

CLAUSE NO.	Scope of Supply and Services
	ANNEXURE-XXIII CIVIL WORKS
1.00.00	CIVIL WORKS
1.01.00	The scope of Civil, Structural and Architectural works shall include survey, site clearance and preparation of design and drawings and getting approval of the same from the Employer and construction of all Civil, Structural and Architectural works including supply of all materials, complete for all buildings, structures, equipment and facilities under this scope. The nature of work shall generally involve survey, site clearance, earth work in site leveling, excavation in soil, dewatering, dressing to required profile, sheet piling or shoring/strutting, controlled filling with earth/sand, backfilling around completed structures and plinth filling, disposal of surplus earth/rock, concreting including reinforcement and formwork, masonry work, vibration isolation system consisting of springs and viscous dampers for machine foundations, plastering, painting, uninsulated/sandwiched metal wall cladding, roofing including permanent steel decking/ insulated metal sheeting, flooring, acid and alkali resistant lining, doors/windows, ventilators, underdeck insulation, false ceiling, roof water proofing, Energy conservation building compliance, Rain water harvesting, Ramps and toilets for physically challenged people, fabrication and erection of all structural steel and miscellaneous steel (i.e. steel staircase, cable/duct/pipe supports, underground structures like track hopper, tunnel etc., stacker reclaimer supporting structure, ladders, walkways, railing, chequered plate/grating floor, inserts, anchor bolts, etc.), piling, CW ducts/pipes, paving, gravel filling, precast covers, trestles, conveyor galleries, cable ducts/duct banks, expansion joints, rain water pipe, water supply, toilet & kitchen fittings, lift-well, sewerage, insulation, stoplogs/gates/valves, damp proofing, water proofing, anti-weed and anti-termite treatment, roads, drainage, fencing, final grading and site clearance before handing over, other related items of work, etc. complete.
1.02.00	The scope of work described below is general in nature. The Bidder shall provide all structures/facilities required for the effective functioning of various systems of the power plant, whether or not they are specifically mentioned.
1.03.00	Detailed design criteria for selection and sizing of various systems & structures and basis of design shall be prepared by the Bidder based on various requirements specified elsewhere in the specifications. All the above documents shall be finalised after Employer's approval and the same shall form the basis of Detailed Engineering work including the foundation system. The scope of Bidder for Civil, Structural and Architectural works shall include but not limited to the following areas and facilities: 1. Survey, site leveling and grading for complete Stage-IV areas within the plant boundary wall as shown in General Layout Plan, including site/Jungle clearance, excavation/filling with excavated/borrowed earth, disposal of earth outside boundary wall upto dump areas to be arranged by bidder, compaction (95% or more of standard Proctor's density) and leveling to specified formation levels as shown in General Layout Plan after completion of construction activities. Rerouting and construction of drains/nallah diversions are also in the scope of Bidder.
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	2. Main powerhouse including TG bay(with provision of roof light structure), deaerator bay, control tower etc., spring supported foundations for TG, Turbine driven Boiler feed pump, Motor driven Boiler feed pumps and all other foundations for major/minor equipments, foundations for ECW system pumps, AC plant equipment room, air handling units room, condensate storage tank foundation, condensate transfer pump house, ARCW PH/air washer building, air compressor building etc. 3. Foundations of Steam generator and its auxiliaries including ESP's, boiler elevators, flue ducts, spring supported foundations for PA/FD/ID fans, civil works for fan handling arrangements, new ESP control/ VFD building. 4. Paving in entire Main Plant area block from transformer yard to chimney, as enclosed within the peripheral roads (shown on General Layout Plan) of the main plant area, plinth protection around all buildings. Heavy duty passages through the Main plant block. 5. Mill and Bunker building with steel coal bunkers including stainless steel lined hoppers, foundations for building, mills etc. 6. Transformer yard including transformer foundations, oil soak pits, oil separating pits, oil drainage to oil separating pit and oil recovery, cable ducts, cable trenches with covers, cable cum pipe trestles, fire protection walls, gravel filling, fencing and gate, transformer rail track including jacking pads along with associated foundations, etc. 7. Single flue steel lined R.C.C. chimney including it's foundations, elevators, flue gas ducting, painting, aviation lighting etc. 8. Service building, Air compressor house, D.G. set, Fire Water pump house, hose houses, pipeline pedestals, trenches, culverts, firewater tank and other associated works. 9. All civil, structural and architectural works associated with O & M stores (3000 sqm area). 10. All civil, structural and architectural works associated with Induced Draught Cooling Towers and CT switchgear building including transformer foundations and all other associated works. 11. All civil, structural and architectural works associated with CW system, i.e. CW pump house including forebay, steel lined concrete encased supply & discharge CW ducts, valve pits, manholes & chambers to provide flow measurement devices, RCC channels, Stop log gates, trash racks and hoisting arrangement etc. 12. All civil, structural and architectural works associated with Make-up water system, i.e. Raw water pump house including forebay, switchgear building/control room as required, inter-connection of RWPH forebay with the pit outside the make-up water channel through MS pipes, valve pit etc. 13. All civil, structural and architectural works associated with DM plant, PT plant, ETP, CW chemical treatment and CPU regeneration system and as per
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	system requirement. 14. All civil, structural and architectural works associated with Switchyard as per system requirement including rail track, jacking pads, fire wall, roads and drains, soil sterilization/anti-weed treatment, gravel filling and fencing etc. 15. All civil, structural and architectural works associated with Coal Handling system, i.e. Transfer points, overhead/ground conveyor galleries & their supporting trestles (including foundations), transfer houses, crusher house with vibration isolation system for crusher, stacker reclaimer foundation, pump houses, pent house, track hopper, machinery hatches, under ground TPs & tunnel, drainage, etc. 16. All civil, structural and architectural works associated with Fuel oil handling system, i.e. Unloading cum pressurizing pump house, LDO tanks, Paving and drains around tanks, Containment wall around the tank area for all tanks, chain link fencing for fuel oil installations, pipe trestles/racks/pedestals & foundation, thrust blocks, culverts, pump foundations, oil-water separator pit, drainage trenches to oil-water separator pit and oil recovery, crossovers & platforms for valve operation, etc. 17. All civil, structural and architectural works associated Mill reject handling system including foundation, platforms, staircase, pipe supports, pits & trenches. 18. All civil, structural and architectural works associated with complete Ash Handling system, i.e. Ash slurry pump house cum TAC house, Ash water pump house - along with related sumps/tanks, BA slurry pump house and their related sumps/tanks, Switchgear / Control / RIO rooms, Silo Utility Building, supporting structures and foundations for Bottom ash hopper, Buffer hoppers / Collector tanks, Fly Ash Silos, bottom ash overflow tank Settling tanks and Surge tanks, Silo area paving and boundary wall, miscellaneous equipment foundations, trenches, pipe racks, pedestals/thrust blocks for pipe supports, culverts, drains etc. as per the system requirement. Survey for all areas under the scope including the ash pipe corridor (inside and outside the plant boundary) shall also be in scope of bidder. Disposal of ash slurry in the dyke shall be done in such a way so as to cause no damage to the dyke slope. 19. All piping and cable supporting arrangement/structures including foundation, pipe and cable trenches, duct banks, crossings, etc. 20. All culverts and RCC bridges at crossing of all rail tracks/roads/nallahs / channels / drains / pipes / other facilities etc. 21. All civil, structural and architectural works associated with miscellaneous switchgear buildings (including necessary trenches). 22. Complete storm water drainage system for the Stage-IV areas with provision of garland drains around building/structure/facilities, including providing drainage pumps (if required) along with pump house, provision of storm water drains along the roads on both sides of the road and trunk drains which shall cover all major areas and providing discharge drain up to nearest existing drain of plant. Bidder's scope shall include rerouting & construction of existing drain as required..
