.00%	c) Insoluble residue, percentage by mass Max. 2.00%	c) Insoluble residue, percentage by mass Max. 2.00%	
		d) Magnesia percentage by mass Max. 6%	d) Magnesia percentage by mass Max. 6%	d) Magnesia percentage by mass Max. 6%	
		e) Total sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 2.5 and 3.0 when tri-calcium aluminate percent by mass is 5 or less and greater than 5 respectively.	e) Total sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 2.5 and 3.0 when tri-calcium aluminate percent by mass is 5 or less and greater than 5 respectively.	e) Total sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 2.5 and 3.0 when tri-calcium aluminate percent by mass is 5 or less and greater than 5 respectively.	
		f) Total loss on ignition shall not be more than 5 percent	f) Total loss on ignition shall not be more than 5 percent	f) Total loss on ignition shall not be more than 5 percent	



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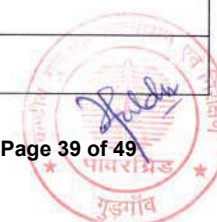
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S. No.	Name of the test	Remarks
2.	POZZOLANA PORTLAND CEMENT AS PER IS 1489	
a)	Physical tests	
	i) Fineness	Specific surface area shall not be less than 300 sq.m. per Kg. or 3000 cm^2/gm
	ii) Compressive strength	a) 72 ± 1 hour : Not less than 16 Mpa (16 N/mm^2) b) 168 ± 2 hour : Not less than 22 Mpa (22 N/mm^2) c) 672 ± 4 hour : Not less than 33 Mpa (33 N/mm^2)
	iii) Initial & Final setting time	Initial setting time : Not less than 30 minutes Final setting time : Not more than 600 minutes
	iv) Soundness	Un-aerated cement shall not have an expansion of more than 10mm Le Chatlier test and 0.8% by Autoclave test as per IS 4031 (Part-3)
b)	Chemical composition tests	
	a) Magnesia percentage by mass Max. 6%	Review of MTCC only
	b) Insoluble material, percentage by mass $x + 4(100-x)/100$ where x is the declared % of pozzolana in the PPC	-do-
	c) Total sulphur content calculated as sulphuric anhydride (SO_3), percentage by mass not more than 3.0	-do-
	Total loss on ignition shall not be more than 5 percent	



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ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR REINFORCEMENT STEEL AS PER IS 1786-1985 Edition-4.3 (2004-12)

S. No.	Name of the test	Fe 415	Fe 500
i)	Chemical analysis test		
	Carbon	0.30 Percent Maximum	0.30 Percent Maximum
	Sulphur	0.060 Percent Maximum	0.055 Percent Maximum
	Phosphorus	0.060 Percent Maximum	0.055 Percent Maximum
	Sulphur & Phosphorus	0.11 Percent Maximum	0.105 Percent Maximum
ii)	Physical tests		
	a) Tensile Strength Minimum	10% more than actual 0.2% proof stress but not less than 485 N/Sq.mm.	8 % more than actual 0.2% proof stress but not less than 545 N/Sq.mm
	b) 0.2% of proof stress/Yield stress Minimum, N/mm ²	415	500
	c) Elongation percent , Minimum	14.5	12
iii)	Bend & Rebend tests	Pass	Pass

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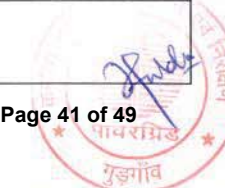
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Annex-3

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR COARSE AGGREGATES AS PER IS 383

