Corrigendum - 4 dated 20/03/2025 to CPC Tender No. BHEL/CPC/RTP/BLR_FGD/25/086

Name of work - "CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO, GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/ CABLE RACK, MISC. MCC BUILDING & CONTROL ROOM, OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC., ACW PUMP HOUSE, DG FOUNDATION, FGD TANKS, SUMPS , PUMPS, DUCT FOR FGD, BALL MILL BUILDING, FOPH, ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, RAGHUNATHPUR, WEST BENGAL".

A) The following clauses of Technical Conditions of Contract (TCC) are revised as mentioned below:

S. N.	Clause No	Existing Clause in Tender	Revised Clause
1	2.7.3	**Computer Operator and Support Staff:** Computer Operator and Support Staff: The successful bidder shall also provide the following for miscellaneous service for BHEL's use at site/ PSER-Kolkata/ BHEL-CPC, Noida office for construction detail drawings, reconciliation, progress review & day-to-day planning purpose, documentation, etc.: - • 01 No Computer operator and 1 no supporting staff at PSER/HQ for assist in coordination & planning between site, Bidders HQ & PSER/HQ. • 01 no. Skilled ITI Civil draughtsman from a recognized institute, proficient in AUTOCAD software with experience (min. 3 years) in generating drawings of concrete and steel structural works, at BHEL-CPC, Noida office. • 01 No Computer operator at Central Procurement Cell (Noida) for assist in coordination & planning between site, Bidders HQ & PSER/HQ. • 02 Nos Computer operator and 4 nos supporting staff at BHEL Site office for assist in bill processing and maintaining infrastructure provided by the bidder (Computer, Printer etc.) to BHEL site office. Approval or Rejection of the candidate shall be sole discretion of BHEL and shall be binding on the Contractor.	**Computer Operator and Support Staff:** Computer Operator and Support Staff: The successful bidder shall also provide the following for miscellaneous service for BHEL's use at site/ PSER-Kolkata/ BHEL-CPC, Noida office for construction detail drawings, reconciliation, progress review & day-to-day planning purpose, documentation, etc.: - • 01 No Computer operator and 1 no supporting staff at PSER/HQ for assist in coordination & planning between site, Bidders HQ & PSER/HQ. • 01 no. Skilled ITI Civil draughtsman from a recognized institute, proficient in AUTOCAD software with experience (min. 3 years) in generating drawings of concrete and steel structural works, at BHEL-CPC, Noida office. • 01 No Computer operator at Central Procurement Cell (Noida) for assist in coordination & planning between site, Bidders HQ & PSER/HQ. • 02 Nos Computer operator and 4 nos supporting staff at BHEL Site office for assist in bill processing and maintaining infrastructure provided by the bidder (Computer, Printer etc.) to BHEL site office. Approval or Rejection of the candidate shall be sole discretion of BHEL and shall be binding on the Contractor. These facilities are to be provided within 15 days from the written

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S. N.	Clause No	Existing Clause in Tender	Revised Clause
		These facilities are to be provided within 15 days from the written intimation of BHEL site till completion of scheduled contract period (i.e 32 contractual months). If case successful bidder fails, to provide computer/ printer or personnel as per requirement in the aforesaid mandatory period (i.e 32 contractual months), for a continuous period of fifteen days or more, BHEL shall have the right to deduct as per following rates on prorate basis, from successful bidder's RA bill or any other dues with 5% overheads. a. @Rs 30,000/- (Twenty-five thousand) per month for each computer operator. b. @Rs 40,000/- (Forty thousand) per month for Skilled ITI Civil draughtsman. c. @Rs 25,000/- (Twenty thousand) per month for each supporting staff. d. Computer/Printer as per actual purchase/market price with 5% overheads. In case BHEL intends to extend the services of computer operator or service staff beyond the aforesaid mandatory period (i.e 32 contractual months), the successful bidder shall extend the service to BHEL, for which BHEL will reimburse following rates. a. @Rs 30,000/- (Twenty-five thousand) per month for each computer operator. b. @Rs 25,000/- (Twenty-thousand) per month for each supporting staff. c. @Rs 40,000/- (Forty-thousand) per month for Skilled ITI Civil draughtsman.	intimation of BHEL site till completion of scheduled contract period (i.e 28 contractual months). If case successful bidder fails, to provide computer/ printer or personnel as per requirement in the aforesaid mandatory period (i.e 28 contractual months), for a continuous period of fifteen days or more, BHEL shall have the right to deduct as per following rates on prorate basis, from successful bidder's RA bill or any other dues with 5% overheads. a. @Rs 30,000/- (Thirty thousand) per month for each computer operator. b. @Rs 40,000/- (Forty thousand) per month for Skilled ITI Civil draughtsman. c. @Rs 25,000/- (Twenty-five thousand) per month for each supporting staff. d. Computer/Printer as per actual purchase/market price with 5% overheads. In case BHEL intends to extend the services of computer operator or service staff beyond the aforesaid mandatory period (i.e 28 contractual months), the successful bidder shall extend the service to BHEL, for which BHEL will reimburse following rates. a. @Rs 30,000/- (Thirty thousand) per month for each computer operator. b. @Rs 25,000/- (Twenty-five thousand) per month for each supporting staff. c. @Rs 40,000/- (Forty-thousand) per month for Skilled ITI Civil draughtsman.
2	6.2.10	Bunker Bay – Feeder Floor, Tripper Floor and Roof Slab with Parapet Wall including Side Metal Cladding in order to Handing Over for Erection, Unit#2 - Progressively from 24th to 30th Months	Bunker Bay – Feeder Floor, Tripper Floor and Roof Slab with Parapet Wall including Side Metal Cladding in order to Handing Over for Erection , Unit#2 - Progressively from 24th to 28th Months
3	2.5.16	The Contractor shall maintain accurate records of material supplies, including delivery challans, invoices, and stock registers. These records shall be submitted periodically for verification and reconciliation by the BHEL.	The Contractor shall maintain accurate records of material supplies, including delivery challans, invoices, and stock registers. These records shall be submitted to BHEL on monthly basis maintaining proper format of records in consultation with BHEL site.

S. N.	Clause No	Existing Clause in Tender	Revised Clause
4	2.8.2	**Setting Up of Laboratory Works:** BHEL shall set up centralised civil quality laboratory in the close vicinity of the work site wherein test shall be performed for all civil contractors working for the project. The civil lab building shall be excluded from contractor's scope however required latest testing equipment as per attached Annexure-I shall be in the scope of contractor. The contractor shall establish and maintain a fully equipped site laboratory facility, including necessary furniture, at the designated location by BHEL within the project premises. The laboratory shall be housed in a proper structure, with adequate space for testing operations, sample storage, documentation work, and staff workspace. The contractor shall ensure appropriate environmental conditions, including temperature, humidity, and dust control, as required for precise testing operations and equipment maintenance. The agency must maintain at all times all necessary consumables like distilled water, standard sand, etc. The laboratory building, along with power and water connections initially, shall be provided by BHEL. However, the contractor shall be responsible for all additional requirements to maintain a functional and compliant laboratory setup. The contractor shall deploy adequate manpower including helpers to assist in all testing activities (including tests of other contractors too) in the centralised civil laboratory. The lab equipment shall be handed over to BHEL after completion of contract peiod. .....ensuring traceability of measurements.	**Setting Up of Laboratory Works:** BHEL shall set up centralised civil quality laboratory in the close vicinity of the work site wherein test shall be performed for all civil contractors working for the project. The civil lab building shall be excluded from contractor's scope however required latest testing equipment as per attached Annexure-I shall be in the scope of contractor. The contractor shall establish and maintain a fully equipped site laboratory facility, including necessary furniture, at the designated location by BHEL within the project premises. The laboratory shall be housed in a proper structure, with adequate space for testing operations, sample storage, documentation work, and staff workspace. The contractor shall ensure appropriate environmental conditions, including temperature, humidity, and dust control, as required for precise testing operations and equipment maintenance. The agency must maintain at all times all necessary consumables like distilled water, standard sand, etc. The laboratory building, along with power and water connections initially, shall be provided by BHEL. However, the contractor shall be responsible for all additional requirements to maintain a functional and compliant laboratory setup. The contractor shall deploy adequate manpower including helpers to assist in all testing activities (including tests of other contractors too) in the centralised civil laboratory. Failure to comply with the above requirements, including delays in providing logistics, labour, or witnessing personnel, or failure to arrange for special tests, shall attract penalties as deemed appropriate by BHEL, which will be recovered from the successful bidder's bills. The lab equipment shall be handed over to BHEL after completion of contract period. .....ensuring traceability of measurements.
5	2.9.1	The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of	The work to be carried out at quoted / accepted rates by the Contractor under the scope of these specifications covers the complete work of handling, loading and transporting of materials from project stores sheds / storage yards to site of erection or preassembly yard

S. N.	Clause No	Existing Clause in Tender	Revised Clause
		erection or preassembly yard and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipment at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, fixing, grinding, wherever needed (as and where required). Payment for application of Primer & Paint, including its supply, for touch-up works in shop fabricated structure shall be paid separately as per BOQ.	and unloading at pre-assembly area/erection site, checking, cleaning chipping and levelling of foundations, providing packers and shims/pre-assembling of equipment at the preassembly yard, inspection, minor rectification, preservation, erection, levelling, and other adjustments, cutting, edge / surface preparation, welding, fixing, grinding, wherever needed (as and where required). Payment for application of Primer & Paint, including its supply, for touch-up works in shop fabricated structure shall be paid separately as per BOQ. Bidder must acquaint himself to the locality and power station and the planning must be in line with the clear understanding that the project is inside an existing unit and all procedures and norms of the land/owner has to be followed. No delay/justification shall be accounted due to above.
6	3.11.1	Labour colony comprising of 25 labour shed/sets for approx. 3000 workers are to be developed by contractor. The ownership of all the sheds shall lie with the contractor. Land for labour colony shall be arranged by Contractor (payable under BOQ schedule) and lease of total land shall be kept valid till the contract period or as decided by BHEL. If required, tripartite lease agreement shall be made including BHEL and decision of BHEL in this regard shall be binding to the contractor. All labour colony set-up is to be developed as per attached layout drawing (Design Shall be in the scope of Contractor) and in compliance of statutory requirements. All common areas in the Labour colony shall be developed by the contractor initially. Cement & Steel required for the labour sheds shall be in contractor's scope.	Labour colony comprising of 25 labour shed/sets for approx. 3000 workers are to be developed by contractor. Out of 25 labour sheds, 10 labour sheds will be for the exclusive use of the contractor and remaining 15 labour shed shall be at the disposal of BHEL for allotment to various other agencies working at site from time to time. The contractor shall be the owner for the 10 labour sheds assigned for exclusive use of the contractor. However, for the 15 labour sheds handed over to BHEL, the ownership shall not lie with the contractor. Land for labour colony shall be arranged by Contractor (payable under BOQ schedule) and lease of total land shall be kept valid till the contract period or as decided by BHEL. If required, tripartite lease agreement shall be made including BHEL and decision of BHEL in this regard shall be binding to the contractor. However, in case the land is provided inside the plant by BHEL, BOQ item no. A1.2 shall not be executed. Bidder has to provide fencing for labour colony inside the plant as well as for separation of existing unit with the project unit as per Customer requirement. The levelling and grading of the land shall be in the bidder's scope. Bidder to note that the construction water and power shall be on chargeable basis. All labour colony set-up is to be developed as per attached layout

S. N.	Clause No	Existing Clause in Tender	Revised Clause
			drawing (Design Shall be in the scope of Contractor) and in compliance of statutory requirements. All common areas in the Labour colony shall be developed by the contractor initially. Cement & Steel required for the labour sheds shall be in contractor's scope.
		The following shall be applicable for construction of labour sheds: - 1) All civil & architectural works, electrification works including lighting and fans, switches, sockets, etc., plumbing, sanitary, bed with mattress, finishing, etc. for labour sheds shall be in the scope of the contractor 2) The bed shall be metal type of min size 6 feet by 3 feet with mattress (min 3-inch-thick) 3) Windows shall be of metal make, openable window with 6 mm thick toughened glass. 4) Roof shall be of metallic color coated profiled sheet (min 0.45mm thick) with proper under deck insulation & false ceiling (bottom of false ceiling shall be min 3m from floor level). 5) The wall panel shall be Aerocon panel of min. 50mm thick. 6) Doors shall be of metal door frame with solid core flush door shutter with all necessary fittings. Out of 25 labour sheds, 10 labour sheds will be for the exclusive use of the contractor and remaining 15 labour shed shall be at the disposal of BHEL for allotment to various other agencies working at site from time to time. For sheds handed over to BHEL, providing bed with mattress, wiring &fittings for electricity distribution, etc. shall be one-time requirement. Maintenance of the labour sheds allotted to BHEL and its working agencies shall be in the scope of allotted working agencies. In this case, the maintenance of only 10nos sheds shall be in the scope of Contractor. Contractor shall take written clearance from BHEL prior to construction of 15 nos. BHEL allotted labour sheds. .....The following completion schedule for labour sheds shall be ensured: -	The following shall be applicable for construction of labour sheds: - 1) All civil & architectural works, electrification works including lighting and fans, switches, sockets, etc., plumbing, sanitary, bed with mattress, finishing, etc. for labour sheds shall be in the scope of the contractor 2) The bed shall be metal type of min size 6 feet by 3 feet with mattress (min 3-inch-thick) 3) Windows shall be of metal make, openable window with 6 mm thick toughened glass. 4) Roof shall be of metallic color coated profiled sheet (min 0.45mm thick) with proper under deck insulation & false ceiling (bottom of false ceiling shall be min 3m from floor level). 5) The wall panel shall be Aerocon panel of min. 50mm thick. 6) Doors shall be of metal door frame with solid core flush door shutter with all necessary fittings. For sheds handed over to BHEL, providing bed with mattress, wiring & fittings for electricity distribution, etc. shall be one-time requirement. Maintenance of the labour sheds allotted to BHEL and its working agencies shall be in the scope of allotted working agencies. In this case, the maintenance of only 10nos sheds shall be in the scope of Contractor. Contractor shall take written clearance from BHEL prior to construction of 15 nos. BHEL allotted labour sheds. .....The following completion schedule for labour sheds shall be ensured: - 1 First 8 Labour Shed/set (03 nos. for BHEL as per requirement) - within Three (03) Months from date of start of work 2 Next 17 Labour Shed/set (12 nos. for BHEL as per requirement) - within Six (06) Months from date of start of work

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<table>
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<tr><td></td><td></td><td>1 First 8 Labour Shed/set (03 nos. for BHEL as per requirement) - within Three (03) Months from date of start of work
2 Next 17 Labour Shed/set (12 nos. for BHEL as per requirement) - within Six (06) Months from date of start of work</td><td></td></tr>
<tr><td>7</td><td>4</td><td>Tools and Plants:
A. T & Ps for Civil Works
SI.no 1 to 41
Sl.no 42 - NA</td><td>Tools and Plants:
A. T & Ps for Civil Works
SI.no 1 to 41
Sl.no 42. T&Ps for hard rock blasting arrangements (controlled blasting) - As per requirement.</td></tr>
<tr><td>8</td><td>5.2</td><td><table><tr><th>SN</th><th>DESCRIPTION</th><th>QUANTITY</th><th>REMARKS</th></tr><tr><td>1.</td><td>CRAWLER/MOBILE CRANE OF CAPACITY 75 MT CRANE</td><td>Over and above quantity mentioned in Chapter – IV – (T&PS AND MMES TO BE DEPLOYED BY CONTRACTOR.)</td><td>BASED ON WORK REQUIREMENT</td></tr></table></td><td><table><tr><th>SN</th><th>DESCRIPTION</th><th>QUANTITY</th><th>REMARKS</th></tr><tr><td>1.</td><td>CRAWLER/MOBILE CRANE OF CAPACITY 75 MT CRANE</td><td>Over and above quantity mentioned in Chapter – IV – (T&PS AND MMES TO BE DEPLOYED BY CONTRACTOR.)</td><td>BASED ON WORK REQUIREMENT</td></tr><tr><td>2.</td><td>CRAWLER/MOBILE CRANE OF CAPACITY OVER AND ABOVE 75 MT CRANE</td><td>As per requirement</td><td>BASED ON WORK REQUIREMENT</td></tr></table></td></tr>
<tr><td>9</td><td>9.3.1</td><td>Cement, Reinforcement Steel, (wherever specified as free issue by BHEL) required for the tender scope shall be procured by BHEL and issued to contractor free of cost (As FOC Item). However, unloading, handling / storage of Cement, Gratings and Reinforcement steel procured by BHEL for this tender scope at site, Contractor’s Stores, issuance of materials from BHEL Stores and further transportation from Stores to work area (including loading and unloading) will be in the scope of contractor. No Extra payment shall be made for this work.</td><td>Cement, Reinforcement Steel, (wherever specified as free issue by BHEL) required for the tender scope shall be procured by BHEL and issued to contractor free of cost (As FOC Item). However, unloading, handling / storage of Cement, Gratings and Reinforcement steel procured by BHEL for this tender scope at site, Contractor’s Stores, issuance of materials from BHEL Stores and further transportation from Stores to work area (including loading and unloading) will be in the scope of contractor. If required, bidder has to provide the services for escorting the cement/steel vehicle from source to site. No Extra payment shall be made for this work.</td></tr>
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S. N.	Clause No	Existing Clause in Tender	Revised Clause
10	11	Following Technical Specifications shall be integral parts of this tender (attached separately): • SECTION-C: CUSTOMER CONTRACT SPECIFIC TECHNICAL REQUIREMENTS • SECTION-D: GENERAL TECHNICAL REQUIREMENTS • TECHINCAL SPECIFICATION FOR AC & VENTILATION DUCTING • GENERAL LAYOUT ARRANGEMENT OF WORKER'S ESTABLISHMENT FOR BHEL'S PROJECT-SITE (ANNEXURE-1A) • WORKER'S REST ROOM DRAWING (enclosed in Section C) • STANDARD GUIDLINES FOR WORKER'S ACCOMODATION/ESTABLISHMENT AT BHEL'S PROJECT SITES (ANNEXURE-A) (enclosed in TCC) • TYPICAL LAYOUT DRAWING FOR WORKMEN'S SHED (120 NOS) • BOI VENDOR/SUPPLIER'S LIST • TOPOGRAPHICAL SURVEY DRAWING • PLOT PLAN (TENDER STAGE DRAWING FOR BIDDER'S INFORMATION ONLY. FINAL PLOT PLAN SHALL BE PROVIDED TO THE SUCCUESSFUL BIDDER AFTER AWARD OF WORK).	Following Technical Specifications shall be integral parts of this tender (attached separately): • SECTION-C: CUSTOMER CONTRACT SPECIFIC TECHNICAL REQUIREMENTS • SECTION-D: GENERAL TECHNICAL REQUIREMENTS • TECHINCAL SPECIFICATION FOR AC & VENTILATION DUCTING • GENERAL LAYOUT ARRANGEMENT OF WORKER'S ESTABLISHMENT FOR BHEL'S PROJECT-SITE (ANNEXURE-1A) • WORKER'S REST ROOM DRAWING (enclosed in Section C) • STANDARD GUIDLINES FOR WORKER'S ACCOMODATION/ESTABLISHMENT AT BHEL'S PROJECT SITES (ANNEXURE-A) (enclosed in TCC) • TYPICAL LAYOUT DRAWING FOR WORKMEN'S SHED (120 NOS) • BOI VENDOR/SUPPLIER'S LIST • TOPOGRAPHICAL SURVEY DRAWING • PLOT PLAN (TENDER STAGE DRAWING FOR BIDDER'S INFORMATION ONLY. FINAL PLOT PLAN SHALL BE PROVIDED TO THE SUCCUESSFUL BIDDER AFTER AWARD OF WORK). • TYPICAL LAYOUT OF MEDICAL CENTER

B) The following Item Descriptions of BOQ Cum Rate Schedule are revised as mentioned below (Revised BOQ Cum Rate Schedule is attached as Annexure - A):

S. No.	ST No	Existing Item Description in Tender	Revised Item Description
1	A1.1	Construction of Worker's Accommodation sheds(120-125 workers) having adequate no. of rest rooms along with toilets etc. including associated civil and structural works on built, own and operate basis (ownership of sheds lies with the contractor) as per attached drawing, Standard Guidelines for Worker's Accommodation / Establishments at Project Site and Clause 3.11 & 3.12 of TCC for development of labour colony. Payment shall be released on completion of each shed/set as per attached drawing. Cement & Steel shall be in bidder's scope.	Construction of Worker's Accommodation sheds(120-125 workers) having adequate no. of rest rooms along with toilets etc. including associated civil and structural works on built, own and operate basis (ownership of sheds shall be in line with TCC) as per attached drawing, Standard Guidelines for Worker's Accommodation / Establishments at Project Site and Clause 3.11 & 3.12 of TCC for development of labour colony. Payment shall be released on completion of each shed/set as per attached drawing. Cement & Steel shall be in bidder's scope.

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S. No.	ST No	Existing Item Description in Tender	Revised Item Description
2	A201	Concrete of grade **M7.5** (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume) as mass filling course, lean concrete, levelling course, mud mat under and around foundations/floors below finished ground level upto depth of 10m from FGL. (For depth greater than 10m from FGL, extra over for additional depth to be paid in Item No **A**224)	Concrete of grade **M7.5** (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume) as mass filling course, lean concrete, levelling course, mud mat under and around foundations/floors below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No **A**224)
3	A202	Concrete of grade **M10** (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors below finished ground level upto depth of 10m from FGL. (For depth greater than 10m from FGL, extra over for additional depth to be paid in Item No **A**224)	Concrete of grade **M10** (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No **A**224)
4	A203	Concrete of grade **M15** (1 part cement, 2 part sand, 4 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors, **plinth protection etc. complete** below finished ground level upto depth of 10m from FGL. (For depth greater than 10m from FGL, extra over for additional depth to be paid in Item No **A**224)	Concrete of grade **M15** (1 part cement, 2 part sand, 4 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors, **plinth protection etc. complete** below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No **A**224)
5	A204	Concrete of grade **M20** (1 part cement, 1.5 part sand, 3 parts of 10-20 mm graded aggregate by volume) under floors, paving, plinth protection, pipe encasing etc complete below finished ground level upto depth of 10m from FGL. (For depth greater than 10m from **FGL**, extra over for additional depth to be paid in Item No **A**224).	Concrete of grade **M20** (1 part cement, 1.5 part sand, 3 parts of 10-20 mm graded aggregate by volume) under floors, paving, plinth protection, pipe encasing etc complete below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No **A**224).
6	A205	Providing and laying Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with sand and graded hard stone aggregate of 20mm nominal size in foundations/substructure, grade slab, paving, drains, trenches, under floors, **duct banks** etc for any shape, position or thickness etc complete all i**ncluding with addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent having minimum water reduction capability of 30% to achieve required slump** in concrete complete as per specification & drawing	Providing and laying Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with sand and graded hard stone aggregate of 20mm nominal size in foundations/substructure, grade slab, paving, drains, trenches, under floors, **duct banks** etc for any shape, position or thickness etc complete all i**ncluding with addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent having minimum water reduction capability of 30% to achieve required slump** in concrete complete as per specification & drawing below finished floor level of ground floor upto a depth of

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		below finished ground level upto a depth of 10m from FGL (For depths greater than 10m from **FGL**, extra over for additional depth to be paid in Item No **A**224), for the following.	10m from FFL of ground floor (For depths greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No **A**224), for the following.
7	A206	Providing and laying Design Mix cement concrete of grade conforming to IS:456 & IS 10262-2009 for reinforced concrete works with sand and graded hard stone aggregate of 20mm nominal size in **superstructure** for any shape, position or thickness etc complete **including with addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent having minimum water reduction capability of 30% to achieve required** slump in concrete all complete as per specification & drawing upto 10m level above finished ground level (For height greater than 10m from **FGL**, extra over for additional height to be paid in Item No **A**225), for the following.	Providing and laying Design Mix cement concrete of grade conforming to IS:456 & IS 10262-2009 for reinforced concrete works with sand and graded hard stone aggregate of 20mm nominal size in **superstructure** for any shape, position or thickness etc complete **including with addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent having minimum water reduction capability of 30% to achieve required** slump in concrete all complete as per specification & drawing upto 10m level above finished floor level of ground floor (For height greater than 10m from FFL of ground floor, extra over for additional height to be paid in Item No **A**225), for the following.
8	A207	Providing and laying Design Mix cement concrete confirming to IS:456 & IS 10262-2009 for reinforced concrete works of grade mentioned below in **machine foundations** for TG, Gas Turbine, ID/FD/PA fans, BFP, Mills, Crusher House, CHP-AHP civil works, FGD,etc at all elevations below/above finished floor level (except top decks supported over vibration isolation system, BFP deck and TG deck) but including TG foundation Columns, BFP foundation Columns with addition of suitable plasticizer conforming to IS 9103(latest) **or ASTM C494** to achieve a slump **in the range of 100 mm -150** mm in concrete as per manufacturer's recommendation with 20 mm nominal size graded aggregate in concrete all complete as per specification & drawing all complete.	Providing and laying Design Mix cement concrete confirming to IS:456 & IS 10262-2009 for reinforced concrete works of grade mentioned below in **machine foundations** for ID/FD/PA fans, BFP, Mills, FGD, etc at all elevations below/above finished floor level of ground floor with addition of suitable plasticizer conforming to IS 9103(latest) **or ASTM C494** to achieve a slump **in the range of 100 mm -150** mm in concrete as per manufacturer's recommendation with 20 mm nominal size graded aggregate in concrete all complete as per specification & drawing all complete.
9	A214	Providing and laying **Design Mix cement concrete** as per **IS:456, IS 3370 & IS 10262-2009** for reinforced concrete works using graded aggregate for Concrete in water retaining/conveying structures including addition of suitable plastisizer confirming to IS 9103 and crystalline waterproofing cement additives to achieve a slump more than 125 mm in concrete as per manufacturers recommendation and crystalline	Providing and laying **Design Mix cement concrete** as per **IS:456, IS 3370 & IS 10262-2009** for reinforced concrete works using graded aggregate for Concrete in water retaining/conveying structures including addition of suitable plastisizer confirming to IS 9103 and crystalline waterproofing cement additives to achieve a slump more than 125 mm in concrete as per manufacturers recommendation and crystalline waterproofing conforms to limits of permeability as per

S. No.	ST No	Existing Item Description in Tender	Revised Item Description
		waterproofing conforms to limits of permeability as per **ACI212-3R10(chapter-15,PRAH), BS8102 Type-B and IS 2645** and specification with 20 mm nominal size graded aggregate upto depth of 10m from **FGL**, (For depth greater than 10m from **FGL**, extra over for additional depth to be paid in Item No A224). for following grades. Crystalline waterproofing additive reduces permeability by more than 90%,tested as per DIN 1048-V, ensuring waterproof concrete with self-healing capabilities for cracks up to 0.5 mm with valid test results. The recommended dosage rate should be 0.8% by weight of total cementitious content or such lower dosages, allowing the concrete to withstand 16 bars of hydrostatic pressure and reduces chloride diffusion coefficient more than 45%, tested as per ASTM C 1556, resistant to sulphate attack and resistance to Alkali-Silica Reaction (ASR). The product should be certified under NSF 61, and accredited from IRC & MoRTH. Water tightness is to be ensured including structural grouting if required.	**ACI212-3R10(chapter-15,PRAH), BS8102 Type-B and IS 2645** and specification with 20 mm nominal size graded aggregate upto depth of 10m from FFL of ground floor, (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No A224). for following grades. Crystalline waterproofing additive reduces permeability by more than 90%,tested as per DIN 1048-V, ensuring waterproof concrete with self-healing capabilities for cracks up to 0.5 mm with valid test results. The recommended dosage rate should be 0.8% by weight of total cementitious content or such lower dosages, allowing the concrete to withstand 16 bars of hydrostatic pressure and reduces chloride diffusion coefficient more than 45%, tested as per ASTM C 1556, resistant to sulphate attack and resistance to Alkali-Silica Reaction (ASR). The product should be certified under NSF 61, and accredited from IRC & MoRTH. Water tightness is to be ensured including structural grouting if required.
10	A224	Extra over item no. A201 to A205 and ~~214~~, A214 for depth below FGL (Finished Ground Level) as per following: (a) Depth exceeding 10m from FGL but not exceeding 20m	Extra over item no. A201 to A205 and A214 for depth below FFL of ground floor (Finished Floor Level of ground floor) as per following: (a) Depth exceeding 10m from FFL of ground floor but not exceeding 20m
11	A225	Extra over item no. A206, and A212 for height above FGL (Finished **Ground** Level) as per following:	Extra over item no. A206, and A212 for height above FFL of ground floor (Finished floor level of ground floor) as per following:
12	(a)	Height exceeding 10m from FGL but not exceeding 20m	Height exceeding 10m from FFL of ground floor but not exceeding 20m
13	(b)	Height exceeding 20m from FGL but not exceeding 30m	Height exceeding 20m from FFL of ground floor but not exceeding 30m
14	(c)	Height exceeding 30m from FGL but not exceeding 40m	Height exceeding 30m from FFL of ground floor but not exceeding 40m
15	(e)	Height exceeding 50m from FGL but not exceeding 60m	Height exceeding 50m from FFL of ground floor but not exceeding 60m

C) Following additional documents attached herewith (Annexure – B) are to be treated as part of Tender:

i) NTPC Safety Rules adopted by DVC for Construction and Erection of Power Plants

ii) Supplementary HSE document.