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2.00.00	23. All roads i.e. double lane & single lane within plant area, access roads from main roads to all buildings / plant and facilities.			
	24. All civil, structural and architectural works associated with Plant potable water supply & Sewage disposal system for all buildings and facilities including providing sewerage pumps & pump house. Existing sewerage facilities affected by stage-IV shall be suitably re-built.			
	25. Earthing mat, wherever it is required.			
	26. Dismantling existing Auto base, Temporary office sheds in switchyard area, existing approach road, amenities in CHP area and any other facilities/structures as required and disposal of serviceable/unserviceable materials as directed by Engineer-in-charge.			
	27. Dismantling & relocation of existing coal slurry settling pond, EDP Building, ash slurry pipes, and any other facilities/structures as per requirements .			
	CONSTRUCTION FACILITIES			
	The following are also in the Bidder's scope of work pertaining to construction facilities for the project.			
	1. All Civil and Structural work associated with drinking and service water for Bidder's labour and other personnel at the work site/colony/offices including pump houses, pipes, overhead tank, tube wells etc.			
	2. Development of his temporary staff colony and labour colony along with fencing etc. Land for staff and labour colony shall not be provided by the owner and contractor has to make his own arrangement for the same at his own cost.			
	3. Making all arrangements for distribution of construction power at various locations as per his requirements.			
4. Making all arrangements himself for the supply of construction water.				
5. Construction of construction office, construction stores of 3000Sqm area (open/covered), workshops, material/field testing laboratory and any other temporary building and construction equipment, labour and materials.				
6. Providing all necessary fire fighting devices/equipment/fire tender etc. required during the project execution stage.				
7. Providing all the tools and tackles required for the work.				
8. The Bidder shall arrange skilled/semiskilled/unskilled labour from local source(s) as far as available and supervisory staff for quality execution of all civil, structural and architectural works.				
9. Development of fabrication yard for structural steel.				
10. Chain link fence between existing main plant facilities and areas identified for stage-IV for isolation during construction stage.				
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		ANNEXURE- X	
9.00.00	INDUCED DRAUGHT COOLING TOWERS The civil works for cooling towers are related mainly to following areas, but not limited to:		
9.01.00	Cooling Tower The basin of the cooling tower for collection of cold water shall be made of Reinforced Cement Concrete (RCC M - 30 grade as per IS: 456). The floor of the basin shall be sloped to minimum 1 in 80 towards the sludge drains as indicated in tender drawings. The required slope shall be achieved by screed concrete of grade M-15 as per IS:456 having minimum thickness at edge as 25 mm. Drainage arrangement of basin shall be as specified elsewhere in the Technical Specifications. Galvanized handrail (32 NB medium class) 1000 mm high and at an interval of 1500mm c/c shall be provided all around the cooling tower basin and sludge sump pit. The bottom 500 mm of this railing shall also have galvanized wire mesh with opening size of 50mm grid to avoid ingress of leaves, vegetation, and debris into the basin. The Bidder's scope includes construction of one outlet channel per cooling tower, stoplog gate and trash rack/screen for the each cooling tower as indicated elsewhere in the Technical Specification. The basin shall be tested for water tightness as per IS:3370. Bottom of the lowest level beam shall be at least at free board level. In case, the beams are provided into the water, the same shall be designed for uncracked section as per IS:3370. The end of the outlet channel shall be provided with 230 mm wide and 6 mm thick PVC water stop all round the cross section of channel at the terminal point of bidder to enable further extension by the Employer. The outlet channel shall be covered on top with removable precast concrete slabs with 32 NB (Medium) G. I. handrails on both sides of the channel. The vertical post of handrail shall be 1000 mm high and at an interval of 1500mm c/c. There shall be two levels of horizontal pipes for hand railing spaced equally in vertical plane. Hot water duct around cooling towers shall be below ground as per details indicated in tender drawings. b) <u>Foundation of Cooling Tower</u> The foundation of the Cooling Tower shall be as detailed out elsewhere in the specifications. c) <u>Super Structure of Cooling Tower</u>		
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	Columns, beams and other structures like tie beams, slabs etc. shall be of reinforced cement concrete of grade M-30 (minimum) as per IS : 456. Uniform concrete grade shall be used for the entire cast-in-situ reinforced concrete superstructure. The fan deck slab shall be properly sloped so that rain water does not accumulate over the deck slab. The slope shall be 1 : 120 (min.). The slope shall be provided with screed concrete of grade M-15 (minimum) as per IS : 456.. Fan Deck slab and all other over ground platforms shall be provided with galvanized 32 mm. dia. Medium class GI hand rails and with galvanised toe guard all around. The vertical post of handrail shall be 1000 mm high and at an interval of 1500mm c/c. There shall be two levels of horizontal pipes for handrailing spaced equally in vertical plane. Suitable arrangement for drainage of rain water to be provided. However, there is no specific requirement of Rain Water down comers. d) <u>Cells, Distribution System and Stack</u> Cooling tower cells shall consist of RCC columns, beams and walls. Hot water distribution channel shall also be of RCC. Cell division partition walls shall be Cast - in - Situ RCC. The Cast - in - Situ RCC cladding walls and Cast- in - Situ RCC cell partition wall shall have two layers of reinforcements on either faces in both directions with minimum dia of reinforcement bars as 8mm and maximum spacing as 150mm c/c. Minimum thickness of Cast - in - Situ RCC cladding walls and Cast - in - Situ RCC cell partition wall shall be 150mm. External surfaces of Cooling tower peripheral cladding walls, and fanstack shall be painted with two or more coating of waterproof cement paint