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This volume shall be construed as part of tender document and shall be read along-with others volumes of tender. Unless otherwise specified, in case of any confusion of any clause/ provision of this volume or any conflict/ inconsistency of any clause/ provision of this volume with that of other volume, the same shall be brought out by the bidder in writing to BHEL for clarification or during pre-bid discussions, if applicable, failing which most stringent interpretation in favour of BHEL shall be adopted and the same shall be binding to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope of the tender.

CLAUSE NO	DESCRIPTION
1.0	NAME OF WORK
	Construction of 3 nos new covered stores, relocating of 02 nos old store (partly covered and partly semi covered) and 04 nos dog house, 01 no. safety park, hard surfacing, brick soling, area development of open yard, area fencing, making of concrete sleepers, renovation of BHEL office & residential complex and other civil misc. enabling works along with electrical job for extension of construction power sources, general illumination of all the working areas, buildings and offices etc. including periodic electrical maintenance job at 1 x 660 mw, unit#5 Sagardighi Thermal Power Project , West Bengal.
2.0	BROAD SCOPE OF WORK
2.1	The detail work includes providing required materials (Except those which BHEL may provide as per tender terms, if any), manpower, including supervision, tools & plants, consumables, watch & ward, etc. for Relocating of 02 nos old store (partly covered and partly semi covered),04 nos dog house, 01 no. safety park, hard surfacing, brick soling, area development of open yard, area fencing, making of concrete sleepers, renovation of BHEL office & residential complex and other civil misc. enabling works along with electrical job for extension of construction power sources, general illumination of all the working areas, buildings and offices etc. as per specification, direction of BHEL and schedule of items of Volume-III.
2.2	Providing all types of labour, supervisors, engineers, watch & ward as required, T&P including fuel, operators, etc as the case may be, consumables as required for completing the works.
2.3	The work also includes all types of repairs; renovation and upgradation work as & when required.
2.4	Detail construction drawings/ sketches shall be issued to successful bidder after award of work. Successful bidder shall perform the work in accordance with CPWD schedule/ relevant IS codes and as per instruction of engineer.
2.5	Structural fabrication work for roof truss, fencing post, security posts, gates, etc shall also be the responsibility of successful bidder.
3.0	GENERAL TECHNICAL REQUIREMENT
3.1	GENERAL
	All works shall be carried out in proper workmen like manner. Items of works covered by the specification shall be carried as per the best practice according to the direction of the engineer to his satisfaction. Unless otherwise specified in this tender or in the description of item, cost of stage of works mentioned hereunder shall be deemed to have been included in the rates of items provided in schedule.
3.2	EXCAVATION OF FOUNDATION AND FILLING UP OF TRENCHES
3.2.1	Foundation when excavated to the level shown in the drawing will be shown to engineer and if on account of technical ground or for any reason whatsoever, he decides to go deeper with the foundation, successful bidder shall excavate further to the depths required by the engineer. In no case shall foundation soling or concrete be laid prior to receiving orders to that affect from the engineer or his authorized representative. Any extra depth excavated when instructed shall have to be filled up, rammed, graded with crushed stone or lean concrete as directed by engineer.
3.2.2	Excavation shall include keeping the excavated earth up to 150 mm clear of the edge of plain cement concrete or as directed by engineer whichever is less.
3.2.3	The excavated areas around foundation of structures are to be filled up properly

	to the required levels with earth obtained from excavation or other materials as directed well rammed with water and consolidated on layers not exceeding 15 cm at a time. The quantity for this item of work will be measured on the basis of quantity of excavation, less the volume occupied by the structure in foundation. Any water accumulating in trenches from underground water, rain, floods, etc shall be pumped/ bailed out by successful bidder, without any extra charge.
3.3	CLEANING OF WORK SITE All trees, bushes and other vegetable matters shall be removed. Cleaning shall also include removing of stumps, roads, etc to 1 foot below furnished grades or as directed by engineer. All debris from the above operation shall be removed from the site at location to be decided by engineer. The bidder in their own interest should visit the site and make themselves conversant with the actual conditions of the site so as to include all costs on their tender rates. No additional payment due to non-availability of site information shall be entertained in the future.
3.4	EARTHWORK IN GRADING, EXCAVATION AND BACK FILLIING
3.4.1	Successful bidder shall carry out the survey of the site before excavation and set properly all lines and establish levels for various works, such as earthwork in excavation for grading basement, foundation, plinth filling, roads, drains etc.
3.4.2	The excavation shall be done to correct lines and levels. This shall also include, where required, proper shoring to maintain excavations and also the furnishing, erecting and maintaining of substantial barricades around excavated areas.
3.4.3	Excavation for permanent work shall be taken out to such widths, lengths, depths and profiles as are shown in the drawings / specifications or such other lines and grades as may in the drawings or such other lines and grades as may be specified by the engineer. Rough excavation shall be excavated with special care, soft pockets shall be removed even below the final level and extra excavation if instructed by the engineer, should be carried out by successful bidder just prior to laying the mud mat, at is own cost.
3.4.4	Should any excavation be taken below the specified elevations successful bidder shall fill it up with concrete of same class as in the foundation resisting thereon, upto the required elevation. No extra shall be claimed by successful bidder on this account.