Note - Please note that this is a Supplementary document that is to be referred & its provisions implemented in conjunction with the apex BHEL HSE (for Site Safety Management) document HSEP-14 (Rev. 02) uploaded earlier, and extant NTPC Safety Rules adopted by the Customer (uploaded along with this Corrigendum).

iii) Typical layout of Medical Centre

D) Some of the Bidders sought clarifications in regard to the published tender specification. The clarifications issued by BHEL are as below;

S. No	Reference clause of tender document	Bidder's Query	BHEL's Clarification
1	BOQ CUM RATE SCHEDULE (BOQ)	Sum of WEIGHTAGE IN % mentioned in BOQ_CUM_RATE_SCHEDULE is 99.9586642830% in lieu of 100%. Kindly review and amend the same.	Sum of weightage is 100%. Tender condition shall prevail.
2	BOQ Items related to Earthwork	As the scope of work involves major excavations & it is understood that from the Soil Investigation Report that proposed project are fall under rocky area and substantial quantity kept in the BOQ & corresponding weightage of respective earth work items but with respect to market prevailing Rate for Earth work in excavation by control Blasting & Chiselling are too less. Due to prefixed weightage of items, it is difficult to maintain the cash flow at site during execution stage. Therefore, we are requesting you to kindly review the weightage of items as per present Market rates. Kindly arrange to review the above points and confirm	Weightages are ok. Tender condition shall prevail.
3	BOQ item no. 200	Bidder understand that Cement will be provided by BHEL as FIM. Kindly arrange to confirm the Type of Cement to be used in relevant items enabling estimate by the bidder appropriately, the Aggregates Quantities to be used, which vary due to type and consumption of cement.	Cement shall be provided free of cost (unless otherwise noted elsewhere). Majorly PPC cement shall be used.
4	BOQ item no. 307	Please confirm the names and type of structures for which this item shall be applicable.	The BOQ item no. 307 shall be applicable for chimney raft.
5	BOQ item no. 905	The full description of Item is not visible, please review & provide us the same.	Providing and fixing electrically operated, self-operable/closing anodized extruded aluminium doors (single or double shutter) conforming to IS:1948, IS:1949 fabricated from extruded sections of HINDALCO/JINDAL or equivalent make having minimum 3mm wall thickness as per IS:1285, IS:733 (Grade of Aluminium shall be Alloy 63400) and anodized and electro color coating of required shade as per IS 1868 (minimum anodized

S. No	Reference clause of tender document	Bidder's Query	BHEL's Clarification
			coating of grade AC15). fixed with rawl plugs, expansion fasteners, SS screws / fixing clips necessary filling of gaps at Junctions, at top, bottom & sides with required PVC / neoprene felt for bi-metallic protection etc. Glazing shall be clear float glass of 6mm thickness including snap fit type beading, concealed screws, fixtures, Dorma, Godrej or equivalent make Mortice lock with handle on both sides, etc all complete. Aluminium section shall be smooth, free of stains, straight, mitred & jointed mechanically wherever required. Weight of aluminium section only shall be measured. (Glazing shall be paid separately).
6	BOQ Item 1864 and 1865 for Structural Glazing	Kindly arrange to review and confirm, the weightages for these items, and the quantities and units of these items which appears to be require modifications as per proposed project scope	Tender condition shall prevail.
7	BOQ item no. 2328	Kindly provide us the specification, drawing and approved vendor list for lightning arrester and air terminal	Shall be provided during execution stage of contract.
8	BOQ item no. 2901 (l) Thermal insulation with cladding of AC	Kindly specify the density, thickness of Thermal insulation material. Also specify the thickness and MOC for cladding works.	Refer technical specification.
9	HSFG Bolt	Bidder understands that the weight of HFSG Bolt (required for erection of bolted structure) shall be paid against SOR item sl. no. 2311, 2312 and A2312. Kindly confirm the same.	Yes. Shall be paid as per BOQ description
10	GCC- Clause 2.14: Quantity Variation	The subject tender is item rate basis with pre-filled weightage Rate & bidder has only option is quote in Single amount accordingly distribute the Rates according to Prefilled weightage in all items. Therefore, the quantities given in the BOQ are tentative and may change to any extent (both in plus side and minus side) is quite risk for bidder during execution stage if any pre-filled item rates are lower side so, we are requesting you to kindly individual item's quantity variation restriction will be +/- 10% for smooth progress of work.	Tender condition shall prevail.

S. No	Reference clause of tender document	Bidder's Query	BHEL's Clarification
11	TCC clause no. 2.2.2 and 2.2.3: Pipe cum cable rack	AS per TCC clause no. 2.2.2 Pipe and cable rack shall be fabricated at site. However, as clause no. 2.2.3, same shall be supplied by BHEL as fabricated structure. Therefore, kindly specify the area wise break up for site fabrication and erection of fabricated structure (supplied by BHEL).	Tender condition shall prevail.
12	TCC clause no. 2.7.3: Computer Operator and Support Staff:	Please confirm providing of Computer Operator and Support Staffs to be engaged for 32 months or for 28 Months.	Computer Operator and Support Staffs to be engaged for 28 months. Please refer revised TCC Clause 2.7.3, as mentioned in Sl. No. A-1 of this Corrigendum.
13	TCC clause no. 6.5: Intermediate milestones:	Please confirm whether any Milestone completion shall be applicable to Unit 4. **Please confirm for achieving Milestone 1, BHEL will issue Construction Drawings and clear Workfront within ten days from the date LOI**	Tender condition shall prevail.
14	Cl. B.1 Annexure I for Prequalification criteria	As per this criteria, Bidder should have executed "Piling or Civil or ……." It is understood from above criteria, Bidders who have executed Piling works ONLY, shall be eligible to be qualified, for the proposed Civil and Structural Steel works; however, the proposed work does not have Piling scope. Kindly clarify whether the above understanding is correct.	Tender condition shall prevail.
15	Tender Information Drawings	To ascertain the item rates, it is requested to please arrange to provide Bid information drawings and/or Height and other dimensions of proposed structures, as mentioned in the scope.	Shall be provided during execution stage of contract.

Note:

1) **All other terms and conditions against this NIT shall remain unchanged.**
2) **This corrigendum is to be submitted duly signed and stamped along with the Techno-commercial bid (Part- I).**

for BHARAT HEAVY ELECTRICALS LTD
Manager/ SCT- CPC

ANNEXURE – A

REVISED BOQ CUM RATE SCHEDULE

PREAMBLE FOR BOQ CUM RATE SCHEDULE	
1	**Preamble for the Schedule of Quantities/BOQ Cum Rate Schedule:**
1.1	Details of the items in the BOQ Cum Rate Schedule shall be read in conjunction with the Corresponding Consultants/ Customer specifications, drawings and other documents and shall have precedence over any contrary statement mentioned anywhere in this document.
1.2	The work shall be carried out as per construction drawings, specifications, the description of the items in this schedule and/or Engineer's instructions, Drawings enclosed with these documents are only indicative giving some idea of the type of work involved. The layout, sizes and details of the building, structures and foundations shown in tender drawings may vary at a large extent during actual construction. Final drawings will be issued progressively during the execution of the work.
1.3	Items of work provided in this schedule but not covered in the specifications shall be executed strictly as per instructions of the Engineer.
1.4	Unless specifically mentioned otherwise in the contract, the contractor shall quote his rates for the finished items and shall provide for the complete cost towards fuel, tools, tackle, equipment, constructional plant , temporary works, labour materials, levies , taxes , transport, layout, repairs, rectification, maintenance till handing over, supervision, shops, establishments, services, temporary roads, revenue expenses, contingencies, overheads, profits and all incidental items not specifically mentioned but reasonably implied and necessary to complete the works according to the contract.
1.5	The rate shall also be inclusive of carrying out topography survey of site to establish levels and coordinates at suitable intervals, form existing grid levels and coordinates furnished by the owner, establish bench marks, setting out the location and levels of the proposed structures, constructions and making references, pillars and other identification marks etc. No separate payment will be made towards the same.
1.6	The quantities of the various items mentioned in the BOQ cum Rate Schedule are approximate and may vary up to any extent or be deleted altogether. The overall variation in contract value on execution shall be dealt as per GCC. Contractor has to obtain prior approval of BHEL/ Customer before procurement of bought out items/ building materials.
1.7	BHEL Engineer's decision shall be final and binding on the contractors regarding clarification of items in BOQ cum Rate schedule with respect to the other sections of the contract.
1.8	In case of any discrepancy between item description, relevant specification, clarification shall be sought at tender stage itself. Otherwise it shall be assumed that the contractor has quoted for the more stringent requirement.

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
A1.1	Construction of Worker's Accommodation sheds(120-125 workers) having adequate no. of rest rooms along with toilets etc. including associated civil and structural works on built, own and operate basis (ownership of sheds shall be in line with TCC) as per attached drawing, Standard Guidelines for Worker's Accommodation / Establishments at Project Site and Clause 3.11 & 3.12 of TCC for development of labour colony. Payment shall be released on completion of each shed/set as per attached drawing. **Cement & Steel shall be in bidder's scope.**	Set	25	₹ 5,000,000.00	₹ 125,000,000.00	**Fixed Rate**
A1.2	Payment for Lease of land provided for labour colony area including all statutary clearences, expenses for agreement and any other incidental charges, etc. **Mode of measurement:- Say Duration is 5 years, land lease area is 4.50 acres and Cost per acre of land for 1 year is Rs A.** **Unit Rate(per acre per month) shall be = Rs A / 12 and Total Amount payable finally - Rs A / 12 x 60 months(5 years) x 4.50 Acres.**	acre-month	196	₹ 31,500.00	₹ 6,174,000.00	**Fixed Rate**
A2	Deployment of QA/QC Engineer B.E (Civil with min. 3 years of experience) or Diploma holders with min. 5 years of experience in Civil construction quality management either in construction field or any NABL-Laboratories or any research institute like NCCBM/SERC/CGCRI/NTH or equivalent. Preference - Part time experience in QA/QC lab.	Man- Months	100			0.6791439034%
A3	Deployment manpower for QA/QC Testing Fresh B.E with min. 70% marks or Diploma holder with 3 years of experience in Civil construction quality management either in construction field or any NABL-Laboratories or any research institute like NCCBM/SERC/CGCRI/NTH or equivalent.	Man- Months	200			1.0866302454%
A4	Deployment of Laboratory Technician Previous experience of working as a Lab. Assistant in Civil construction quality management either in construction field or any NABL-Laboratories or any research institute like NCCBM/SERC/CGCRI/NTH or equivalent.	Man- Months	300			0.8149726840%
100	**EARTH WORK: Earth work In excavation, backfilling and disposal including all labour, equipments etc complete as per specification, drawing and as directed by engineer- in-charge for the following.**					
101	Earth work in **excavation in all types of soil including** ash which can be excavated by any means including setting out, levelling, removing of surface water accumulated due to rain or any other reason (but excluding dewatering to lower the ground water table), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 1Km, spreading/levelling of disposed materials etc all complete for following depths below ground level.					
a	Depth from ground level but not exceeding 2 m	CUM	83,496			0.3990394315%
b	Depth exceeding 2 m but not exceeding 4 m	CUM	1,133			0.0067848432%
A102	Extra over ST No. 101,103,104,105 & 106 for **dewatering of ground water by sump pump method** as per IS 9759.Ground water table shall be lowered up to 1 m below the founding level to make the site workable for foundation construction till backfilling up to ground level.Mode of measurement shall be the quantity of excavation of soil including ash below ground water table to founding level of the footing.	CUM	109,428			1.2110968565%
103	Earth work in excavation in **soft rock** including weathered rock which can be excavated by means of crow bar, pick axe, pneumatic rock breaker attachment with excavator machine etc but does not require chiselling or blasting including setting out, levelling, removing of surface water accumulated due to rain or any other reason (but excluding dewatering to lower the ground water table), dressing the sides & bottom, all lifts, ramming/compacting the excavated bottom, stacking, disposal of surplus excavated materials within a lead upto 1 Km, spreading / levelling of disposed materials etc all complete for following depths below ground level.					
a	Depth from ground level but not exceeding 2 m	CUM	29,444			0.2088512996%
b	Depth exceeding 2 m but not exceeding 4 m	CUM	631			0.0053695681%
105	Earth work in excavation in **hard rock requiring controlled blasting** including wedging, line drilling, pre shearing etc as required, setting out, levelling, removing of surface water accumulated due to rain or any other reason (but excluding dewatering to lower the ground water table), dressing the sides & bottom, all lifts, necessary licenses/statuatory clearances for blasting, supply, storage & handling of blasting materials, stacking/disposal of surplus excavated material within a lead upto 1Km, spreading / levelling of disposed materials etc all complete for following depths below ground level.					
a	Depth from ground level but not exceeding 2 m	CUM	56,686			1.2233800213%
b	Depth exceeding 2 m but not exceeding 4 m	CUM	81,667			2.1158239138%
c	Depth exceeding 4 m but not exceeding 6 m	CUM	19,207			0.5971455943%
d	Depth exceeding 6 m but not exceeding 8 m	CUM	60			0.0022396657%
106	Earth work in excavation in **hard rock requiring chiselling including** setting out, levelling, removing of surface water accumulated due to rain or any other reason (but excluding dewatering to lower the ground water table), dressing the sides & bottom, all lifts, stacking/disposal of surplus excavated material within a lead upto 1Km, spreading / levelling of disposed materials etc all complete for following depths below ground level.					
a	Depth from ground level but not exceeding 2 m	CUM	990			0.0241050809%
b	Depth exceeding 2 m but not exceeding 4 m	CUM	2,970			0.0867782914%
c	Depth exceeding 4 m but not exceeding 6 m	CUM	3,365			0.1179834144%
d	Depth exceeding 6 m but not exceeding 8 m	CUM	395			0.0166193576%
A107	Earthwork in **Back filling** upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding **300mm compacted** thickness using/with selected materials from **compulsorily excavated earth** available within a lead upto 1 Km and compacted as specified including re-excavation of stacked earth, watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following.					
a	at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	75,059			0.3927039851%
A108	Earthwork in **Back filling** upto any depth below ground level around foundations, plinths, trenches, drains etc to proper grade and level in layers not exceeding 3**00 mm compacted** thickness using/with selected earth **directly from excavation** within a lead upto 1Km and compacted as specified including watering, ramming/compaction by manual/mechanical means, dressing etc all complete.for the following:					
a	at least 90% maximum dry density as per IS-2720 (Part-VII)	CUM	18,525			0.0823822845%
A109	Extra over ST No. 101, 103 to 106, A107and **A**108 for carriage of material/earth for every 500m or part thereof beyond an initial lead of 1km.					
b	Carriage for disposal of serviceable/unserviceable material/ earth	CUM	203,178			0.1328767348%
A111	Supplying and filling clean and well graded **natural river** sand (conforming to IS 383 with grading zone I to III) upto any depth under floors, around foundations, plinths, paving, tank foundations, etc. in layers not exceeding **300mm** compacted thickness and compacted so as to achieve at least **80%** relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical means, dressing, royalty (if any) etc. all complete.	CUM	393			0.0456341057%
B111	Supplying and filling clean and well graded **Crushed stone** sand **(conforming the deleterious materials as per Table-2 of IS-383 & also confirming the grading zone I to III as per Table-9 of IS-383-2016)** upto any depth under floors, around foundations, plinths, paving, tank foundations, etc. in layers not exceeding **300mm** compacted thickness and compacted so as to achieve at least **80%** relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical means, dressing, royalty (if any) etc. all complete.	CUM	80,555			6.9500245003%
D111	Supplying and filling clean and well graded **Crushed stone** sand **(conforming the deleterious materials as per Table-2 of IS-383 & also confirming the grading zone I to III as per Table-9 of IS-383-2016)** upto any depth under floors, around foundations, plinths, paving, tank foundations, etc. in layers not exceeding **200mm** compacted thickness and compacted so as to achieve at least **85%** relative density as per IS-2720 (Part-XIV) including spreading, watering, ramming/compaction by manual / mechanical means, dressing, royalty (if any) etc. all complete.	CUM	200			0.0173860839%
112	Extra over item no. 101 for **shoring and strutting in trenches** including packing cavities (wherever required as instructed by engineer) all complete as per specification and as directed by engineer in charge.					
a	upto depth of 2m	SQM	3,713			0.0621926030%
b	Depth exceeding 2 m but not exceeding 4 m	SQM	1,238			0.0258980208%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
200	**CONCRETE WORK: Providing and placing concrete work including cost of labour, materials (unless otherwise specified in BOQ/contract specification) and equipment for handling, transportation, batching, mixing, placing, vibrating and curing (excluding cost of centering, shuttering and reinforcement) with mechanised equipments like batching plant, transit mixer, concrete pump etc. complete as per drawing, specifications and as per direction of engineer in charge for the following. (Cement shall be provided by BHEL free of cost)**					
A201	Concrete of grade **M7.5** (1 part cement, 4 part sand, 8 parts of 40 mm graded aggregate by volume) as mass filling course, lean concrete, levelling course, mud mat under and around foundations/floors below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No A224)	CUM	9,670			2.5242577105%
A202	Concrete of grade **M10** (1 part cement, 3 part sand, 6 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No A224)	CUM	2,026			0.5287526203%
A203	Concrete of grade **M15** (1 part cement, 2 part sand, 4 parts of 40 mm graded aggregate by volume) as lean concrete, levelling course, mud mat under and around foundations/floors,plinth protectection etc. complete below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No A224)	CUM	228			0.0595177570%
A204	Concrete of grade **M20** (1 part cement, 1.5 part sand, 3 parts of 10-20 mm graded aggregate by volume) under floors, paving, plinth protection, pipe encasing etc complete below finished floor level of ground floor upto depth of 10m from FFL of ground floor. (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No A224).	CUM	137			0.0339226846%
A205	Providing and laying Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with sand and graded hard stone aggregate of 20mm nominal size in foundations/substructure, grade slab, paving, drains, trenches, under floors, **duct banks** etc for any shape, position or thickness etc complete all **including with addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent having minimum water reduction capability of 30% to achieve required slump** in concrete complete as per specification & drawing below finished floor level of ground floor upto a depth of 10m from FFL of ground floor (For depths greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No **A**224), for the following.					
a	M 20 Grade	CUM	500			0.1327349029%
b	M 25 Grade	CUM	34,546			9.2074158966%
c	M 30 Grade	CUM	31,220			8.3602141619%
A206	Providing and laying Design Mix cement concrete of grade conforming to IS:456 & IS 10262-2009 for reinforced concrete works with sand and graded hard stone aggregate of 20mm nominal size in **superstructure** for any shape, position or thickness etc complete **including with addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent having minimum water reduction capability of 30% to achieve required** slump in concrete all complete as per specification & drawing upto 10m level above finished floor level of ground floor (For height greater than 10m from FFL of ground floor, extra over for additional height to be paid in Item No **A**225), for the following.					
b	M 25 Grade	CUM	5,823			1.5909430392%
c	M 30 Grade	CUM	500			0.1372373754%
A207	Providing and laying Design Mix cement concrete confirming to IS:456 & IS 10262-2009 for reinforced concrete works of grade mentioned below in **machine foundations** for ID/FD/PA fans, BFP, Mills, FGD,etc at all elevations below/above finished floor level of ground floor with addition of suitable plasticizer conforming to IS 9103(latest) **or ASTM C494** to achieve a slump **in the range of 100 mm -150** mm in concrete as per manufacturer's recommendation with 20 mm nominal size graded aggregate in concrete all complete as per specification & drawing all complete.					
a	M 30 Grade	CUM	11,721			3.4441329691%
A209	Extra over St. No. A205,A206,A207 for **controlling of temperature** of fresh concrete to less than **25 degree** centigrade using ice, including all related arrangements for providing, storing and mixing of ice with water, cooling of aggregates etc. All complete as per specification, drawing and instruction of engineer in charge.	CUM	6,461			0.4667116143%
A210	Extra over ST Nos. A205,A206,A207 for conducting **UPV test** for concrete at all levels including all equipments, making necessary arrangements, staging, submission of report etc. all complete as directed by engineer in charge and as per specification.	CUM	1,511			0.0630998134%
211	Providing and **encasing of structural steel** member with concrete using nominial aggregate size of 12.5mm down. Encased member shall be wrapped with welded wire mesh/chicken wire mesh with proper lap etc. complete as per specification for the following grades					
b	M 25	CUM	960			0.2506010819%
A212	**Screed concrete** conforming to IS 456 with sand and graded hard stone aggregate 12.5mm/6 mm nominal size on the roof upto 10m level above finished Ground level (For height greater than 10m from **FGL**, extra over for additional height to be paid in Item No A225) or thickness, drains etc complete as per following.					
a	1:02:04	CUM	244			0.0636944417%
213	Providing and laying **Design Mix cement concrete** as per IS:456 & IS 10262-2009 for reinforced concrete works using graded aggregate for Concrete **in precast work**s like roof slabs/trench covers, fins, lintels, chajas, beams, columns, wall panels, facias etc.at all levels in all kinds of work including formwork/moulds, curing, rendering the top exposed surface with cement sand mortar (1:3), handling, storing, transpoting, all leads, erection without damage, setting in position with cement sand mortar (1:3), filling the gaps between adjacent preacast units with M30 grade concrete or cement sand mortar (1:3) and including making of holes for bolts for fixing, welding etc.complete with graded aggregate (20/12.5/10 mm) and as per specification and drawing for following grades.					
c	M30	CUM	272			0.1168022875%
A214	Providing and laying **Design Mix cement concrete** as per **IS:456, IS 3370 & IS 10262-2009** for reinforced concrete works using graded aggregate for Concrete in water retaining/conveying structures including addition of suitable plastisizer confirming to IS 9103 and crystalline waterproofing cement additives to achieve a slump more than 125 mm in concrete as per manufacturers recommendation and crystalline waterproofing conforms to limits of permeability as per **ACI212-3R10(chapter-15,PRAH), BS8102 Type-B and IS 2645** and specification with 20 mm nominal size graded aggregate upto depth of 10m from FFL of ground floor, (For depth greater than 10m from FFL of ground floor, extra over for additional depth to be paid in Item No A224). for following grades.Crystalline waterproofing additive reduces permeability by more than 90%,tested as per DIN 1048-V, ensuring waterproof concrete with self-healing capabilities for cracks up to 0.5 mm with valid test results. The recommended dosage rate should be 0.8% by weight of totation - 40%tion bolts & nuts (weight of erection bolts, nuts and welds not payable), assembly, edge preparation, preheating (min preheat and interpass temperature of 20o C for welding over 20 mm and upto 40 mm & 66o C for welding over 40 mm and upto 63 mm & 110o C for thickness over 63 mm & use of low hydrogen/ radiogenic electrodes), post heating,testing of welders, inspection of welds, visual inspection, non destructive a					
b	M30	CUM	985			0.2822997463%
215	**Dismantling concrete work** for all types of structures at all levels including stacking of servicable material to a lead of 500 m and disposal of unservicable material upto a lead of 2 km, cutting of reinforcement, labour, equipment, safety precautions etc all complete as per drawings, specification and instructions of engineer in charge.					

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
a	Plain cement concrete of all grades	CUM	240			0.0147660977%
b	Reinforced cement concrete of all grades	CUM	1,365			0.1292847714%
216	**Chipping of concrete** in reinforced concrete work, cutting pockets, making openings at all levels and according to shapes, disposal of waste materials upto a lead of 2 km as directed by engineer including equipment, safety precautions, making good the broken surface etc all complete as per specification, drawing, instructions of engineer in charge but excluding cutting of reinforcement .	CUDM	1,950			0.0085328244%
217	Extra over and above St No 216 for **cutting of reinforcement**, all sizes and types including labour, equipment, return of cut reinforcement to store etc all complete as per specification, drawings and instructions of engineer in charge. Measurement shall be on the cross sectional area of reinforcement cut.	SQCM	312			0.0001255662%
218	**Cutting Reinforced concrete** with mechanised tools like Core drilling machine etc. for cutting pockets, holes, cores in slab, beam, column or foundation as per direction of engineer in charge.	CUDM	195			0.0020327230%
A222	**Cutting of groove** of 8mm X 65mm size with groove cutting machine in concrete paving all complete.	RM	1,600			0.0063587992%
223	**Cutting of existing concrete/ RCC work** inside control room/ pump house or anywhere inside boundary using power tools of (DD2E of HILTI/ BOSCH make) with low noise and dust including cutting reinforcements, removing the rubbish within a lead of 1 km, including making good the broken edges/ surface with cement mortar, painting, finishing to match with existing finishing, scaffolding/ supporting at any level, all complete and as directed by Engineer (measurements shall be taken as per cutting surface area).	SQM	50			0.0073875765%
A224	Extra over item no. A201 to A205 and A214 for depth below FFL of ground floor (Finished Floor Level of ground floor) as per following:					
(a)	(a) Depth exceeding 10m from FFL of ground floor but not exceeding 20m	CUM	100			0.0018060197%
A225	Extra over item no. A206 and A212 for height above FFL of ground floor (Finished Floor Level of ground floor) as per following:					
(a)	Height exceeding 10m from FFL of ground floor but not exceeding 20m	CUM	303			0.0068441104%
(b)	Height exceeding 20m from FFL of ground floor but not exceeding 30m	CUM	134			0.0054468347%
(c)	Height exceeding 30m from FFL of ground floor but not exceeding 40m	CUM	687			0.0372220663%
(e)	Height exceeding 50m from FFL of ground floor but not exceeding 60m	CUM	610			0.0413357164%
300	**FORMWORK: Providing, fixing and removing formwork at all elevations for all structures, as per specifications and including all labour, material, scaffoldings and centereing etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.**					
A301	Fairface form work with **good quality water proof ply wood with Filmface** of minimum 12mm thickness and smooth surface below finished ground floor level for foundations, footings, base of columns, walls, columns, pilasters, beams & slabs(for which scaffolding work not required for vertical support of bottom face of formwork), mass concrete, trenches, grade slab, paving etc.including chamfering of edges as per drawing, specification and instruction of engineer in charge.					
a	Upto Depth 10m From FGL	SQM	90,783			3.1192721799%
A302	**Fairface form work with good quality water proof ply wood with Film face** of minimum 12mm thickness and smooth surface above finished ground floor level for columns, beams, suspended/intermediate floors, roofs, lintels, cantilevers, staircases, landings, balconies, etc. including chamfering of edges as per drawing.for all heights as per specification, drawing and instruction of engineer in charge.					
a	For Height Upto 20m from FGL	SQM	44,812			1.8508257042%
304	Providing, fixing and removing formwork in **block-outs/pockets** and openings (below 0.1 sqm plan area) at all elevations including cutting, formation of all shapes and all other operations required for making the required shape and size all complete as per specification, drawing and instruction of engineer in charge.					
a	Upto 150 mm depth	Each	198			0.0024503512%
b	Pockets of depths more than 150mm and upto 300 mm depth	Each	99			0.0020170574%
c	Pockets of depths more than 300mm and upto 600 mm depth	Each	198			0.0070920734%
d	Pockets of depths more than 600mm and upto 1000 mm depth	Each	198			0.0110066589%
e	Pockets of depths more than 1000mm and upto 1500 mm depth	Each	149			0.0118334034%
f	Pockets of depths more than 1500mm and upto 2000 mm depth	Each	149			0.0155985772%
305	Extra over item no.301 and 302 for curved form work for foundations, footings, beams, walls, trenches, domes, arches etc as per specification.					
a	Extra for Curve Shuttering for Item No. 301/ A301	SQM	100			0.0006892053%
b	Extra for Curve Shuttering for Item No. 302/ A302	SQM	100			0.0008250341%
A307	Providing and fixing formwork of approved quality for cast-in-situ, plain or reinforced concrete works of any type and section (including curved surfaces and chimney shell) for all elevations, including labour, materials, equipment, waste of forms, shoring, strutting, scaffolding, staging, tieing, nailing, caulking, bolting etc. and removal of form work and staging etc. all complete as per specifications, drawings and instructions of the Engineer.					
i	For works below ground level (excluding shell)	SQM	2,060			0.1705788135%
400	**REINFORCEMENT WORK : Reinforcement work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling etc at all level as per specification, drawings and as directed by engineer - in - charge.**					
401	Providing, straightening, cutting, bending, placing in position at any level, binding of mild steel reinforcements conforming to grade 1 of IS:432 part 1 in concrete including cost of reinforcement and binding wire, labour, scaffolding, transportation to & from stores etc. all complete as per specifications & drawings.	MT	10			0.0422885301%
A403	Transportation, straightening, cutting, bending, placing in position at any level, binding in position of steel reinforcements of **TMT steel of grade** Fe-500 / **Fe-500D/ 500EQR/Fe 550 D** or any other Grade confirming to IS:1786 including cost of binding wire, labour, scaffolding, transportation to & from stores,loading, Unloading etc complete all as per specifications, drawings and as directed by Engineer.(BHEL to supply steel free of cost)	MT	7,928			5.1811158836%
405	Providing & fixing of **Rebar** in existing concrete surface by inserting reinforcemnet bar with Epoxy based suitable bonding compound of Hilti or equivalent make (HIT-RE-500 of Hilti or equivalent make) for interconnection of new R.C. structure with existing R.C. structure. Depth of drilled hole should be suitable to develop maximum recommended strength as per approved manufacturer's recommendation. This item includes supply of all materials including bonding chemicals, T&P required to execute the work, cost of all labour, transportation of chemical, staging to reach work place etc. all complete as directed by Engineer - in - Charge. Random Pull out non destructive test as directed by engineer shall beconducted to ensure strength of bond and same is included in this item. Reinforcement bar shall be paid separately under item no. 402, 403, 405 as applicable.					
a	12mm Reinforcement bar	Nos.	10			0.0003179400%
b	16mm Reinforcement bar	Nos.	10			0.0005171555%
c	20mm Reinforcement bar	Nos.	10			0.0007495736%
Ad	25mm Reinforcement bar	Nos.	10			0.0009369671%
406	Supply and fixing reinforcement bar **couplers** (of approved manufacturer's as per the relevant IS code) in position for steel reinforcements of TMT steel of grade Fe-500D or 500EQR or any other Grade confirming to IS:1786 including , labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer.(Agency has to supply reinforcement bar couplers).					
b	16mm dia	Nos.	10			0.0000296811%
c	20mm dia	Nos.	10			0.0000316934%
d	25mm dia	Nos.	10			0.0000397425%
e	28mm dia	Nos.	10			0.0000588591%
f	32mm dia	Nos.	10			0.0000719389%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
g	36mm dia	Nos.	10			0.0000910556%
h	40mm dia	Nos.	10			0.0001202336%
A409	Supply and Fixing of Hard Drawn Steel Wire fabric including straightening, cutting, bending, placing in position at grade slabs / plinth levels / pavings etc. binding in position **of grade Fe-500 (min.) confirming to IS:1566** including cost of steel, binding wire, labour, scaffolding, transportation to & from stores etc complete all as per specifications, drawings and as directed by Engineer.	MT	10			0.0422885301%
500	**Roof Treatment works: Roof treatment works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, curing, sampling, testing etc at all level as per specification, drawings and as directed by engineer - in - charge. (Cement shall be provided by BHEL free of cost)**					
502	Providing and laying **underbed/topping** grading plaster with cement mortar 1:4 (1 cement : 4 sand) and average thickness of **15 mm** including preparation of surface, batching, mixing, leveling etc all complete.	SQM	9,756			0.0809811190%
A506	Providing and applying PU based 100% solid content of approved make water proofing treatment with epoxy based or equivalent material based primer with an application rate of minimum 200gm persqm and two successive liquid coatings of high solids content urethane pre-polymers or equivalent material based finish coats as per relevant IS/ASTM standards to form an elastomeric membrane with overall dry film thickness 1.5 mm subject to minimum 500 gm/sqm/coat application rate.The coating shall be applied with a total consumption of 1.6kg/sqm to achieve total system DFT of min.1.5mm .The elastomeric membrane shall be of two component, instant setting, spray applied hybrid polyurea polyurethane liquid elastomeric seamless waterproofing membrane.Item includes surface preparation.The coating shall have high viscosity, more than 450% elongation and forming a perfectly smooth permanently flexible seamless membrane which should have good adhesion to roof substrates.The cured film should have a very low water absorption rate (0.5% maximum at ambient temperature after 7 days), reinforcing layer of polyscrim cloth (non woven polyscrim cloth of 100% polyester with min. weight of 40gsm/sqm) or geo-textile non woven polyster (150 gsm), polymerised mastic base preparation, primer, making of fillets, cleaning & preparation of surface, vacuum removal of loose sand, expansion joints & sealing at suitable intervals, application by using a pneumatic machine as per manufactures recommendations,grouting the porous area with cementitious grout, proper coving between slab and wall junctions and priming the surface with two component solvent free epoxy primer etc. all complete as per specifications, drawings and direction of engineer in charge. The application of waterproofing treatment shall be carried by authorised applicator of approved Manufacturer of Waterproofing materials.	SQM	9,756			0.5698126012%
A507	Providing and laying **wearing course** consisting of **20 mm thick plain cement mortar** 1:4 (1 cement : 4 sand)) cast in panels of maximum size 1.2mx1.2m and reinforced with 0.56 mm dia. galvanised chicken wire mesh and sealing of joints (in grooves of 6mm X 6mm) using silicon /elastomeric compound etc all complete.	SQM	9,756			0.2188944187%
A510	Providing and laying **cement concrete chequered and designed roof / floor tiles of 22 mm thickness** and size min. 200x200 mm conforming to IS 13801 with 8 mm thick 1:4 cement mortar over the top most layer of roofing treatment in pathway or entire area with fine joints including sealing of joints (silicon/elastomeric sealant) and providing expansion gap in both directions including underbed (as per drawings) filled up with (silicon/elastomeric) joint sealant etc all complete. (Water proofing paid elsewhere) (including cost of cement for tiles making).	SQM	2,439			0.0880976416%
511	Providing and applying two coats of bitumen grade 85/25 as per IS 702 (@ 1.7kg/sqm)with 1% antistripping compound conforming to IS 6241 in foundation, wall, column etc on concrete surfaces exposed to soil / ash including surface preparation etc. all complete.	SQM	1,000			0.0119227485%
A511	Providing and applying **two coats of bitumen paint** of minimum 150 micron total DFT with suitable primer, conforming to IS 9862 with 1% antistripping compound conforming to IS 6241 in foundation, wall, column etc on concrete surfaces including surface preparation etc. all complete.	SQM	4,950			0.0649193657%
A513	Providing and mixing Integral waterproofing Compounds conforming to IS:2645 along with crystalline admix in concrete or cement mortar all complete.the crystalline admixture confirming to ASTM C-494 / IS9103 used for for undeground structures, concrete roof where water proofing is required, sustain 16 bar hydrostatic presuure and NSF certification with CE approval; as per EN 934-2.	KG	500			0.0016324607%
A514	Providing and applying **two component transparent polyamide cured epoxy sealer coating** (having solid by volume minimum 40% ±2%) of minimum 50 micron DFT followed by **epoxy phenolic coating** (solid by volume minimum 63%) of minimum 400 micron DFT. This coat shall be applied after an interval of minimum 24 hours (from the application of primer coat) by airless spray technique on beams,wall, column, slab, basin floor, basin wall, fill supporting beams and columns, internal surfaces of fan stack, underside of fan deck roof slab etc on concrete surfaces as per IS 9862 and IS 3384 complete all as per specifications & drawings.	SQM	2,273			0.0651142633%
B514	Providing and applying **Food grade epoxy coating complying to FDA Ttitle 21, Part 175.300** of minimum **400 micron DFT** over absolutely dry, clean and dust free surafe of water retaining structures storing drinking water. This coat shall be applied by airless spray technique and shall conform to as per IS 9862 ,complete as per specifications & drawings.	SQM	619			0.0191103266%
A 517	Providing and laying **Cinder / foam concrete blocks i**n the toilets,pantry,sunken slab etc. after water proofing and laying of plumbing pipes complete as directed by engineer in charge.	CUM	248			0.0310762808%
A518	Providing and laying water proofing treatment for wet areas like toilets,kitchen,pantry for sunken slab etc.material with min.two coats of Acrylic Polymer Modified Flexible Cementitious Waterproofing Coating material like Danocrete I-protect flex, penetron SF-50 or equivalent make applied @ 0.70 to 0.8 0 Kg./m2 per coat .The First layer shall be of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/sqm.The Second layer shall be of slurry of cement @ 0.242 kg/sqm mixed with water proofing cement compound @ 0.126 kg/sqm.The integral waterproofing coat applied (confirming to IS 2645) , while maintaining a gap of 4 to 8 hours between the coats all complete with water ponding test as per IS Code and as directed by engineer in charge	SQM	495			0.0134174855%
A521	Providing and laying an angular fillet around parapet wall junction at roof level of min.50mm x 50mm, shall be trowel applied in cement-sand mortar in 1:3 proportion. A latex based bonding agent should be added (10% by weight of cement) and also a glass cloth must be inserted while the angle fillet is being constructed.	RM	395			0.0121266037%
600	**JOINTS AND FILLERS: Joints & fillers including all labour, material, equipment, transportation, handling etc at all level as per specification, drawings and as directed by engineer - in - charge.**					
601	Supplying & installation of **bitumen impregnated fibre board** confirming to IS 1838 as joint filler at joints in concrete including nailing, coating of both faces with coal tar pitch/bitumin etc. all complete.					
a	12 mm wide joints.	SQM	99			0.0031476056%
b	20 mm wide joints.	SQM	150			0.0057274469%
c	25 mm wide joints	SQM	1,788			0.0993001837%
d	50 mm wide joints	SQM	1,335			0.1544675078%
A601	Supplying & installation of engineering grade **polystyrene foam backer rod** (circular cross section) at 12 mm depth with minimum density of 22 kg/cum and compressive strength of 0.40 kg/sqm having dia. 25% more than the expansion joint width as joint filler at joints in concrete including nailing, coating of both faces with coal tar pitch/bitumin etc. all complete.					
a	12 mm wide joints.	RM	99			0.0010008091%
b	20 mm wide joints.	RM	99			0.0014471017%
c	25 mm wide joints	RM	1,337			0.0214894605%
d	50 mm wide joints	RM	1,337			0.0365320829%
A602	Providing and applying polysulphide based sealant conforming to IS:12118 in expansion joints in concrete including cleaning of joints, raking out groove, application of primer, scaffolding etc. all complete for following size grooves:					