of approved shade, make and color. Hot water channel shall be covered with suitably designed precast / cast - in - situ concrete slab. Wherever flow control valves are located over hot water basin, these shall be placed over precast concrete covers / concrete slab and designed for specified load. The minimum thickness of RCC fan stack shall be 150 mm. The fanstack shall have two layers of reinforcement on either faces in both directions with minimum dia of reinforcement bars as 8mm and maximum spacing as 150mm c/c. e) <u>Stairs</u> RCC staircase for approach to fan deck for each cooling tower shall be provided. The stairs shall have 1000 mm clear width and 32 NB Medium class, GI handrailing. The vertical post of handrail shall be 1000 mm high and at an interval of 1500mm c/c. There shall be two levels of horizontal pipes for handrailing spaced equally in vertical plane. The steps shall be finished with IPS Flooring. The riser shall be maximum 175 mm & treads 250 mm (minimum). Edge protection angle (min 35X35X6, made of aluminum) shall be provided to the treads with the lugs. f) <u>Steel Structures</u>		
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	All mild steel parts of structures used in cooling towers shall be hot dip galvanized or seal spray zinc coated as per BS:5493 (for a very long period of maintenance of more than 20 years). The minimum coating for galvanization shall be 610 gm/sq.m and shall comply with relevant IS Codes. Galvanizing shall be checked and tested in accordance with IS: 2629. All welding shall be done before galvanizing. Any site joints required to be carried out after galvanizing shall be either flanged or screwed joints. Nails, nuts, bolts and all components coming in direct contact with water shall be of stainless steel of SS 316. g) <u>Water proofing of structures and construction joints</u> For water proofing of underground structures including basin slab and hot water distribution channel, water proofing cum plasticizer compound shall be mixed with the concrete. In addition Chemical injection treatment shall be provided for the construction joints of all underground structures. h) <u>Expansion Joints</u> PVC sealing strips shall be used for all expansion joints where water is retained. The minimum thickness of PVC sealing strip will be 6 mm (minimum) and minimum width 230 mm. The expansion joint shall be as per IS : 3370. At expansion joints, joints filler material with sealing compound on both sides shall be provided throughout the height of the cooling tower. i) <u>Grade of concrete</u> All RCC work to be done under this specification, unless specified otherwise, shall be design mix (controlled) concrete of grade M 30 of IS: 456. Water - cement ratio shall not exceed 0.45. Minimum 75 mm thick PCC of grade M-10 as per IS:456 shall be provided as mud mat below foundation unless specified otherwise. The PCC shall extend 75 mm beyond the outer edge of structural concrete. For water retaining structure minimum 100 mm thick PCC of grade M-10 as per IS:456 shall be provided as mud mat below the bottom slab / raft. The PCC shall extend 100 mm beyond the outer edge of the structural concrete. A layer of bitumen paper or craft paper shall be provided over the blinding layer (lean concrete) to destroy the bond between structural concrete and blinding layer. j) All other Civil works required to make installation of cooling tower complete, including the connection of hot water duct at terminal point. k) <u>Lead for surplus earth and degree of compaction</u> The maximum lead for disposal of surplus earth shall be 2 km. outside the plant boundary. Filling in trenches, plinth, sides of foundations and other underground structures, pipes shall be done so as to achieve the 90% of		
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	Standard Proctor's density. Filling for paving below ground floor shall be done to achieve 95 of Standard Proctor's density. l) <u>Form-Work</u> Form-work for basin, basin walls, outlet channel and super structures plywood form work shall be used. m) <u>Doors</u> Single sheet steel door of 18 G mild steel with suitable stiffeners hot dip galvanized or seal spray zinc coated as per BS:5493 (for a very long period of maintenance of more than 20 years) or FRP door shall be provided in each fan stack at fan deck level. Door height & width as per requirement for equipment movement (clear) shall be provided. However, door size shall be minimum 2100 mm high (clear) & 1200 mm wide (clear). The galvanization shall not be less than 610 gm / sq.m as per IS : 4759. Door shall have locking facility. n) <u>Coating</u> All concrete surfaces in direct contact with water/ water spray/moist air shall be applied with Moisture Compatible Corrosion Resistant Coating System or its equivalent as specified in Annexure-A. All concrete surfaces subject to water/ water spray/moist air upto and including Fan Deck slab level including basin slab, inner faces of cladding walls, all faces of cell partition wall, all faces of columns, all faces of beams (both cast in situ and precast), bottom surface of fandek slab for counter flow tower and both surface of fandek slab for cross flow tower, inner face of fanstack, all faces of hot water basin (for cross flow tower) etc shall receive the said coating after cleaning and drying of the concrete surface. The detailed specification of the coating system on concrete surfaces is given in Annexure-A. o) <u>Paving</u> Paving shall be provided for a minimum clear width of 5.0 m from the outer face of the HW risers all around the cooling tower basin. Paving shall also be provided in between the hot water risers and space available between HW risers and CT basin wall spray catcher. The minimum total width of paving around CT basin shall be atleast 8.5 m from outer edge of the spray catcher basin wall. Paving shall consist of reinforced concrete base slab laid over 75 mm thick PCC of grade M-10 as per IS:456 sub-base and 200 mm thick stone soling. The sub-base shall be laid on the compacted and suitably prepared sub-grade. The degree of compaction of sub-grade shall be as specified elsewhere in the specification. The thickness of the RCC base slab of grade M - 25 shall be suitably designed considering a superimposed load intensity of 5T / Sq.m. However the minimum thickness of base slab shall be not less than 150 mm having double layered reinforcement in both directions both top and bottom. The maximum spacing of the reinforcement bars shall be 150mm c/c and minimum dia of reinforcement bars shall be 8mm.		