3.4.5	All fill materials will be subject to engineer's approval. If any material is rejected by engineer, successful bidder shall remove the same forthwith from the site at no extra cost to BHEL. Surplus fill material shall be deposited / disposed of as directed by engineer after the fill work is completed.
3.4.6	Wherever block excavation is involved, successful bidder shall notify the engineer about his intention to start the work at 3 days earlier to the actual date of starting of work to enable him to take cross sectional levels for purpose of measurement before ground is disturbed.
3.5	CEMENT CONCRETE WORKS (PLAIN OR REINFORCED)
3.5.1	SHUTTERING AND STAGING
3.5.1.1	Wherever necessary, shuttering and staging must be provided. Unless otherwise stated, no payment shall be made for such shuttering or staging and cost thereof deemed to have been covered by the rate for relevant finished item of work. Where payment for shuttering have been specified, the rate shall be deemed to cover the cost of the necessary staging as well. Payment, if any, for shuttering will be on the basis of surface area of shuttering in actual contact with concrete.
3.5.1.2	Shuttering may be approved dressed true to line not less than 2.0 cm thick. Surface in contact with concrete are to be planned smooth except where otherwise stated. As an alternative, sufficiently rigid steel shuttering may be used for which same rate of timber shuttering will be allowed. In every case the joints shall be such that there is no loss of the liquid from the concrete. In timber shuttering the joints shall therefore, be either tongued or grooved or the joints must be perfectly closed and lined with craft paper of other types of approved materials. In case of steel shuttering also, the joints are to be similarly lined. All shuttering and framing must adequately be stayed and braced to the satisfaction of the engineer for properly supporting the concrete during the period of

	hardening. It shall be so constructed that it may be removed without shock or vibration to the concrete.		
3.5.1.3	Before concrete is placed, shuttering shall, if considered necessary, to be coated with an approved preparation for preventing the adhesion of the concrete to the moulds and it is to be of such a nature and so applied that the surface of the finished concrete is not stained. Before the formwork is stripped, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has hardened sufficiently. In normal weather and with ordinary cement vertical or side shuttering may be removed after three days and the bottom shuttering of the horizontal members after 14 days in case of slabs and 21 days in case of beams, cantilevers, etc from the date of placing of last portion of concrete on the structure. The above period is minimum and may be extended, if found necessary. Before stripping the shuttering of structural members successful bidder shall take previous permission of engineer or his representative.		
3.5.1.4	No plugs, bolts, ties, hold post or any other appliances, whatsoever, for the purpose of supporting the shuttering are to be fixed in the structure or placed in such a way that the damage might result to the work in removing the same when the shuttering is struck off.		
3.5.2	MIXING, PLACING AND COMPACTING		
3.5.2.1	The proportion specified is by volume in dry condition of different constituents.		
3.5.2.2	Boxes of suitable size shall be used for measuring sand and aggregate. The unit of measurement for cement shall be a bag of cement weighing 50 kg and shall be taken as 0.335 cub. meter. While measuring the aggregate, shaking, removing and hammering shall not be done. The proportioning of sand shall be on the basis of dry volume and in case of damp sand allowance for bulkage shall be made. The aggregate in each batch of concrete are to be proportioned as to contain full bag of cement.		
3.5.2.3	Normally, all structural concrete shall be mixed in mixture machine of appropriate capacity and shall be vibrated with suitable vibrator. Mixing shall be continued till there is uniform distribution of materials and mass is uniform in colour and consistency but in no case, shall mixing be done for less than two minutes. The rates appearing in the schedule of rates against such items are inclusive of hire and operational charges of each appliance. For particular job, engineer may allow hand mixing extra cement upto 10% over the standard requirement of cement for machine mix of particular mix have to be provided by successful bidder at their own cost.		
3.5.2.4	As the bulking of material may vary from day to day and at different parts of the day on account of varying moisture content, frequent tests for bulking shall be carried out with sand to be used and the amount of bulking allowed for in the field mix so as to keep the actual proportion constant throughout.		
3.5.2.5	Only the quantity of mix required is to be mixed and workability shall be measured by the amount of slump. The quantity of water, to be used for each mix of 50 kg of cement, to give required consistency shall be as directed at site. The slumps to be adopted should be as directed by the engineer at site.		
3.5.2.6	Strength requirement of concrete (in kg/ sqcm)		
	Grade of concrete	Compressive strength of 15 cm cube 7 days & 28 days	
		Work test at 7 days minimum	Work test at 28 days minimum
3.5.2.6.1	M-10 (1:3:6)	70	100
3.5.2.6.2	M-15 (1:2:4)	100	150
3.5.2.6.3	M-20 (1:1:5:3)	125	200
3.5.3	PROTECTION AND CURING		
3.5.3.1	Successful bidder shall adequately protect freshly laid concerts about 1 to 2 hours after its laying, from too rapid drying due to sunshine, drying winds, etc. and also from running or surface water and shocks. After 24 hours of laying of concrete, the surface shall be cured by flooding with water of minimum 25 mm depth or by covering with wet absorbent materials. The curing shall be done for a minimum period of 10 days. Over the foundation concrete, the masonry works		

	may be started after 48 hours of its laying, but the curing of cement shall be continued alongwith the masonry work for a minimum period of 10 days.