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
a	12mm X 25mm	RM	50			0.0007715075%
b	20mmX25mm	RM	50			0.0012858458%
c	25mmX25mm	RM	50			0.0016073072%
d	50mmX25mm	RM	50			0.0030309941%
603	Providing and applying polysulphide based sealant conforming to IS:12118 in expansion joints in concrete including cleaning of joints, raking out groove, application of primer, scaffolding etc. all complete for following size grooves (10 mm thick backer rod to be paid separatly):					
a	25mmX25mm groov size	RM	50			0.0016073072%
b	50mmX25mm groove size	RM	50			0.0030309941%
c	20mmX25mm groove size	RM	50			0.0012858458%
604	Supplying and filling in position hot applied **bitumin sealing compund (Grade A)** confirming to IS 1834 including cleaning, mixing, heating, pouring/injecting sealing compound in gaps in joints including application of primer etc. all complete.					
a	10mm X 40mm	RM	248			0.0008466661%
b	12mm X 25mm	RM	3,146			0.0093383283%
c	20mmX25mm	RM	4,662			0.0180585405%
A605	Supply and installation of Polystyrene flexible board confirming to IS 4671 (type-1), 20 Kg/ Cum. as joint filler at joint of concrete including nailing, coating of both faces with coal tar pitch /butimen etc. all complete.					
a)	100 mm thick	SQM	4,000			0.4603909068%
b)	50mm thick	SQM	614			0.0530025031%
A610	Providing and fixing ribbed **PVC water stop**s in joints conforming to IS 12200 & IS 15058 all complete for the following: (Bulb or Kicker type)					
b	**230 mm wide and 8 mm thick**	**RM**	25			0.0006225486%
bb	**230 mm wide and 10 mm thick**	**RM**	50			0.0014318617%
c	150 mm wide and 6 mm thick	**RM**	100			0.0011520293%
d	**230 mm wide and 6 mm thick**	**RM**	716			0.0125709033%
B610	Providing and fixing FPO(Flexible polyolefin Tap) based waterproofing membrane in construction joints and expansion joint with specifically formulated single-ply of width 2000mm, thickness 1mm membrane fixed at both ends of the external face of the expansion joint on the walls, roof using epoxy bonding adhesive and laid loosely at middle in the expansion joint. Waterproofing tape to be anchored using epoxy adhesive for a width of 75mm on either side of the joint and leaving 50mm in the centre for allowing necessary movements. The waterproofing system shall be overlapped and covered with protection medium before back filling. The waterproofing tape shall have a Tensile Strength- 12.5.0 N/sqmm, Elongation at break- 400%,Water tightness, 60 kPa/24 Std (As per DIN EN1928-A) and Water tightness, 400 kPa/72 Std (As per DIN EN 1928-B) above joint followed by another layer of epoxy adhesives complete as per specification.	**RM**	25			0.0011281335%
A615	Providing and fixing 300 mm wide Stainless steel strips (316 GRADE) over expansion joints with minimum lap of 50mm length including stainless steel screws, rawl plugs etc. all complete	**Kg**	99			0.0032571742%
700	**MS EMBEDMENTS: Embedments including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
A701	Supply, fabricating and fixing of **mild steel embedments,** inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc. including welding, bolting, cutting, drilling, scaffolding, setting, including preparation of surface by manual cleaning and provided with **Primer Coat of Chlorinated Rubber based zinc phosphate primer** of **minimum 50 micron dry film thickness (DFT)** etc. all complete as per specification. Payment Breakup: 1. On Supply & reciept of materials at site - 60% 2. On completion of fabricating, fixing, welding, etc. complete as per description/specification - 40%	MT	149			0.8513987846%
A702	Supply, Fabrication, transportation, delivery at site and erection, installation and alignment of **mild steel foundation bolt assembly** conforming to IS:2062 and grade 1 of IS:432 in concrete along with nuts, lock nuts (as per IS:1363, 1364 and IS:3138), washers, anchor plates, stiffner plates, protective tape, pipe sleeves, templates etc. including welding, cutting, grinding, threading, drilling etc. all complete. All threaded and other surfacses of foundation bolts shall be coated with temporary rust preventive fluid and during execution of civil works, the dried film of coating shall be removed using organic solvents. Payment Breakup: 1. On supply & reciept of fabricated materials at site - 60% 2. On completion of fixing, welding, etc. complete as per description/specification - 40%	MT	55			0.3800943404%
A703	Same as above items A701 & A702 with BHEL supplied material free of cost including loading, transportation, unloading etc. all complete from BHEL store to plant site.					
A	Mild steel embedments, inserts, pipe sleeves, angle pieces, rungs of various diameters, plates of dimensions as required etc.	MT	56			0.0748189194%
B	Mild steel foundation bolt assembly conforming to IS:2062 and grade 1 of IS:432 in concrete along with nuts, lock nuts (as per IS:1363, 1364 and IS:3138), washers, anchor plates, stiffner plates, protective tape, pipe sleeves, templates etc.	MT	135			0.1895354806%
704	Supplying, fabricating, erecting and installing following items in concrete/brickwall for all kind of works, including setting material in concrete, layout, scaffoling, cutting, forming, grinding, drilling, bolting, welding, jointing, testing etc. all complete.					
a	MS pipes of all diameters	kg	50			0.0002792036%
b	PVC pipes / conduits of all diameters	kg	50			0.0009432554%
c	UPVC pipes / conduits of all diameters	kg	50			0.0011897595%
d	Expansion anchor fasteners (galvanised) of HILTI make(HUD-1 Universal Fastners) or equivalent of safe tensile capacity as specified below for brick work with expansion sleeve of A6 polyamide:					
i	8mm Dia	Nos	50			0.0001257674%
ii	10mm Dia	Nos	50			0.0001609823%
iii	12mm Dia	Nos	50			0.0001987125%
iv	14mm Dia	Nos	50			0.0003068724%
e	Expansion fasteners (mechanical galvanised) of HILTI make or equivalent of safe tensile capacity as specified below for concrete work with expansion sleeve of stainless steel:					
i	HST M8	Nos	50			0.0006892053%
ii	HST M10	Nos	50			0.0009533168%
iii	HST M12	Nos	50			0.0017179825%
iv	HST M16	Nos	50			0.0030259634%
v	HST M20	Nos	50			0.0052545615%
vi	HST M24	Nos	50			0.0105216998%
f	Chemical Expansion fasteners (galvanised)of HILTI make or equivalent of safe tensile capacity as specified below for concrete work with anchoring rod,nuts,washers,chemicals all complete,etc:					
i	HAS-E5.8 M8	Nos	50			0.0013482264%
ii	HAS-E5.8 M10	Nos	50			0.0016450375%
iii	HAS-E5.8 M12	Nos	50			0.0021003154%
iv	HAS-E5.8 M16	Nos	50			0.0035617325%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
v	HAS-E5.8 M20	Nos	50			0.0055740107%
vi	HAS-E5.8 M24	Nos	50			0.0076818722%
800	**GROUTING: Grouting including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, roughening surface, cleaning, ramming, curing etc. at all level , drawings and as directed by engineer - in - charge. (Cement shall be provided by BHEL free of cost)**					
801	Providing & **grouting** with cement slurry mix of approved ratio using pressure pump for water retaining concrete structures as per approved procedure including cost of nipples/ nozzles, cement, admixture, curing, pressure pumps, slurry agitator etc. all complete. Cost shall include fixing of nipples at maximum 500 mm centre to centre spacing, cutting of nipples after completing of grouting, making good of the nipple hole with appropriate non-shrink cement paste, water tightness test etc. all complete wherever specified in the drawing.	SQM	2			0.0000897476%
802	Providing & **grouting of pocket hole**s, pipe sleeves under base plates, machinery, pipe supporting structures etc. with mix 1:1 (1 cement :1 sand) using non shrink admixture etc. all Complete.	CUM	5			0.0063273574%
803	Providing & grouting of pocket holes, pipe sleeves and under base plate of structural steel work/ machinery/ pipe supporting structures including roughening of surface, cleaning, ramming, curing etc. all complete with **mix 1:1:2 (1 cement : 1 coarse sand : 2 aggregate of 6 mm down** graded stonechips) using non shrink admixture as per specification, drawing and direction of engineer-in-charge. (Cost of all material and cleaning the pocket by compressed air shall be in the scope of the contractor).	CUM	5			0.0063338973%
804	Providing & **grouting of poc**ket holes, pipe sleeves and under base plates of structural steel work/ machinery/ pipe supporting structures including roughening of surface, cleaning, ramming, curing etc. all complete with **Conbextra GP-1 or equivalent** as per specification, drawing and direction of engineer-in-charge. (Cost of all material and cleaning of the pockets by compressed air shall be in the scope of the contractor).	CUM	83			0.1954512013%
806	Providing Chemical (epoxy) injection grouting with pressure pump for water retaining concrete structures conforming to IS:6494, including fixing nozzles, cost of approved chemical, admixture, curing etc. all complete . Payment shall be made as per the consumption of chemical grout.	Kg	25			0.0023543655%
900	**DOORS & WINDOWS: Doors, windows, ventilators, louvers, roof ventilators, rolling shutters, partitions including all labour, material (unless otherwise specified in BOQ/contract specification), equipments, transportation, handling, preparation of working drawings etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
901	Providing and fixing **wooden frame** conforming to IS 4021 made of best quality seasoned CP teakwood free from large or loose knots, cracks or other defects including sand paper smoothening, hold fasts, beading, primer and finish painting / polishing etc. all complete with proper wood joinery, accurately set to required lines or levels and rigidly secured in place. (Finish painting / polishing paid separately)	CUM	1			0.0116916887%
902	Providing and fixing **teak wood frame panel door shutter** as per IS 1003 with 35 mm x 150 mm vertical rail & 35mm x 125 mm horizontal rail and 12 mm thick interlocked panels of teakwood with proper wood joinery including beading, preperation of working drawings,godrej or equivalent make mortice lock with handels on both sides,approved ISI mark anodised fittings like door stopper,300mm long tower bolts,16x300mm long aldrops ,125mm long handles on both sides etc. butt hinges, sliding bolt ,knobs, (all fitting shall be anodised aluminium color dyed), screws, primer and finish painting / polishing etc. all complete. (Finish painting / polishing paid separately) Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	SQM	10			0.0041322133%
A903	Providing, fitting and **fixing solid core flush door shutte**r as per IS 2202 part II, 35mm thick homogenous particle board bonded with BWP type phenolformaldihyde synthetic resin, partical board core conforming to IS 3087 type I, 35x12 mm thick teakwood beading all around including preparation of working drawings. godrej or equivalent make mortice lock with handels on both sides,approved ISI mark anodised fittings like door stopper,300mm long tower bolts,16x300mm long aldrops ,125mm long handles on both sides etc. butt hinges, sliding bolt, knobs, (all fittings shall be anoidised aluminium color dyed), finish flat oil paint confirming to IS: 137 over primer, screws etc. all complete as per drawing, specification and instruction of engineer in charge. with commercial faces and teak wood edges. (Finish painting paid separately) (Note: All particle board shall have recycled content. The bidder is required to provide material cutsheet sample/ declaration from manufacturer mentioning the percentage of recycled content used in maufacturing of particle board to the engineer in charge) Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	10			0.0038644797%
904	Providing and fixing **single or double steel door shutters with 45mm thk flush** design shutter comprising of two outer sheets of 18 gauge steel sheets rigidly connected and reinforced inside with continuous vertical 20 gauge stiffeners, spot welded in position at not more than 150mm on centres including void filled with mineral wool (density as per specification), all fittings, Godrej or equivalent make mortice lock with handle on both sides, side, top & bottom edges of shutter shall be reinforced by continous pressed steel chanel with min 18G, shop and final painting etc all complete. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	99			0.0712544201%
A904	Providing and fixing **single or double steel door shutters with 35mm (min) thk flush design shutter** comprising of two outer sheets of 16 gauge steel sheets rigidly connected and reinforced inside with continuous vertical 18 gauge stiffeners, spot welded in position at not more than 150mm on centres including void filled with mineral wool (density as per specification), all fittings, Godrej or equivalent make mortice lock with handle on both sides, shop and final painting etc all complete. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	107			0.0755165618%
A905	Providing and fixing electrically operated, self operable/closing anodized extruded aluminium doors (single or double shutter) conforming to IS:1948, IS:1949 fabricated from extruded sections of HINDALCO/JINDAL or equivalent make having minimum 3mm wall thickness as per IS:1285, IS:733 (Grade of Aluminium shall be Alloy 63400) and anodized and electro color coating of required shade as per IS 1868 (minimum anodized coating of grade AC15). fixed with rawl plugs, expansion fasteners,SS screws / fixing clips necessary filling of gaps at Junctions, at top, bottom & sides with required PVC / neoprene felt for bi-metallic protection etc. Glazing shall be clear float glass of 6mm thickness including snap fit type beading, concealed screws, fixtures,Dorma, Godrej or equivalent make Mortice lock with handle on both sides, etc all complete. Aluminium section shall be smooth, free of stains, straight, mitred & jointed mechanically wherever required. Weight of aluminium section only shall be measured. (Glazing shall be paid separately).	SQM	69			0.0549699875%
A906	Providing and fixing anodized extruded aluminium doors (single or double shutter) conforming to IS:1948, IS:1949 fabricated from extruded sections of HINDALCO/JINDAL or equivalent make having minimum 2 mm wall thickness as per IS:1285, IS:733,(Grade of Aluminium shall be Alloy 63400) and anodized (15 micron coating thickness) and electro color dyed of required shade as per IS 1868 (minimum anodized coating of grade AC15). fixed with rawl plugs, expansion fasteners,SS screws / fixing clips necessary filling of gaps at Junctions, at top, bottom & sides with required PVC / neoprene felt for bi-metallic protection etc. Glazing shall be clear toughened glass of 8/10 mm thickness including snap fit type beading, concealed screws, fixtures, Dorma,Godrej or equivalent make Mortice lock with handle on both sides, etc all complete. Aluminium section shall be smooth, free of stains, straight, mitred & jointed mechanically wherever required. (Glazing shall be paid separately) Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	KG	356			0.0129842253%
A907	Acoustic Wooden Fire Door : **Providing of Single / Double Leaf both side laminated finish fully insulated wooden fire door** of 120 min. fire rating, of min.50mm thickness, comprising of 75mm x 50mm hardwood internal timber frame work, with infill of 96 kg/m3, ceramic fiber blankets, coated with FR intumuscent coating on both sides for insulation. The coated insulation shall be sandwiched between 12mm thick, Matrix Mineral Engineered Boards on both sides (edge to edge on internal Hardwood frame) and cladded with 3mm ply on both sides, with 55mm x 14mm teak wood lipping all round the shutter the main door frame will be made out of Hardwood of section 120 x 70mm and cotaed with Fire reatrdent Primer.The rebate shall be of 20mm x 57mm in Door Frame to accommodate the shutter in frame.Both frame and shutter shall be fitted with fire & smoke intumescent seal of size 20 x 4mm on all the three sides except bottom.The pasting of the ply/veneer/laminate should be done using automatic machine and should be free from any nails or perforations. The doors shall be provided with Pyroswiss Extra" or equivalent vision panel of 300mm x400mm. Test certificate for fire rating from International testing facility shall be provided by its relevant manufacturer. Provisions/ reinforcement for fixing all fixtures shall be built in on the doors prior to the supply.The rate should be inclusive of all fire rated hardware door handle 32X1200 H shape, door closer, dead lock, etc complete as per manufacture spec. (The rate should be inclusive of door frame) Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	99			0.1245097156%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
B907	Providing and fixing automatically closing **fire proof steel flush insulated doors** along with frame of minimum 44mm thk flush shutter design comprising of two outer sheets of 18 gauge steel sheets rigidly connected and reinforced inside with continuous vertical 20 gauge stiffeners, spot welded in position at not more than 150mm center to center of approved make conforming to IS:3614 (part 1) & CBRI tested- ISI marked for both Single leaf & Double leaf, comply IS/ISO 3008,satisfying LPA regulations and shall carry a unique label with certification/test report number,fire rating embossment, fixed at all elevations, with or without removable panels,with panic bar,panic trim,smoke seal with following fire rating using galvanised MS sheets for frames conforming to IS 277, made out of minimum 1.6mm (16 SWG) for both frame and shutter, G.I. sheet (min.zinc coating 120 gsm), and leaves, mineral wool / PUF/ any other fire retardant insulation material filled with required density, mastic caulking and grouting the frame, reinforcing and insulating the shutters with fire retardant material, with panic devices, including all fittings, fire rated vision glass, shop painting with approved post office/signal red color fire resistant paint and mineral wool insulation (min.64 kg/cum density) complete and shall be fire proof as per IS:3614, NBC, LPA requirements and as per specification.Shop drawings shall be submitted by the fabricator/manufacturer for approval before exectuion. Minimum ratings shall be 2 Hrs. All hardware fittings shall be 2 Hours fire rated. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	50			0.0754604337%
908	Providing and fixing steel windows/ventilator with steel sections as per IS:1038, IS:1361 & IS:7452 latest revision including all fittings, metal beadings, hold fasts, shop and final painting ,glazing etc. all complete. (Glazing shall be paid separately)					
a	Openable type	SQM	58			0.0085870955%
b	fixed type	SQM	58			0.0055029773%
A908	Providing and fixing M.S. grills in windows/ventilator as per approved design for security purpose made of M.S. Flats / M.S. square bar of approved design shall be provided to suit security requirements.	kg	100			0.0007128496%
B908	Providing and fixing anodised aluminium Grills in windows/ventilator of approved design.	kg	100			0.0028964230%
C908	Extra over Item 908 for providing pre-coated (polyster painted) steel windows/ventilators	SQM	50			0.0001754455%
A909	Providing and fixing anodised aluminium work of Jindal, Hindalco or other equivalent approved make for door frames, windows, ventillators, partitions, railing etc with extruded standard tubular and other sections(of minimum 2mm wall thickness) including all fittings & fixtures and accessories of approved make conforming to IS733 and IS1285,(Grade of Aluminium shall be Alloy 63400) anodised and electro color dyed to required shade according to IS 1868 (minimum anodic coating of grade AC15), fixed with rawl plugs, expansion fasteners, SS screws or with fixing clips, including necessary filling of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt for bi-metalic protection etc. including preparation of fabrication/working drawings, aluminium cleat angle, aluminium snap-on-beading for glazing/panelling, stair case tread nosing, with all fittings and fixtures (like tower bolts, handles, door stopper with rubber shoes, 'L' drops, stays, floor springs, hydraulic door closures etc. of Dorma, doorset or equivalent.), CP brass/stainless steel screws of SS304 Grade, providing and fixing hinges/pivots, and making provision for fixing of fitting wherever required including cost of PVC/neoprene gasket, all complete as per drawing, specification and instructions of engineer in charge (Glazing and panelling shall be paid separately).Weight of aluminium section only shall be measured. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	Kg	11,959			0.4506046225%
B909	Providing and fixing aluminium work of Jindal, Hindalco or other equivalent approved make for door frames, windows, ventillators, partitions, railing etc with extruded standard tubular and other sections(of minimum 2mm wall thickness) including all fittings & fixtures and accessories of approved make conforming to IS733 and IS1285,(Grade of Aluminium shall be Alloy 63400) powder coated to required shade (minimum thickness of powder coating 50 micron), fixed with rawl plugs, expansion fasteners, SS screws or with fixing clips, including necessary filling of gaps at junctions, at top, bottom and sides with required PVC/neoprene felt for bi-metalic protection etc. including preparation of fabrication/working drawings, aluminium cleat angle, aluminium snap-on-beading for glazing/panelling, stair case tread nosing, with all fittings and fixtures (like tower bolts, handles, door stopper with rubber shoes, 'L' drops, stays, floor springs, hydraulic door closures etc. of Dorma, doorset or equivalent.), CP brass/stainless steel screws of SS304 Grade, providing and fixing hinges/pivots, and making provision for fixing of fitting wherever required including cost of PVC/neoprene gasket, all complete as per drawing, specification and instructions of engineer in charge (Glazing and panelling shall be paid separately).Weight of aluminium section only shall be measured. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	Kg	11,959			0.4731348536%
A910	Providing, fabricating, designing, supplying and fixing of Aluminium composite panel cladding (ACP) in pan shape in solid or metallic colour,wooden colour,stone finish of approved shades made out of 4mm thick aluminium composite panel **(weight of panel should be minimum 8.1 kg/sqmt)** material consisting of 3mm thick FR grade Class A2 as per EN 13501,mineral core sandwiched between two Aluminium sheets (each 0.5mm thick BMT).The aluminium composite panel cladding sheet shall be coil coated, with Kynar 500 based PVDF conforming to AAMA 2605 or Lumiflon based fluoropolymer resin coating of approved colour and shade on face # 1 and polymer (Service) coating on face # 2 as specified using stainless steel screws, nuts, bolts, washers, cleats, weather silicone sealant, backer rods etc. The top coated surface of ACP shall comply with the "specification for coated coil for the exterior building application" issued by ECCA (European Coil Coating Association). The aluminium composite panel top and bottom skin should conform to Aluminium Alloy 5005 (AlMg 1) marine grade series and H 22/24 temper with mechanical properties confirming to EN 485-2 standard. The ACP product must conform to Class A2, s1,d0 as per EN-13501-1.The manufacturer must furnish the FPC and Certificate of conformity of EN13501-1 for Class A2,s1,d0 from the certifiers and Product must be supplied from the Certified Unit which has been mentioned on the FPC and COC.The panel shall be designed for 12mm groove in horizontal & in verticals with close joint system. Vertical & Horizontal groove shall be filled by non-staining high performance weather sealant. ACP panel shall have sub frame all around panel and aluminium stiffener profile as per structural requirements. The finished surface of ACP shall be protected with a self-adhesive (Rubber based) peel off foil with 70 microns thickness white or black, tested to withstand up to 6 months' exposure to local weather condition without losing the original peel off characteristic or causing stain or other damages on the coated surface of the aluminium composite panel. Installation of ACP Coping/facia at terrace level sealing the top gap of the parapet wall and ACP Panel shall have GI stiffeners below with required aluminium grid work with necessary MS HDG / aluminium alloy brackets & SS fasteners.2nd barrier of 1mm thk GI sheet laid continuously below the copping to seal the parapet wall. Overlap of GI sheet shall be properly sealed with weather sealant, All shade shall be as per Architect's Approval.as per approved sample from Alucobond Plus, Aludecor,Alubond,Virgo or equivalent. The system shall be designed to withstand a wind pressure of 200kg/Sqm or as per design requirement and shall be fixed to the Masonry/RC walls or aluminium frame with necessary clamps, brackets and anchor fasteners etc. All clamps and brackets shall be Hot dip galvanized minimum 80 microns thick and shall conform to IS: 4759-1996. The extruded aluminium section shall be anodized in approved colour with a anodic coating of minimum 20 microns. Extruded section shall be 6063 T5 or T6 alloy conforming to ASTM B221. Any other festering straps, nuts, bolts, rivets, washers, etc. shall be in stainless steel SS316 grade. EPDM gaskets, open cell polyethylene backer rods, weather sealant etc. shall be provided as per requirement. Item shall include aluminium base frame with all fixing arrangements to wall/RC members, fastening material and hardware(festering straps, nuts, bolts, rivets, washers etc.), EPDM gaskets, open cell polyethylene backer rods, weather sealant, scaffolding, approach to all height, material handling, transportation, labour, T&P, preparation of working drawings etc.all complete as per drawing, specification & instructions of engineer in charge. Measurement of payment shall be outer finished area of ACP panel.The contractor shall provide the material cutsheet/ declaration from manufacturer mentioning the recycled content used in maufacturer of ACP. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	1,188			0.3136981172%
911	Providing and fixing of door closers as per IS 3564 ,of approved make & quality all complete of following type :					
a	Over head hydraulic door closures	Each	6			0.0006480542%
b	Floor mounted Hydraulic door closers	Each	6			0.0013703615%
A912	Providing and fixing **pressed steel frames(**complying general requirements of IS 4351) fabricated from 1.6 mm thick M.S sheet mortised, reinforced drilled and tapped for hinges and locks bolts strikes, hold fasts adjustable floor anchors, floor tiles/weather bars ,paintings etc all complete as per specifications.	Kg	6,277			0.0609410313%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
A913	Providing and fixing in position **rolling shutter of hot rolled double dipped galvanised steel** lath section of 18 SWG tested mild steel strips at 75mm rolling centres interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides of 75mm wide and 3mm thick(min.) and arrangements for inside and outside locking with push and pull operation including wire springs, top/hood cover 0.9mm thick (min.) , factory galvanized, primed & field painted, partly grilled (as required) with approved enamel paint etc, all complete as per IS 6248 and specification of approved make of following types: The bottom lath shall be coupled to a lock plate fabricated from 3mm thick galvanised steel plate and securely rivetted with stiffening angles.(partly coiled and lath/full lath).					
b	Mechanically Operated	SQM	50			0.0116837905%
c	Electrically & Mechanically operated	SQM	83			0.0248357392%
A914	Providing and fixing Solid core PVC doors (25 thk double skin) with PVC frame of sintex or equivalent make including all fitting & fixtures as per specification, drawing and instructions of engineer in charge.	SQM	25			0.0037164264%
915	Providing, fixing and fitting of **glazing** of first grade class in steel/aluminium/wooden frames, where ever required, cleaning after fixing including hardware, gaskets, clips, beadings etc. all complete.					
d	6 mm thick wired glass	SQM	220			0.0226773695%
Ae	3mm thick Polycarbonate sheet with profile matching with metal sheeting shall be provided. The Polycarbonate sheets shall be fire and u/v resistant, and suitable for continuous use up to a temperature of 1000C. Suitable aluminium beading shall be used. The open ends of the sheet shall be sealed as per manufacturer's recommendations .	SQM	377			0.0409712647%
Ag	6 mm thick tinted heat reflecting toughened type float glass	SQM	622			0.0723759130%
h	6 mm thick clear toughened safety glass	SQM	220			0.0270047739%
h (a)	6 mm thick **clear reflective toughened safety glass** of Saint Gobain(India) or Asahi (India) or equivalent make and should have solar factor 25% or less, Maximum U-vlaue 3.3W/SQMK, VLT min 30%, light reflection internal 10 to 15%, light reflection external 10 to 20%, shading coefficient (0.25-0.28),values varies as per manufacturer specifications.	SQM	686			0.1052572436%
Ah	**6 mm thick clear toughened glass** conforming to IS 2553.	SQM	479			0.0587967577%
AhA	**6 mm thick reflective toughened glass** conforming to IS ~~5437~~ 2553 Reflective toughened glass, with technical characteristics: Solar factor 45% or less, U-value less than 5.7 W/m2.K, VLT min 40% shall be used. The glass to be used should be from the manufacturers of glass like Saint Gobain (India) or ASAHI (India) or equivalent. The glass should be free from distortion and thermal stress.	SQM	15			0.0023936050%
AhB	8 mm thick clear toughened glass	SQM	579			0.0923931513%
i	Two nos. 6 mm thick clear toughened float glass hermetically sealed and separated by 12 mm thick air gap for thermal insulation (only single elevation area to be measured)	SQM	54			0.0113145374%
I(C)	One outer 6mm thick tinted heat-reflecting toughened glass and one inner 6mm thick clear toughened float glass hermetically sealed and seperated by 12 mm thick gap for thermal insulation (only single elevation area to be measured).The glazing to be used in all exterior walls shall be of Saint Gobain or equivalent.The glazing to be used should comply to mentioned standards VLT (Visible Light Transmittance) ≥62 %, SHGC/ SF (Solar Heat Gain Coefficient/ Solar Factor) 0.2 ≤ 0.32 and U- Value 1.2 TO 2.5 W/MSq K,The properties of performance glass shall be as per detail design values as approved by engineer incharge.The glass to be used should be from the approved manufacturers of glass and should be free from distortion and thermal stress.	SQM	96			0.1545429682%
An	8 mm thick laminated toughened glass	SQM	50			0.0082126105%
Aq	6mm thick laquered glass as per approved shade colour and design.	SQM	25			0.0036135486%
917	Providing and fixing 1**2 mm thick BWP particle board**, decorative veneer (prelaminated) on both sides, as panels in aluminium framed door shutter, fixed with necessary snap-on-beading etc. all complete (excluding aluminium works).	SQM	50			0.0042232689%
A921	Providing & fixing 120 minutes Fire Rated, Fully Glazed non load bearing fixed partition with valid fire test certificate from national or international lab with Partition Frame manufactured from minimum 1.6mm galvanized steel sheet pressed to form a profile of nominal size 60mm x 70 mm & fixed to the supporting construction by means of M 10 X 120 or bigger steel bolts at 150mm from the edges & every 500mm c/c. The frame shall be finished with etch primer for scratch resistance and shall be powder coated of approved shade and color. The glass panels shall be interlayered minimum 14mm thick, 120 minute fire rating and partially insulated (EW120), with 30minute full insulation, Non Wired Toughened Interlayered glass having a sound reduction of greater than 37dB, light transmission of 86% and compliant to class 1(B)1 category of impact resistance as per EN 12600. The glass should be manufactured in UL & TUV audited Facility and including UL-EU Certification. The glass shall be held in position with minimum 1.6mm G.I Beading, clamped or bolted to the frame profile by 4mm x 35mm steel screws at every 250 mm c/c and a ceramic tape of cross section of 5mm x 20mm on both sides of the glass. The item shall include intumescent putty and fire resistant acrylic sealants and the total assembly shall satisfy the fire resistance criteria of stability, integrity & radiation control and partial insulation (EW120). Design, Shop drawings along with hardwares for the item with all construction and anchoring details, etc. along with fire rating test reports shall be got approved before execution. Payment Breakup: a) On Supply & receipt of material at site - 50% b) On complete execution as per item description - 50%	SQM	99			0.1419410758%
A931	Provide & Install SS Logo/ Signature ICON of DVC as per Guidelines of "Client" complete in all aspects. Logo to be fabricated in Stainless steel finish as per approved pattern and Shades of Client Guidelines along with proper provision of fixing arrangement of Logo on Partition Surface/Glass Surface/Acrylic Surface etc.Shop drawings for the item with all construction and anchoring details shall be got approved before execution, all complete as per specification and approved by Engineer incharge.	SQM	10			0.0085147057%
A933	Providing, fabricating, designing, supplying and fixing of 8mm thick **Suede Finish exterior grade High Pressure Laminates (HPL)** made up of 1300mm x 3050mm in size and manufactured under EN438-2&3:2005 standard, including supply and fixing of all necessary supporting arrangements, etc. all complete as per drawing, specification & instructions of engineer-in-charge. Measurement of payment shall be outer finished area of HPL.	SQM	50			0.0008868613%
1000	**BRICKWORK: Brickwork masonry including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, scaffolding etc. at all levels as per specification, drawings and as directed by engineer - in - charge. (Cement shall be provided by BHEL free of cost)**					
A1001	Providing **brick work** in cement mortar **1:6** (1 part cement 6 parts coarse sand) in walls, chambers etc. in thickness varying from 230mm to 460mm at all depths, places and positions **below plinth** including raking out joints, curing, scaffolding etc. complete excluding plastering and painting.					
a	Using t**able moulded/machine made fly ash** lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash **25**% (including cost of cement for brick making)	CUM	742			0.2589252305%
A1002	Providing **brick work in cement mortar 1:6** (1 cement 6 coarse sand) in walls, chambers etc. in thickness varying from 230mm to 460mm upto 1**0m level above finished grade level** (For height greater than 10m from **FGL**, extra over for additional height to be paid in Item No 1014), places and position above plinth including raking out joints, curing, scaffolding etc complete but excluding plastering and painting.					
a	Using t**able moulded/machine made fly ash** lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash **25**% (including cost of cement for brick making)	CUM	2,435			1.0650014187%
c	Using **burnt clay bricks** of class designation 7.5 of nominal dimension	CUM	200			0.1085925948%
B1002	Providing and laying Autoclaved Aerated concrete blocks in cement mortar 1:6 (1 part cement 6 parts coarse sand) with suitable plasticizer,confirming to (IS: 2185 Pt- 3) in walls, chambers etc. in thickness 100mm to 300mm having oven dry density of 550kg/m3 to 650kg/m3, of minimum 30kg/sqm of compressive strength (other parameters as per specification), at all depths, places and positions below/above plinth including raking out joints in line with specification and as per approval of engineer in-charge, curing, scaffolding etc.complete excluding plastering and painting all complete as per specification and drawing. AAC masonry work shall conform to I.S 6041I.S - 1905.All other structural requirements like stiffening of masonry, joint reinforcement etc. (For height greater than 10m from FGL, extra over for additional height to be paid in Item No 1014). **Note: Cement for making of AAC blocks is in the scope of contractor.** **Payment Breakup: a) On Supply & receipt of AAC Blocks at site - 50% b) On complete execution as per item description - 50%**	CUM	794			0.3358515108%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
A1003	Providing **brick work in cement mortar 1:4** (1 cement 4 coarse sand) in partition walls, chambers etc. in thickness 115mm upto 10m above finished **ground** level (For height greater than 10m from **FGL**, extra over for additional height to be paid in Item No 1015), places and position above or below plinth/graded level including providing two nos. 6 mm diameter MS bars at every third layer, raking out joints, curing, scaffolding etc complete excluding plastering and painting as per specification. (Reinforcement payment shall be made seperately as per applicable BOQ in 400 Series)					
a	Using t**able moulded/machine made fly ash** lime bricks confirming to IS 12894 with crushing strength of 75 kg/cm2 and minimum percentage of fly ash **25**% (including cost of cement for brick making)	SQM	383			0.0204926592%
B1003	Providing factory made **composite modular light weight aerated concrete panels** of minimum 75mm thick and minimum 2 hours of fire rating, consisting of two fiber reinforced cement sheets(min. 4 mm thick) on either side of light weight concrete core, having min. compressive strength of 35 Kg/Cm2 and density in the range of 700-900 Kg/Cu.M. to provide external wall and internal partition at all levels. The panels shall be fixed in position through toungue and groove jointing system by screwing the panels to top & bottom U channels(channels min. 1.25 mm thick and galvanized to min. grade 180 as per IS:277), fixing U profiled top & bottom channels to concrete/primary steel members which are placed at max vertical spacing of 4.5 M with the help of galvanized steel expansion fasteners, filling the joints from both faces with silicon acrylic paste and making the same water tight by covering with fiber glass tape(min. 50 mm wide & min. 0.5 mm thick) or by any other suitable material, so as to ensure that entire construction done is weather proof and panel surfaces are fush for painting, creating opening for doors/windows/ventilators/ducts/pipes/fans/AC etc. and finishing the opening with same U profiled galvanized steel channel which is used at top & bottom. The wall must be capable of sustaining wind pressure of 4.5 M height within limiting deflection of span/250. Payment Breakup: a) On Supply & receipt of panels at site - 50% b) On complete execution as per item description - 50%	SQM	1,262			0.1586681386%
1005	Breaking of existing brick work at all levels including plastering, removing the rubbish up to a distance of 500 m including transportation, loading, unloading etc. all complete as directed by the engineer.	CUM	44			0.0044539867%
A1006	Providing and encasing of structural steel member with masonary work around flanges, webs etc. and filling the gap between steel and masonry by minimum 12mm thick mortar. Encased member shall be wrapped with chicken wire mesh with 50mm lap etc. complete as per specification. (Chicken wire mesh to paid separately)	CUM	10			0.0036407144%
1007	Providing and laying 75 mm thick bed of dry brick aggregate including of excavation, disposal of surplus earth spreading of earth, ramming, watering etc. complete in all respects as directed by the engineer.	SQM	10			0.0001383441%
1008	Making openings in existing brick wall or partition wall including making good the broken edges/surface with cement mortar 1:6 etc. complete.	CUM	2			0.0002359396%
A1009	Supply and placing in position GI of 0.9 mm welded wire mesh/ chicken wire mesh for encasing of steel sections in concrete/ brick/ plaster at the junction of RCC and brickworks including cutting, bending, fixing etc. complete.	SQM	190			0.0020072475%
1010	Filling existing brick wall/ partition wall opening at all level including making good the broken edges/surface with cement mortar 1:6, painting, finishing to match with existing finishing, scaffolding/supporting at any level, removal of debris upto a lead of 1 km including loading, unloading, transportation etc. all complete.	SQM	2			0.0001316030%
1011	Providing and filling brick bats in soak pits all complete.	CUM	1			0.0000856727%
1014	Extra over item no. A1002,B1002 & A1006 for height above FGL (Finished Ground Level) as per following:					
a	Height exceeding 10m from **FGL** but not exceeding 20m	CUM	150			0.0063688606%
b	Height exceeding 20m from **FGL** but not exceeding 30m	CUM	40			0.0030566506%
c	Height exceeding 30m from **FGL** but not exceeding 40m	CUM	20			0.0020384378%
1015	Extra over item no. A1003 for height above **FGL (Finished Ground Level)** as per following:					
a	Height exceeding 10m from **FGL** but not exceeding 20m	SQM	100			0.0002766883%
b	Height exceeding 20m from **FGL** but not exceeding 30m	SQM	20			0.0000996078%
c	Height exceeding 30m from **FGL** but not exceeding 40m	SQM	20			0.0001328104%
1100	**DAMP PROOF COURSE: Damp proof course including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, shuttering, centering, curing etc at all level as per specification, drawings and as directed by engineer - in - charge. (Cement shall be provided by BHEL free of cost)**					
1101	Providing **Damp Proof Course** of following thickness with **1:1.5:3** concrete (10mm and down graded aggregate) with 2% of approved admixture of water proofing compound all complete. Two layers of hot bitumen coating 85/25 grade as per IS:702 @ 1.7Kg./sqm shall be applied one before & one after the DPC.					
b	50mm thick	SQM	531			0.0122357031%
1200	**PLASTERING: Cement mortar plaster including making grooves wherever required including all labour, material (unless otherwise specified in BOQ/contract specification), scaffolding, curing etc at all level as per specification, drawings and as directed by engineer - in - charge. (Cement shall be provided by BHEL free of cost)**					
A1201	Providing **18mm thick** plaster in two layers outside the building/boundary wall/rough surface of internal wall in cement mortar as applicable upto 10m above finished ground level (FGL) (For height greater than 10m from FGL , extra over for additional height to be paid in Item No A1206) on walls, finished to a smooth finish including providing 3mmx3mm size grooves at junctions of two dissimilar materials all complete					
a	Cement Mortar 1:6	SQM	14,917			0.3309369086%
1202	Providing 12mm thick plaster internal/external surfaces of building/boundary wall in cement mortar as applicable above finished **Ground** level (For height greater than 10m from FGL, extra over for additional height to be paid in Item No 1206) on walls finished to a smooth finish as per specification all complete.					
a	Cement Mortar 1:6	SQM	15,609			0.2921181750%
1204	Providing 6mm thick plaster on ceiling in cement mortar 1:4 finished to a smooth all complete.	SQM	15,761			0.2632304420%
A1206	Extra over Item A1201, 1202 for plastering on exterior/interior walls over & above 10m height from FGL					
a	Height exceeding 10m from FGL but not exceeding 20m	SQM	723			0.0017458526%
b	Height exceeding 20m from FGL as applicable but not exceeding 30m	SQM	723			0.0031279859%
c	Height exceeding 30m from FGL but not exceeding 40m	SQM	253			0.0014636809%
1207	Forming **groove** of uniform size from 12X12 mm upto 25X15 mm in plastered surface as per approved pattern, using wooden battens nailed to the under layer, including removal of wooden battons, repair of the edges of plaster panel and finishing the groove etc. complete as per specification, drawing and the instructions of engineer in charge.	RM	188			0.0003785095%
1208	Providing and laying **encasement** to **box type steel beams** at all levels with lath plaster 50 mm nominal thickness with cement plaster (1:4) over chicken wire mesh including all labour, materials, equipment, handling, transporting, mixing, placing, leveling, curing and cleaning, finishing the exposed surfaces etc including centering and shuttering all complete as per specification, drawing and instructions of enginner in charge (chicken wire mesh to be paid separately)	SQM	50			0.0018009890%
A1210	Providing moldings and cornices on plastered surface at all elevations for all type of work such as chajjas, parapet, projections etc. including scaffolding, finishing etc. complete with all labour, tools and plants as per specification, drawing and instructions of engineer in charge.	RM	200			0.0005131309%
1300	**FINISHES TO CONCRETE / PLASTERED SURFACES: Finishes, painting to concrete, plastered surfaces including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, surface preparation, scaffolding etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
1301	Two or more coats of **white wash/ colour wash** as per IS 627 of approved brand and manufacture to give an even shade including a priming coat as per specifications.	SQM	50			0.0001041354%
A1304	Two or more coats of Low VOC (volatile organic compound, less than 50g/L) **acrylic distemper** of approved brand and manufacture to give an even shade including a priming coat with distemper primer complete.All necessary documentation (certificates, manufacturer declarations) should be provided by the contractor to engineer in charge	SQM	22,651			0.1391323773%
A1305	Providing and applying **two or more coats of low VOC (volatile organic compound) acrylic emulsion paint** as per IS 15489,relevant latest code of approved brand, shade and manufacture to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guideline. Note: The paint should have VOC content ~~limit~~ less than 50 grams per litre. All necessary documentation (certificates, manufacturer declarations) should be provided by the contractor to engineer in charge.	SQM	5,983			0.0518939527%
A1306	Providing and applying **2 or more coats of oil resistant paint(**epoxy based & minimum 150 micron thickness) of approved brand and colour to floors, walls and ceiling including preparation of surface to receive paint, providing and applying primer complete all as per manufacturer's recommendations and as approved by engineer, at all heights above or below grade level, complete as per specifications.	SQM	802			0.0116198270%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
B1306	Providing and applying **2 or more coats of epoxy based acid/alkali chemical resistant pain**t (minimum 150 micron thickness) on epoxy primer of approved manufacturer Berger,Naya Rangoli,or equivalent, approved finish, shade and colour to floors, walls and ceiling including preparation of surface to receive paint, providing and applying primer complete all as per manufacturer's recommendations and approved by engineer, at all heights above or below grade level, all complete as per specifications.	SQM	802			0.0154931026%
1312	Providing and applying 3 coats of water proof cement paint of approved make and color on exterior surface at all heights including material, labour, scaffolding, curing etc including primer coat complete as per specification.	SQM	50			0.0003096393%
A1314	Providing and applying resin bonded granular textured premium Acrylic paint finish,shall consist of crushed stone/special quality Silica quartz chips of .5 mm to 2.5 mm size, and of approved natural color/shade and bonded with synthetic resins, Silicone additives, acrylic modified exterior adhesives and additives altogether in a single pack mix, applied on primer base coat, after necessary cleaning/ washing, preparing the surface using coir brush/ wire brush, sand paper, including filling of cracks with putty wherever required etc.cured and dried plaster surface with a dry film nominal thickness of 2.5 mm from approved manufacturer Asian ,Luxture, Berger or equivalent.The final finished coating shall be fungus resistant, UV resistant, water resistant & repellant and extremely durable with color fastness as per manufacturer's specifications including warranty as per specification ,instructions and instruction of Engineer-in-charge	SQM	5,445			0.1635310605%
A1317	Providing and applying **2 mm thick Acrylic wall putty punning** on walls including preparation of surface, staging, etc. to achieve a smooth even surface all complete as per specification and as directed by Engineer.	SQM	28,635			0.1972091934%
A1319	Providing and applying two or more coats of Premium Acrylic Smooth weather resistant Paint with Silicone additives, over and including base coat, of approved brand and manufacture and required shade over one coat of primer after necessary cleaning/ washing, preparing the surface using coir brush/ wire brush, sand paper, including filling of cracks with external water resistant putty wherever required etc. all complete to give smooth, hard, durable & glossy finish over a coat of primer over prepared plaster surface as per manufacturers guidelines. The final finished coating shall be fungus resistant, UV resistant, water repellant and extremely durable with color fastness as manufacturer's specifications, including warranty as per specification.(Asian / Nerolac / Berger / Equivalent as per selection).	SQM	13,314			0.1145979409%
1400	**FLOORING AND SKIRTING: Flooring and skirting at all level including base layer, labour, material (unless otherwise specified in BOQ/contract specification), equipments, transportation, handling, curing, polishing etc. at all level as per specification, drawings and as directed by engineer - in - charge. (Cement shall be provided by BHEL free of cost)**					
A1401	Providing and laying **50 mm thick heavy duty cement concrete** in flooring with **metallic hardener** pigmented topping 12mm thick uniform graded treated iron particles in flooring. Under layer of 38mm thick cement concrete mix 1:1.5:3 (1 cement: 1.5 sand : 3 stone aggregates 12.5 mm well graded) and top layer of 12mm thick metallic concrete of mix 1:2(1 cement hardner mix with approved quality metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including cement slurry, rounding off edges etc. all complete The ratio of approved quality metallic hardening compound and cement shall be 1:4.(Quoted item rate shall be inclusive of providing glass joint strips).	SQM	25,456			0.8810484960%
B1401	Providing and laying **50 mm thick heavy duty cement concrete in flooring with non- metallic hardener** pigmented topping 12mm thick uniform graded hardener in flooring. Under layer of 38mm thick cement concrete mix 1:1.5:3 (1 cement: 1.5 sand : 3 stone aggregates 12.5 mm well graded) and top layer of 12mm thick hardener concrete of mix 1:2(1 (1 cement hardner mix with approved quality non-metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including as per manufacturer specification, cement slurry, rounding off edges etc. all complete.The ratio of approved quality hardening compound and cement shall be 1: 4 as per approved sample and manufacturer specifcation. (Quoted item rate shall be inclusive of providing glass joint strips):	SQM	282			0.0097603543%
A1402	Providing and laying **25 mm thick heavy duty cement concrete mix** 1:1.5:3 (1 cement: 1.5 sand : 3 stone aggregates) with metallic hardener pigmented topping of 10 mm thick uniform graded treated iron particles in skirting and dado. Under layer of **15mm thick cement concrete mix 1:1.5:3 (**1 cement: 1.5 sand : 3 stone aggregates 12.5 mm well graded) and top layer of 10mm thick metallic concrete of mix 1:2 (1 cement hardner mix with approved quality metallic hardening compound :2 stone aggregate 6mm nominal size) by volume including cement slurry, rounding off edges, etc. all complete as per specification.The ratio of approved quality metallic hardening compound and cement shall be 1: 4.	SQM	50			0.0014262022%
B1402	Providing and laying **25 mm thick heavy duty cement concrete mix 1:1.5:3** (1 cement: 1.5 sand : 3 stone aggregates) with Non-metallic hardener pigmented topping of 10 mm thick uniform graded in skirting and dado. Under layer of 15mm thick cement concrete mix 1:1.5:3 (1 cement: 1.5 sand : 3 stone aggregates 12.5 mm well graded) and top layer of 10mm thick with hardener concrete of mix 1:2 (1 cement hardner mix with approved quality hardening compound :2 stone aggregate 6mm nominal size) by volume as per manufacturer specification including,cement slurry, rounding off edges etc. all complete as per specification.The ratio of approved quality hardening compound and cement shall be 1: 4 as per approved sample and manufacturer specifcation.	SQM	200			0.0057048088%
C1402	Providing and laying **25 mm thick cement concrete mix 1:1.5:3 (1 cement: 1.5 sand : 3 stone aggregates)** with 10 mm thick uniform graded particles in skirting and dado. Under layer of 15mm thick cement concrete mix 1:1.5:3 (1 cement: 1.5 sand : 3 stone aggregates 12.5 mm well graded) and top layer of 10mm thick cement mortar 1:2 (1 cement :2 sand) by volume including cement slurry, rounding off edges etc. all complete as per specification.	SQM	50			0.0013548921%
A1403	Providing and laying **precast polished heavy duty cement concrete tiles** (Carborundum/quartz chips topping pigment content is 3.5 kg per 50 Kg of white Cement) of size 300X300X25mm thick of approved shade as per IS 1237, including minimum 20mm cement mortar bedding of 1:3 (1 cement : 3 sand) jointed with neat cement slurry@4.4 kg/sqm,labour,materials, etc. all complete with pigment to match the shade of the tiles including rubbing, curing, grinding and polishing complete with laying as per IS 1443 etc.(inclusive of cost of cement for tiles manufacturing) all complete for following: Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
a	Laid in floors	SQM	125			0.0088540242%
A1404	Providing and laying **interlocking M35 Grade concrete blocks** in paving with approved colour and pattern and should be laid on the subbase and bedding of sand minimum 20mm thick as per specifications and recommendations of manufacturer.(inclusive of cost of cement for paver manufacturing) Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
b	80mm	SQM	1,708			0.0919120659%
A1412	Providing and laying 18-20mm thick Mirror polished (6 layers of polish)/Flame finish (making top surface rough by burning / shot blasting)Granite stone of approved color and texture in flooring. Under bed shall average 30mm thk of 1 cement : 1.5 sand : 3 stone aggregate by volume and brought to proper level. The granite stone slabs/tiles laid over under bed, pressed and tapped down with wooden mallet to the proper level, lifted and pressed again with thick cement slurry spread over the surface with fine joint finished including pigments, moulding, cornice, curing, grinding, granite polishing etc. all complete. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%	SQM	400			0.0946495189%
B1412	Providing and laying 18-20mm thick Mirror polished Granite stone slabs in approved shade/color /design in staircase landing/skirting and corridors over minimum 30 mm thick underbed of 1 cement : 2 sand by volume mixed with sufficient water to form a stiff workable mass. The slabs shall be laid over under-bed, pressed and tapped down with wooden mallet to the proper level, lifted and pressed again with thick cement slurry spread over the surface with fine joint finished including moulded nosing, pigments, curing, grinding, making corners, granite polishing etc.all complete. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%	SQM	1,426			0.3373308855%
1414	Providing and laying polished Granite stone 18-20mm thk in skirting and dado with 6mm thick projection from adjacent plaster minimum 12 mm thick cement mortar bedding of 1:3 (1 cement : 3 sand) with thick cement slurry @3.3kg/sqm spread over the surface with fine joint finished including cutting brickwall upto the required depth, edging, finishing etc. all complete. including mortar ,cement slurry ,pigments, curing, grinding,moulding, granite polishing etc. all complete. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%	SQM	200			0.0431331839%
1416	Providing and laying vitrified ceramic tiles of polished variety of size 600x600 from reputed / approved manufacturer, complete including underbed of cement mortar 1:3 minimum 20mm thick underbed for flooring and 12mm thick underbed for dado/skirting with neat cement slurry @3.3Kg/sqm etc. all complete for following. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
b	10mm thick tiles In flooring	SQM	200			0.0153536829%
d	10mm thick tiles In skirting and dado upto specific height	SQM	50			0.0040220411%
A1416	Providing and laying vitrified ceramic tiles min 10mm thick of polished variety of size 600x600 with Matt/ Glazed from reputed / approved manufacturer, complete including underbed of cement mortar 1:3 average 40mm thick underbed for flooring and 12mm thick underbed for dado/skirting with neat cement slurry @3.3Kg/sqm etc. all complete Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%	SQM	475			0.0401114966%
B1416	Providing and laying heavy duty Antiskid full body vitrified tiles 18-20 mm thick of size 600x600mm in flooring, of approved shade, colour, pattern and make from reputed / approved manufacturer as Simpolo,Varmora or equivalent ,complete including underbed of cement mortar 1:3 minimum 30mm thick for flooring with neat cement slurry @3.3Kg/sqm etc.all complete. Full body Vitrified Tiles shall be laid on properly laid levelled floor, with joints 3 to 5mm wide & 8 to 10mm deep & shall be filled with approved Epoxy Grout mix of 0.70kg of organic coated filler of desired shade (0.10kg of hardener and 0.20kg of resin per kg). Full body Vitrified Tiles shall have water absorption less than 0.5%, Modulus of Rupture more than 38N/mm2, Breaking strength more than 7500N, Moh's scale more than 6, Abrasion resistance less than 144 mm3 and coefficient of friction more than 0.4. Vitrified Tiles shall generally conform to IS: 15622. All complete (including cost of epoxy grouting)as per engineer incharge. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%	SQM	1,911			0.2943412821%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
C1416	Providing and laying vitrified ceramic tiles of polished variety of size 800x800 from reputed / approved manufacturer, complete including underbed of cement mortar 1:3 with neat cement slurry etc. all complete for following NOTE: All vitrified tiles to be used should be with appropriate % of recycled content. The contractor should provide the material sample/ declaration from manufacturer mentioning the recycled content used in maufacturing of vitrified tiles to be used to engineer in charge) Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
a	10mm thick tiles In flooring	SQM	495			0.0418004017%
b	10mm thick tiles In skirting and dado upto specific height	SQM	245			0.0216788016%
D1416	Providing and laying **matt finish vitrified ceramic tiles of polished variety** of size 600x600 / 800x800 of approved shade, colour, pattern and make from reputed / approved manufacturer as Simpolo,Varmora or equivalent , complete including 40mm average thick underbed of cement mortar 1:4 for flooring with neat cement slurry and 12mm thick underbed for dado/skirting with cement mortar 1:3 with neat cement slurry @3.3Kg/sqm etc.,3mm groove joints as per approved pattern pointed neatly with 3X4mm stainless epoxy grout SP- 100 of Laticrete, Luxture or approved equivalent in approved colour to match colour of tile etc. all complete for following. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
a	9.0 mm (min.) thick tiles In flooring	SQM	124			0.0095192834%
b	9.0 mm (min.) thick tiles In skirting and dado upto specific height	SQM	36			0.0028958696%
A1417	Providing and laying **Digitally vitrified ceramic tiles of matt finish** of size 600x600mm from reputed / approved manufacturer Simpolo, varmora or equivalent complete including minimum 40 mm thick underbed of cement mortar 1:4 for flooring and 12mm thick underbed of cement mortar 1:3 for dado / skirting with neat cement slurry @3.3Kg/sqm etc. all complete for following Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
b	9.00 mm (min.) thick tiles In flooring	SQM	1,353			0.1118065100%
d	9.00 mm (min.) thick tiles In skirting and dado upto specific height	SQM	215			0.0185688809%
C 1417	Providing and laying **vitrified ceramic tiles of matt finish polished variety** of size 1000X1000 from reputed / approved manufacturer Simpolo,varmora or equivalent, complete including 40mm average thick underbed of cement mortar 1:4 for flooring with neat cement slurry and 12mm thick underbed for dado/skirting with cement mortar 1:3 with neat cement slurry @3.3Kg/sqm etc. with 3mm groove joints as per approved pattern pointed neatly with 3X4 mm stainless epoxy grout SP- 100 of Laticrete,Luxture or approved equivalent in approved colour to match colour of tile etc. all complete for following. . Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
a	10 mm thick tiles In flooring	SQM	212			0.0234631642%
1419	Providing and laying granite stone slab of 20mm thickness single piece for wash basin / sink slab /facia of black or approved colour including 20mm underbed of cement mortar 1:3 with cutting,making corners,moulding and opening etc. all complete.	SQM	20			0.0055880967%
A1420	Providing and laying Heavy Duty dust pressed Ceramic Tiles of 7mm thick Designer glazed/matt finish of reputed manufacturer Simpolo,varmora or equivalent of approved finish shade and colour on walls, skirting etc.including 20 mm underbed of cement mortar 1:4 in flooring and cement mortar of 1: 3 for skirting/dado with neat cement slurry etc. all complete. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
a	300X300 mm	SQM	266			0.0168983479%
A1422	Providing & fixing Acid / Alkali resistant (Chemical resistant) tiles comply to IS:4457 and shall be laid over bitumastic lining of min 12mm thick (to be laid in layers of 6mm each). The tiles shall be applied in flooring/Dado of reputed / approved manufacturer Simpolo,varmora,Naya Rangoli or equivalent of approved finish, shade and colour with 6mm thick Potassium Silicate bedding mortar as per IS:4441, 4443 & 4832 and including preparation of surface, application of bitumen primer, curing, pointing joint of bedding 20mm deepx6mm wide with epoxy/Furane morter etc. all complete for following thicknesses. The tiles should be abrasion resistant & durable. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
Aa	12mm thick	SQM	559			0.0730507305%
a	20mm thick	SQM	200			0.0326995213%
b	38mm thick	SQM	200			0.0350538868%
A1427	Providing and fixing Designer digitally glazed ceramic tiles of approved color and design as per IS: 15622 of size 300x300mm / 300x450mm, 300X600 of reputed / approved manufacturer Simpolo,varmora or equivalent of approved finish,size in dado, projecting 6mm uniformly from adjacent plaster or wall finish. The mix for 20mm thick underbed plaster shall consist of 1part cement and 3 parts sand by weight. fairly moist but firm, tiles shall be pressed over under bed by applying cement slurry @ 3.3kg/sqm including pigments, curing etc all complete as instructed by engineer incharge for following thicknesses,. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%					
a	5mm thick	SQM	482			0.0272045126%
b	7mm thick	SQM	92			0.0056927351%
A1428	Providing and laying 2mm thick heavy duty antistatic PVC(Virgin) tile in flooring / skirting of approved shade,from reputed / approved manufacturer Naya Rangoli,robina or equivalent as per IS:3462 and laying as per IS:5318 all complete as per specficaitons.	SQM	142			0.0047242927%
A1429	Providing and fixing Removable type flooring system (raised access floor) consisting of of fire resistant Cementitious panels of 600 x 600x 35 mm and Laminated with 1.2 mm thick fire retardant food grade antistatic laminate top finish to ensure max bonding to the steel surface. Cementatious panels shall be steel welded construction, with an enclosed bottom pan of 64 hemispherical and top plain sheet which are fuse welded at multiple location to form a panel. The panel is coated with 40-60-micron epoxy coat after cleaning, de-greasing, phosphate by several tank processes & is heated to achieve max adhesion to the panel surface & corrosion resistance. The inner empty core of the panel is injected with a light weight fire retardant, non-combustible cementatious compound at high pressure to fill in all the crevices of the panel and ensures support of not less than 90% of the top surface area of the panel. Pedestal (300mm – 800 mm) must be 25mm dia. pipe with min.2.0 mm thickness with bottom plate of 100x100x min.2.0mm thick & top plate must be 75x75x3.0 mm. All pedestal shall be tightening to Stringer of 20x30x575x1.0 mm Rectangular tube. The system shall be design and taken approval for Uniformly distributed load (UDL) of 13 KN (1300 kg/ sqm), for the same all complete as per specification. Cavity area below the false flooring shall be made dust proof by using Polyurethane paint etc complete as per specification. Payment Breakup: a) On Supply & receipt of materials at site - 50% b) On complete execution as per item description - 50%	SQM	50			0.0174514830%
A1431	Providing and fixing, laying min.15mm wodden panel flooring and skirting of pergo,bekker,greenlam or equivalent multi-layered engineered wooden planks treated with VOC free lacquers and stains to provide extra strengthening, longevity and durability to planks. In all planks each layers are arranged at cross grain to each other for provide the balancing and stability to all three layers. Top layer of flooring is made up of about 3.0 mm thick thermosetting re-polish able natural veneer setting on a core of about 10 mm thick pine wood that produce natural characteristic of wood with 2.0mm thick bottom ply based veneer balancing layer. The planks are joint to each other through plankloc system with glue less technology system and laid on 2mm thick dual barrier underlay protecting sheet having anti-bacterial, Anti-termite, fire-resistant, noise reduction, high wear and abrasion resistance, water resistant properties. The system includes all accessories like beading, Quadrant, Veneered/solid wood skirting, end profile etc.as per as per manufacturer specification and approved by Engineer Incharge..	SQM	50			0.0089672149%
B1431	Providing and laying minimum 50 mm thick wooden flooring, consisting of 37 mm thick hardwood planks, finished with min.11mm thick laminated wooden flooring and skirting of pergo,bekker,greenlam, or equivalent with plank size min.193x1195mm as per manufacturer (material class shall be 34 as per EN13329) of approved pattern, colour, shade, design over 2 mm expanded polystyrene foam and polythene sheet under laying,along with all accessories like beading, Quadrant, Veneered/matching skirting, end profile etc.as per as per manufacturer specification and approved by Engineer Incharge.	SQM	20			0.0066352359%
A1432	Providing and laying Decorative/designer pre-polished, plain and pigmented, high wearing resistance concrete tiles of 20mm thickness (minimum) in various non-standard interlocking patterns of approved color,shade all complete as per specification.	SQM	20			0.0008294194%
A1435	Providing and fixing Glass mosaic tiles at finished plain wall surface of size 24 mm x 24 mm x 3.8 mm thick (minimum) in in decorative murals and pattern of approved colour, shade, design , fixing in customize design, as per direction of Engineer-in- Charge. The glass mosaic tiles to be fixed on the vertical wall surface with the help of approved adhesive applied at the rate of 2.5 kg per sqm and grouting of the same. The rate is inclusive of all operation, material and required pattern approved by Engineer-in- Charge:.	SQM	325			0.0476863514%
A1437	Providing Dielectric epoxy based coating as per IS: 15652 shall be provided with suitable primer. The minimum dielectric strength for insulating floor (for all switchgear rooms up to and including 11 KV switchgear) shall be 45 KV ac rms (Class B as per Table-4 of IS 15652: 2006). The minimum thickness of insulation coating shall be 2000 microns for switchgear rooms up to 11 KV or as per the lab certificate fulfilling the dielectric strength requirement, whichever is higher. Dielectric test reports as per IS-2584 from a NABL accredited laboratory shall be submitted. Further, test reports for adhesion, tensile strength, scratch hardness, shore hardness, abrasion resistance shall be submitted in line with requirement of relevant national/international standard. The coating shall be high gloss finish and top color of coating shall be decided during the detailed engineering. Arc flash boundary and golden yellow safe boundary shall be provided. The item includes preparation and submission of procedure of coating and conducting dielectric testing in a NABL accredited laboratory on a sample prepared during application at site, all complete as per specification.	SQM	569			0.0595392883%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
1500	**ROOFING / SIDE CLADDING: Roofing / side cladding work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, scaffolding, laps, hooks, washers, corner pieces etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
A1502	**METAL DECK SHEET Type-I,** Designing, providing and fixing permanently **color coated galvanised MS troughed** metal sheet decking plate of approved colour **over roof purlins for cast-in-situ roof slab** as per relevant IS code and Grade as per specification. Bare metal thickness(BMT) of deck plate shall be minimum **0.8mm** with minimum trough depth of **44mm** (or as per design whiever is higher) of grade G250 as per AS1397/grade SS255 as per ASTM A653M/ grade S250GD as per EN 10326 with zinc coating to class Z275 and shall serve as permanent shuttering to the ro**of slab 40mm - 100mm thick** measured over crest of metal decking & shall have adequate strength to support weight of green concrete and imposed loads of **min 100 kg/sqm** (for two span condition) during construction between beams as per manufacturer's recommendations/ calculations/ test certificates for approval including fixing of plates to beams, side lapping, end lapping etc. all complete for below mentioned spans. The sheet shall be permanently coated with silicon modified polyster(SMP silicon content 30%-50%) paint or super polyster paint of minimum 20 micron DFT on exposed surface (facing operating floor) over primer coat of minimum 5 micron(nominal) and minum 10 micron (nominal) SMP or super polyester paint over primer coat of minum 5 micron (nominal) on other face. SMP and polyster paint system sahll be of idutrial finish of product type 4 of AS/NZ2728, including fixing of sheet to top flange of beam with drawn arc welding of headed shear anchor studs @ 260mm c/c in the trough and stich screws between two adjacent sheets and sealing with epoxy sealant.The shear anchor studs shall confirm to type B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 16 mm dia & 65 mm length manufactured from cold drawn round steel bars confirming to ASTM A 29 of grade designation 1010 through 1020 of standard quality with either semi killed or killed welded by drawn arc stud welding through metal deck sheet. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%					
a	Span Upto 1800mm	SQM	10,423			0.8360226839%
A1503	Providing and fixing shear anchor studs for fixing metal deck sheet to floor structural beams conforming to Type-B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 19mm diameter and 100mm length manufactured from cold drawn round steel barsconforming to the requirement of ASTM A 29, of grade designation 1010 through 1020, of standard quality with either semi-killed or killed, welded by Drawn Arc Stud Welding through metal deck sheet etc all complete as per specification. Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	QUINTAL	10			0.0235356062%
B1503	Providing and fixing shear anchor studs for fixing metal deck sheet to roof structural purlins conforming to Type-B studs specified in AWS D1.1/D1.1M or equivalent as shear connector of 16mm diameter and 65mm length manufactured from cold drawn round steel bars conforming to the requirement of ASTM A 29, of grade designation 1010 through 1020, of standard quality with either semi-killed or killed, welded by Drawn Arc Stud Welding through metal deck sheet etc all complete as per specification. Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	QUINTAL	21			0.0494247730%
A1504	Designing, providing and fixing **External sheet of Permanent colo**ur coated metal cladding with troughed M.S. sheets of 0.6mm bare metal thickness having minimum yield strength 250 MPa complying AS1397 and zinc-aluminium alloy coating not less than 275 gm/sqm total on both sides including fixing to supports / rails by concealed fixing system, corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing etc. all complete. The exposed face of the sheet shall be permanently colour coated with silicon modified polyester (SMP with silicon content of 30% to 50%) paint or Super Polyester paint of minimum dry film thickness (DFT) 20 microns(nominal) over suitable primer coat of 5mm DFT(nominal). Inner face of the sheet shall be provided with suitable pre-coating of minimum DFT 10 microns(nominal) over suitable primer of 5mm DFT(nominal). The permanent colour coated sheet shall meet the general requirements of IS : 14246 and shall conform to class 3 for the durability. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	9,955			0.6976224028%
A1505	Designing, providing and fixing External/ Inner sheet of Permanent colour coated metal cladding / roofing with troughed M.S. sheets of minimum 0.5 mm bare metal thickness of min. grade G350 as per AS1397/grade SS340 class 4 or as per ASTM A792M/ grade S350 GD as per EN 10326 with zinc coating to class Z275 / aluminium zinc alloy coating to class AZ150 on both sides including fixing to supports / rails by concealed fixing system, corrosion resistant self tapping / self drilling type fasteners with suitable cap, flashing, etc. all complete over columns, beams, bracings etc. at all levels. The exposed face the sheet shall be permanently coated with silicon modified polyster(SMP silicon content 30%-50%) paint or super polyster paint of minimum 20 micron DFT on exposed surface over primer coat of minimum 5 micron and minum 10 micron SMP or super polyester paint over primer coat of minimum 5 micron on other face. SMP and polyster paint system sahll be of industrial finish of product type 4 of AS/NZ2728. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	9,955			0.5979620596%
A1514	Providing and fixing underdeck insulation with resin bonded rock wool /Mineral wool 50 mm nominal thickness conforming to IS 8183 having a density of 48kg/cum with minimum 0.05 mm thick aluminium foil on exposed surface followed by 0.6 mm dia and 25 mm mesh GI wire netting, fixed with 2mm wire ties at various elevations with rawl plugs including clips, etc complete as per specifications and instructions of the engineer incharge.	SQM	811			0.0433284755%
1517	Providing and fixing 1 mm thick corrugated/semicorrugated G.I. sheet in roofs, cladding of minimum galvanisation of 275 gsm total on both sides with minimum 150mm overlapping, 8 dia G.I. hook bolts or 'J' Bolts and nuts @305 mm c/c along with G.I. and bitumen washers including cutting of sheets for opening etc. all complete.	SQM	50			0.0037151687%
A1519	Designing, providing and fixing Factory made (Continous Line) prefabricated sandwiched Permanent colour coated metal cladding comprising top sheet as troughed(minimum depth of trough shall be 30 mm) permanently colour coated sheet & bottom sheet as plain permanently colour coated for covering of exposed metal/concrete / brick surfaces with insulation shall be of Polyurethane type of minimum 50mm thick (excluding trough). The polyurethane shall be Chlorofluorocarbon (CFC) free and self-extinguishing and shall conform to IS 12436: 1988. It shall have Modular Density 40 +/- 2 Kg/m3 and Thermal Conductivity @ 10 Deg.C 0.017 - 0.020 W/M 0k, Water absorption (% by vol) 3.1, Critical Oxygen Index 23 and Compressive Strength 1.2 Kg/sq.cm, sandwiched between the two sheets, each sheet shall be high strength tensile steel sheet 0.5mm bare metal thickness (minimum) of YS350 as per IS 15961 /grade G350 as per AS1397 / grade SS340 class 4 as per ASTM A792M / grade S350GD as per EN 10326 with zinc coating to class Z 275 / aluminium-zinc alloy coating to class AZ150 on both sides, both sheet shall be permanently coated with silicon modified polyster (SMP with silicon content of 30% to 50%) paint of minimum 20 micron DFT on exposed surface on 5 microns (min.) epoxy primer/phosphate primer coat and 10 micron (min.) SMP on 5 micron (min.) epoxy primer/phosphate primer on other face, SMP paint system shall be of industrial finish of product type 4 of AS/NZS 2728,troughed sheet shall be of approved profile, sectional properties, (suitable for the specified loading / deflection and purlins / runner spacing), colour and shade, at all levels, including all labour, materials, equipment, handling, transportation, special coated fastener conforming to corrosion resistant Class 3 of AS3566 and tested for 1000 hours salt spray test, fixing insulated sandwiched metal sheet with the structural members below for supporting the sheeting system, scaffolding, equipment, end and side laps, cutting of openings, preparation of working drawings, testing, etc., all complete, as per specifications. Sealant used for cladding shall be butyl based, two parts poly sulphide or equivalent approved, non stainless material and be flexible enough not to interface with fit of the sheets. Coated surface shall be provided with a protected guard film (polyethylene) of about 40 microns to avoid any damage to the coating during handling. Overlap shall be min. 100 mm or as specified by manufacturer. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	3,459			0.5025459633%
1600	**FALSE CEILING: False ceiling including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, suspension system etc at all level as per specification, drawings and as directed by engineer - in - charge.**					
1601	Providing and fixing glass fibre reinforced gypsum plaster board (GRG) ceiling (having gypsum core mixed with glass fibre) system consisting of metal supporting grid system forming panels of specified size, suspended from RCC slab/structural steel or catwalkway grid above with 4 mm (minimum) galvanised wires (rods) with special height adjustment clips, including preperation of working drawing, providing openings for AC ducts, return air grills, light fixtures etc (but excluding the cost of catwalkway grid) all complete as per drawings, specification and instructions of the engineer. Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%					
aa	12.5mm thick GRG board confirming to IS: 2095 with galvanised light gauge steel load bearing supporting GI frame (minimum 0.8mm thk and grid size of 600x1200mm.) and finished flat (seamless).	SQM	50			0.0031455682%
b	12 mm thick GRG board in profile (dome ,curved profiled etc.) with galvanised light gauge steel load bearing supporting GI frame and finished smooth (seamless).	SQM	25			0.0022474633%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
A1601	Providing and fixing 12.5 mm thick tapered/square edge glass fibre reinforced gypsum board conforming to IS:2095 having fine texture finish including providing and fixing of frame work at all levels, for all kind of work, consisting of light weight galvanised steel member (minimum 0.8 mm thick and galvanised as per IS : 277) having maximum grid size of 1200 mm x 600 mm for supporting panels of specified size, suspended from RCC slab/ structural steel or catwalkway grid above, with 4 mm (minimum) galvanised wires (rods), with special height adjustment clips, providing angle section of minimum 25 mm width along the perimeter of ceiling, supporting grid system (minimum 0.8 mm thick and galvanised as per IS : 277), expansion fasteners for suspension arrangement from RCC, providing openings for AC ducts, return air grills, light fixtures, etc., all complete. (but excluding the cost of catwalkway grid) all complete as per drawings, specification and instructions of the engineer. Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	SQM	50			0.0049444192%
A1602	Providing, fixing and laying light weight mineral fiber tile false ceiling of minimum thickness 15 mm and exposed surface semi-perforated with depth of perforation as 4 mm and humid resistance of 95% RH and fire performance of class 0/1 as per BS 476 with metal suspension grid system with galvanized Tees of section 24 X 38 mm for main runners of approved colour and make as per specification. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures. A.C. ducts etc. suitable M.S. channel (minimum MC 75 @ 1.2m) grid shall also beprovided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. complete with cut-outs etc.The size of tiles shall be 600 X 600 mm or 600 X 1200 mm. Required M.S. channel shall be measured & paid extra under respective item unit rate.(All mineral fiber board to be used should be with appropriate % of recycled content.	SQM	449			0.0503030822%
A1603	Providing and fixing permanently colour coated aluminium false ceiling of approved colour of Luxalon Hunter douglas, Newage or approved equivalent with corrosion resistant aluminium alloy panels of size 600 mm x 600 mm and min.0.6 mm thk. with clip on torsion spring system ,perforation patterns in combination with built in nonwoven tissue, acoustic fleece for providing good acoustic properties with NRC 0.7 and installed with silhouette T-Grid (of profile 24 mm) in same or contrasting colours or with 6 mm recess joints. The whole system shall be level adjusting arrangement and shall be suspended as per manufacturer. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures, A.C. ducts etc all complete. Suitable M.S. channel grid with minimum MC 75 shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. (Materials for structural platform grid made up of MS Channels/ Beams / Angles shall be supplied by BHEL and shall be paid under ST No **D**2301) Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	1,223			0.3314988926%
B1603	Providing and fixing permanently colour coated aluminium false ceiling of approved colour of Luxalon 150C,300C, of Hunter douglas, Newage or approved equivalent with corrosion resistant aluminium alloy (grade 3105) panels of of minimum thickness 0.6mm with perforation patterns in combination with built-in non-woven tissue, acoustic fleece for providing good acoustic properties with NRC 0.55. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures, A.C. ducts etc all complete. Suitable M.S. channel grid with minimum MC 75 shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc.(Materials for structural platform grid made up of MS Channels/ Beams / Angles shall be supplied by BHEL and shall be paid under ST No **D**2301). Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	200			0.0487896980%
A1604	Providing, fixing and laying permanently colour coated Designer metal aluminium false ceiling of approved colour with stove enamel finish of approved make of Luxalon Hunter douglas,Newage or approved equivalent in LINEAR, RECTANGULAR, SQUARE, CURVILINEAR , OPEN GRID type etc.as per detail engineering drawing , with corrosion resistance aluminium alloy (grade 3105) panels of minimum thickness 0.6mm,with perforation patterns in combination with built-in non-woven tissue, acoustic fleece for providing good acoustic properties with NRC 0.7. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures etc.Suitable M.S. channel (minimum MC 75) grid 1200 mm C/C maximum shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. The work to be complete as per specifications, drawings and direction of engineer. (Structural steel works for platform for movement is separately payable under relevant items of BOQ) Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	100			0.0235771933%
B1604	Providing, fixing and laying permanently colour coated Designer metal Batten panel aluminium false ceiling of colour with stove enamel finish of approved make of Luxalon Hunter douglas,Newage or approved equivalent in combination with demountable translucent stretch ceilign memebres etc.as per detail engineering drawing & manufacturer specification with corrosion resistance aluminium alloy (grade 3105) panels of minimum thickness MIN. 0.6mm. Additional hangers and height adjustment clips shall be provided for return air grills, light fixtures etc.Suitable M.S. channel (minimum MC 75) grid 1200 mm C/C maximum shall also be provided above the false ceiling level for movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. The work to be complete as per specifications, drawings and direction of engineer. (Structural steel works for platform for movement is separately payable under relevant items of BOQ) Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	100			0.0278096852%
1606	Providing and Fixing 12mm thick Gypsum board plain/perforated false celing tiles(600x600mm) of India Gypsum or equivalent make in plan or elevation with aluminium grid, metal suspension system, anchor fastener adjustable hangers etc. including two or more coats of acrylic emulsion paint of approved colour to give an even shade with smooth finish all complete.as per architectural design and detail.metal suspension system as per ASTM C-635 shall be hot dipped M.S.galvanized (grade 180 as per is :277) nominal size of T-section shall be 24 x 38 mm or 24 x 25 mm cross runners. 24mm wide exposed flange surface shall be permanently color coated.suspension system shall be as per manufaturer's specification supported over movment platform.The work to be complete as per specifications, drawings and direction of engineer.(Materials for structural platform grid for movement made up of MS Channels/ Beams / Angles shall be supplied by BHEL and shall be paid under ST No **D**2301)	SQM	50			0.0034862720%
1607	Providing and Fixing 12mm thick Gypsum board plain/ mineral fibre based acoustic ceiling board in plan or elevation with aluminium grid, metal suspension system, anchor fastener adjustable hangers etc. including two or more coats of acrylic emulsion paint of approved colour to give an even shade with smooth finish all complete.as per architectural design and detail.metal suspension system as per ASTM C-635 shall be hot dipped M.S.galvanized (grade 180 as per is :277) nominal size of T-section shall be 24 x 38 mm or 24 x 25 mm cross runners. 24mm wide exposed flange surface shall be permanently color coated.suspension system shall be as per manufaturer's specification supported over movment platform. The work to be complete as per specifications, drawings and direction of engineer. Payment terms - a) On receipt of Gypsum board false ceiling at site - 50%; b) On completion of erection & fixing - 50%.	SQM	25			0.0018676457%
A1607	Providing and Fixing **12mm thick Calcium silicate board of HILUX** or equivalent in plan or elevation with aluminium grid, metal suspension system, anchor fastener adjustable hangers etc. including two or more coats of acrylic emulsion paint of approved colour to give an even shade with smooth finish all complete as per architectural design and detail. Metal suspension system as per ASTM C-635 shall be hot dipped M.S.galvanized (grade 180 as per is :277) and nominal size of T-section shall be 24 x 38 mm or 24 x 25 mm cross runners. 24mm wide exposed flange surface shall be permanently color coated. Suspension system shall be as per manufaturer's specification. Movement platform of structural steel shall be provided if required for the movement of personnel to facilitate maintenance of lighting fixtures, AC ducts etc. (Structural steel works for platform for movement is separately payable under relevant items of BOQ). Work shall include 25mm thick resin bonded mineral wool insulation (as per IS:8183) bound in polythene bags on top of ceiling. The work to be complete as per specifications, drawings and direction of engineer. Payment terms - a) On receipt of Gypsum board false ceiling at site - 50%; b) On completion of erection & fixing - 50%.	SQM	100			0.0119390983%
1608	Providing & fixing 12.5 mm thick glass fibre reinforced gypsum plastic board in plan curve or in elevation with aluminium grid, metal suspension system, anchor fastener adjustable hangers etc including two or more coats of acrylic emulsion paint of approved colour to give an even shade with smooth finish all complete, as per architectural design and detail, metal suspension system as per ASTM C-635 shall be hot dipped MS galvanized (grade 180 as per IS:277) nominal size of T-section shall be 24 x 38 mm or 24 x 25 mm cross runners. 24 mm wide exposed flange surface shall be permanently color coated.suspension system shall be as per manufaturer's specification supported over movment platform. The work to be complete as per specifications, drawings and direction of engineer.	SQM	25			0.0019343025%
A1608	Providing and fixing **Pre-Painted Coil coated Steel false ceiling system**, at all level, for all kind of works, in approved pattern,consisting of 0.5 mm thick galvanised as per IS 277 including 50mm thick mineral wool insulation(density 48 kg/cum) conforming to IS:8183 bound in polythene bags on top of panels. , along with galvanised supporting steel members exposed faces of galvanised member to be prepainted with regular modified polyester coating / super polyester coating minimum 20 DFT, to form panels of specified size for tile type panels and roll formed stove enamelled 0.6 mm thick steel carrier, for fixing of lineal type panels by clip on arrangement, suspended from RCC slab / structural steel or catwalk way steel channel grid above with 4 mm (minimum) galvanised wires (rods), with special height adjustment clips, providing angle section of minimum 25 mm leg width along the perimeter of ceiling, including all labour, material, supporting grid system (members minimum 0.8 mm thick and galvanised as per IS 277) anchor fasteners for making suspension arrangement from RCC, providing openings for AC ducts, return air grills, insulation light fixtures, etc., all complete.(Materials for structural platform grid for movement made up of MS Channels/ Beams / Angles shall be supplied by BHEL and shall be paid under ST No **D**2301)	SQM	50			0.0044597116%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
A1609	Providing and fixing **stainless Steel false ceiling system in lineal/tile shape**, approved colour Luxalon hunter douglas or approved equivalent, lineal pattern (closed type) of 100 mm nominal width , bright finish at all level, for all kind of works, consisting of 0.5 mm thick stainless steel sheet, along with galvanised supporting steel members exposed faces of galvanised member to be prepainted with regular modified polyester coating / super polyester coating minimum 20 DFT and roll formed stove enamelled 0.6 mm thick steel carrier, for fixing of lineal type panels by clip on arrangement, suspended from RCC slab / structural steel or catwalkway steel channel grid above with 4 mm (minimum) galvanised wires (rods), with special height adjustment clips, providing angle section of minimum 25 mm leg width along the perimeter of ceiling, including all labour, material, supporting grid system (members minimum 0.8 mm thick and galvanised as per IS 277) anchor fasteners for making suspension arrangement from RCC, providing openings for AC ducts, return air grills, insulation light fixtures, etc., all complete.(Materials for structural platform grid for movement made up of MS Channels/ Beams / Angles shall be supplied by BHEL and shall be paid under ST No **D**2301) Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	SQM	50			0.0132491427%
1700	**RAIN WATER DOWN TAKE PIPES: Rain water down take pipes at all level including all labour, material (unless otherwise specified in BOQ/contract specification), transportation, 2 coats of approved paint over one primary coat, fixtures, accessories etc as per specification, drawings and as directed by engineer - in - charge.**					
A1704	Providing and fixing **galvanised MS down take pipes of 150 mm dia-** Medium quality as per IS:1239(part-I)with welded joints and provided with roof drain heads and complete with shoes bends, junctions, sockets, adapters, brackets and finished with anti corrosive painting over acoat or primer all complete.Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be lessthan 360 gms/sq.m. as per IS:6745. The zinc coating shall be smooth and shall be subjected to testing as per IS: 2633, for uniformity of coating. The zinc coating shall be free from all defects as per IS: 2629. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	RM	4,009			0.4142519233%
B1704	Providing and fixing **galvanised MS down take pipes of 200 mm dia**- Medium quality as per IS:1239(part-I)with welded joints and provided with roof drain heads and complete with shoes bends, junctions, sockets, adapters, brackets and finished with anti corrosive painting over acoat or primer all complete.Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be less than 360 gms/sq.m. as per IS:6745. The zinc coating shall be smooth and shall be subjected to testing as per IS: 2633, for uniformity of coating. The zinc coating shall be free from all defects as per IS: 2629. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	RM	1,485			0.2333324907%
C1704	Providing and fixing galvanised MS down take pipes of 100 mm dia- Medium quality as per IS:1239 (part-I)with welded joints and provided with roof drain heads and complete with shoes bends, junctions, sockets, adapters, brackets and finished with anti corrosive painting over a coat or primer all complete.Galvanising shall be as per IS: 4736. The minimum mass of zinc coating shall not be lessthan 360 gms/sq.m. as per IS:6745. The zinc coating shall be smooth and shall be subjected to testing as per IS: 2633, for uniformity of coating. The zinc coating shall be free from all defects as per IS: 2629. Payment Breakup: a) On Supply & receipt of material site - 60% b) On complete execution as per item description - 40%	RM	500			0.0385602816%
1800	**MISCELLANEOUS: Miscellaneous works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level unless otherwise specified as per specification, drawings and as directed by engineer - in - charge.**					
A1801	Providing and Filling in trenches, plinths, area paving, grade slab and other underground structures with **graded stone aggregate of size range 63 mm to 45 mm** in layers not exceeding **200 mm** in compacted thickness including breaking of stone boulders to required sizes, filling the interstices with selected moorum/non expansive soil and compacting to **85 %** of original volume of stone stack for all lifts etc. all complete. Payment shall be made for the measurement of the volume of the compacted fill.	CUM	16,450			3.1132030783%
B1801	Providing and Filling in trenches, plinths, area paving, grade slab and other underground structures with **graded stone aggregate of 40 mm size rammed,consolidated** in layers not exceeding **200 mm** in thickness including breaking of stone boulders to required sizes, filling the interstices with selected fine sand and compacting to **85 %** of original volume of stone stack for all lifts etc. all complete. Payment shall be made for the measurement of the volume of the compacted fill.	CUM	5,717			1.0818938053%
1802	Supply and laying approved quality Stone aggregate 40mm size in transformer yards.	CUM	500			0.1147753197%
1803	Supply and laying approved quality rounded pebbles / gravels of 40mm size in transformer yards.	CUM	200			0.0485160282%
A1804	Providing and fixing **weep holes** in drains consisting of 75 mm dia **HDPE** pipe sleeves including sand (250sq x 150 mm thick), aggregates (250sq x 150 mm thick), 200mm dia geo-textiles (pasted on concrete surface) etc. all complete as per specifications, drawings and guided by engineer-in-charge. (item is inclusive the cost of materials like HDPE pipe, sand, aggregates, etc.).	EACH	661			0.0080798429%
1807	Anti termite chemical treatment of soil with Chlorpyriphos/Lindane E.C. 20% with 1% concentration conforming to IS:8944 and as per IS 6313 all complete. (Plinth area of building at ground floor only shall be measured for payment). Drilling 12mm dia hole @300 c/c using material one liter per hole.	SQM	4,213			0.0584963245%
1808	Laying of earthing mats/rods including risers, transportation from yard stores, loading, unloading, cutting to length, welding, protective painting of joints etc. all complete. (Excavation & Back filling shall be paid separately under respective item of earth work. Earthing mats/rods shall be supplied by BHEL free of cost)	MT	357			0.2848704821%
1809	Construction of below ground earthing system test pits as per drawing / sketches including concreting, reinforcement, formwork, providing & fixing GI strip etc as per drawing and specification (excavation & backfilling only will be paid under applicable BOQ items & cement/steel to be supplied by BHEL free of cost)	NO	198			0.1308646915%
1810	Construction of below ground earthing system test links as per drawing/ sketches including concreting, reinforcement, formwork, providing & fixing GI strip etc as per drawing & specification (excavation & backfilling only will be paid under applicable BOQ items & cement/steel to be supplied by BHEL free of cost)	NO	198			0.0981435382%
1811	Construction of below ground earthing system earth electrodes as per drawing and specification. (Excavation and backfilling only will be paid under applicable BOQ items & steel shall be supplied by BHEL free of cost.)	NO	198			0.0084068960%
1812	Construction of below ground earthing system - Earth connection and riser pig tails as per drawing and specification. (Excavation and backfilling only will be paid under applicable BOQ items& steel shall be supplied by BHEL free of cost.)	NO	198			0.0070123872%
1813	Providing Earthing pit as per drawing with charcoal & salt, GI pipes, GI earth electrodes, GI wire, GI strips, brick chamber with covers including associated earthwork etc. all complete.	NO	198			0.3766070270%
1814	Construction of below ground earthing system test pits as per drawing/ sketches including brickwork, plaster, providing & fixing GI strips/pipes, GI wires, covers etc as per drawing & specification including associated earthwork.	NO	198			0.2177127083%
1815	Providing and fixing GI rungs in concrete/brick walls having zinc coating of minimum 900 g/sqm etc. all complete.	Kg	198			0.0013447049%
A1815	Providing and fixing GI rungs in concrete/brick walls having zinc coating of minimum 610 g/sqm etc. all complete.	Kg	990			0.0060511722%
1821	Sprinkling of water by water tanker fitted with perforated GI pipe (portable tanker minimum 3000 litre capacity) for roads and miscellaneous area within plant boundary, for dust supression and reduction of suspended material at site for day to day work, as directed by BHEL site engineer (water for this purpose shall be provided by BHEL free of cost and utilisation of machine will be in terms of Tank-hour put in actual use for water sprinkling).	TANK-HR	495			0.0265703733%
1823	Providing and laying cinder filling in the toilets,roads,etc complete as directed by engineer in charge.	CUM	99			0.0086210527%
1827	Anti weed chemical treatment of soil with suitable chemical etc all complete.	SQM	4,213			0.0008477728%
1835	Firecrete for FO tank pad	CUM	10			0.0260796290%
1836	Flame arrestor in refinery area CRWS and OWS system	Each	3			0.0043933065%
1844	**Providing engineering services** for Rain water harvesting including preparation of Rain water harvesting scheme, collection of required data, submitting to ground water board and getting approval from Customer and Ground water board at start & completion of work etc. complete as per statutory norms. The Engineering firm/person should be approved/accepted by ground water board and shall have similar experience of rain water harvesting for complete power plant. The scope shall include rain water harvesting for entire plant including Coal handling plant, ash handling plant inside plant boundary. The scope shall include preparation of rain water calculations, calculations for ground recharge/collection, economical design of rain water harvesting with different options under discussion with BHEL and submit design, drawings, report to Ground water board, obtain approval from Ground water board & Customer and on completion of work get the completion approval for rain water harvesting from Ground water board. This includes visits to site with/without ground water board officials and rate of this item shall include all expenses of consultancy, site visits etc. required from start of work till final obtaining of completion approval from ground water board. Payment for execution of rain water harvesting ponds shall be paid separately. Payment for execution of ground water recharge scheme shall be paid separately.	LS	1			0.0589395229%
1851	Providing and fixing G.I strips minimum 1.5mm thk and 150mm wide including fixing accessories etc. all complete.	Kg	99			0.0013198030%
1852	Providing and fixing aluminium strips minimum 18 SWG thk and 300mm wide over expansion joints with minimum lap of 50mm length including brass / aluminium screws, rawl plugs etc. all complete.	Kg	99			0.0030031743%
1853	Providing, laying and fixing rails and guide rails in concrete for transformer, rail track(52 kg/m) including cutting of rails, joining of rails, anchoring lugs etc all complete.	MT	5			0.0264627164%
A1860	Providing and installation of Bio-Toilet near all the modular worker's sheds/accommodation etc all complete as per specification.	Nos	2			0.0055136424%
A1862	Supplying and installation of pipes in concrete / Duct bank for all kind of works, including setting material in concrete, layout, cutting, forming, grinding, jointing etc. all complete as per specification and as guided by engineer-in-charge for the following: (Concrete, Reinf. paid separately)					