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9.02.00	RCC peripheral drain of minimum cross sectional dimensions 300mm X 300mm to dispose storm water shall be provided around area paving and shall be connected to nearest Owner's storm water drain. p) <u>Trenches</u> All trenches for cables, pipes or any other underground facility as detailed out elsewhere shall be of RCC M - 30 grade. Cable trenches shall be provided with precast RCC M - 30 grade or chequered plate covers. The portion of cable trenches which is inside the building shall be provided with chequered plate covers and others with precast RCC covers. Thickness of chequered plate shall not be less than 6 mm. Cable trenches as well as precast covers shall be provided with edge protection angles and lifting hooks. All embedments / blockouts as required for supporting pipes, cables etc. shall be provided. RCC Cable trenches shall be filled with sand after installation of cables, upto top level. All outdoor cable trench's top edge shall be 300 mm above FGL (finished ground level) and for cable trenches inside the building top edge shall flush with FFL (Finished floor level) of buildings unless specified otherwise. All cable entry to the building shall be above ground level. All cable / pipe entry shall be properly sealed. q) <u>Walkways</u> Permanent walkways at least 1000mm clear width as per plan indicated in tender drawings shall be provided at hot water distribution level and at drift eliminator level for counter flow type cooling towers. The clear working height available above these walkways shall be at least 2.0 meters. The walkway and its supporting structure shall be of RCC M - 30 grade. Suitable RCC guards rails 300 mm high shall also be provided on both sides of these walkways. Over the guards rails hand railing shall be provided. The vertical post of handrail shall be 700 mm high and at an interval of 1500mm c/c. There shall be two levels of horizontal pipes for hand railing spaced equally in vertical plane. Permanent walkways at least 1000 mm clear width shall also be provided for access to fan and around gear box with aluminium gratings with clear opening size not more than 50 MM x 50 mm and grating thickness of 50 mm on RCC supports at fan deck level.		
	Switch Gear / Control Room for Cooling Tower a) Switch Gear Room/Control Room It shall be single storeyed building, framed RCC structure with beams, columns, floor and roof. It shall have non-load bearing brick wall cladding. It shall house the switch gear and MCC of cooling tower & associated cable trenches. b) Architecture Features		
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	The architectural concept for the exterior of the buildings of this package is required to be in harmony with adjoining buildings. All architectural features of buildings shall be detailed by contractor's qualified architect. Necessary projections, finishes etc. In addition to the minimum areas specified elsewhere this specification shall be provided as required. Detailed architectural drawings alongwith coloring schemes and finishing schedules for both interior and exterior submitted by the contractor shall be got approved by Owner. Nothing extra shall be payable for any changes required while getting the drawings/scheme approved and for executing the same, Architectural works envisaged are related to but not limited to the following : 1) Walls Cladding for all buildings (except cooling towers) shall be of brick work. The brick walls shall be plastered on both sides. Framed structures shall have nonload bearing infilled panel walls. All external brick wall shall be minimum 230 mm thick and all brick work shall be provided with reinforcement consisting of 2 numbers of 6 mm dia bars at every fourth layer. The brick wall of switchgear and control room adjacent to transformer foundation shall be minimum 345 thk. 2) Plastering External surfaces of brickwork shall be plastered with 18 mm thick cement plaster consisting first (base) layer of 12 mm thick plaster in cement mortar (1:4) and second (finishing) layer of 6 mm thick plaster in cement mortar (1: 4). The internal surface shall have 12mm thick plaster in cement mortar (1:4). All RCC ceiling shall have plaster with 6mm thick plaster in cement mortar (1:4). Inside surface of walls office areas, entrance lobby, corridors etc. shall be provided with neat lime punning over plastered surface. Air conditioned areas shall have plaster of paris punning. 3) All roof shall have access through staircase / ladder, Minimum 1.0 wide access path on roofs shall be provided with tiles. All roofs shall have heavy duty water proofing and grading underbed, which shall be provided to give an ultimate run off gradient not less than 1 : 120 to effectively dispose off the rain water. All upstand / parapet on roof shall be RCC and shall have minimum clear height of 750 mm. 4) Rain water down comers shall be concealed either in the brick work or by encasing in cement concrete or by any other suitable arrangement approved by the Engineer. Number of down comers for roof water drainage shall be decided based on IS : 1742 & IS : 2527 and the minimum diameter shall be 100 mm.		
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	5) 1200 mm wide plinth protection with PCC M -25 Grade over underbed arrangement shall be provided for all building, as specified for CT Paving. 6) Peripheral drain in RCC (with minimum cross section 300mm X 300mm) shall be provided all around switchgear building beyond plinth protection and shall be connected to nearest NTPC storm water drain. 7) Damp proof course and anti termite treatment shall be shall be provided at plinth level for all masonry walls and below grade slab respectively. c) Doors, Windows, Ventilators, Louvres and Rolling Shutters Adequate doors (double plate flushed type), Windows, Louvres and Ventilators shall be provided for proper lighting and ventilation of all buildings. The area of windows shall be at least 10 of the floor area of the respective building. In addition to the above, wherever room height is more than 3.5m, a continuous band of ventilations shall be provided at the top. Switchgear building shall have aluminium doors with glazing. All windows and ventilators shall also be in Aluminium frame with glazing. The doors and windows frames shall be suitable for glazing with clear glass. Glazing thickness shall be minimum 6.3mm for doors and minimum 5.5 mm for windows & ventilators. Doors and windows on external wall shall be provided with sunshade over the openings, with width 600 mm more than the opening width. The projections from the wall for sunshade shall be 450 mm over window openings, 750mm over door openings and 900mm over rolling shutter opening or as decided and approved by the Engineer. Rolling shutters of suitable size shall be provided in buildings to facilitate handling and transportation of equipment. d) <u>Floor Finish, Skirting, Wall Finish, Dado and Painting</u> Following finishes shall be provided at the places mentioned against each finish : 1) Metallic hardner like ironite finish shall be provided in the switch gear room. Battery room shall be provided with acid alkali resistant tiles on ground and skirting and on wall upto a height of 2 meters. 2) Vitrified ceramic tiles shall be provided in control room 3) Paving in Ground Floor For Ground floor having earthen subgrade, the paving work shall consist of following part i.e. 150 mm thick RCC M – 25 Grade base slab with double layer reinforcement both top and bottom, 75mm thick			
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	PCC of grade M-10 as per IS:456, 250 mm thick rubble soling sub base and 100 mm thick sand on compacted and dressed sub-grade. The total thickness of base slab, sub-base and sand shall be approximately 575 mm. The paving work in ground floor of all plant buildings shall be as per relevant drawings and as described in the specifications. Finished floor level (FFL) of ground floor shall be 500 mm above finished ground level (FGL). However, top layer over lying the 150mm thick RCC slab shall be floor finish work as per the finish schedules specified elsewhere. 4) Internal Wall Finish The internal surface of all brick walls shall be supplied with minimum coats of oil bound distemper for switchgear room & acrylic emulsion for control room over 2mm thick POP punning. 5) External Wall Finish The external finish of walls of the building shall be subject to the resin bonded textures granular finish 2.5 mm thick of vineratex type or equivalent shall be applied on external walls / fins of buildings. The colour scheme of various finishes shall be subject to the approval of Owner. 5) Ceiling Finish Ceiling shall have 2 (Two) coats of oil bound distemper 6) Skirting shall be minimum 150 mm high and shall match with floor finish. 7) All structural steel work including doors and windows shall have one shop coat and one site coat of red oxide zinc chromate and two coats of synthetic enamel paint as specified elsewhere. 8) False ceiling in AC control room shall be in 12 mm thick glass reinforced gypsum (GRG) plaster board. e) The scope for drainage of surface water shall include design, layout and construction of drains from buildings upto Owner's main drain at a distance of about 10 meters from outside face of all the buildings and structures. All buildings shall be provided with open surface RCC drains of minimum clear size 300 mm width and 300 mm average depth all around periphery and suitably connected to with Owner's drain. f) The following miscellaneous items shall be provided in the Cooling Tower switch gear building by the Bidder.		