3.5.3.2	In case cement concrete is used as sub-grade, flooring should be commenced within 48 hours of laying of sub-grade. In case this is not possible due to exigencies of work, suitable arrangement as per order of engineer for roughening with steel wire brushes and subsequently neat cement slurry laying as directed may be done.
3.6	CONSTRUCTION JOINTS All joints in slabs & other horizontal members to be formed by inserting vertical boards against which concrete deposited can be properly rammed. The position where such joints may be made will be indicated by engineer or his representative.
3.7	TEST RESULTS Test cubes moulds of the concrete should be taken and laboratory cube test results should be obtained for every day of concrete possibly. In the case of concrete showing on quantity on cubic meter certified by engineer, so as deficient may be allowed to remain, subject in such a case to a deduction for such sum as are or may become due under the contract, not exceeding Rs. 24.00 per cum of the quantity so certified in case where the deficiency does not exceeds 5% and Rs. 48.00 per cum where deficiency 5%. The engineer will have full power in his absolute discretion to fix the actual rate of the deduction subject only to that the rate so fixed shall not exceed the minimum provided above. If the deficiency exceeds 10% the engineer at his discretion direct the portion of the concrete certified by him as so deficient in strength to be removed from the structure and replaced by concrete of specified strength and successful bidder shall in that case have to carry out that direction at his own cost irrespective of the amount of loss, remain liable under the provision of his clause notwithstanding signing by the engineer of any certificate or the passing of the bills or accounts.
3.8	STORAGE OF MATERIALS
3.8.1	CEMENT The cement shall be stored above the ground level in perfectly dry watertight sheds. The bags shall be stacked in a manner so as to facilitate easy removal. Any material considered defective by the engineer shall not be used by successful bidder and shall be removed from the work site immediately.
3.8.2	AGGREGATE Aggregate shall be stored on brick soling or an equivalent platform so that they do not come in contact with dirt, clay, grass or any other injurious substance at any stage.
3.8.3	REINFORCEMENT Reinforcement bar shall be stored off the ground. If necessary a coat of cement wash shall be given to the bars to guard against rusting.
3.9	BRICK/ MASONARY/ FLY ASH BRICKS
3.9.1	Cement mortar shall be prepared by mixing sand and cement in specified proportion. Sand shall be measured on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitable to allow for bulkgage.
3.9.2	Brick work shall be done as instructed at site. A layer of mortar shall be spread on full width for suitable length on top on the lower course. Each brick should be pressed into mortar and shoved into final position so as to embed in the brick and to fill its inside face fully with mortar. Cut bricks shall not be used except where necessary. A set of tools comprising of wooden straight edge, masonry spirit level, square half-meter rule, line and pins, string and plumb shall be kept for every three masons for frequent checking during progress of work. Faces of the walls found not in plumb shall be dismantled.
3.9.3	Both the faces of the walls of thickness greater than 25 cm shall be kept in proper plan. All the connected brick work shall be out in more than one scaffolding height of about 1.2 meter to 1.5 meter above adjoining walls. The surface of the wall shall be plastering whilst the mortar is fresh.
3.9.4	Brick shall be so laid that all joints are quite full of mortar. The thickness of spirits

	shall no exceed 10 mm. Bricks shall be laid with frogs upward except in the top coarse where frogs shall be placed downwards. The face joints shall be racked to a minimum depth of 15 mm (3/5 inch) by racking tools daily during the progress of work when the mortar is still green so as to provide proper key for plaster or pointing is not required to be done, the joints shall be struck flush and finished at the line of laying.
3.9.5	The face of brick work shall be cleaned the very day that brick work is laid daily and all mortar droppings shall be removed.
3.9.6	Green work shall be protected from rain by suitable covering. The brick work shall be kept for a period of at least 7 days.
3.9.7	Scaffolding should be sound and strong and holes left in masonry work for supporting and scaffolding shall be filled and made good before plastering.
3.9.8	Sand to be used for mortar shall be hard, durable, clean and free from dirt, clay, organic matter or other impurities.
3.10	BRICK FLAT SOLING After the ground is prepared and rammed, brick shall be laid flat in one layer with closed fine joints. After laying the bricks sand shall be spread over the soil and the joints of bricks filled up by sand. Rate tendered shall include all charges for ramming etc.
3.11	DAMP PROOF COURSE This shall be laid to specified thickness of 40 mm or as per drawing over walls for the full thickness of the super-structure walls. The surface shall be leveled and prepared before laying the cement should be doubly chequered, damp proof course shall be covered for at least seven days after which shall be allowed to dry. Water proofing materials of approved qualities shall be added to the concrete mixture in accordance with the manufacturer's specification.
3.12	CEMENT POINTING
3.12.1	The joints of masonry shall be raked atleast 12 mm deep 3 or 4 days after the course is laid, if not done earlier. The dust shall then be brushed out of the joints and the wall washed with water.
3.12.2	Mortar shall be filled into joints and well pressed with special steel trowels. The joints shall be touched again after it has once begun to set. The joints of the pointing work shall be neat. The lines shall be regular and uniform in breadth and the joints shall be raised flat, sunk 'V' as may be directed. No false point shall be allowed.