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
a	200 mm dia HDPE Pipes	RM	1,975			0.1955330758%
b	200 mm dia PVC pipe ISI mark 6 Kg/cm2	RM	500			0.0346111856%
A1864	Providing and fixing Semi Unitised **STRUCTURAL GLAZING** to fixed panels with no aluminium section exposed to outside and only glass panels with silicon joint visible from outside. The system specially designed with **aluminium sections of grade 63400 WP IS: 733 and IS: 128**5 pure polyester powder coated 50- 60 microns make; Akzo Nobel applicator only in approved colour with mullion fixed to beams / columns through adequately designed MS powder coated. The member and bracket shall be fixed with appropriate bolts and expansion fasteners, so as to withstand the dead load of the structural glazing as well as stresses due to wind pressure. The Structural glazing system shall be designed **as per BIS code for required wind pressure IS: 875 part III (the system must passed the proof test at 1.5 times design Wind pressure without any failure)**, with as per the prevailing site conditions and building profiles,), including functional design of the aluminium sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc., structural and weather silicone sealants, flashings, fire stop (barrier)- cum-smoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation& drainage and protection against fire hazard including, Fabrication and supplying serrated M.S. hot dip galvanised / Aluminium alloy of 6005 T5brackets of required sizes, sections and profiles etc. to accommodate 3 Dimensional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC/ masonry/structural steel framework of building structure using stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers and use of aluminium section alloy as per IS : 8147. System design to strictly consider for thermal movements, air infiltration, water penetration, seismic movement and structural movement, submit the calculation for review and approval of shop / fabrication/shop drgs,cutting plan, from BHEL.Silicon sealant structural grade and weather grade shall be GE/Dow corning or Equivalent.The contractor shall submit structural stability report of the structural glazing system from a consultant to be get approved by the engineer incharge.Providing and fixing G.I. flashing at soffit level /sill level made out of 1.5mm thick G.I. Sheet with powder coated bent to required profile and shape to seal the soffit area.Openable glazing panel where ever requried shall be with two point locking with friction stays, as per detail design requirement,provided with approved hardware of Dorma/Gieeze or equivalent make, all complete as per techncial specification. (Payment for Glass shall be made separately).	KG	100			0.0052751874%
A1865	Providing, fixing and Fabricating shadow box of required size and shape, for fixing in the spandrel portion of the structural glazing, in linear as well as curvilinear portions of the building by providing semi -rigid, inorganic, non-combustible fibre glass wool insulation 50 mm thick,conforming to IS: 8183 and BS: 3958 Part 5. The insulation layer shall have facing (factory bonded on surface # 1 of the fibre glass insulation layer), of black non-woven fibre glass tissue of nominal thickness 0.5 mm and nominal mass not less than 60 gm /sqm, made of randomly oriented glass fibres distributed in a binder by a wet-lay process including fixing 1.5 mm thick solid aluminum sheet backing using, 6 mm thick cement board including SS rivets, nuts, bolts, washers etc complete.	SQM	50			0.0054322709%
2000	**FENCING AND GATES: Fencing and gates including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc at all level as per specification, drawings and as directed by engineer - in - charge.**					
2003	Supplying and erecting in position 2.4 m high PVC coated gavanised chain linked fencing of minimum 8 gauge (including PVC coating) of mesh size 75mm x 75mm. The diameter of the hot dip galvanised steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge. Concertina of height of 600 mm at top of chain link fencing shall be provided with all accessories. Concertinal shall be from tensile serrated galvanised wire (HTSW) made with wire diameter of 2.5 mm which will be stretched to 6m and attached on two strands of galvanised HTSSW (high tensile spring steel wire) of 2.5mm dia by means of clips at 1m interval. These two HTSSW strands will be attached to the fence posts/ angles with 12 mm security fasteners. Cost to include for GI hook bolts, rings & washers, hot dip galvanised tension wires, 25X6 mm GI flat stretcher bar at end posts etc. all complete. (Structural post shall be separately under ST No. 2007) Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	RM	100			0.0149864421%
A2003	Supplying and erecting in position 2.4 m high PVC coated gavanised chain linked fencing of minimum 8 gauge (including PVC coating) of mesh size 75mm x 75mm. The diameter of the hot dip galvanised steel wire for chain link fencing excluding PVC coating shall not be less than 12 gauge. The PVC coated chain link will be stretched by the clips at 0.5m intervals to three strands of galvanised high tensile spring steel wire (HTSSW) of 2.5 mm diameter interwoven with chain link wire mesh and kept under tension which in turn are attached to the fence post with security nuts and bolts. Concertina of height of 600 mm at top of chain link fencing shall be provided and fixed with all accessories. Concertinal shall be from tensile serrated galvanised wire (HTSW) made with wire diameter of 2.5 mm which will be stretched to 6m and attached on two strands of galvanised HTSSW (high tensile spring steel wire) of 2.5mm dia by means of clips at 1m interval. These two HTSSW strands will be attached to the fence posts/ angles with 12 mm security fasteners. Cost to include for GI hook bolts, rings & washers, hot dip galvanised tension wires, 25X6 mm GI flat stretcher bar at end posts etc. all complete. (Structural post shall be paid separately under ST No. ~~2007~~ A2008) Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	RM	524			0.0785289568%
2006	Supplying and fixing 600mm high concertina on top of boundary wall including GI tension wires, clips, anchors, accessories etc. all complete. Concertinal shall be from tensile serrated galvanised wire (HTSW) made with wire diameter of 2.5 mm which will be stretched to 6m and attached on two strands of galvanised HTSSW (high tensile spring steel wire) of 2.5mm dia by means of clips at 1m interval. These two HTSSW strands will be attached to the fence posts/ angles with 12 mm security fasteners. (Structural post shall be separately under ST No.A2008)	RM	100			0.0019217257%
A2008	Supply, fabrication and fixing of mild steel posts for fencing including painting with chlorinated rubber paint over a suitable primer etc all complete.	MT	20			0.1194025535%
2009	Supply, fabrication and installing in position and testing galvanised MS Gates out of channels, joists, angles, flats, plates, pipes, welded steel wire mesh & sheets including stiffners, bracings, fabricated hinges, MS Aldrops with locking arrangement, tempered steel pivot, guide track of MS Tee, bronze aluminium ball bearing arrangements, castor wheels, paintings etc. all complete. Payment Terms: a) On receipt of material at site - 60% b) On complete execution as per item description - 40%	MT	26			0.1742400531%
2100	**WATER SUPPLY: Water supply work including men, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
A2101	Providing and fixing in position tested heavy duty type **chromium plated (CP) brass long neck bib cocks** with flow rate less than 5 LPM (litres per minute) at 45 psi, including sockets, union, nuts etc all complete -15mm nominal bore.(Note: Flow rate of all faucets at 45 psi should be less than 5 lpm. The contractor should submit the cutsheets/ declaration from the manufacturers mentioning the same to Engineer in charge.)	NOS	99			0.0054136824%
2102	Providing and fixing in position heavy duty **brass stop cock** of approved quality including all specials etc all complete - 15mm nominal bore.	NOS	99			0.0048110554%
2103	Providing and fixing in position **heavy duty brass full way valve** with wheel of approved quality including all specials etc all complete for following sizes:					
a	25mm nominal bore.	NOS	50			0.0027341830%
b	50mm nominal bore.	NOS	50			0.0039490960%
2104	Providing and fixing **GI pipes class B medium class** conforming to IS:1239 pipes shall be concealed and painted with anticorrsive paint, complete for **internal works** with GI sockets, unions, elbows, tees, nipples etc and clamps including cutting and making good the walls etc all complete for following sizes:					
a	15 mm nominal bore.	RM	198			0.0049803886%
b	20 mm nominal bore.	RM	99			0.0027342334%
c	25 mm nominal bore.	RM	50			0.0016374914%
d	50 mm nominal bore.	RM	50			0.0021933833%
B2104	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, confirming to IS 15778, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings shall be concealed, complete for internal works with sockets, unions, elbows, tees, nipples etc of approved manufacturer supreme,prakash,ajay pipes or equivalent and clamps including cutting and making good the walls etc all complete for following sizes:					
a	15 mm nominal bore.	RM	50			0.0012521401%
b	20 mm nominal bore.	RM	25			0.0006761255%
c	25 mm nominal bore.	RM	25			0.0007888760%
Ac	32mm nominal bore	RM	25			0.0009297983%
Bc	40mm nominal bore	RM	25			0.0011622479%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
d	50 mm nominal bore.	RM	25			0.0014528099%
2105	Providing and fixing **GI pipes class B complete for external work** with GI sockets, unions, elbows, tees, nipples etc including trenching & refilling, anti-corrosive paint etc all complete for following sizes:					
a	15 mm nominal bore.	RM	99			0.0019124692%
b	20 mm nominal bore.	RM	50			0.0010866302%
c	25 mm nominal bore.	RM	50			0.0013431957%
d	50 mm nominal bore.	RM	25			0.0009508015%
A2106	Providing and fixing **600mm x 900mm x 6mm thk mirror** from reputed mirror manufacturer. Mirror shall be mounted with glass adjustable revolving CP brackets with CP screws , edge mounting with teak beading and minimum 12 mm thick plywood backing etc all complete.	EACH	50			0.0052675674%
2108	Providing and fixing **25 mm diameter stainless steel towel rails** (600mm X 25mm) with C.P. mounting brackets all complete.	NOS	50			0.0034711800%
2110	Providing and fixing **C.P. Soap holder** mounted with C.P. screws etc all complete.	NOS	99			0.0042980754%
2111	Providing and fixing **stainless steel / C.P. liquid soap dispenser**. Dispenser shall be round and easily revolving with removable threaded nozzle and mounted on C.P. brackets etc all complete.	NOS	99			0.0034962328%
2112	Providing and fixing glazed **vitreous wall mounted paper holder** with suitable cover cum cutter fitted with CP screws etc. all complete.	NOS	50			0.0020600698%
A2113	Providing and fixing rotating type **chromium plated brass shower** rose with 15 or 20 mm inlet all complete.	NOS	35			0.0013821836%
B2113	Providing and fixing rotating type Emergency safety shower,conforming to IS 10592 latest code, head with water column of height 210 to 240 cm is provided from the standing level.water column provided with a minimum spray pattern diameter of 50 cm at 150 cm height from standing level and the centre of the spray pattern shall be located at least 40 cm from any obstruction or emergency. Shower head shall be so designed that it produces a straight water column. Emergency shower head shall deliver a minimum of 76 l/min of water and substantially dispersed throughout the pattern,complete with installation,with accessories etc all complete.	NOS.	5			0.0116440008%
2114	Providing & fixing in position P.V.C. water tank of Syntex or approved equivalent including making all necessary inlet & outlet pipes, fixture, ball cocks, valves etc all complete for following capacities. GI pipes shall be paid separately under ST No. 2105.					
a	500 litres capacity	NOS	10			0.0041654159%
b	1000 litres capacity	NOS	5			0.0041654159%
c	2000 litres capacity	NOS	5			0.0083308319%
d	5000 litres capacity	NOS	10			0.0416541594%
2115	Providing and installing approved brand single tap **water cooler** of 150 L cooling capacity all complete.	NOS	10			0.0408583034%
A2116	Providing and fixing glass shelves 600mmx127mmx4 mm with chromium plated brackets all complete.	EACH	10			0.0004864683%
A2117	Providing and fixing metal storing cabinets all complete.	EACH	10			0.0077642284%
A2118	Providing and fixing electric operated **hand dryer with photo voltaic control**.etc all complete..	EACH	10			0.0025882516%
A2120	Providing and fixing **grab bars,** barrier-free access and appropriate fittings and fixtures for toilets for handicapped etc. all complete.	EACH	50			0.0051759769%
2200	**SANITARY: Sanitary work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
A2201	Supply and fixing coloured **glazed vitreous oval shape china wash basin** 450x550mm conforming to IS: 2556 mounted over 18 to 20 mm thk granite beveled edge counter. The Basin shall be fitted with approved shape bib cock, photo-voltic control system for water control with flow rate less than 5 LPM (litres per minute) at 45 psi,CP brass chain with rubber plug, 40mm CP brass waste and bottle trap as per IS: 2556 with angle valve,taps,32mm dia chromium plated brass trap unions, plastic connection pipe with chromium plated nuts, fittings, cutting and making good the walls where required,necessary union including cutting of notch in granite counter slab etc.all complete as per specification	EACH	99			0.0775247293%
A2202	Providing and fixing approved **vitreous china laboratory sink** of size **600x400x200mm** conforming to IS:2556 (part-5) with R.S. or C.I. brackets, chromium plated brass chain with rubber plug 40mm, 40mm heavy duty CP brass waste bottle trap and 15mm CP brass pillar tap (hot and cold dual function) with elbow,operated level ISI marked, with necessaary union,elbow,angle valve,tees, junctions,extension pipes complete including painting the fittings, cutting and making good the wall where required etc. all complete.	EACH	3			0.0015393928%
A2203	Providing and fixing stainless steel kitchen sink of size 610 x 510 mm, bowl depth 200 mm as per approved manufacturer with drain board of at least 450 mm length with trap, hot and cold water mixer, conforming to IS: 13983 including all fittings, necessaary union,elbow,angle valve,tees, junctions,extension pipes etc. all complete.	EACH	3			0.0013853026%
B2203	Providing and fixing stainless steel Eye wash sink of size size 610 x 510 mm, bowl depth 200 mm as per approved manufacturer with drain board of at least 450 mm length with trap, water mixer, conforming to IS 10592 latest code including all fittings, necessaary union,elbow,angle valve,tees, junctions,extension pipes etc. all complete.	EACH	1			0.0004155908%
A2204	Providing and fixing **colour glazed vitreous china European type water closet** of approved make conforming to IS:2556 with siphon, open front solid plastic seat and plastic cover, low level 12.5 litre PVC flushing cistern (same colour as WC,dual flushing system) with valveless fittings,2 way angle valve, with health faucet necessary C.P connections, water faucet etc all complete.					
a	Floor mounted	EACH	10			0.0055714954%
b	Wall mounted	EACH	40			0.0359755102%
2205	Providing and fixing colour glazed vitreous indian type Orissa pattern (580x440mm) water closet conforming to IS:2556 part 3 with all fittings including foot rests, low level 12.5 litre PVC flushing cistern with valveless fittings, 2 way bibcock with health faucet necessary C.P connections etc all complete.	EACH	50			0.0219212560%
A2205	Providing and fixing colour glazed vitreous china Orissa pattern (580x440mm) water closet conforming to IS:2556 part 3 with all fittings including foot rests, low level 12.5 litre PVC flushing cistern with valveless fittings, necessary C.P connections etc all complete having flow rate of 6/3 LPF (litres per flush) or less at 45 psi.	EACH	99			0.0455742912%
A2206	Providing and fixing white/coloured water efficient flat black glazed vitreous china urinals of size 610x375x390mm with photo voltaic control flushing systems of approved manufacturer simpolo, varmora or eqivalent per IS: 2556(pt-6 sec-1) with flush pipes, lead pipes, gratings, traps and necessary C.P fitting etc. all complete as per specification having flow rate of 2 LPF (litres per flush) or less at 45 psi.	EACH	99			0.1262727732%
2207	Supply, laying and jointing UPVC pipes of class 3 as per IS:4985 including bends, branches and all other necessary fittings, M.S holder bats/clamps, cutting and making good the walls and floors, jointing, testing etc all complete for following. Payment Breakup: a) On Supply & receipt of material site - 50% b) On complete execution as per item description - 50%					
a	75mm dia pipes	RM	248			0.0056153882%
b	110mm dia pipes	RM	149			0.0053489374%
c	160mm dia pipes	RM	149			0.0073809359%
d	200mm dia pipes	RM	198			0.0143634408%
2208	Providing, laying light duty non pressure NP3 class RCC pipes with collars jointed with stiff mixture of cement mortar 1:2 including testing of joints etc all complete for following. Payment Breakup: a) On Supply & receipt of material site - 50% b) On complete execution as per item description - 50%					
a	200mm dia	RM	322			0.0212363771%
b	300mm dia	RM	371			0.0394073250%
c	450mm dia	RM	198			0.0267745692%
d	600mm dia	RM	99			0.0164801060%
e	900mm dia	RM	20			0.0044574478%
2209	Providing, laying light duty non pressure NP2 class RCC pipes with collars jointed with stiff mixture of cement mortar 1:2 including testing of joints etc complete for following. Payment Breakup: a) On Supply & receipt of material site - 50% b) On complete execution as per item description - 50%					
a	150mm dia	RM	668			0.0339874171%
b	250mm dia	RM	50			0.0032447232%
c	300mm dia	RM	50			0.0036630758%
d	450mm dia	RM	50			0.0051372709%
e	500mm dia	RM	50			0.0060486820%
2210	Providing, laying light duty non pressure NP4 class RCC pipes with collars jointed with stiff mixture of cement mortar 1:2 including testing of joints etc complete for following: Payment Breakup: a) On Supply & receipt of material site - 50% b) On complete execution as per item description - 50%					