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	1) Cable trench within the buildings cable trestle between buildings structures, and cable trench /trestle from Owner's cable trench trestle/ cable trench to Cooling Tower switch gear room shall be in the Bidder's scope. All cable trenches shall generally be provided with suitable insert plates for fixing angle of cable tray & RCC precast slab, however, the portion of the cable trenches behind and sides of control panel / MCC shall be covered with chequered plate. 2) Earthing mat with 40mm dia M.S. bar shall be provided around the structures & buildings as per specifications. 3) Roofing shall consist of grading underbed to provide 1 : 120 slope, 50 mm thick cellular concrete layer, 12mm thick 1 : 4 cement sand plaster followed by heavy duty water proofing treatment. Junction of roof and parapet shall be provided with 150 x 150 mm fillet. 4) Formwork shall be ordinary type for underground work and with plywood for all super structure work. 5) Parapets, chajjas, window and door heads, architectural facias, fins etc shall be provided with drip course by 1 cement 3 sand mortar. 6) Roof drain level shall be provided with 45 cm x 45 cm size khurras having minimum thicknes of 30 mm of PCC M 7.5 over PVC sheet of 1m x 1m x 400 micron and finished with 12 mm 1 : 3 cement sand plaster. 7) The chain link fencing shall be provided where specified in drawings and/or as directed by Engineer. The details of laying & fixing the fencing shall be as per drawings. The fencing to be used for work shall be of Galvanised iron of 50 mm mesh with PVC coated 3.0 mm dia..This shall be fixed on the RCC posts (Precast) spaced at an interval of 3.0 Meters c/c. Design Mix of concrete for RCC posts shall be M25 Grade. 8) M.S. Gate of 3.0 M wide x 2.5 M height shall be provided to provide access through the fencing to the transformer. It shall be made in two leaf, with locking arrangements. The gate shall be made with outer frame of 50 NB (Medium) M.S. Pipe, vertical & horizontal runners with 40x6 M.S. flat and weld mesh of opening size 50x25 mm and nominal size of mesh 4 mm dia. Hinges, aldrops and other accessories shall be provided for effective working of the gate. g) <u>Overhead cable trestle</u> Overhead cable trestle shall be of structural steel (Painting on all MS parts of cable trestle shall be as per Annexure-B. The clear height of these trestles shall be such as to ensure free and uninterrupted traffic movement in place of road crossings without taking any support built by owner. The minimum height of these trestles shall be 4m (clear) at road crossing and 3.0m
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	elsewhere unless noted otherwise. The cable trestle shall also be 3.5m clear high above crossings with the cold water channel incase the trestle is routed to cross Cold water channel. The foundation shall be suitably designed as detailed out elsewhere and shall not in any case obstruct/take support from the structures/facilities built by owner. The load of cable trays for design purpose shall be at least 500kg/m, in addition to dead load, seismic load, and wind load. The layout of these trestles shall be as per approved layout drawing. h) <u>Grade of concrete</u> All RCC work to be done under this specification, unless specified otherwise, shall be design mix (controlled) concrete of grade M 30 as per IS: 456 (2000). Water - cement ratio shall not exceed 0.45. Cable & pipe trenches, precast covers and lining of drain shall have M 30 grade concrete. Minimum 100 mm thick PCC of grade M 10 shall be provided as mud mat below foundation unless specified otherwise. PCC shall extend 75 mm beyond the outer edge of structural concrete. A layer of bitumen paper or craft paper shall be provided over the blinding layer (PCC) to destroy the bond between structural concrete and blinding layer. Screed Concrete shall be of concrete grade M15 (min).		
9.03.00	DESIGN CRITERIA		
9.03.01	R.C.C. Structures		
	(a) The design of all liquid retaining/conveying structures of cooling tower like C.W. basin, sump, outlet channel, hot water distribution channel/basin, sludge drain and pits shall be designed by working stress method as outlined in Clause 4.5 of IS 3370 (Part 2) : 2009. These structures shall be designed for following conditions :- 1. Water filled inside upto the designed level and no earth outside. 2. Earth pressure plus $2.5 T / M^2$ surcharge (Vertical direction) plus ground water table at Finished Graded ground Level (FGL) outside and no water inside. (b) The design of all structures other than liquid retaining/conveying structures of cooling tower above CW basin slab such as columns, beams, fins, walkways, slabs, cladding/partition wall, fanstack, precast beams etc. shall be carried out by limit state method as outlined in Clause 4.4 of IS: 3370 (Part 2): 2009. Further, for limiting the crack width, the stress for the reinforcement steel shall be limited to 130 MPa (on all faces) as per clause 4.4.3.1 of IS: 3370 (Part 2): 2009 using the partial safety factor for serviceability condition as per clause 4.4.1.3.		
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9.03.02	Wherever, the foundation raft of cooling tower is same as CW basin slab, the foundation shall be designed by working stress method as outlined in Clause 4.5 of IS 3370 (Part 2): 2009 (all faces). However, if the cooling tower foundation is not the same as the CW basin slab and a separate foundation for the cooling tower is provided below the CW basin slab due to founding level requirements, the CW basin slab (both faces, including beams at CW basin slab level) shall be designed as structural slab by working stress method as outlined in Clause 4.5 of IS 3370 (Part 2): 2009 and the structures below CW basin slab shall be designed as per IS:456 (2000). However, the size of the column below CW basin slab upto foundation shall be maintained same as the size of the columns just above CW basin slab. (c) The design of staircase, switchgear building, control room/RIO room, transformer and trestle foundation, storm water drain shall be designed as per IS: 456 (2000). (d) For uplift due to ground water table the CW basin shall be checked against uplift for basin empty condition with ground water table at FGL. Stability against uplift shall be ensured both for construction & operating stage with no water inside. The provision of flap valve / pressure release valves is not permitted. The factor of safety against uplift shall be as per IS: 3370. (e) Fan deck shall also be designed for rolling loads due to movement of equipment during Installation / maintenance operation. Minimum Clear cover for all RCC structures/elements of cooling towers to meet durability requirements shall conform to severe exposure condition as per IS: 456 (2000).		