3.12.3	The work shall be kept wet for a week after the pointing with complete. Whenever coloured pointing has to be done, the colouring pigment of the colour required shall be added to cement in such proportions as recommended by the manufacturer and approved by the engineer.
3.13	CEMENT PLASTER
3.13.1	All joints in masonry shall be cleaned by using a hooked tool made for the purpose when mortar is still green and in any case within 48 hours of laying. The surface to be rendered shall be washed with fresh clean water free from all dirt, loose material, grease etc. and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be rendered will be, however, kept dry. The wall shall not be too wet but only damp at the time of plastering. Damping shall be uniform to get uniform bond between the plaster and wall.
3.13.2	Proportion of the mortar shall be as specified under the respective items of work. Cement shall be mixed thoroughly in dry condition and just enough water added to obtain a workable consistency. The quality of water, sand and cement shall be as per IS standards. Mortar thus made shall be used immediately and in no case shall the mortar be allowed to stand for more than 25 minutes after mixing with water.
3.13.3	Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. The decision as to when the plaster has hardened will be given by the engineer. Curing shall be done by continuous applying water in a fine spray and shall be carried out for at least 7 days.
3.13.4	Whenever the specification or the item of work calls for water proofing successful

	bidder shall provide the percentage of water proofing compound as specified in the item of work.
3.13.5	Ceiling plaster shall be done before wall plaster and wall plaster shall commence at top and work downwards.
3.13.6	Mortar shall be dashed on the prepared surface with a trowel and finished smooth by toweling on the surface with neeru (lime-cement). Neeru shall be properly slaked fat lime. Standard of finish expected is high and shall conform to IS 2394.
3.13.7	INTEGRAL CEMENT FINISH ON CONCRETE FLOOR In all cases where integral cement finish on a concrete floor has been specified. The layer of concrete shall be screeded off to proper level and tamped with tamper having conical projections so that the aggregate shall be forced below the surface. The surface shall be finished with a wooden float and a trowel with pressure. The finish shall be continued till the concrete reaches its initial set. No cement or cement mortar finish shall be provided on the surface. Where specified, a floor hardener as approved by the engineer shall be supplied as recommended by the manufacturer.
3.14	WHITE WASHING/ COLOUR WASHING
3.14.1	PREPARATION OF SURFACE
3.14.1.1	All surfaces for white washing, colour washing, painting shall be thoroughly brushed free from mortar dropping and foreign matters and prepared to the satisfaction of engineer before application of treatment.
3.14.1.2	Before white washing, all the nails etc. shall have to be removed from the wall as directed. Nail holes or other holes, small depressions or damages in plaster or wall surface shall be filled or repaired to original condition with paster.
3.14.1.3	Old surfaces spoiled by smoke and grease soot's shall be sprinkled with surki and water and rubbed brick bats still or wire brushes or steel scappers. The surface shall then be broomed to remove all dust and shall be washed with clean water.
3.14.2	WHITE WASH AND COLOUR WASH
3.14.2.1	PREPARATION OF WHITE WASH The white washing to be done with five parts of stone lime and part of shell lime with necessary gum (2 kg per cum of lime) using as necessary and to be mixed as per standard practice.
3.14.2.2	PREPARATION OF COLOUR WASH
3.14.2.2.1	Colour washing shall have a primer of white wash and shall be of shade approved by engineer.
3.14.2.2.1	Sufficient quantity of colour wash enough for complete job shall be prepared in one operation to avoid any difference in shade. Procedure and preparation of the shall be the same as in white washing. Application of white end colour wash – the operation for each coat shall consist of four consecutive strokes of the brush one horizontally from right to left and the next from left to right and the third stroke bottom upward and the fourth from top downward before the previous strokes dries. Each coat shall be allowed to dry before next coat as applied. No portion of the surface shall be left out initially to be patched up later on. The brush shall be dipped in white wash or colour wash pressed lightly against the wall of container and then applied by lightly pressing against the surface with full swing of hand.
3.14.2.2.3	The white wash on ceiling should be done prior to that on walls.
3.14.3	CEMENT PRIMER COAT
3.14.3.1	Cement primer coat is used as base on wall finish of cement, lime or lime cement plaster or on asbestos cement surface before oil bound distemper or oil based paints are applied on them. The cement primer is composed of a medium and pigment which are resistant to the alkalies present on the cement, lime, lime cement in wall finish and provides a barrier for the protection of subsequent coat of oil bound distemper or paints. Priming coat shall preferably be applied by brushing and not be spraying. Hurried priming should be avoided particularly on absorbent surface. New plaster patches in old work, before applying oil bound distemper paints etc. should also be created with cement primer. The surface shall be thoroughly cleaned of dust, all white or colour wash by washing &

	scrubbing. The surface shall be allowed to dry for at least 48 hours, it shall be sand prepared to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulation and then preparing the same after it is dry.
3.14.3.2	The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first, vertical strokes shall be applied immediately afterwards. The entire operation will constitute one coat. The surface shall be finished as uniformly as possible having no brush marks. It shall be allowed to dry at least 48 hours bound distemper is applied.
3.15	PAINTING
3.15.1	All surfaces for painting shall be properly sand prepared and cleaned and where necessary good quality putty shall be used to hide all holes, cracks, open joints etc. The rate for painting includes such work.