3. Coarse Aggregates											
i) Physical Tests											
	a) Determination of particles size	a. IS Sieve Designation	%age passing for Single-Sized Aggregate of nominal size					Percentage Passing for grades Aggregate of nominal size			
			40 mm	20 mm	16 mm	12.5 mm	10 mm	40 mm	20 mm	16 mm	12.5 mm
		63 mm	100	-	-	-	-	-	-	-	-
		40 mm	85 to 100	100	-	-	-	95 to 100	100	-	-
		20 mm	0 to 20	85 to 100	100	-	-	30 to 70	95 to 100	100	100
		16 mm	-	-	85 to 100	100	-	-	-	90-100	-
		12.5 mm	-	-	-	85 to 100	100	-	-	-	90 to 100
		10 mm	0 to 5	0 to 20	0 to 30	0 to 45	85 to 100	10 to 35	25 to 55	30 to 70	40 to 85
		4.75 mm	-	0 to 5	0 to 5	0 to 10	0 to 20	0 to 5	0 to 10	0 to 10	0 to 10
		2.36 mm	-	-	-	-	0 to 5	-	-	-	-
	b. Flakiness index	Not to exceed 25%									
	c. Crushing Value	Not to exceed 45%									
	d. Presence of deleterious material	Total presence of deleterious materials not to exceed 5%									
	e. Hardness	Abrasion value not more than 40%, Impact value not more than 30%									
	f. Soundness test (for concrete work subject to frost action)	12% when tested with sodium sulphate and 18% when tested with magnesium sulphate									



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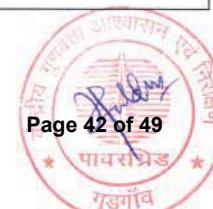
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ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR FINE AGGREGATES AS PER IS 383

4.	Fine aggregates				
i)	Physical Tests	IS Sieve Designation	Percentage passing for graded aggregate of nominal size		
	a) Determination of particle size		F.A. Zone I	F.A. Zone II	F.A. Zone III
		10 mm	100	100	100
		4.75 mm	90-100	90-100	90-100
		2.36 mm	60-95	75-100	85-100
		1.18 mm	30-70	55-90	75-100
		600 microns	15-34	35-59	60-79
		300 microns	5 to 20	8 to 30	12 to 40
		150 microns	0-10	0-10	0-10
	b) Silt content		Not to exceed 8%	Not to exceed 8%	Not to exceed 8%
	c) Presence of deleterious material	Total presence of deleterious materials shall not exceed 5%			
	d) Soundness Applicable to concrete work subject to frost action	12% when tested with sodium sulphate and 15% when tested with magnesium sulphate			



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ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR CONCRETE WORK

1)	Concrete	a) Workability	Slump shall be recorded by slump cone method and it shall be between 25-75 mm. depending upon workability requirement as per IS 456.
		b) Compressive strength	For Design mix as per IS:456 for Grade M20 or above For nominal (volumetric) concrete mixes compressive strength for 1:1.5:3 (Cement : Fine aggregates : Coarse aggregates) concrete 28 days strength shall be min 265Kg/cm² and for 1:2:4 (Cement: Fine Aggregate: Coarse aggregate) nominal mix concrete 28 days strength shall be min 210Kg/cm².

Notes :

- 1) All Design Mix concrete shall be as per IS: 456.
- 2) ACCEPTANCE CRITERIA BASED ON 28 DAYS COMPRESSIVE STRENGTHS FOR DESIGN MIX CONCRETE: AS PER Table-11 of IS:456 as given below:

Specified Grade	Mean of the Group of 4 Non-Overlapping consecutive test results in N/sq mm	Individual Test Results in N/sq mm
M 20 or above	Shall be greater than or equal to $f_{ck} + 0.825 \times \text{established standard deviation (rounded off to nearest 0.5 N/sq mm)}$ * Or $F_{ck} + 3 \text{ N/sq mm}$, whichever is greater	$\geq f_{ck} - 3 \text{ N/sq mm}$

* Established value of standard deviation shall be determined based on Note of Table-11 of IS:456

- 3) ACCEPTANCE CRITERIA BASED ON 28 DAYS COMPRESSIVE STRENGTHS FOR NOMINAL MIX CONCRETE:
 - a) On the basis of mandatory lab test result, in case of actual average compressive strength being less than specified strength but up to 70% of specified strength, concrete may be accepted and the rate payable shall be in the same proportion as the actual average compressive strength bears to specified compressive strength..
 - b) If the actual average strength of accepted sample is less than 70% of specified strength, the Site-in-charge shall reject the defective portion of work represented by sample and nothing shall be paid for the rejected work. Remedial measures necessary to retain the structure shall be taken at the risk and cost of contractor. If, however, the Engineer-in-charge / Project In-charge so desires, he may order additional tests to be carried out to ascertain if the structure can be retained/rectified. All the charges in connection with these additional tests shall be borne by the Contractor.
 - c) 53 Grade cement shall be used after obtaining specific approval of the Engineer in charge.
 - d) Portland slag cement conforming to IS: 455 may be used as per Technical Specification.