	Fan Supporting Structures <u>Static Analysis & Design</u> The following load conditions and load combinations shall be considered for the design of the Fan supporting structures. (a.) Machine Load (b.) Load case a + unbalance load for the balance of the fan corresponding to Q 16 as per VDI 2056 / VDI 2060. (c.) Load case a + unbalance load corresponding to one blade failure load condition. The strength design of the Fan supporting structure shall be done for worst loading combinations as stated above. <u>Dynamic Analysis</u>		
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9.03.03 9.03.04 9.03.05	(a) Free vibration analysis A free vibration analysis of the fan supporting structure including the intermediate supporting structure for motor, gear box and pillow block (if applicable) shall be carried out to calculate the natural frequency of the fan supporting structure and its fundamental natural frequency shall be at least + 20% away from the operating speed of the fan and motor. (b) Forced vibration analysis Forced response analysis shall be carried out on the fan supporting structure including the intermediate structure supporting the motor, gear box and pillow block to calculate the vibration amplitudes for the following unbalance condition : - - For unbalance load corresponding to Q 16 balance grade of the fan as per VDI 2056. - For unbalance load corresponding to one blade failure condition. The amplitude so calculated shall be within the permissible values as specified by the fan manufacturer or IS : 2974 (Part - IV), whichever is more stringent. Mid Bearing Supporting Structure The intermediate supporting structure for motor, gear box and pillow block if provided shall be so arranged that it does not cause any torsional moments on the beams / pedestals on which the intermediate support rests. The intermediate supporting structure shall be orthogonal to the grid of beams on which it rests. The motor shall be supported on a base frame. The concrete block supporting the fan/gear reducer shall be connected to immediate lower level of beam column junctions by means of atleast four diagonal columns. Fan Stack The fan stack shall be made of RCC with minimum 150 mm thickness. With reinforcement provided on both faces in either direction. Design of the fan stack shall be made on the basis of relevant stipulations of IS : 11504 for Natural Draught Cooling Towers. The fanstack shall have two layers of reinforcement on either surfaces in both directions with minimum dia of reinforcement bars as 8mm and maximum spacing as 150mm c/c. Steel Structure		
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	These structures shall be designed, fabricated and erected as per IS: 800 (latest revision). All mild steel parts or structural steel works used in the cooling towers shall be hot dip - galvanised as per IS: 4759 with 610gm/sq.m. coating or seal spray zinc coated as per BS:5493 (for a very long period of maintenance of more than 20 years). Nails and all components coming in direct contact with water shall be of stainless steel of SS 316 or equivalent. (a.) All welds shall be subject to 100% visual examination. (b.) Dye penetration test on welds shall be carried out. (c.) Welding shall be done as per approved procedures and by qualified welders. Galvanising shall be checked / tested for all tests as per IS : 2629. For all steel structures, other than hot water pipes, sludge pipes and hot water distribution pipes, which are outside cooling tower painting shall be as per Annexure-B of this Sub Section III-D-01. However, for painting of hot water pipes, sludge pipes and hot water distribution pipes, Clause 2.09.00 of Sub Section III-A-02 of the technical specification shall be referred.		
9.03.06	The minimum cement content as specified in subsequent clauses of this specification shall be applicable for all structures of cooling towers.		
9.03.07	Test for water tightness The water tightness of C.W. basin, outlet channel, hot water channel and all other water retaining structures shall be tested for water tightness as per the provisions of IS : 3370.		
9.03.08	STOPLOG GATES AND TRASH RACK FOR COOLING TOWER Stoplog gates The stoplog gate shall cover the clear opening of the cold water channel and effectively stop the water leakage. Clear size of the stoplog gates shall be equal to the clear opening size (freeboard of minimum 300mm over the maximum water level in stop log depth shall be ensured.). The capacity of the hoist (Min 2 ton capacity) shall be decided to match with provided size units of the stoplog gate. Structural design of stoplog gate shall conform to IS : 5620 and IS : 4622 (latest). Maximum water level for designing the stoplog gates shall be taken as maximum water level in the CT basin indicated in the tender drawing. Suitable lifting beam shall be provided to operate the stoplog gates. Stoplog gate and its lifting arrangement shall designed for a condition when basin is empty and water upto full level on the other side. Proper rubbers seal shall be provided in the stoplog to avoid any leakage of water. All gates shall be hot dip galvanized as per IS:4759 with 610 gm/sqm coating. Alternatively, all gates shall be		