3.15.2	Paint shall be applied with approved brushes and surfaces shall be sand papered after every coat. All work when completed shall present a smooth, clean, solid and uniform surface to the satisfaction of the engineer.
3.15.3	SYNTHETIC ENAMEL PAINT Synthetic enamel paint of approved brand and manufacture and of the required shade shall be used for the top coat and an under-coat of shade to match the top coat as recommended by manufacturer shall be used. Undercoat of the specified paints of shades suited to the shade of top coat shall be rubbed next day. It shall be rubbed next day with fine grade of wet abressive paper to ensure a smooth and even surface free from brush mark and all loose particles dusted off. Top coats of specified paint of the desired shade shall be applied after the undercoat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure properly uniform glossy surface.
3.15.4	ALUMINUM PAINT Aluminum paint of approved brand and manufacture shall be used. The paint comes in compact dual containers with paste & medium separately. The two shall be mixed together to proper consistency before use. Each coat shall be allowed to dry for 24 hours and lightly rubbed down with fine grade sand paper and dusted before the next coat is applied. The finished surface shall present an even and uniform appearance. As aluminum paint is likely to settle in the container, care shall be taken to frequently stir the paint during use. Also the paint shall be applied and laid off quickly, as surface is otherwise not easily finished.
3.15.5	PLASTIC EMULSION PAINT Plastic emulsion paints are not suitable for application on external wood and iron surface and are to be used generally on masonry or plastered surfaces. No priming coat is required for the later. Plastic emulsion paint of approved brand and manufacture and of the required shade shall be used. The paint will be applied in the usual manner with brush or roller. The paint dries by evaporation of water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time to dry varies from one hour on absorbent surfaces to 2 to 3 hours on non-absorbent surface. Thinning of emulsion is to be done with water will be particularly required for under coat which is applied on the absorbent surface. Quantity of thinner to be added shall be as per manufacturer's instructions. The surface on finishing shall present flat smooth finish. If necessary, more coats will be applied till the surface presents a uniform appearance.
3.15.6	PRECAUTION
3.15.6.1	Old brushes if they are to be used with emulsion paints should be completely dried of turpentine or oil paints by washing in worm-soap water. Brushes should be quickly washed in water, immediately after use and kept immersed in water during break period to prevent the paint from hardening on the brush.
3.15.6.2	In the preparation of walls for plastic emulsion painting, an oil base putty shall be used in filling cracks, holes etc.
3.15.6.3	Splashes on floor etc. shall be cleaned without delay, as they will be difficult to remove after hardening.

3.15.6.4	Washing of surfaces treated with emulsion paints shall not be done within 3 to 4 weeks of application.
3.16	PROTECTIVE MEASURE Surfaces of rolling shutters, steel ventilators and articles of furniture, flooring etc. and parts of building not to be white or colour washed shall be protected from being splashed down. Such surfaces shall be cleaned of white or colour wash splashes, if any.
3.17	GROUTING Grouting of pockets shall be done as per the direction of the engineer at site and as given in schedule of items.
3.18	STRUCTURAL STEEL WORK
3.18.1	All materials for structural steel works have to supplied by successful bidder and necessary test certificate of the materials procured for this work has to be submitted for scrutiny.
3.18.2	All fabrications, and erection of structures must be executed according to the specification and drawings and all steel works should be as per IS code No. 800, 806, 875, 1161 of latest Editions. Erection of trusses are true to line and level and aligned properly, as per drawing and instruction of engineer. Necessary connections of member are to be riveted / bolted/ welded as per design and drawing. All fasteners required for the connections are to be supplied by successful bidder.
3.18.3	All fabricated members are to be painted with one coat of shop painting of red oxide / zinc chromites of J&N or equivalent make and final two coats of synthetic enamel paint of approved quality and shade.
3.118.4	Successful bidder has to prepare necessary shop & erection drawings in sufficient numbers attheir own cost and submitted for obtaining approval from BHEL, including design of connections etc.
3.18.5	All the materials procured for this work should be of approved brand and quality. AC sheet should have protection in both sides width wise 800 mm beyond the brick wall.
3.18.6	During dismantling and relocating of existing stores care should be taken for proper utilization of existing structural member.
3.18.7	Successful bidder have to give their competitive offer taking into consideration of all above points and based on schedule of items enclosed in this tender.
3.19	WINDOWS AND VENTILATORS (STEEL)
3.19.1	GENERAL
3.19.1.1	Supply and fixing in position of window/ ventilators sashes with glazing bars. These sashes should be provided with 12 mm MS round bars welded in window frame horizontally and approximately not more than 100 mm centre to centre and glazing bars shall be fixed/ welded to shutter frame as per standard design and as per instruction of BHEL.
3.19.1.2	Glazing and painting etc. as worded in the respective item.
3.20	STEEL WINDOWS/ VENTILATOR SASHES
3.20.1	The steel window/ ventilator sashes shall be conform to IS 1038-1968 regarding sizes, material design etc. and only such windows manufactured by reputed manufacturers by continuous electric welding with flash butt welding process shall be accepted.
3.20.2	The windows and ventilator frames shall be manufactured from rolled steel sections conforming to IS 7452-1974 free from rolling defects and suitable for punching and cutting .