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SAMPLING PLAN FOR BRICK-WORK

Scale of sampling and permissible number of defectives for visual and dimensional characteristics.

No of Bricks in the lot	For characteristics specified for individual bricks		For Dimensional characteristics for group of 20 bricks- No of bricks to be selected
	No of bricks to be selected	Permissible no of defective in the sample.	
(1)	(2)	(3)	(4)
2001-10000	20	1	40
10001-35000	32	2	60
35001-50000	50	3	80

Note : In case the lot contains 2000 or less bricks the sampling shall be as per decision of the Engineer – in- charge.

Scale of sampling for physical characteristics

Lot size	Sampling size for compressive strength water absorption and efflorescence	Permissible No of defectives for efflorescence
(1)	(2)	(3)
2001-10000	5	0
10001-35000	10	0
35001-50000	15	1



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ACCEPTABLE CRITERIA FOR BRICK WORK

1) Dimensional Tolerances: The dimensions of modular/ Non modular bricks when tested shall be within the following limits per 20 bricks.

S.No	DESCRIPTION	MODULAR BRICKS	NON-MODULAR BRICKS
1	LENGTH	372 to 388 cm (380± 8 cm)	432 to 468 cm (450 ± 18)
2	WIDTH	176 to 184 cm (180± cm)	213 to 231cm (222± 9)
3	HEIGHT	176 to 184 cm (180± 4 cm)	134 to 146 cm (140 ± 6)

2) Compressive strength: the bricks shall have a minimum average compressive strength as specified in POWERGRID specification. The compressive strength of any individual brick tested shall not fall below the min. average compressive strength specified for the corresponding class of brick by more than 20% . in case compressive strength of any individual brick tested exceeds the upper limit specified for the corresponding class of bricks, the same shall be limited to upper limit of the class as specified for the purpose of calculating the average compressive strength.

3) Water absorption : The average water absorption of bricks shall not be more than 20% by weight.

4) Efflorescence : The rating of efflorescence of bricks shall not be more than moderate.



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PHYSICAL, REQUIREMENT OF COARSE AGGREGATE

S.No.	Type of Constn.	Type of W.B.M	Test Method	Requirements
1.	Sub-base	Los Angeles Abrasion Value or Aggregate Impact value	IS:2386(Pt.IV) IS:2386 (Pt.IV) IS:5640***	60% max. * 50% max
2.	Base	a) Los Angeles Abrasion Value or Aggregate Impact value b) Flakiness Index	IS:2386(Pt.IV) IS:2386 (Pt.IV) IS:5640*** IS:2386 (Pt.I)	50% max. * 40% max ** 15% max
3.	Surface Course	a) Los Angeles Abrasion Value or Aggregate Impact value b) Flakiness Index	IS:2386(Pt.IV) IS:2386 (Pt.IV) IS:2386 (Pt.I)	40% max. 30% max 15% max
4	Binding Material	Plasticity index	IS :2720 (Pt V)	Less than 6

* Aggregates may satisfy requirements of either of the two tests

** The requirements of flakiness index shall be enforced only in case of crushed/broken stone and crushed slag.

*** Aggregates like brick metal, kankar and laterite which get softened in presence of water, shall be tested for impact value under wet conditions in accordance with IS:5640.