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	painted with sealed spray zinc coating conforming to BS:5493 (Table – 3, Part-8) for very long (20 or more) years of maintenance interval. Lifting Beams Separate lifting beams (automatic) shall be designed & fabricated with guide shoes, hooks, links and counter weights etc. complete for automatic operation to engage and disengage the stoplog gates in the required position. Leakage Tests of Stoplog Gates Leakage tests shall be carried out with the stoplog gates lowered onto the sill. Before observation for leakage, the stoplog gate shall be raised and lowered about one meter several times in order to dislodge any debris that might have lodged in the side and bottom seals, The leakage shall then be measured and it should not be more than 5 Liters / Minute / Meter length of seal under maximum head. Material Specifications of stop log gate All material used in the fabrication of stoplog gate shall be of high grade, free from defects and imperfections and shall be of the highest standard commercial quality suitable for the intended use. Radiographic examination or magnetic particle testing or other comparable tests shall be carried out for determining the soundness of steel castings and shall be conducted by the Contractor, if asked for by the Employer. Materials for the various components of Stoplog gates <table border="1" data-bbox="399 1187 1356 1859"> <thead> <tr> <th>Sl. No.</th><th>Component Parts</th><th>Recommended Materials</th><th>Reference</th></tr> </thead> <tbody> <tr> <td>1.</td><td>Stoplog Gate Leaf</td><td>Structural steel</td><td>IS : 2062</td></tr> <tr> <td>2.</td><td>Stoplog Gate Frames and 1st stage embedded parts</td><td>Structural steel</td><td>IS : 2062</td></tr> <tr> <td>3.</td><td>2nd stage embedment</td><td>Stainless steel</td><td>SS 316 or IS : 1570 (Part 5).</td></tr> <tr> <td>4.</td><td>Wheels (the hardness of wheel track surface shall be kept 50 points higher than that of wheel tread)</td><td>Cast steel</td><td>IS : 1030</td></tr> <tr> <td>5.</td><td>Wheel axles, wheel track</td><td>Corrosion resistant steel.</td><td>IS : 1570</td></tr> <tr> <td>6.</td><td>Seals</td><td>Rubber</td><td>IS : 11855</td></tr> </tbody> </table>			Sl. No.	Component Parts	Recommended Materials	Reference	1.	Stoplog Gate Leaf	Structural steel	IS : 2062	2.	Stoplog Gate Frames and 1st stage embedded parts	Structural steel	IS : 2062	3.	2 nd stage embedment	Stainless steel	SS 316 or IS : 1570 (Part 5).	4.	Wheels (the hardness of wheel track surface shall be kept 50 points higher than that of wheel tread)	Cast steel	IS : 1030	5.	Wheel axles, wheel track	Corrosion resistant steel.	IS : 1570	6.	Seals	Rubber	IS : 11855
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	TRASH RACKS Material Specifications for TRASH RACKS: All materials used in the fabrication of equipment required shall be new and shall conform to the requirements of specifications and codes as applicable referred herein. If a material is specifically not referred to in these specifications/specification drawings, Contractor shall furnish material of the highest standard commercial quality suitable for the intended use. The material referred to in the design and drawings mostly conform the Indian Standard Specifications unless otherwise stated :																											
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9.03.09	Materials for Trash Racks			
	S.No.	Component/Part	Recommended material	Reference
	1.	Trash rack and embedded parts	Structural Steel	IS-2062
	2.	Slide block	Structural Steel with bronze padding	IS-2062 and IS:305
	3.	Track base	Stainless Steel	SS 316 or IS : 1570 (Part 5)
	4.	Track	Stainless Steel	SS 316 or IS : 1570 (Part 5)
	5.	Guides	Corrosion resistant Steel	IS : 6603
	6.	2 nd stage embedment	Stainless steel	SS 316 or IS : 1570 (Part 5)
	Design			
	Trash rack should be designed for 2.0m differential head as per IS:800 and also conform to IS:11388 (latest). Each unit of trash rack shall be consisting of vertical flats and horizontal flats. The grating shall be pressure locked. Size of opening shall be 100 mm x 100 mm for all trash racks.			
All trash rack should be capable of being lowered in the associated stoplog gate grooves to enable drawl of clean water while a particular track rash is raised for cleaning purposes.				
LOADING				
For consideration of loads on structures and load combinations IS : 875 (Part -1 to 5) Code of Practice for design loads (other than Earthquake) for Buildings and Structures shall be followed.				
Site specific seismic data and wind data shall be followed for design of cooling towers.				
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	Live Loads The following live loads (minimum) shall be adopted for the design of buildings, structures: <table><tr><td>a)</td><td>Roof / Fan deck</td><td>500 Kg / Sq. M.</td></tr><tr><td>b)</td><td>RCC Floors</td><td>500 Kg / Sq. M.</td></tr><tr><td>c)</td><td>Stair, landings</td><td>500 Kg / Sq. M.</td></tr><tr><td>d)</td><td>Chequered & Grating floor</td><td>400 Kg / Sq. M.</td></tr><tr><td>e)</td><td>Culverts and its allied structure</td><td>As per I.R.C. class A' loading for two lane and 70R for single lane roads.</td></tr><tr><td>f)</td><td>Basin, sump and duct</td><td>Earth pressure; water pressure as applicable and additional surcharge load of 2.50 T/Sq. M.</td></tr><tr><td>g)</td><td>Covers for H.W. channels / H.W. distribution basin</td><td>300 Kg / Sq. M.</td></tr><tr><td>h)</td><td>Walkways inside cooling towers</td><td>300 Kg / Sq. M.</td></tr><tr><td>i)</td><td>Underground pipes and ducts</td><td>Earth pressure and surcharge load of 2.50 T / Sq. M.</td></tr><tr><td>j)</td><td>Cover of cable / pipe trenches</td><td>500 kg / sq.m. or as per (e) above as the case may be.</td></tr></table>				a)	Roof / Fan deck	500 Kg / Sq. M.	b)	RCC Floors	500 Kg / Sq. M.	c)	Stair, landings	500 Kg / Sq. M.	d)	Chequered & Grating floor	400 Kg / Sq. M.	e)	Culverts and its allied structure	As per I.R.C. class A' loading for two lane and 70R for single lane roads.	f)	Basin, sump and duct	Earth pressure; water pressure as applicable and additional surcharge load of 2.50 T/Sq. M.	g)	Covers for H.W. channels / H.W. distribution basin	300 Kg / Sq. M.	h)	Walkways inside cooling towers	300 Kg / Sq. M.	i)	Underground pipes and ducts	Earth pressure and surcharge load of 2.50 T / Sq. M.	j)	Cover of cable / pipe trenches	500 kg / sq.m. or as per (e) above as the case may be.