3.20.3	FRAMES Both the fixed and opening frames shall be constructed of sections, approved and to be cut to true length. The corners of fixed and opening frames shall be electrically butt welded to form a solid and true right angle and all frames shall be square & flat. Subdividing bars of the unit shall be tanned and riveted into the frame. No face welding at the joint of the subdividing bars and frame is required. Casements shall be fixed to their frames so as to provide continuous contact for weathering on the inside and outside and shall be secured in closed position by

	the fittings which shall have been properly checked and adjusted.
3.20.4	<p>SCREWS</p> <p>Slotted steel adjustable lugs with a standard slot steel windows ventilators shall conform to the requirements of IS 1362-1962.</p>
3.20.5	FIXING MATERIALS
3.20.5.1	Slotted steel adjustable lugs with a standard slot of 8 mm wide for MS screw of 6 mm and 12 mm long with square nuts shall be used as fixed lugs. The other dimension of the lugs shall be as per IS 1081-1960. Lugs shall only be placed in the specified positions and grouted into their holes with cement mortar.
3.20.5.2	The outer frame shall be provided with fixing holes centrally in the section. Additional holes shall be provided at suitable intervals for inserting special spring glazing clips, glazing beads.
3.20.6	SIDE HUNG SHUTTER
3.20.6.1	Windows shall be provided with steel hinges inserted inside slot out in the fixed frame and welded to the frame. The hinges shall be normally of the projecting type and not less than 65 mm. Friction hinges need not be provided and for easy operation non-friction type projected hinges with hinge pins may be provided. It shall be fitted with peg stays which shall be of aluminium & should be 300 mm long with steel peg and locking bracket. The peg stay should have three holes to open the side hung casements in three different positions.
3.20.6.2	The side hung shutter shall be provided with aluminium handle and shall be mounted on steel handle plate which shall be welded or screwed or riveted to the opening frame in such a way that it could be fixed before the shutter is glazed and may not be removed after glazing. The handle shall have a two point nose, which shall engage with a cast steel rust protected striking plate on the fixed frame in a slightly open or fast position.
3.20.7	TOP HUNG VENTILATORS
3.20.7.1	Steel butt hinges for top hung ventilators shall be riveted to the fixed frame or welded to it after cutting a slot in it. Hinges to the opening frames should be riveted and welded and cleaned off. Hung casements shall be provided with a Aluminium peg stay with three holes which when closed shall be held tightly by locking bracket. Locking bracket shall either be fitted to the fixed frame or window.
3.20.7.2	All windows/ ventilators shall be designed to open outside.
3.20.8	GLAZING
3.20.8.1	Glazing shall be provided on the outside of the frames. The glass panels shall be free from flow, specks, bubbles etc. and shall have properly squared corners and straight edges. The glass panels shall be of 4 mm thickness, approved figured glass plain sheet glass and of best quality and fixed with special glazing clip/ glazing bids the putty containing a hardening agent like lither-age or a patent mastic. The fixing and glazing work shall conform to the relevant specification, contained in the IS-1001-1960.
3.20.8.2	No glazing shall be considered as complete until all stains have been removed from the surface of glass and metal forms. Successful bidder shall make good any glass broken while fixing or cleaning. All windows/ glazing repaired and the whole work left perfect on completion.
3.20.8.3	Payment shall be for the finished work of providing installation of windows/ ventilator frame, as provided. Overall dimensions of the ventilator/ window shall be measured for payment. The length and breadth shall be measured to nearest to 1 cm and area worked out to two places of decimals of a square meter. No deduction shall be made for the thickness of frame.
3.21	<p>MS GRILLS/ MS ROUND</p> <p>Where MS grills/ doors are to be provided in openings, the same shall be fabricated by welding MS Round bars welded as joints to the approved design and pattern or as directed by engineer from approved quality of material conforming to IS 226-1958 and IS 800-1956. The outside strip frame of the shall be housed to its full thickness into the surfaces as directed by the engineer. The grills shall be painted with one coat of red oxide paint and two coats of oil paints of approved make and shade.</p>

3.22	FLOORING AND ALLIED WORKS
3.22.1	In Situ Integral Finish To Concrete Base
	<p>While the surface of the concrete laid as per specification for 'Cement Concrete' has been fully compacted and levelled but the concrete is still 'green' thick slurry, made with neat cement shall be applied evenly and worked in with iron floats. When the slurry starts to set it shall be pressed with iron floats to have a firm compact smooth surface without trowel mark or undulations. This finish shall be as thin as possible by using 2.2 kg. of cement per Sq.M. of area.</p> <p>The surface shall be kept in shade for 24 hours and then cured for at least 7 days continuously by flooding with water. The surface shall not be subjected to any load or abrasion till 21 days after lying.</p> <p>As desired by the Engineer the surface, while still 'green' shall be indented by pressing strings, the marking shall be of even depth, in straight lines and the panels shall be of uniform and symmetrical patterns</p>
3.22.2	Chequered Tile Finish