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
a	450mm dia	RM	50			0.0076971906%
b	600mm dia	RM	25			0.0046566634%
c	900mm dia	RM	25			0.0062877406%
A2211	Providing and fixing C.I Manhole heavy duty cover of size 600mmx600mm including frame from reputed manufacture confirming to IS:4111 etc all complete as per specification.	EACH	74			0.0677888166%
2212	Providing and fixing circular heavy duty C.I. manhole cover of 600 mm dia with frame etc. all complete.	EACH	99			0.0889447604%
2213	Providing and fixing square mouth S.W Gully trap grade 'A' complete with CI grating, brick masonry chamber(Clay Brickwork in 1:6 mortar, 12mm plaster in 1:6 mortar & 1:2:4 Cement Concrete) and water tight CI cover with 300x300mm (inside). The weight of cover to be not less than 4.53 Kg and frame to be not less than 2.72 Kg etc all complete for following sizes:					
a	100x100mm P or S Type.	EACH	50			0.0062952112%
b	150x100mm P or S Type.	EACH	25			0.0034389583%
c	150x150mm P or S Type.	EACH	25			0.0039046247%
A2214	Providing and fixing Heavy duty CP brass floor traps size 100mm with stainless steel grating etc all complete.	EACH	99			0.0119828150%
A2216	Providing and installing approved brand single tap water efficient water cooler of 50 L cooling capacity all complete.	EACH	4			0.0086984479%
B2216	Providing and installing approved brand single tap water efficient water cooler of 80 L cooling capacity all complete.	EACH	4			0.0115979306%
A2217	Providing and installing approved brand single tap water efficient water cooler of 150 L cooling capacity all complete.	EACH	5			0.0202248602%
2219	Providing and fixing eye and face drinking water fountain (combined unit with receptacle conforming to IS: 10592) all complete as per specification.	EACH	13			0.0137971706%
2221	Providing, laying spun CI pipes with conforming to IS 1536 complete for following.(Excavation,backfilling,concrete to be paid seperately)					
c	150mm dia	RM	198			0.0283284505%
d	200mm dia	RM	347			0.0717126158%
2222	Providing and fixing HDPE pipes in concrete/ brick work of following sizes including cutting, fixing and levelling in position etc. all complete.					
a	Upto 75 mm dia	RM	100			0.0026712994%
b	100 mm dia	RM	50			0.0016249147%
c	150 mm dia	RM	25			0.0016802523%
d	200 mm dia	RM	10			0.0009900409%
2223	Providing and fixing vertical wall mounted water geysers/heaters(minimum 5 star rating) of required capacity including all connections & fittings(angular stop cock and brass connection pipes, etc.) all complete as per specification.					
a	15 Litres	Each	5			0.0034032656%
b	25 Litres	Each	5			0.0044156930%
A2224	Providing and fixing suitable water meter (Maximum Working Pressure 16 bar; Maximum Liquid Temperature 60°C; Connection Flanges according to ISO, BS 10, American Water works Association (AWWA) or others; Register water consumption in cum) on 50 mm domestic water inlet pipe	NOS.	5			0.0028156051%
A2225	Supply, laying and jointing sand cast iron pipe conforming to IS: 1729 including bends, branches and all other necessary fittings, M.S holder bats/clamps, cutting and making good the walls and floors, jointing, testing etc all complete for following.					