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GRADING REQUIREMENTS OF COARSE AGGREGATE FOR W.B.M

Grading No.	Size Range	Sieve designation	% by weight passing the sieve
1	90mm to 45mm (Suitable for sub base courses of compacted layer of not less than 90mm thickness).	125mm 90mm 63mm 45mm 22.4mm	100 90-100 25-60 0-15 0-5
2.	63mm to 45mm	90mm 63mm 53mm 45mm 22.4mm	100 90-100 25-75 0-15 0-5
3.	53mm to 22.4mm	63mm 53mm 45mm 22.4mm 11.2mm	100 95-100 65-90 0-10 0-5
4	Screening		
	A) 13.2 mm	13.2 mm 11.2 mm 5.6 mm 180 micron	100 95-100 15-35 0-10
	B) 11.2 mm	11.2 mm 5.6 mm 180 micron	100 90-100 15-35



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Requirement of grading of broken Burnt Brick Coarse aggregate

IS Sieve Designation	Percent Passing
75 mm	100
37.5 mm	95-100
19.0 mm	45-75
4.75 mm	0-5

General Notes:

- 1) This standard Field Quality Plan is not to limit the supervisory checks which are otherwise required to be carried out during execution of work as per drawings/Technical specifications etc.
- 2) All materials under supply contract should have Cat-A CIP before they are erected.
- 3) Contractor shall be responsible for implementing/documenting the SFQP. Documents shall be handed over by the contractor to POWERGRID after the completion of the work.
- 4) Project incharge means over all incharge of work. Site Incharge means incharge of the Site. Site Engr means incharge of the section.
Site Engineer's responsibility may be allocated to Site JE, with the approval of Regional Head, only in such cases where, Site Engineer is not in position.
- 5) In case of deviation the approving authority will be one step above the officer designated for acceptance in this quality plan subject to minimum level of Site incharge.
- 6) Acceptance criteria and permissible limits for tests are indicated in the Annexures. However for further details/tests POWERGRID specification and relevant Indian standards shall be referred.
- 7) Tests as mentioned in this FQP shall generally be followed. However E.I.C. reserves the right to order additional tests wherever required necessary at the cost of the agency.
- 8) All counter checks/tests by POWERGRID shall be carried out by POWERGRID's officials' at least at the level of Site. Engr.
- 9) The authorized dealer means the dealer whose names are listed in the main producer's web site or certified by the main producers.
- 10) Accepting Authority for testing Laboratory shall be Regional Head.



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- 11) Mobile testing Labs owned by the contractor may also be acceptable if their facilities meet the testing requirements and the testing equipments are properly calibrated at Third Party Labs where testing/calibration is to be carried out should be accredited by NABL or an agency operating in line with ISO/IEC 17011 and having full membership & MRA of ILAC/APLAC, subject to approval of project Incharge.
- 12) **READYMIX CONCRETE (RMC) IS ACCEPTABLE FOR USE. HOWEVER, SITE INCHARGE SHALL APPROVE THE SOURCE OF MATERIALS TO BE USED FOR RMC .The documentation to be maintained shall be as per IS 4926:2003 i.e i) Information to be supplied by the purchaser (clause 7)**
ii) Information to be supplied by the producer (clause 8)
iii) Sampling for concrete strength should be one set of 3 nos of cubes for every 50 cu.m or part thereof for each day of concreting and 28 days compressive strength shall be tested in line with IS:456.
- 13) Epoxy coating on reinforcement steel wherever required shall be done as per IS 13620.
- 14) Cement is to be used in the order it is delivered (ie. First in First Out). Cement bought to works shall not be more than 6 weeks old from the date of manufacture.in case the cement remains in storage for more than 3 months, the cement shall be retested before use and shall be rejected, if it fails to conform to any of the requirements given in the relevant Indian Standard. Cement shall be packed in bags and stored in accordance with the provisions in IS -4082.
- 15) Three samples of each size of steel (all sizes of 10mm & above) out of 100MT steel Lot need to be physically weighted to ascertain their acceptance as per technical specification. The weighted samples at site may be kept under custody for three months.
- 16) If e-mail facility is not available in POWERGRID approved Lab, report may be collected directly by POWERGRID /Speed Post / Register Post / UPC.
- 17) In case any Laboratory refuses to allow POWERGRID representative for witnessing the test, same shall be taken in writing and approved by Regional Head.