	<p>The finish shall consist of manufactured gray or coloured cement tiles or terrazzo tiles with chequered face and an underbed laid over concrete or brick surface.</p> <p>a) Thickness The total thickness including the underbed shall be minimum 40 mm for floors 30 mm for walls unless otherwise specified. The skirting, dado and similar vertical surfaces shall project out 6 mm uniformly from the adjacent plaster or other wall finishes. The necessary cutting into the surface receiving the tiled finish, to accommodate the specified thickness shall be done</p> <p>b) Tiles: Chequered The tiles shall have chequers not less than 2.5 cm. c/c and not more than 5 cm. c/c. Depth of grooves shall be not less than 5 mm. The grooves shall be uniform and straight. The tiles shall conform to clause 2.02.01 (b) except that these may have the topping in terrazzo or plain gray cement or colour pigment added to cement</p> <p>c) Mix: Underbed The mix for the underbed shall consist of 1 part cement and 3 parts coarse sand by weight mixed with sufficient water or any other mix if specified.</p> <p>d) Laying The underbed mortar shall be evenly spread and brought to proper grade and consolidated to a smooth surface. The surface shall be roughened for better bond. Before the underbed had time to set and while it is still fairly moist but firm, cement shall be hand dusted over it or a cement slurry applied and the tiles shall immediately be placed upon and firmly pressed by wooden mallet on to the underbed until it achieves the desired level. The tiles shall be kept soaked for about 10 minutes just before laying. The joints between tiles shall be as close as possible and not more than 1.5 mm wide. Special care shall be taken to check the level of the surface and the lines of the joints frequently so that they are perfect. When tiles are required to be cut to match the dimensions these shall be sawn and edges rubbed smooth. The location of cut tiles shall be planned in advance and approval of the Engineer taken. At the junction of horizontal surface with vertical surface the tiles on the former shall enter at least 12 mm under the latter. After fixing, the floor shall be kept moist and allowed to mature undisturbed for 7 days. Heavy traffic shall not be allowed.</p> <p>e) Grinding and Polishing The tiles shall be ground and polished by hand and after laying taking special care in polishing the grooves properly and uniformly.</p>

3.22.3	CURING The surface shall be left for curing for about 12 to 18 hours and they cured by allowing water to stand on surface or by covering with wet sack for four days.
3.23	SANITARY AND PLUMBING WORKS The detailed specifications for various appliances are given below. In all cases the rate shall include for supply, fitting and fixing including painting where necessary, and making good all-round.
3.23.1	SPECIFICATION
3.23.1.1	Sanitary appliances supplied by successful bidder shall be of vitreous china and shall conform to IS 2556 (Part-I) – 1967, neceification for vitreous sanitary appliances (Vitreous china) Part-I general requirement .
3.23.1.2	Water closet wash down shall conform to IS 2556 (Part- II) – 1967.
3.23.1.3	Squatting pans and traps shall conform to IS 2556 (Part-II) – 1967.
3.23.1.4	Flushing cisterns for water closets and urinals (CI) shall conform to IS:774 – 1964.
3.23.2	INDIAN TYPE WATER CLOSET WC pan shall be a white glazed earthenware pan conforming to IS specification. It shall have standard glazed trap ‘P’ or ‘S’ type with effective seal and vent arm as per drawing. A pair of white glazed earthenware foot trade shall be provided set in cement mortar (1:3) flushing, cistern shall be high level mosquitop roof cistern of approved capacity as per schedule of item, made of best cast iron and on the “Pull let go” valves siphon type. Other accessories like cover, lever GI chains, pull handle, ball valve with copper float, inlet and outlet pipes with necessary unions, shall be of standard size and make. The flush pipe shall be of GI pipe and shall be connected to the WC pan by means of cement or putty joint.
3.23.3	EUROPEAN TYPE WATER CLOSET WC pan shall be of white glazed earthenware, white vitreous china or fire clay and shall be fitted with ‘S’ or ‘P’ type of trap of standard size and make. The sit with lid shall be of wall plastic, well polished with rubber buffers and shall be fixed in position by using Chromium plated (CP) brass hinges and screws. Flushing cistern shall be a low level, mosquito proof cistern of approved capacity made of best cast iron with valve less siphon provided with accessories such as CP brass unions and couplings, etc. Other specifications shall be same as those for Indian type WC.
3.23.4	WASH BASIN The basin shall be of white glazed earthenware or white vitreous china clay conforming to IS specifications. Each basin shall be provided with correct size of CP pillar taps, CP waste coupling with nut, CP chain rubber plug and lead paste pipe with trap leading to floor trap.
3.23.5	TOILET FIXTURE The mirror shall be of best Indian make with beveled edges. The size of the mirror shall be as specified. It shall be mounted on the asbestos sheet base and shall be fixed in position by means of CP brass screws. The glass shall be of best quality with edges rounded off. The shelves have CP brass guard rail with rubber washers in position resting on glass plate and CP brass bracket which shall be fixed with CP brass screws to wooden plugs, firmly embedded in the wall. The towel rail shall be of CP brass with two CP brass brackets. The brackets shall be fixed by means of CP brass screw to wooden cleats firmly embedded in wall.
3.23.6	INSTALLATION
3.23.6.1	All cisterns shall be fixed on cantilevers brackets firmly embedded in the wall. Indian type WC pan and the trap shall be sunk in the floor and jammed around with cement concrete of suitable mixture in such a way that uniform cushion between the concrete base and pan is achieved. The European type WC shall be firmly fixed on the floors with screws or some other arrangement. All joints between the pan and the trap and between pan and flush pipes shall be made leak proof by means of putty and white lead. Urinal basin shall be fixed in position by using wooden plugs embedded in wall and screws of proper size. Hand wash basin shall be supported on a pair of CI cantilever brackets embedded in walls.