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
b	160mm dia pipes	RM	50			0.0053654382%
2300	**STRUCTURAL WORKS: Structural steel works including all labour, material (unless otherwise specified in BOQ/contract specification), equipments unless otherwise specified, transportation, handling etc. at all level as per specification, drawings and as directed by engineer - in - charge.**					
D2301	**Fabrication(Site Welded as per specification,), transportation from fabrication yard and erection** of Mild structural steel (Grade designation **E250)** with **rolled section / built up section / combination of both** conforming to IS:2062, pipes conforming to IS:1161/ IS:1239, chequered plate conforming to IS: 3052, mild steel rounds, monorails, stays, safety chains, ladders, MS grating etc. in columns, beams, gantry girders, bunkers, silos, hoppers, roof trusses, portals, laced purlins, space frames, hangers, struts, monorails, galleries, stiffeners, wall beams, sheeting runners, brackets, stub columns, bracings, cleats, trestles, base plates, splice plates, chequered plate flooring, decking and seal plates, steel frame grid over false ceiling, walkway platforms, ladders, stairs, stringers, treads, landings, hand-rails etc including collection of steel from stores, fabrication, straightening, cutting, bending, rolling, grinding, machining, drilling, welding, electrodes and other consumables, alignment, erection bolts & nuts (weight of erection bolts, nuts and welds not payable), assembly, edge preparation, preheating (min preheat and interpass temperature of 20^{o} C for welding over 20 mm and upto 40 mm & 66^{o} C for welding over 40 mm and upto 63 mm & 110^{o} C for thickness over 63 mm & use of low hydrogen/ radiogenic electrodes), post heating, testing of welders, inspection of welds, visual inspection, non destructive and special testing, rectification and correction of defective welding works, production test plate, inspection and testing, erection scheme, protection against damage in transit, stability of structures, installation of temporary structures, setting column bases, rectification, dismantling and removal of all temporary structures (weight of temporary structures not payable), return of surplus / waste steel materials to store etc all complete.(Rate shall be exclusive of surface preparation and primer). Payment Break-up 1) On Completion of Fabrication - 60% 2) On Completion of erection-25% 3) Balance on completion of alignment,welding etc.-15%	MT	2,133			3.7329853977%
E2301	Erection of shop fabricated (field connections will be bolted type) Mild structural steel (Grade designation E250), Medium and High Tensile structural steel (Grade designation E350 or higher) with rolled section / built up section / combination of both conforming to IS:2062, pipes conforming to IS:1161/ IS:1239, chequered plate conforming to IS: 3052, mild steel rounds, monorails, stays, safety chains, ladders, MS grating etc. in columns, beams, gantry girders, roof trusses, portals, laced purlins, space frames, hangers, struts, monorails, galleries, stiffeners, wall beams, sheeting runners, brackets, stub columns, bracings, cleats, trestles, base plates, splice plates, chequered plate flooring, decking and seal plates, steel frame grid over false ceiling, walkway platforms, ladders, stairs, stringers, treads, landings, hand-rails etc including loading,transportation, unloading,collection of steel from stores, alignment, true to line, level, plumb & dimension,erection bolts & nuts (weight of erection bolts, nuts and welds not payable), assembly, visual inspection, non destructive and special testing, rectification and correction of defective bolting works, inspection and testing, erection scheme, protection against damage in transit, stability of structures, installation of temporary structures, setting column bases, rectification, dismantling and removal of all temporary structures (weight of temporary structures not payable), return of surplus / waste steel materials to store etc all complete as per approved drawing, specification and approval of engineer in charge. The work shall be satisfactorily completed with required tightening of HSFG bolts along with DTI (DIRECT TENSION INDICATOR) washers to be supplied by the bidder(Cost of DTI washer is included in this item and not payable). The prefabricated structure shall be supplied in variable length to the maximum length of 10 meters -12 meters and all erection work on ground or at any elevation is included in this item. Payment shall be made for weight of structure & splice plate but not for erection bolts & nuts, DTI washers, gusset plates, stiffeners etc. Payment Breakup:- 1) On Completion of erection-60% 2) Balance on completion of alignment,bolt tightening etc.-40%	MT	5,013			4.8730041414%
F2301	**Erection of shop fabricated** (field connections will be welded type) Mild structural steel (Grade designation E250), Medium and High Tensile structural steel (Grade designation **E350 or higher)** with **rolled section / built up section / combination of both** conforming to IS:2062, pipes conforming to IS:1161/ IS:1239, chequered plate conforming to IS: 3052, mild steel rounds, monorails, stays, safety chains, ladders, MS grating etc. in columns, beams, gantry girders, roof trusses, portals, laced purlins, space frames, hangers, struts, monorails, galleries, stiffeners, wall beams, sheeting runners, brackets, stub columns, bracings, cleats, trestles, base plates, splice plates, chequered plate flooring, decking and seal plates, steel frame grid over false ceiling, walkway platforms, ladders, stairs, stringers, treads, landings, hand-rails etc including loading,transportation,unloading,collection of steel from stores, machining,welding, electrodes and other consumables, alignment, true to line, level, plumb & dimension,erection bolts & nuts (weight of erection bolts, nuts and welds not payable), assembly, edge preparation, preheating (min preheat and interpass temperature of 20^{o} C for welding over 20 mm and upto 40 mm & 66^{o} C for welding over 40 mm and upto 63 mm & 110^{o} C for thickness over 63 mm & use of low hydrogen/ radiogenic electrodes), post heating,testing of welders, inspection of welds, visual inspection, non destructive and special testing, rectification and correction of defective welding works, production test plate, inspection and testing, erection scheme, protection against damage in transit, stability of structures, installation of temporary structures, setting column bases, rectification, dismantling and removal of all temporary structures (weight of temporary structures not payable), return of surplus / waste steel materials to store etc all complete as per approved drawing, specification and approval of engineer in charge. Payment Breakup:- 1) On Completion of erection-60% 2) Balance on completion of alignment,bolt tightening etc.-40%	MT	557			0.5955893951%
A2302	Extra over ST NO. A2301,B2301,C2301,D2301 for blast cleaning of steel structures to near white metal surface conforming to Sa 2 1/2 finish of ISO 8501-1 with surface profile 40-60 Micron and applying coat of two component moisture curing zinc (ethyl) silicate primer (having minimum 80% metallic Zinc content in dry film, solid by volume minimum 60 % +/-2%). Zinc dust composition and properties shall be Type-II as per ASTM D520-00. Primer of minimum 70 micron DFT shall be applied over shot blast cleaned surface including touch-up painting etc all complete. Primer coat shall be applied in Shop immediately after blast cleaning by airless spray technique.	MT	2,133			0.4728156256%
A2305	Providing and applying (with airless spray technique) intermediate coat of two component polyamide cured epoxy with MIO Content (containing lamellar MIO minimum 30% on pigment, solid by volume minimum 80% ±2%) of minimum 100 micron DFT to be applied after an interval of minimum 24 hours (from the application of primer coat by airless spray technique) and of approved make including protection and cleaning, scoffolding etc. all complete as per specification for all structures .	MT	2,133			0.2850459192%
B2305	Providing and applying Finish coat of two-pack aliphatic Isocyanate cured acrylic finish paint (solid by volume minimum 55% ±2%) with Gloss retention (SSPC Paint Spec No 36, ASTM D 4587, D 2244, D 523) of Level 2 (after minimum 1000 hours exposure, Gloss loss less than 30 and colour change less than 2.0 ΔE) and minimum 70 micron DFT shall be applied after an interval of minimum 10 hours (from the ~~application~~ completion of ~~sealer~~ intermediate coat), Colour and shade of the coat shall be as approved by the Employer) over steel sections already having intermediate coats including protection and cleaning, scoffolding etc. all complete as per specification for all structures .	MT	2,133			0.2850459192%
A2307	Supplying, fabrication, erection and alignment of factory made **electroforged galvanised grating** units with mild steel conforming to IS:2062 having hot dip galvanisation,surface preparation of shot blast cleaned to Sa 2 ½ finish or cleaned by acid pickling as per ISO 8501-1, in flooring, platforms, drain and trench covers, walk-ways, passages, staircases with edge binding strips and anti-skid nosing in treads etc. including fixing clamps, fittings, fixtures, all taxes, duties, packing, grinding, drilling, welding, edge preparation, etc. all complete. Payment Breakup: a) On Supply & receipt of material at site - 60% b) On completion of alignment, fixing, etc. complete as per description/specification - 40%					
a	Minimum galvanisation of 610 g/sqm	MT	328			2.0786403511%
2311	Providing and fixing in position of permanent mild steel bolts (class 4.6 as per IS : 1367 and grade `C' as per IS: 1363) and nuts, washers etc. up to and inclusive of 39 mm diameter and upto 300mm long for structural steel work etc all complete. a) On Supply & receipt of material at site - 60% b) On completion of alignment, fixing, etc. complete as per description/specification - 40%	KG	770			0.0057739658%
2312	Providing and fixing in positing of high strength structural bolts (of property class 8.8 and product grade `C' as per IS: 1367) and conforming to IS: 3757 and high strength structural hardened and tempered nuts (of property class `8' as per IS:1367) conforming to IS:6623 with hardened and tempered washers as per IS:6649 etc. up to and inclusive of 39 mm diameter and upto 300 mm long for structural steel work etc all complete. a) On Supply & receipt of material at site - 60% b) On completion of alignment, fixing, etc. complete as per description/specification - 40%	KG	83,545			0.7228978751%
A2312	Providing and fixing in positing of high strength structural bolts (of property class 10.9 and product grade `C' as per IS: 1367) and conforming to IS: 3757 and high strength structural hardened and tempered nuts (of property class `8' as per IS:1367) conforming to IS:6623 with hardened and tempered washers as per IS:6649 etc. up to and inclusive of 39 mm diameter and upto 300 mm long for structural steel work etc all complete. a) On Supply & receipt of material at site - 60% b) On completion of alignment, fixing, etc. complete as per description/specification - 40%	KG	13,816			0.1315017385%
2313	Dismantling of steel structure, lowering of material and carriage of the dismantled material up to field fabrication shop / projects storage including temporary dismantling, cutting, re-welding, supporting, and restoring to correct position all temporarily dismantled members, re-alighment of all adjacent connected members to their correct positions (weight of such adjacent members and temporarily dismantled members not payable), scafolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	41			0.0230947664%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
2314	Addition to, alterations in and/or modifiction of "Erection Marks" including cutting of parts, gauging of welds, cutting, grinding, fabrication, welding, drilling holes, straightening, removal of bends, raising to the required level, painting, transportation, return of unutilised steel pieces to the project store, temporarily dismantling, cutting, re-welding, supporting and restoring to correct position of all the temporarily dismantled members, realignment of adjacent connected members (weight of such temporarily dismantled and adjacent members not payable) etc all complete for the following:					
a	In erected position	MT	41			0.0585031663%
b	In fabrication yard	MT	41			0.0486171955%
2315	Re-erection of dismantled fabricated structural steel members including carriage of modified "Erection Marks" from the field fabrication shop to erection site, lifting to required posiion, aligning in position, tack welding, final welding including temporary dismantling and re-erection of temporarily dismantled members, cutting, rewelding, supporting and restoring to the correct position of all temporarily dismnatled members, re-alignment of adjacent connected members(weight of such temporarily dismantled members and adjacent members not payable), scafolding, staging, tools & tackles, gas cutting, welding, consumables etc all complete.	MT	41			0.0369326504%
A2317	**Supply, fabrication and erection** of **minimum 4 mm thick stainless** steel liner conforming to ASTM A 240 S304 (Type 304) ; Finish Grade 2B (Cold rolled, Annealed & Pickled and Skin passed) on M.S. plate for inside surfaces of hopper & mouth of hopper of bunkers including fixing with stainless steel studs, bolting (including countersunk), welding with electrode classification E308L for welding of stainless steel to stainless steel and E309 for stainless steel to mild steel, fabrication detailed drawing etc.all complete. (The measurement for the item of stainless steel liner in hopper shall be based on the actual finished weight of SS liner over hopper) Payment Breakup: 1. On Supply & Reciept at site - 60% 2. On completion of fabrication at yard - 20% 3. On completion of erection, alignment, welding, etc. complete as per description/specification - 20%	MT	162			3.4187289123%
A2319	Providing and fixing **preformed flexible open ended bellow strap of neoprene of minimum thickness 2 mm** and minimum width 200 mm under un-stretched condition with aluminium stripped edges as sealing below top of bunker and bottom of tripper floor to avoid the coal dust nuisance all complete.	RM	486			0.1097279222%
A2320	Supply, fabrication and fixing of stainless steel pipe (polished) hand railing conforming to SS 304 made of Hollow tubes 25NB/32NB/40NB/50NB/60N**B** , channels, plates,decorative posts,Newel post, midrail, kick plate,knee guard, toe guard, etc.,including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts,fastners, bolts necessary accessories & stainless steel dash fasteners, stainless steel bolts etc.,of required size, with suitable arrangement as per approval of Engineer-incharge,including transportation, loading/unloading etc. all complete Payment Breakup: 1. On Supply & Reciept at site - 60% 2. On completion of erection, alignment, welding, etc. complete as per description/specification - 40%	MT	4			0.0603403763%
A2322	Supply, fabrication and fixing of galvanised MS pipe hand railing (Min. 1000 mm high) of 32mm/40mm/50mm dia (Medium Class) including transportation, loading/unloading, painting etc. all complete.Payment Breakup: 1. On Supply & Reciept at site - 60% 2. On completion of erection, alignment, welding, etc. complete as per description/specification - 40%	MT	83			0.5966172540%
2323	Conducting radiography test on welds wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	41			0.0209146138%
2324	Conducting ultasonic test on welds wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	41			0.0026875485%
2325	Conducting ultasonic test on steel plates as per ASTM-A435 or equivalent wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	SQM	63			0.0018128615%
2326	Conducting magnetic particle test on welds wherever specified including equipments, measuring devices, gauges, test report etc. all complete.	RM	**41**			**0.0018645770%**
2327	Conducting dye penetration test on welds wherever specified by the engineer including provision of necessary equipments, measuring devices, gauges etc. all complete (over and above the work already specified in the specifications.)	RM	41			0.0019842070%
2328	Supply, fixing lightning arrester and air terminal over roof of power house building, pump house and other structures inluding all materials, labour, electrodes etc complete (all materials to be supplied by the contractor).	EACH	6			0.0016543945%
A2333	Touch up paintings on damaged areas **(exposed metal surface)** including Surface preparation by manual tools, wire brush/ emery paper etc. Minimum 6 inches peripheral area, adjoining to damaged area to be covered. For exposed metal surface , it is to be painted with Zinc rich epoxy (70 micron) or suitable primer with existing paint scheme as per description of paint specified under item no . A2302,A2305,B2305. The mode of measurement for payment in SQM shall be the actual area of touch up paint.	SQM	987			0.0185099446%
B2333	Touch up paintings on damaged areas**(surface exposed to prime coat)** including surface preparation by manual tools, wire brush/ emery paper etc. Minimum 6 inches peripheral area, adjoining to damaged area to be covered. .For damaged surface, intermediate & top coat to be provided as per description of paint specified under item no.A2305,B2305. The mode of measurement for payment in SQM shall be the actual area of touch up paint.	SQM	987			0.0114345998%
2400	**ROAD WORKS: Road works including all labour, material (unless otherwise specified in BOQ/contract specification), equipment etc. as per specification, drawings and as directed by engineer - in - charge.**					
2401	Preparation of sub grade by **excavating** earth to required depth for all types of soil/ rock, dressing to camber and consolidating the base including making good the undulation etc and disposal of surplus earth within a lead upto 1 km etc. all complete.	CUM	4,579			0.0170463107%
A2402	Supplying and **filling with selected good earth** of approved quality in layers not exceeding **300 mm loose thickness** using **excavated soil** within a lead upto1km soil and compacted so as to achieve at least **95 %** maximum dry density as per IS-2720 (Part-VII) including royalty/seignorage fee (if any), sorting, spreading, breaking clods, watering, ramming/compaction by manual/mechanical means, dressing, finishing to required lines, grades and slopes, tesing etc all complete.	CUM	1,368			0.0079142903%
A2404	Providing & laying **granular sub-base** using close graded material conforming to specification, mixing in a mechanical mix plant at OMC, carriage of mixed material to work site, for all leads & lifts, spreading in uniform layers of specified thickness on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge.	CUM	2,892			0.5403413779%
A2406	Providing & Laying **water bound macadam sub base/base course** with stone aggregate 53 mm to 22.4 mm size stone conforming to **MORTH specification (Table 400-9) (IRC 19 -grading -3)** mixing in a mechanical mix plant at OMC, carriage of mixed material to work site, for all leads & lifts, spreading in uniform layers of specified thickness on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications, drawings and directions of Engineer-in-Charge.	CUM	83			0.0163970995%
A2410	Providing & laying **40mm bitumen mastic wearing course** over concrete pavement with industrial bitumen of grade 85/25 conforming to IS : 702, prepared by using mastic cooker and laid to required level and slope, including providing antiskid surface with bitumen fine grained hard stone chipping of approved size at the rate of 0.005 precoated cum per 10 sqm and at approximate spacing of 10 cm centre to centre in both directions, pressed into surface protruding 1 mm to 4 mm over mastic surface, including cleaning the surface, removal of debris etc. all complete as per specification, drawings and as per direction of engineer-in-charge. (Considering bitumen using 10.2% as per MORTH specification).	SQM	9,641			0.5629382400%
A2413	Supplying and laying **450mmx250mmx500mm deep** precast concrete kerb stone of grade **M25** with 20 mm nominal size stone aggregate and of shape as per detailed drawing including fixing with cement mortar (1:6) in 13mm thick joints, finishing of joints with neat cement paste, making drainage opening where required etc all complete.	RM	3,663			0.1957126509%
B2413	Supplying and laying 300mmx250mmx150mm deep **precast concrete kerb stone** of grade M-25 with 20 mm nominal size stone aggregate and of shape as per detailed drawing including fixing with cement mortar (1:6) in 13mm thick joints, finishing of joints with neat cement paste, making drainage opening where required etc all complete.	RM	495			0.0142156148%
A2415	Supply and laying **200mm dia R.C.C NP3 type Hume pip**e in raised shoulders as rain water drains as per detailed drawing including fixing with cement mortar (1:2) in 13mm thick joints, finishing of joints with neat cement paste etc all complete.	RM	737			0.0486440091%
A2419	Providing and laying **cement concrete of grade M35/40** using 20 mm nominal size stone aggregate with including addition of high performance PCE-based BIS approved water reducing admixture of Type-G as per ASTMC-494 of approved make FOSROC/STP/SIKA/BASF or Equivalent, provision for necessary joints including compaction, finishing to lines and grades, curing and providing & fixing forwork etc. all complete. (Excluding the cost of reinforcement and dowel bar)	CUM	3,133			0.8389670394%
A2421	Providing & laying **dry lean cement concrete** of grade **M10** with 20 mm nominal size graded stone aggregate over a prepared sub-base including compaction, finishing, curing etc all complete	CUM	1,530			0.3993954743%
B2421	Providing and laying of **plain cement concrete of grade M15** using **40** mm graded stone aggregate including providing and fixing formwork, compaction etc. all complete	CUM	446			0.1164250860%
	REINFORCEMENT					
A2423	Providing and fixing in position **MS dowel bar** reinforcement including surface painted with epoxy, dowel end caps with cotton fills etc all complete as per specification, drawing and as directed by Engineer.	MT	26			0.1099501783%