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	ANNEXURE-A Specification For High Performance Moisture Compatible Corrosion Resistant Coating System a) Providing & applying High Performance Moisture Compatible Corrosion Resistant Coating System manufactured as per technical specifications of Central Electrochemical Research Institute, Karaikudi, (C.S.R.I. affiliate Institute), Tamil Nadu Pin - 630 006. b) The coating system shall be water compatible, compatible for applying in wet conditions also and shall be tolerant to under-prepared surfaces and existing residual tar / paint. The system shall also be quick curing so as to be suitable for application during shut downs. The coating material shall be stored in the manner as per recommendations of the manufacturer until ready for use. The coating material shall be used within the manufacturer's written recommended shelf life. c) The coating system shall conform to the following : PROPERTIES OF PAINT<table><tr><td>Base</td><td>High Performance Moisture Compatible Corrosion Resistant Coating System CECRI know-how system</td></tr><tr><td>Volume Solids</td><td>70%</td></tr><tr><td>Specific Gravity (ASTM-D-1475)</td><td>1.25 ± 0.1</td></tr><tr><td>Dry Film Thickness (ASTM-D-1186)</td><td>160 ± 10 µm per coat</td></tr><tr><td>Coverage</td><td>4 - 4.5 sq.m/ ltr</td></tr><tr><td>Touch Dry</td><td>2 Hours</td></tr><tr><td>Recoating</td><td>24 Hours</td></tr></table>PROPERTIES OF COATING<table><tr><td>Salt Spray (ASTM-B 117)</td><td>2000 Hours</td></tr><tr><td>Resistance to sea water (Carried out upto 6 months)</td><td>Passes</td></tr><tr><td>Coating Resistance (Carried out upto 6 months)</td><td>10⁹ Ω. cm²</td></tr><tr><td>Adhesion (ASTM-D 4541)</td><td>4.5 kN minimum</td></tr><tr><td>Flexibility (ASTM-D-522) Elongation</td><td>1/8" passes 33%</td></tr><tr><td>Impact (ASTM G 14-04)</td><td>45 cm passes</td></tr></table> d) Paint material & its application method shall be obtained from any manufacturer who has been granted License by CECRI, Karaikudi for technical know how for High Performance Moisture Compatible Corrosion Resistant Coating System. The application method of coating shall be got duly approved from CECRI, Karaikudi.				Base	High Performance Moisture Compatible Corrosion Resistant Coating System CECRI know-how system	Volume Solids	70%	Specific Gravity (ASTM-D-1475)	1.25 ± 0.1	Dry Film Thickness (ASTM-D-1186)	160 ± 10 µm per coat	Coverage	4 - 4.5 sq.m/ ltr	Touch Dry	2 Hours	Recoating	24 Hours	Salt Spray (ASTM-B 117)	2000 Hours	Resistance to sea water (Carried out upto 6 months)	Passes	Coating Resistance (Carried out upto 6 months)	10 ⁹ Ω. cm ²	Adhesion (ASTM-D 4541)	4.5 kN minimum	Flexibility (ASTM-D-522) Elongation	1/8" passes 33%	Impact (ASTM G 14-04)	45 cm passes
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	ANNEXURE-B		
1.00.00	HIGH PERFORMANCE PAINTING SYSTEM		
1.01.00	Materials		
1.01.01	Zinc silicate primer (minimum 75 micron Dry Film Thickness - DFT) shall be inorganic (Ethyl) self curing high built (Solid by volume minimum 60%) formulation as per BS : 5493 (Inorganic Zinc rich systems).		
1.01.02	Intermediate (Under) coat (minimum 75 micron DFT) shall be of polyamide cured titanium di-oxide / micaceous iron oxide pigmented high performance (solid by volume minimum 60%) epoxy coating as per BS : 5493 (two pack chemical resistant under coats).		
1.01.03	Finish coat (minimum 75 micron DFT) shall be of polyamide cured colored pigmented high performance (solid by volume minimum 60%) epoxy coating as per BS : 5493 (two pack chemical resistant finishes).		
1.01.04	Final finish coat (minimum 25 Micron DFT) shall be of polyurethane colour pigmented (solid by volume minimum 40%) as per BS : 5493 (two pack chemical resistant finishes).		
1.01.05	All paints including primer shall be of reputed brand / manufacturer and as approved by the engineer.		
1.02.00	Preparation of Surface		
1.02.01	The surfaces shall be blast cleaned to near white metal surface (Sa 2 ½) i.e. 2nd quality (requiring at least 95% of the surface completely cleaned) as given in BS : 4232 . For blast cleaning dry method as approved shall be used.		
1.02.02	Approved type of abrasives shall only be used for blast cleaning of steel surfaces. To avoid contamination of the adjoining areas with abrasive, suitable enclosure shall be provided to carry out the blast cleaning operation. If required prior approval from the factory inspector / pollution control board etc. shall be obtained regarding the method of blast cleaning and abrasives used therein.		
1.02.03	Steel may be blast cleaned either before or after fabrication. Immediately after blast cleaning of the steel surfaces, primer coat shall be applied onto the surfaces.		
1.03.00	Application of paint		
1.03.01	The contractor shall submit the total painting scheme and works shall be started after the approval of the scheme, from the engineer.		
1.03.02	Painting works shall be carried out on structural as per the approved scheme. The total painting scheme to be submitted to the engineer shall include the following:		
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	i) Method of blast cleaning giving the details and sizing of various equipment required, abrasive used, enclosure provided to avoid contamination of the adjoining area, expected productivity on an eight (08) hour shift working etc. ii) Arrangement of airless spray with the equipment rating. iii) Drying time to be allowed before the application of subsequent coat. iv) Recommended paint for primer, intermediate (under) coat, finish coat and final finish coat with their brand name and designation, considering the requirements of BS : 5493 for long range (typical time to first maintenance 10 to 20 years), life for exterior exposed non polluted inland atmosphere. v) Number of coat and the thickness of each coat to be applied to achieve the specified thickness of each coat i.e. primer, intermediate (under), finish and final finish coats. vi) Environmental conditions i.e. ambient temperature and humidity at the time of application of the paint. vii) Quality control setup for painting i.e. checking of surface preparation, thickness of each coat, quality of applied paints vis-a-vis the approved sample etc. viii) Method of touch up painting for surfaces damaged during handling, transit, erection, welding, subsequent to painting, removal of the temporary supports etc. ix) Reference of relevant Indian / International standards for the testing and acceptance.			
1.03.03	Before application of inorganic zinc silicate primer, the steel surfaces shall be blast cleaned to near white metal surface (Sa 2 ½).			
1.03.04	Primer paint and intermediate (Under) coat shall be done by airless spray. However finish coat and final finish coat can be applied either by spray and or brush.			
1.03.05	All subsequent coats shall be applied only after acceptance of the previous applied coat. Inaccessible surfaces shall be primer painted before shop assembly.			
1.03.06	For final touch up painting of surfaces, which are damaged during handling, transit, erection, etc. surfaces shall be well prepared, by rubbing the entire damaged area using wire brush, emery paper etc. and shall be provided with minimum 100 micron (DFT) of self priming high build epoxy based primer followed by intermediate, finish and final finish coats as described elsewhere in this document. Touch up painting of areas welded subsequent to painting and areas exposed after removal of temporary supports shall also be carried out in same way.			
1.03.07	Rectification of the damaged painted surfaces on account of welding / handling etc. of each coat shall be done by touch up painting, before the application of next coat,			
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CLAUSE NO.	CIVIL WORKS	एनटीपीसी NTPC		
	using minimum 100 micron (DFT) self priming high build epoxy based primer followed by various coats in sequence of thickness as specified elsewhere.			
1.04.00	Acceptance Criteria			
1.04.01	All painted surfaces shall be uniform and pleasing in appearance.			
1.04.02	Dry film thickness of each coat shall be checked and measured by using elcho-meter. The thickness as measured shall not be less than the minimum thickness specified for the coat of paint under relevant clauses of the technical specification.			
1.04.03	Colour, texture shall match exactly with the approved sample.			
1.04.04	Sampling, testing and quality assurance requirements are given elsewhere in the technical specification.			

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