3.23.6.2	The CI brackets, lead connection pipes and waste pipes shall be painted with two

	coats of approved paint over a coat of primer. The inside and outside of the cistern shall be painted with an approved bitumen paint.
3.23.7	PLUMBING
3.23.7.1	SOIL WASTE, VENT PIPES AND FITTINGS These will conform to IS:1729 – 1964 or IS:3909 – 1967. All pipes and fittings shall be made of cast iron of approved manufacture and shall conform to relevant Indian standard specifications. The pipes shall have spigot and socket ends. The pipes shall be free from cracks and flaws and the inside and outside shall be painted with and anticorrosive paint. The access door of fittings shall be of approved design.
3.23.7.2	STONEWARE PIPES AND FITTINGS These will conform to IS:651 – 1965. All stoneware pipes, bends, fully traps shall be of approved manufacture of the best salt glazed variety inside and outside, hard burst dark grey colour, perfectly sound free from fire crack and imperfection of glaze, truly circular in cross section, perfectly straight and of standard nominal length and depth of socket and barrel.
3.23.7.3	GI PIPES
3.23.7.3.1	These shall conform to IS:1239 – 1964. All GI pipes shall be of 'B' class quality and shall be of reputed manufacturer and shall have threaded ends with a socket at one end only. All fittings for GI pipes are galvanized rough iron.
3.23.7.3.2	All exposed pipes shall be painted with two coats of an approved paint over one coat of approved primer, under ground pipes shall be treated with two coats of an approved bituminous paint.
3.24	MISCELLANEOUS
3.24.1	All sanitary and plumbing works shall be carried out by skilled plumbers so that best workmanship can be attained. It shall comply with local laws where applicable.
3.24.2	No work shall be covered over or surrounded with concrete until it has been inspected and approved by engineer.
3.24.3	The rates for all piping work shall include for supplying, laying & fixing in position including necessary fixture, jointing, painting, necessary earthwork in excavation in all kinds of soil, refilling in 15 cm layers including watering, consolidation, top dressing, removal of spoils, making holes and for the completed work.
3.25	GENERAL If technical specification of any item is not available, the same will be governed by relevant IS code or manufacturer's specification. -
4.0	APPROACH TO WORK SITE Successful bidder shall make their own arrangements at their own cost for the necessary approach roads for transportation of materials to site of work. No extra charge in this regard will be entertained.
5.0	SUPPLY OF MATERIALS
5.1	Cement for various plain and reinforcement cement concrete works shall conform to relevant IS codes as received from various cement manufacturing companies. Cement shall be Ordinary Portland Cement conforming to IS:269.
5.2	Successful bidder to carry out the test as regards conformity/ suitability of cement with reference to IS code.
6.0	DAMAGE TO OTHER STRUCTURE AND PLANT Successful bidder shall be totally held responsible for any loss or damages, caused by any act of successful bidder, labour or their sub-vendor bidder's labour including but not limited to covered/ open blasting any structures and plants that may be under construction/ erection by any other agency at this site during this entire period covered by this tender along with extension, if any.
7.0	BHEL'S INPUT
7.1	BHEL will furnish, within the plant site area, the following services and materials under the conditions described below.
7.2	One permanent benchmark at site.
7.3	All further layout work shall be carried out very accurately by successful bidder with their own instruments. Successful bidder shall have on site a good number of

	survey instruments such as levels, theodolite, stuffs, measuring devices, survey umbrella etc.
8.0	SPECIFICATION AND CODES
	All works shall be carried out strictly in accordance with technical specification unless otherwise approved by engineer in writing. Where not specified in tender, the relevant latest IS codes shall be followed.
9.0	TECHNICAL INSTRUCTIONS
9.1	Successful tenderer on receipt of letter of intent from BHEL shall prepare a detailed work program including items of work within the overall time period allowed and shall submit the same to the engineer for approval.
9.2	The work has to be carried out according to priority as may be fixed up by site engineer of BHEL at site.
9.3	The materials and workmanship must be of good quality and accepted standards and specifications.
9.4	All material for construction is required to be procured by successful bidder and should conform to relevant IS specifications.
9.5	The site engineer reserves the right to reject any material not upto the specification. All taxes, levies and duties on construction materials will be on successful bidder's account.
9.6	After completion of work, the building and areas around them should be cleared of all rubbish, debris etc. and handed over in fit condition for occupation.
9.7	Unless otherwise specified, rates quoted under the contract shall apply for works irrespective of lifts and leads. Rates shall also include providing scaffolding and its subsequent removal.
9.8	All quantities under schedule of rates and quantities are approximate and are subject to change.
10.0	METHOD OF MEASUREMENT
	Mode of measurement shall be as per relevant clauses of this tender. In case the same is not available, the relevant IS:1200 in conjunction of IS:3385 shall be adopted. In case the same is also not available, the standard procedure adopted in CPWD shall be adopted. In case the same is also not available in CPWD, the measurement of the work done will be based on the mutual agreement between BHEL and successful bidder. In all the above cases, the interpretation of BHEL will be final and binding to successful bidder.