PART-B

PROJECT: 2X660MW DVC RAGHUNATHPUR TPS II - SG PKG.,WEST BENGAL, INDIA

BOQ CUM RATE SCHEDULE (PRICE BID)

SCOPE OF WORK:-

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS INCLUDING SITE FABRICATION & STRUCTURAL ERECTION WORK OF SHOP FABRICATED & SITE FABRICATED STRUCTURE FOR - BOILER, ESP, MILL & BUNKER BUILDING, FAN AND MILL FOUNDATIONS, ESP CUM FGD CONTROL ROOM, MAIN PLANT DUCT FOUNDATION, DAY SILO ,GYPSUM DEWATERING BUILDING, FGD ABSORBER, CHIMNEY RAFT, COMPRESSOR HOUSE, PIPE/CABLE RACK ,MISC. MCC BUILDING & CONTROL ROOM , OCCUPATIONAL HEALTH CENTRE, LABOUR HUTMENT FOR WORKERS INCLUDING LAND LEASING ETC , ACW PUMP HOUSE ,DG FOUNDATION ,FGD TANKS, SUMPS , PUMPS , DUCT FOR FGD ,BALL MILL BUILDING,FOPH,ROOF TOP SOLAR CIVIL WORKS, AC & VENTILLATION DUCTING , SHEDS FOR CONSTRUCTION WORKERS AND O&M WORKERS, ROADS & DRAINS ETC. AT 2X660MW DVC RAGHUNATHPUR (RTPS) PHASE-II, WEST BENGAL.

ST NO	ITEM DESCRIPTION	UOM	TOTAL QTY	RATES = TOTAL QUOTED PRICE * WEIGHTAGE / (QUANTITY * 100)	AMOUNT (INR) = RATE * QUANTITY	WEIGHTAGE IN % (UPTO 10 DECIMAL POINT)
A2424	Providing, straightening cutting, bending, placing in position at any level, binding in position of steel reinforcement of **mild steel reinforcements** including cost of binding wire, labour, scaffolding transportation to & from stores etc all complete as per specifications, drawings and as directed by Engineer.	MT	2			0.0084577060%
	MISCELLANEOUS					
A2425	Providing & installation of **bitumen impregnated fibre board** of 20mm thickness confirming to IS 1838 as joint filler including nailing, coating of both faces with coal tar pitch/bitumin etc. all complete as per specification, drawing and as directed by engineer.	RM	4,241			0.0449194982%
A2426	Providing and filling in position **hot applied bitumen sealing compound (Grade A)** of **20 mm** thick confirming to IS 1834 including cleaning, mixing, heating, pouring/injecting sealing compound in gaps in joints, sealant primer etc all complete as per specification, drawing and as directed by Engineer.	RM	4,241			0.0164287083%
A2427	Providing and laying **debonding strip/tape** of specified thickness before applying sealant including cleaning etc all complete as per specification, drawing and as directed by Engineer.	RM	4,241			0.0116353618%
A2428	Providing & laying **75 mm thick precast interlocking concrete pavers of grade M35** of approved colour and pattern as per specification and recommendation of manufacturer.	SQM	4,517			0.2188466930%
A2429	Providing and laying **20mm thick sand layer** below concrete pavers including compaction etc all complete as per specification, drawing and as directed by Engineer.	SQM	4,517			0.0104900969%
A2430	Providing and laying **Impermeable plastic sheeting 125 microns** thick laid flat without creases as per IRC 15-2002 etc all complete as per specification, drawing and as directed by Engineer.	SQM	4,517			0.0037265429%
A2431	Supplying, **fixing and removing formwork for concrete road pavement c**omplete as per specification and as directed by the engineer-in-charge.	SQM	565			0.0155385336%
A2432	Providing and installation of V**ariable message signs in**cluding Cantilever type MS supports etc. all complete as per drawings, specifications, manufacturer's recommendations, indian standards.	EACH	25			0.0048930989%
2700	**RAIN WATER HARVESTING**					
2701	Making 250mm dia bore hole up to a maximum depth of 20 m below ground level in all types of rocks including all equipments, tools & plants, lowering casing pipes, bentonite slurry, removal of casing pipes etc. complete in all types of soil.	RM	215			0.0165257176%
2702	Supply & fixing 150mm dia perforated PVC pipe ISI mark 6 Kg/ cm2 with air vent at top as per the drawing & specification complete.	RM	741			0.0344278079%
2703	Providing & fixing 150 dia PVC pipe ISI mark 6 Kg/cm2 as per specification.	RM	150			0.0063223543%
2704	Supply & packing uniformly 6mm to 3mm size gravel in the bore hole surrounding the perforated PVC pipe.	CUM	101			0.0144551297%
2705	Supply & packing uniformly downgraded 40mm size gravel at all depth in the well dug for rain water harvesting.	CUM	248			0.0570126315%
2706	Supply & packing uniformly downgraded 40mm size pebbles at all depth in the well dug for rain water harvesting.	CUM	59			0.0144092604%
2707	Supply & laying 300mm thick coarse sand layer at all depth in the well dug for rain water harvesting.	CUM	199			0.0231044213%
2708	Supply & fixing Netlon jali/ PVT net in the well dug for rain water.	SQM	495			0.0088935422%
2900	**AC VENTILATION & DUCTING**					
2901	Supplying, Erection & Commissioning of finished GSS (zinc coating 275 GSM) AC & Ventilation ducting complete with hangers/ supports, Duct supporting structure, threaded rods, anchor fasteners, nuts for threaded rods, support angle, cleats , Consumable items like gaskets, sealant, adhesives, rivets, screws, nuts, bolts, washers etc. (including testing of ducting system by Smoke Test/Light Test) required for completion of leak proof Ducting system etc. with required fire dampers, motorised actuators , Grills/Diffusers ,Dampers & Thermal Insulation with Cladding of AC & exposed Ventilation Ducting all complete work as per technical specification and instruction of Engineer-In-Charge **Note: -Contractor shall ensure availability of commissioning supervisor at Site during commissioning. Also, Civil contractor to rectify/ address any leakages/malfunctioning in duct work without any commercial implication to BHEL.** **Payment Terms:** **a) On receipt of material at site - 60%** **b) On complete execution as per item description - 40%**					
a	18G.	SQM	1,200			0.1236145013%
b	20G.	SQM	1,200			0.1224176204%
c	22G.	SQM	1,800			0.1764451448%
d	24G.	SQM	1,800			0.1746498234%
e	Fire damper with auto resetting, limit switches, indication lamps etc.	SQM	30			0.0313450643%
f	Motorized actuator with single phase power supply for the above fire damper.	No	80			0.0875765634%
g	Supply air grill/diffuser with VCD (Extruded Aluminium).	SQM	20			0.0139344215%
h	Return air grill/diffuser without VCD (Extruded Aluminium).	SQM	25			0.0149318679%
i	MS Grills/Diffusers with VCD complete with fixing frames, nuts, bolts, gasktes,washers etc.	SQM	25			0.0058060089%
j	MS Grills/Diffusers without VCD complete with fixing frames, nuts, bolts, gasktes,washers etc.	SQM	10			0.0019909157%
k	GI Volume control dampers for Duct.	SQM	60			0.0358364829%
l	Thermal insulation with cladding of AC (supply & return air) & exposed ventilation ducting with finish as per specification	SQM	4,000			0.2068926889%
	Total				₹ 131,174,000.00	**100.000000000000%**

ANNEXURE – B

1. **NTPC Safety Rules adopted by DVC for Construction and Erection of Power Plants**
2. **Supplementary HSE document.**
3. **Typical layout of Medical Centre**

ANNEX-IV to SCC

NTPC SAFETY RULES ADOPTED BY DVC FOR CONSTRUCTION AND ERECTION OF POWER PLANTS

Index

Appendix:

NTPC SAFETY RULES

FOR CONSTRUCTION AND ERECTION OF POWER PLANTS

INTRODUCTION:

NTPC Limited is a Maharatna organization taking lead in realizing the power dreams of the Nation with a vision "To be one of the World's largest and best power utilities, Powering India's growth". Safety is one of the prime concerns of NTPC and it always strives towards accident free construction, erection, commissioning, operation and maintenance of its power projects. In this process, NTPC has already formulated Safety policy and guidelines for smooth execution of all its project activities.

In order to strengthen the existing Safety Rules for Construction and Erection and thereby curbing the chances of accidents in Construction & Erection works at various projects of NTPC, the existing safety rules have been revised for strict implementation. These Safety Rules lay down the safety requirements for safe execution of project activities, responsibilities of the contracting agencies, and all concerned involved in Construction and Erection.

A. RESPONSIBILITIES OF CONTRACTORS FOR IMPLEMENTATION OF SAFETY RULES:

The Safety Rules for Construction & Erection as outlined hereunder, while setting out a broad parameter of safety norms, are not exhaustive. The contractor and his agencies are advised to refer to the following statutory provisions as amended from time to time for details and strict compliance therewith.

FOR GREENFIELD PROJECTS:

(a) Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996 (briefly referred to as BOCW Act),
(b) Building and other construction workers (regulation of employment and conditions of service) Central Rules, 1998 (briefly referred to as BOCW Rules) as adopted by the various State Governments,

FOR EXPANSION, MODIFICATION, ALTERATION AND, OR CONSTRUCTION ACTIVITY WITHIN AN EXISTING PLANT OPERATING AS PER APPROVED SITE PLAN UNDER THE FACTORIES ACT;

(a) Factories Act, 1948,
(b) Factories Rules, as adopted by the various State Governments
(c) BOCW Act
(d) BOCW Rules

The contractor is also required to ensure compliance with all the relevant Acts/Rules in addition to above.

It shall be incumbent on the contractor to ensure that the requirements of safety, statutory or otherwise specified, are fully met. Thus the onus of implementation of the norms so prescribed shall squarely rest with the contractor concerned or, on his behalf, his sub-contractor or any other agency deployed by him, indemnifying NTPC from all the liabilities that may arise out of any failure to comply with the above mentioned Acts/Rules or any contravention thereof by the contractor or any other sub-agency on his behalf.

Safety cannot be ensured solely through Rules and Regulations or Codes. It is the responsibility of the Contracting Agency to ensure that basic safety principles are incorporated in the planning stage of their mobilization, execution, installation of machines, equipment, storage, etc., and initiate and maintain *safety programs*. It is desirable to have a planned programme and secure adequate cooperation of senior management, EICs, sub-contracting agencies, supervisory personnel and workers involved to ensure the implementation of the provisions of these Rules in true spirit so as to achieve the ultimate goal of *accident prevention*.

It shall also be the responsibility of the contracting agency to provide amenities and safety requirements on each construction job in order to reduce or to eliminate hazards of construction activities and also to provided necessary *first aid* facilities as well as Ambulance van (in case of major agencies) for prompt transportation of injured persons to a physician or hospital.

It is also mandated that the authorized representative of NTPC, namely, the Engineer-in-charge, may, at his convenience, exercise such superintendence, supervision and, or control as may be deemed necessary, but this shall not absolve the contractor of his basic responsibility for strict compliance with the norms, standards and, or legal provisions as applicable under the Factories Act/Rules and the Building and other construction (regulation of employment and conditions of service) Act/Rules.

Section wise checklist of provisions of BOCW Act/Rules is given hereunder for ready reference of the contractor. (This list has been prepared in chronological order with primary importance to **S**ection of Act and secondary importance to **R**ules)
S - Refers relevant **S**ections in BOCWA
R - Refers relevant **R**ules in BOCWR

Sl. No.	ITEMS	RELEVANT SECTIONS / RULES IN BOCWA AND BOCWR AND RBOCWR
1	Registration of establishment	S – 7, R – 23 to 27
2.	Display of registration certification at workplace	R – 26 (5)
3.	Hours of work	S – 28 R – 234 to 237
4.	Register of overtime	S – 28; S – 29 R – 241(1) Form XXII
5.	Weekly rest and payment at rest	R – 235
6.	Night shift	R – 236
7.	Maintenance of workers registers and records	S – 30 R – 238
8.	Notice of commencement and completion	S – 46 R – 239
9.	Register of persons employed as building workers	R – 240
10.	Muster roll and wages register	R – 241(1) (a); Form XVI and XVII
11.	Payment of wages	R – 248
12.	Display of notice of wages regarding	R – 249
13.	Register of damage or loss	R – 241(1)(a); Form XIX, XX, XXI
14.	Issue of wages book	R – 241(2)(a); Form XXIII
15.	Service certificate for each workers	R – 241(2)(b); Form XXIV
16.	Display an abstract of BOCWA and BOCWR	R – 241(5)
17.	Annual return	R – 242; Form XXV
18.	Drinking water	S – 32
19.	Latrines and Urinals	S – 33 R - 243
20.	Accommodation	S – 34
21.	Creches	S – 35
22.	First-aid boxes	S – 36 R – 231 and Schedule III
23.	Canteens	S – 37 R – 244
24.	Food stuff and other items served in the canteens	R – 245
25.	Supply of tea and snacks in work place	R – 246
26.	Food charges on no loss no profit basis	R - 247
27.	Delhi BOCW welfare Board Rules	R – 250 to 296
28.	Safety committee	S – 38 R – 208

29.	Safety officer	S – 38 R – 209 and Schedule VII
30.	Reporting of accidents and dangerous occurrences	S – 39,R – 210
31.	Procedure for inquiry in to the causes of accidents	R – 211
32.	Responsibility of employer	S - 44 R – 5
33.	Responsibility of Architects, Project engineer and Designers	R – 6
34.	Responsibility of workmen	R – 8
35.	Responsibility for payment of wages and compensation	S – 45
36.	Penalties and Procedures	S – 47; S – 55
37.	Excessive noise, vibration etc.	R – 34
38.	Fire Protection	R – 35
39.	Emergency action plan	R – 36
40.	Fencing of motors	R – 37
41.	Lifting of carrying of excessive weight	R – 38
42.	Health, Safety and Environmental Policy	R – 39
43.	Dangerous and Harmful Environment	R – 40
44.	Overhead protection	R – 41
45.	Slipping, Tripping, Cutting, Drowning and Falling Hazards	R – 42
46.	Dust, Gases, Fumes, etc.	R – 43
47.	Corrosive substance	R – 49
48.	Eye Protection	R – 45
49.	Head Protection and other protection apparel	R – 46; R – 54
50.	Electrical Hazards	R – 47
51.	Vehicular traffic	R – 48
52.	Stability of structure	R – 49
53.	Illumination	R – 50; R – 124
54.	Stacking of materials	R – 51
55.	Disposal of debris	R – 52
56.	Numbering and marking of floors	R – 53
57.	Lifting appliances and gears	R – 55 to 81
58.	Runways and Ramps	R – 82 to 85
59.	Working on or adjacent to water	R – 86 & 87

60.	Transport and earthmoving equipment's	R – 88 to 95
61.	Concrete work	R – 96 to 107
62.	Demolition	R – 108 to 118
63.	Excavation and Tunneling works	R – 119 to 168
64.	Ventilation	R – 153
65.	Construction, repair and maintenance of step roof	R – 169 to 171
66.	Ladders and Step ladders	R – 172 to 174
67.	Catch platform and hoardings, chutes, safety belts and nets	R – 175 to 180
68.	Structural frame and formworks	R – 181 to 185
69.	Stacking and unstacking	R – 186 & 187
70.	Scaffold	R – 188 to 205
71.	Cofferdams and Caissons	R – 206 to 211
72.	Explosives	R – 212 & 213
73.	Piling	R – 214 to 222
74.	Medical Examination for building and other construction worker, Crane operator an Transport vehicle drivers	R – 81; R – 223(a)(iii) and Schedule
75.	Medical examination for occupational health hazards	R – 233(a)(iv)
76.	Charging of workers for Medical Examination	R – 223(b)
77.	Occupational health centres and Medical officers	R – 225 and Schedule X & XI
78.	Ambulance van & room	R – 226 & 227 and Schedule IV & V
79.	Stretchers	R – 228
80.	Occupational health service for building workers	R – 229
81.	Medical examination for occupational health hazards	R – 223(a)(iv)
82.	Emergency care services and emergency treatment	R – 232
83.	Panel of experts and agencies	Central Rule 250
84.	Power of inspectors	Central rule 251

B. RESPONSIBILITIES AND DUTIES OF WORKERS

(a) It shall be the responsibility of the worker to comply with the requirements of safety as laid down for him and the group of workers to which he belongs and fully cooperate in the discharge of the responsibility that has been assigned to the contractor.
(b) If he discovers any defects in the lifting appliance, lifting gear, lifting device or those concerning any transport equipment or other construction equipment or tools as well as the physical work conditions, he will report such defects promptly to his employer or NTPC Engineer or other person in authority;
(c) No building worker shall, unless duly authorized or in case of absolute necessity, remove or interfere with any fencing, guards, gangways, gear, ladder, hatch covering, life saving appliances, lighting or other things whatsoever required and provided for safety and health. If any of the aforesaid things is removed, the persons engaged in the work shall restore such thing at the end of the period during which its removal was necessary;
(d) Every worker shall use only means of access provided in accordance with the approved norms and no person shall authorize or order another to use such means of access or method other than those approved;
(e) Workers shall use such means of access and egress for going to and exiting from the workplace as provided.

SECTION - I
SAFETY MANAGEMENT

1.0 SAFETY MANUAL AND SAFETY POLICY:

1.1 The Safety policy of the contracting agency should reflect the commitment of the concerned agency towards safety and health of the workers specified for the particular site.

1.2 The Contractor shall have Safety Plan detailing the safety norms evolved through Safety Policy and Job Safety Analysis (JSA) or Hazard Identification & Risk Assessment (HIRA) of all package activities and constitute a Safety management program. Contracts shall also ensure POWRA (point of work risk assessment) before start of any activity.

1.3 The safety management programme in the form of Safety Manual shall give details of provisions proposed by the agency w.r.t. Job Safety Analysis (JSA) or Hazard Identification and Risk Assessment (HIRA) to ensure safety of the employees and elimination of health hazards. The Safety Manual including safety policy duly signed by the head/senior executive of the agency shall be submitted to the concerned Engineer-Incharge(EIC), NTPC before start of their project activities at site.

1.4 Each contracting agency shall have facilities for conducting the above safety management programme, commensurate with magnitude of the work under contract.

2.0 APPOINTMENT OF SAFETY OFFICER/SAFETY SUPERVISOR:

2.1 Each contracting Agency shall provide a sufficient number of qualified, suitable and experienced persons to manage all safety related matter on Site relating to the works. Irrespective of manpower employed by the agency whether temporary, casual, probationer, regular or permanent or on contract, Agency shall deploy a qualified Safety Officer/executive, responsible for carrying out the safety management programme before start of the work.

2.2 The safety officer shall create an organization, commensurate with the project activities, consisting of other staff as required for suitable deployment.

2.3 The schedule of requirement of safety personnel is given below.

No. of Workers	No. of Safety Supervisors	No. of Safety Officers
Up to 100	1	1
101 to 250	2	1
251 to 500	4	1
501 to 1000	6	2
1000 to 2000	6+ One additional supervisor up to every additional 250 workers	3
2000-3000	10+ One additional supervisor up to every additional 250 workers	4
3000-4000	14+ One additional supervisor up to every additional 250 workers	5
Above 4000	18 + One additional supervisor up to every additional 250 workers	5 + one safety officer up to addition 1000 workers

2.4 The qualification and experience of the safety personnel should meet the following criteria.

a) Safety Supervisor: (i) Possesses recognized degree in any branch of Engineering. OR
(ii) Diploma in any branch of Engineering with at least one year construction experience.

b) Safety Officer/Safety Executive: Qualification as given under BOCW Act/rules and minimum experience of three years.

2.5 In case contractor fails to employ the required safety professionals, the department may at the cost and risk of the contractor deploy additional/required safety professionals. The cost incurred towards this shall be deducted from contractor's bill at following the rates or actual whichever is higher.

l. Safety Engineer	Rs. 1500/day.
2. Safety Supervisor	Rs. 1000/day.

3.0 MEETING FOR SAFETY AFTER AWARD OF THE CONTRACT:

Representatives of contracting agency along with safety Officer/executive shall meet the concerned EIC of the particular activity prior to start of construction activities for the purpose of discussing safety standards and requirements applicable to the work under contract. The person representing the agency should be a responsible person for all their site activities.

4.0 PERSONAL PROTECTIVE *EQUIPMENT:*

4.1 The contracting agency should ensure sufficient inventory of personal protective equipment (PPEs) prior to initial mobilization as specified in the Bidding Documents. After identifying the need of the required PPEs for various activities performed at the site, an additional inventory of approx. 20% of required PPEs should be maintain during the execution of the work. A PPE plan shall be prepared which gives fair idea regarding issue of PPEs to various personnel as per the following 'PPE Selection Matrix'.

4.2 **Mandatory PPEs:** Wearing of Safety Helmet, Safety Shoes and reflective jacket is mandatory for all work at site and it should be ensured that all employees and project visiting personnel shall invariably wear safety helmet, safety shoes & reflective jacket.

PPE Matrix (apart from mandatory PPEs, i.e., Safety Helmet & Safety Shoes)

Activity	Type of Protection						Remarks, if any
	Hand	Eye	Ear	Body	Respiratory	Others	
Gas Welding & Cutting	LG	WG	-	LA	*SCBA/ OLBA	-	* for confined space
Electric Arc Welding	LG	HMWS	-	LA	*SCBA/ OLBA	-	* for confined space

Rigging	CG	SG	-				--
Working at Height	-	SG	-	DLFBH	-	*FAS	* for vertical columns
Grinding & Chipping	CG	FS / SG	-	LA	-	-	--
Working in High Noise	-	-	EP / EM	-	-	-	--
Handling of Cement Concrete	RG	SG	-	-	DM	-	
Blasting	CG	SG	EP*	-	-	-	* at noise area
Excavation	CG	SG	-	-	DM	-	*Gum boot in place of Safety shoe for foot
Chemical Handling	PVCG	CSG	-	PVCA	-	-	*Full body rubber suit with hood
Electrical and C&I	ERG*	SG	-	-	-	-	*For high voltages
Sand/shot blasting	CG	-	EP/ EM	CA	SAMH	-	

ABBREVIATIONS: *FS: Face Shield, CSG: Chemical splash goggles, HMWS: Helmet mounted welder's shield, GB: gum boot, DLFBH: Double lanyard full body harness, SG: Safety goggles, DM: Dust mask, SAMH L Supplied air mask/hood, EP/EM: Ear plug/Ear Muff, CG: Cotton hand gloves, LG: Leather hand gloves, LA: Leather apron, RG: Rubber gloves, PVCG: PVC Gloves, PVCA: PVC Apron, SCBA: Self-contained breathing apparatus, WG: Welding goggles, ERG: Electrical Rubber Gloves. OLBA : Online breathing apparatus*

4.3 The above-mentioned PPEs should be made available with contractor at site and issued to the concerned workers on the day of employment. All PPEs shall comply with ISI standards with valid test certificates.

4.4 At least two breathing apparatus sets (complying requirement as per IS: 10245) shall be provided at each site where excavation/tunneling works and Welding/ Cutting operations in confined areas are being carried out, to rescue the victims under exposure to harmful gases/vapors, if any.

5.0 SAFETY COMMITTEE:

5.1 *Safety committee* shall be formed within each contracting agency comprising of worker representatives with equal no. of management representatives as per the provisions of BOCW Act/rules. This committee in each agency shall meet at least once in every month. The safety officer of the concerned agency shall coordinate these meetings. NTPC Safety officer shall be special invitee for Safety Committee meetings. The safety committee functioning shall be in line with the provisions of BOCW Act/Rules.

5.2 Apart from the above, each agency shall organize safety meetings every day before start of day's work to educate & motivate the workers about the necessity of safety. Case study of accident/ incident can be shared in these meetings.

5.3 The contractor shall also regularly organize safety meetings for all job supervisors/foremen.

5.4 Weekly meeting with agencies' Safety Officers to be organized by safety department of NTPC and minutes to be recorded, circulated and compliance status to be checked on regular basis.

6.0 SAFETY MESSAGE PROPAGATION:

6.1 Contracting agencies shall arrange for display of safety hoardings depicting suitable safety cartoons/messages/ cautionary notices at appropriate places of project site to remind the workers to perform their duties safely. Minimum one safety message board/hoarding of appropriate size for every 10 workers to be provided and maintained by the concerned agency.

6.2 Apart from safety hoardings, each agency should maintain a safety bulletin board at all their work locations. Such safety bulletin boards should depict the activities being planned for the day, good practices, permit details etc.

6.3 Safety suggestion boxes shall be kept at each contractor's office at site for obtaining safety suggestions from the workers. Best suggestions should be implemented and may be rewarded suitably to encourage the workers for safety.

7. COMPETENCY OF EMPLOYEES:

7.1 Throughout the course of the contract, persons employed by agency shall be physically fit, qualified/experienced to perform their assigned duties/ jobs.

7.2 Employees shall not, knowingly be permitted to work in a manner that their ability or alertness is so impaired because of fatigue, illness or any other reason, that it may expose them and or others to injury.

7.3 No worker, vehicle operator shall be less than 18 years of age. And the vehicle operator shall have a valid license as per requirements of Motor Vehicle Act.

7.4 Contractor shall comply with all applicable state/central laws and codes related to employment of operators for Hoist, Shovel, Crane, Tractor, Bull-dozer, any other howling heavy equipment/vehicle.

8.0 SAFETY INDUCTION AND TRAINING :

8.1 Each worker deployed by the agency shall be given 2-days induction training which shall include the medical examination and instructions related to particular job, fire fighting, first-aid and reporting of accidents. All employees shall be given safety training as per BOCW Act/Rules.

8.2 The contracting agency shall also impart job specific skill based safety training to all its employees (Minimum one day) on various related safety topics using internal/external safety professionals/consultants as per the matrix given below. Record of such trainings and attendance particulars shall be maintained in a register for ready reference to statutory authorities/engineer-in charge.

TRAINING MATRIX:

Name of topic	**Executives**	**Super visors**	**Skilled Workmen**	**Other Workers**
Safety Induction	Y	Y	Y	Y
Accident_ Causes, factors, cost	Y	Y	Y	-
Industrial hazards & Accident Prevention	Y	Y	Y	-
Investigating, reporting, records	Y	Y	-	-
Personal Protective Equipment	-	Y	Y	Y
Construction Safety & Role of Supervisory personnel	-	Y	-	-
Permit to Work (PTW)	-	Y	Y	y
Statutory Provisions (BOCW Act/Rules, Factories Act 1948 etc.)	Y	Y	y	y
Material handling	-	y	Y	Y
Emergency Management	Y	Y	Y	-
Electrical Safety	-	Y	Y	-
Fire safety	Y	Y	Y	Y
First Aid & CPR (cardio pulmonary resuscitation)	-	Y	Y	Y (Selected)
Safety in Welding & Cutting	-	-	Y	-
Safety Audit	Y	Y	-	-
Safety in Lifting Tools & Tackles	-	Y	Y	y
Safety in Working at height	-	Y	Y	Y
Safety in Confined space work	-	Y	Y	Y
Defensive Driving	-	Y*	Y*	Y*

*for construction vehicle operators, helpers & crane operators Y=Yes

9.0 ID PASS

9.1 CLIMS (Contract Labor Information Management System) will be the criterion for entering or gate pass system if implemented at site.

9.2 The contractor shall ensure that all personnel working at site having a photo Identity card before they are engaged for any work and properly mentioned details like validity, Category/designation and work area etc. This ID card should be issued only after ensuring their screening test, medical fitness and safety induction training. Id card gate pass shall be indicated with 3 nos. of offence marks. With each offence the gate pass of concerned workmen/ supervisor will be punched giving on the spot indication of persons indulging in unsafe actions.

9.3 Drinking of Alcoholic beverages is strictly prohibited. Employees under the influence of any intoxicants, even to the slightest degree, shall not be permitted to remain at work. Each contractor should maintain 'breath analyzer' to determine the intoxicated workers at site.

10 SAFETY AUDIT

10.1 Internal Safety Audit once in every six months by the contracting agency and external safety audit as once in a year by third party shall be conducted, with prior intimation to EIC and NTPC Safety Deptt. The external auditing agency should be reputed safety institution or a certified Safety Auditor under any statutory legislation. The audit report along with time bound action plan should be submitted to Engineer-in-charge and NTPC Safety Dept.

10.2 Apart from above, Electrical Safety Audit shall be conducted quarterly by a team comprising of Electrical engineer, Safety representative of contractor and NTPC Electrical Erection representative covering the following and submit the report to EIC.

i) Electrical incidents investigation findings and remedial measures implemented.

ii) Adequacy of power supply requirements

iii) Power distribution system in place

iv) Updated electrical single line diagram including the IP44 DBs arrangement.

v) Electrical protection devices – ELCBs, O/L protections etc.

vi) Earth or ground connection and earth pit maintenance details

vii) Education and training of electrical personnel undertaken

viii) Any other point appropriate to the site conditions.

11. SAFETY BUDGET

Every contracting agency should clearly estimate and allocate a separate budget head for safety requirements every year and make the safety activity plan for the year and submit to NTPC EIC & Head of Safety. Budget allocations should be practically adequate to the site safety requirements and the details shall be intimated to the concerned EIC and safety deptt. before start of the work under the contract and subsequently, every year by 15th of April. Engineer-in Charge in consultation with Head of Safety shall review and monitor the effective utilization of allocated budget for safety related activities by the Contractor.

12. REPORTING AND INVESTIGATION OF ACCIDENTS AND DANGEROUS OCCURRENCES:

12.1 **Reporting of accidents:** Notice of any accident (the prescribed format is annexed to the manual) to a worker at the building or construction site that

(a) Causes loss of life; or

(b) Disables a worker from working for a period of **48 hours** or more immediately following the accident;

Shall forthwith be sent by Telegram, Telephone, Fax, Email or similar other means including special Messenger within **four hours** in case of **fatal accidents** and **72 hours** in case of **other accidents**, besides the Engineer-in-charge, to:

I. The Regional Labour Commissioner (Central);

II. The Board with which the worker involved was registered as a beneficiary;

III. Director General of Building and other construction (regulation of employment and conditions of service) Act/Rules; and

IV. The next of kin or other relative of the worker involved in the accident;

12.2 Further, notice of accident shall be sent in respect of an accident which

(a) Causes loss of life; or

(b) Disables the injured worker from work for more that 10 days to

(1) The Officer-in-charge of the nearest Police Station;

(2) The District Magistrate or, if the District Magistrate by order so desires, to

(3) The Sub-Divisional Magistrate;

12.3 Where any accident causing **disablement that subsequently results in death**, notice thereof in writing of such death, shall be sent the Authorities mentioned above within **72 hours** of such death.

12.4 In case of an accident causing minor injury, first-aid shall be administered and that resulting in disability of **48 hours or more**, the injured worker shall be given first-aid and immediately transferred to a Hospital or other place for medical treatment.

12.5 All near-miss accidents shall be reported to NTPC Engineer In-charge and Safety Officer as per prescribed format.

12.6 **Reporting of dangerous occurrences:** The following classes of dangerous occurrences shall be reported to the Inspector having jurisdiction, whether or not any disablement or death caused to the worker, namely:

(a) Collapse or failure of lifting appliances, or hoist, or conveyors, or similar equipment for handling of building or construction material or breakage or failure of rope, chain or loose gears; or overturning of cranes used in construction work;

(b) Falling of objects from height;

(c) Collapse or subsidence of soil, any wall, floor, gallery, roof or any other part of any structure, platform, staging, scaffolding or means of access including formwork;

(d) Contract work, excavation, collapse of transmission;

(e) Explosion of receiver or vessel used for storage at pa pressure than atmospheric pressure, of any gases or any liquid or solid used as building material;

(f) Fire and explosion causing damage to any place on construction site where building workers are employed;
(g) Spillage or leakage of any hazardous substance and damage to their container;
(h) Collapse, capsizing, toppling or collision of transport equipment;
(i) Leakage or release of harmful toxic gases at the construction site;
(j) In case of failure of a lifting appliance, loose gear, hoist or building and other construction work, machinery and transport equipment at a construction site, such appliances, gear, hoist, machinery or equipment and the site of such occurrence shall, as far as practicable, be kept undisturbed until inspected by the Authorities;

12.7 Every notice given for fatal accidents shall be followed by a written report to the concerned Statutory Authorities and the Engineer In-charge in the specified Form annexed as Schedule, under acknowledgement.

12.8 Incident / injury statistics shall be maintained by all agencies cause wise.

12.9 Investigation of accidents and dangerous occurrences

Besides reporting, it shall be the responsibility of the contractor to constitute a team (members as per the gravity of the incident) of responsible person to thoroughly investigate all incidents involving near-miss accidents, lost-time and reportable accidents and dangerous occurrences with a view to finding out the causative factor, taking remedial measures and fixing responsibility, and make a copy of the investigation report along with action-plan, specifying a definite time-frame for implementation of the findings, available to the Engineer in-charge forthwith.

13. MEDICAL AND FIRST AID AMENITIES:

13.1 It is the responsibility of each contracting agency to ensure the availability of suitable arrangements at their work site for rendering prompt and efficient First aid to injured persons.

13.2 Arrange one trained and certified first aid for every twenty workers in each shift.

13.3 Ambulance with proper equipment for prompt transportation of the injured persons to a physician or a hospital shall be provided before start of the work in cases where 500 or more than 500 workers are employed. For smaller contracts, where less than 500 workers are employed, Contractor shall have a tie-up with suitable Agency for providing Ambulance with proper equipment for prompt transportation of the injured persons to a physician or a hospital in case of an Accident / Emergency. Further, Contractor shall submit a proof of the same to EIC/Safety Officer of NTPC.

13.4 Deploy one full time construction medical officer (qualification as per Schedule XI of BOCW Central Rules -1998) for cases where 500 or more workers are employed (upto one thousand workers) and one additional construction medical officer for additional one thousand workers or part thereof. For smaller contracts, where less than 500 workers are employed, Contractor shall have a tie-up with suitable Hospital / Nursing home in the vicinity of the

Project/Site where work is being executed, for providing adequate medical treatment by qualified medical officers and nursing staff, as and when required. Further, Contractor shall submit a proof of the same to EIC/Safety Officer of NTPC.

Notwithstanding anything stated above, Contractor/Agency shall strictly comply with the requirements of relevant BOCW Act/ BOCW Rules/ Factory Act/Factory Rules/ any other statutory Act/Rules/Law with regards to providing suitable medical facilities to the workers.

In case contractor fails to employ the required construction medical officer alongwith Additional staff, corresponding payment for the same shall not be made and/or necessary action as per provisions of the Bidding documents shall be taken by NTPC.

13.5 Additional staff including one nurse, one dresser-cum compounder, one sweeper-cum-ward boy with each construction medical officer for full working hours

13.6 The Telephone nos. of Medical officer, Hospital(s) or ambulance shall also be conspicuously displayed at each work site.

13.7 First-aid kits as approved by medical officer shall be provided at accessible points in the ratio of at least one kit for every 50 employees.

13.8 **Health Management:** The site manager shall implement health examinations for the working personnel on a regular basis.

Types of health examination	Target	Frequency
General health examination	All workers	Annual
Occupational health examination (Audiometric, PFT, Vision etc.)	Worker engaging in noise, dust, vibration, harmful light generating work	Annual
Occupational health examination (Vision)	Personnel involved in operation of Cranes, heavy vehicles	Annual
Occupational health examination (Vertigo/Height pass)	Workers engaged at Height Works	At the time of induction training and every year

14. TESTING & EXAMINATION OF LIFTING, TOOLS, TACKLES, PRESSURE VESSELS AND OTHER EQUIPMENT:

14.1 All the lifting equipment, tools, tackles, pressure vessels etc. shall be tested & examined as per BOCW or Factories Act and rules made there under.

14.2 The records & certificates of such testing & examination shall be maintained and readily available for reference to statutory authorities/engineer-in-charge.

14.3 Proper color coding system should be maintained and marking should be done accordingly on all lifting tackles.

14.4 Regular testing of ELCBs and RCCBs by competent electrician must be ensured by agencies and record should be maintained.

15. EMERGENCY MANAGEMENT PLAN

15.1 The contractor shall ensure that an Emergency Management Plan is prepared to deal with emergencies arising out of:

a. Fire and explosion;
b. Collapse of lifting appliances and transport equipment;
c. Collapse of building, sheds or structure etc.;
d. Gas leakage or spillage of dangerous goods or chemicals;
e. Drowning of workers, sinking vessels, and
f. Landslides getting workers buried; floods, storms and other natural calamities.

15.2 While arrangements shall be made for emergency medical treatment and evacuation of the victim in the event of an accident or dangerous incident occurring, the chain of command and the responsible persons of the contractor with their telephone numbers and addresses for quick communication shall be adequately publicized and conspicuously displayed in the workplace.

15.3 It is also required that there is a tie-up with the hospitals and fire stations located in the neighborhood for attending to the casualties promptly and emergency vehicle kept on standby duty during the working hours for the purpose.

15.4 It shall be the responsibility of the contractor to keep the Local Law & Order Authorities informed and seek urgent help, as the case may be, so as to mitigate the consequences of an emergency. Prompt communication to NTPC, telephonically initially and followed by a written report, shall be made by the contractor.

16. ENFORCEMENT OF SAFETY CODE, SAFETY RULES & REGULATIONS:

The Engineer-In charge shall ensure that the contractor is exercising at all times, reasonable and proper precautions for the safety of people at works and complying with the provisions of current safety rules and laws according to safety code and relevant statutes of state/central governments. In case of negligence or default, the agency shall be penalized suitably as per penal provisions of NTPC Safety Rules.

17. WORK PERMIT SYSTEM

17.1 The Contractor shall implement Work Permit system, which is a formal written system used to control certain types of work that are potentially hazardous. A work permit is a document, which specifies the work to be done, and the precautions to be taken. Work Permits form an essential part of safe systems of work for many construction activities. They start the work

only after safe procedures have been defined and clearance taken from respective NTPC EICs. Permits to Work are usually required in high-risk areas as identified by the Risk Assessments.

17.2 Examples of high-risk activities include but are not limited to:

i) Entry into confined spaces
ii) Cutting & welding
iii) Working at Height along with checklist iv) Working on electrical equipment
v) Heavy lifting operations
vi) Removal of grating/ Handrail / floor opening
vii) Material Shifting

The copies of recommended formats for reference is given in annexure-IV.

17.3 The permit-to-work system should be fully documented, laying down:

i) How the system works
ii)The jobs it is to be used for;
iii) The responsibilities and training of those involved; and
iv) How to check its operation;

17.4 A Work Permit authorization form shall be completed with the maximum duration period not exceeding 12 hours.

17.5 A copy of each Permit to Work (PTW) shall be displayed near to work are (on PTW Display board) in close proximity to the actual works location to which it applies.

18. ACCESS TO AND FROM THE WORKPLACE

18.1 Safe, clean, well lit, unencumbered access and egress to and from work areas shall be maintained at all times in normal operating conditions.

18.2 The number and location of accesses and egresses from and to the workplace shall be adapted to the number of people likely to be present at any time, and therefore to evacuate from the workplace in case of emergency.

18.3 If access and egress to work areas are restricted due to operational conditions (e.g. access restricted due to pressure testing, etc.), alternative access and egress ways must be implemented, so far as is reasonably practicable. If this is not reasonably practicable, all concerned organizations and persons must be informed of the access restrictions, and work scheduling must be adapted in consequence.

18.4 Temporary access to height or into ground openings shall be of purpose made material such as scaffolds, stair cases/towers and ramps, which incorporate guardrails .

19. INTERFERENCE WITH MOVING VEHICLES AND PEDESTRIANS

19.1 The circulation of vehicles and pedestrians must be segregated by establishing restricted areas, one way routes where possible, pedestrian crossing zones and designated parking areas.

19.2 The appropriate measures must be implemented in order to prevent collision between pedestrians and vehicles at pedestrian crossings. This may include, but shall not be limited to:
- Mirrors;
- Lighting;
- Speed bumps before the crossing point.

19.3 Vehicle and pedestrian ways shall be physically separated with Hard-barriers, so far as is reasonably practicable, and be indicated with signs.

19.4 When it is not reasonably practical to implement a physical segregation, pedestrians must maintain safety distance of at least 2 meters from moving/operating vehicles at all times.

19.5 Traffic rules must be made visible through signage and traffic stops, consistent with those used on public

19.6 Roads as per road safety requirement.

19.7 All pedestrians on Project sites must wear high-visibility garments.

19.8 Pedestrians (including banksmen) must wear high-visibility garments in all areas where trucks and other vehicles (forklifts, cranes, etc.) maneuver. These areas must be clearly signaled / marked (floor painting, Hard-barriers, signs, etc.).Additional points:

19.9 Competent banksmen must be used for operations involving reversing or maneuvering where space or view is restricted.

19.10 Drivers must only operate vehicles they are competent to drive and must follow the established traffic routes and comply with all site rules.

19.11 The maximum driving speed on site is 15 km per hour.

19.12 Drivers and passengers must not get on or off moving vehicles.

19.13 When driving a forklift, forks must be lowered, the mast tilted back.

19.14 Smoking, eating, drinking, using a mobile phone or using earbuds or headphones when driving a vehicle is strictly prohibited.

19.15 When the vehicle is not in use, it must be ensured that:

- The engine is stopped and prevented from unauthorized use (e.g.: starter key removed), brake applied (and with wheels chocked for heavy vehicles);
- All raised parts are lowered to the ground or put in a safe position (cranes);
- It does not obstruct emergency exits, other routes, fire equipment or electricity panels.

20. HOUSEKEEPING

The contractor shall ensure that their work area is kept clean, tidy and free from debris generated by their activities. All debris/scrap should be stored in separate bins. The work areas must be cleaned on a daily basis and a full cleaning session of each area shall be conducted on a weekly basis. All equipment, materials and vehicles shall be stored in an orderly manner. Access to emergency equipment, exits, telephones, safety showers, eye wash stations, fire extinguishers, pull boxes, fire hoses, etc. shall not be blocked or otherwise disturbed, restricted or delayed.

21. STACKING AND STORAGE PRACTICE

Contractor Agency shall ensure stacked material is bonded on a stable and level footing capable of carrying the mass of the stack. Adequate clearances shall be provided between the sides of the stack and top to facilitate unimpeded access to service equipment like overhead wiring, cranes, forklifts and firefighting equipment, and hoses. Circular items shall be sufficiently choked with wedges not with odd bits of materials. Free-standing stacks of gunny bags and sacks such as Cement bags shall be stacked to prescribe safe stacking heights with layers formed for stable bonding, preventing slippage causing accidents. Stacking against walls shall not be permissible.

Contractor shall maintain the premises and surrounding areas in clean and clear manner with safe access and egress. There shall be sufficient and adequate storage racks, shelving, bins and pallets and material handling equipment to stack his construction materials such as Pipes, Structural and his construction enabling materials. Unwanted materials shall be promptly moved away for efficient material movement.

Any temporary store shed will be built in conformity with fire safety requirements. The stores must be provided with adequate lighting arrangement (Flame proof / intrinsically safe depending upon the Zone category) and must be equipped with sufficient fire extinguishing arrangement. “No Smoking” and other relevant signage must be displayed conspicuously at strategic locations and safety precautions must be strictly enforced.

All material should be kept at least 150mm above from the ground by providing wooden packing below. Maximum height of material stacking should not be greater than 3 meter. All loose material must be kept in wooden box or in sharp edge protected drum and material identification details to be displayed. Materials inside store room should be kept on scaffold rack.

Gas cylinder storage area must be 30m away from the hot work zone and separate storage facility must be available for empty and full cylinder with proper shed. Storage area must be design in a way that 6 meter distance between LPG/DA and oxygen maintained

22. CONFINED SPACES

All Confined Spaces belonging to Subcontractor shall be identified and clearly signed posted as a confined space forbidden to unauthorized Personnel at every entrance. A method for preventing entry must be established and maintained for all Confined Spaces. Physical prevention system (such as locks) is preferred.

Before commencing work in a Confined Space, the Subcontractor must obtain a Permit to Work from the relevant authority.

The following requirements shall be met at any time:

- Only competent and trained workers can participate to work in confined spaces (as a minimum as per local Law). A Confined Space Entry Log (or equivalent) must be used to identify the person inside the Confined Space at any time;
- Air Analysis tests must be carried out to determine if the Confined Space is oxygen deficient and/or contains flammable substances, toxic agents, carbon monoxide and/or harmful physical agents. The air shall be analyzed before starting work, during work and after work. Adequate ventilation must be provided;
- Working in the confined space without a watcher is strictly forbidden. An adequate means of communication is required and shall enable easy and clear communication:
- Between those inside the space,
- Between those inside the space and those outside,
- To summon help in case of emergency;
- Adequate emergency provisions must be in place. In particular, necessary rescue equipment must be ready, pre inspected and available. The arrangements need to be suitable and sufficient for the rescue of persons in the event of an emergency.

23. FIRE PROTECTION AND PREVENTION

Routine hot works should be described in the contractor Risk Control Plan .Non-routine hot works are submitted to daily hot works permits given by the relevant authority.

Full and unrestricted access to emergency exits, fire-fighting equipment, fire control and emergency vehicles shall be maintained at all times. The Subcontractor shall provide, install and maintain their own temporary fire protection against hazards they introduce to the Site (work areas, storage areas, and temporary facilities under their responsibilities).

Fire extinguishers shall be inspected at least annually by a certified person and visually inspected monthly and documented by the Contractor.

24. ELECTRICAL SAFETY

Personal authorization must be issued by Contractor Management (or formally designed delegates) likely to perform or supervise electrical works.

Without such an authorization validated by EIC, no Contractor's employee shall undertake electrical works.

No live work on high voltage or medium voltage is allowed. All high voltage and medium voltage electrical works must be performed on isolated equipment and only after verification of absence of voltage with suitable equipment. Low voltage and very low voltage live work is only allowed for measurement tests and checks of equipment. The below measures will be taken:

- Work practices must protect against direct or indirect body contact by means of tools or materials and be suitable for work conditions and the exposed voltage level
- A Lockout and Tagout procedure must be applied prior to commencing any electrical work. Prior to commencing works on isolated equipment, a verification of absence of voltage with suitable safety test equipment must be performed.
- Energized panels will remain locked with a specific key or tool whenever they are unattended and tagged with the signs and warnings indicating the presence of danger. If not reasonably practicable, a restricted area delimited with physical barriers and supported by warning signs must be implemented around the opened equipment.
- Only qualified electrical Contractor Personnel may enter substations and/or transformer vaults and only after being specifically authorized by NTPC EIC.
- All joints (Both terminal and intermediate) in cable should be made using lugs and joint area should be crimped using crimping tools.
- All temporary connection should be provided through 30mA ELCB/RCCB using 3 core double insulated cable and only 3 pin industrial plug top will be used for connection.
- Zero energy verification needs to be ensured before any electrical operation using only VAV before working on a live circuit which has been isolated
- Only industrial type DB to be used for connection and weather protection shed needs to be provided for every DB and shed height should not be less than man height.
- Double earthing protection must be provided for every electrical equipment and earthing value should be less than 1 Ohm
- Deployment of trained, experienced & licensed electrician as well as licensed electrical supervisor must be ensured at site as per Rule-45 of the Indian Electricity Rules, 1956 ;
- EIC May perform screening/ competency test for all contractor electrical professions i.e. electrical engineers and helpers. Selection/ rejection of the personnel who appear for the screening is sole discretion of EIC
- Electrical helper who will be engaged in helping the electrician/ engineer must have minimum ITI certificate to be eligible for working with him
- All PPE' s used while being involved in electrical work must be as per IS Standards available for electrical work

25. COMPRESSED GAS CYLINDERS

Gas cylinders shall be securely stored and transported, and identified and used in line with the safety Requirements as per Gas Cylinder Rules -2106.

Hose lines shall be adequately protected, inspected and tested for leaks in line with the safety Requirements. Flash back arrestor /NRV must be used at both ends of the hoses and all hose should be free from damage and fixed properly preferably using crimping clamps. Leakage test must be done before every use by soap solution and physical inspection of hose must be carried out regularly. Only trolley attached with wheel will be used for cylinder transportation in which cylinders must be kept secured with chain. Only Industrial type regulator fitted with two stage double dial pressure gauze is allowed to be used.

26. LIFTING OPERATIONS

The Contractor shall prepare a lifting plan, checked and submit for authorization by contractor's competent authorized persons prior to any lifting operation and formally communicated to all persons undertaking the work.

All persons preparing, issuing lifting plans and all persons involved in lifting operations must be subject to formal competence checks by the contractor to ensure necessary training, experience and qualification prior to commencing work. The Subcontractor must ensure that their nominated Lifting Leader has appropriate qualifications.

Contractor lifting plans include:

The lifting methodology, step by step

The risk analysis of the operation including consideration for weather conditions and work environments (e.g.: proximity of hazards and obstructions to the load, consideration for overturning, load integrity) where appropriate and consideration for simultaneous operations and the measures taken to avoid conflicting tasks in the lifting area

The identification of the designated lifting area, the fall zone and the control measures to prevent access such as barriers, signs, etc.

The description of the type, weight, size, shape and center of gravity of the load and the method used for slinging, attaching and detaching the load with the availability of approved lifting points on load when necessary

The list of the certified and inspected equipment and lifting accessories to be used

The composition of the team required to perform the task (crane driver, rigger, etc.) with the needed qualifications and description of their roles and responsibilities including the intended communication method

Any Heavy equipment (crane, winch machine, etc.) manufactured less than 15 years from the current year shall be only allowed to be used at our project Site's. Pre-safety Inspection of the equipment by safety deptt. shall be done before mobilizing the equipment at our project site.

The contractor must ensure that a competent operational leader is formally appointed to supervise each lifting operation. All lifting plans must clearly define the specific roles and responsibilities for each person involved (e.g.: crane drivers, lifting coordinators and riggers) and must be checked and issued prior to lifting operation. Clear communication channels must be formally established and maintained between everyone involved in a lift with only authorized person giving instruction to the operator.

Special permission needs to be taken from NTPC EIC for tandem lifting and for any non-routine lifting operations must strictly adhere to the guidelines described in corresponding Standard / Procedures / Directive.

No employee of the contractor shall be positioned under a suspended load or between a suspended load and fixed objects.

All lifting equipment and accessories must have valid manufacturers certificates or thorough examination records and be uniquely identified, marked with the safe working load, listed in a register and subject to formal regular inspection as per EHS requirements and shall have valid certificates from a competent authority. Inspection before use by the operator is mandatory. All lifting hooks must have latch. All cranes shall be fitted with Automatic Safe Load Indicator (ASLI) and Anemo Meter.

The contractor shall operate and maintain cranes and hoisting equipment in accordance with manufacturers' specifications and limitations and the safety Requirements. All defective, non-inspected or unidentified (safe working load / identification number) lifting equipment or accessories must be either removed from site or physically prevented from use.

27. LOCKOUT TAGOUT ("LOTO")

Prior to performing work on Machines or Equipment, the Subcontractor shall ensure that all energy sources are isolated and verify the absence of residual energy (e.g.: by using specific voltage detecting device for electricity).

At any time, the contractor shall follow the Site-specific LOTO and Permit to Work rules. The contractor must ensure that all of their affected Subcontractor Personnel receive the necessary training. Lockout/ Tagout must be implemented before servicing and maintenance is performed on Machines and Equipment, which could unexpectedly start-up, become energized, or release stored energy exposing persons to a risk of injury, unless the works undertaken are performed using alternative measures that provide effective protection.

Absence of residual energy must be verified using the suitable equipment or process adapted to the machine and the kind of energy to be checked before start of work. *The contractor must procure suitable VAV instrument for verification of absence of voltage before implementing LOTO all by themselves*.

When the contractor is in charge of LOTO, each authorized person must be issued with an individual lock with a unique key. The contractor shall secure areas where energy sources have been de energized, so as to prevent the access of unauthorized personnel and erect suitable signs. All affected Personnel shall be notified.

Once an item of electrical equipment has been energized, an item of mechanical plant and/or System has been erected and released for Commissioning, no work will be allowed on such item of Equipment or System unless a valid Permit to Work (PTW) has been obtained from the relevant authority.

28. MONTHLY SAFETY REPORT

Agency has to submit the monthly safety activity report in the form of Lead-Lag indictor to NTPC Safety Deptt. Sample format attached as annexure –IV.

29. In case the Contractor doesn't adhere to any of the provisions of the NTPC Safety Rules for Construction and Erection of Power Plants, corresponding payment for the provisions not adhered, shall not be made and/or necessary action as per provisions of the Bidding documents shall be taken by NTPC.

SECTION-II

1. Safety at workplace and equipment

1.0 GENERAL PROVISIONS:

1.1. Housekeeping:

a. The contractor shall be primarily responsible for maintaining Good housekeeping and safety standards in the workplace;
b. Loose materials that are not required for use shall not be placed or left behind so dangerously as to obstruct workplaces or passageways;
c. All projecting nails shall be removed or bent to prevent injury;
d. Equipment, tools and small objects shall not be left lying unattended or unsecured from where they could fall or cause a person to trip;
e. Scrap, waste or rubbish shall not be allowed to accumulate in the site as these combustibles can create serious fire hazards and affect safe working;
f. Workplaces and passageways that become slippery owing to spillage of oil or other causes shall be cleaned up or strewn with sand, ash or the like;
g. Portable equipment shall be returned after use to their designated storage place.

1.2. Means of access and egress shall consist of

a. Adequate and safe means of access and egress shall be provided in all workplaces;
b. The means of access and egress shall be maintained in a safe condition;

1.3 Lighting and ventilation

a. All practical measures shall be taken to prevent smoke, fumes etc. from obscuring any workplace or equipment at which any worker is engaged;
b. Adequate and suitable artificial lighting shall be provided where natural lighting is not sufficient as per IS 3646 (Part II). The artificial lighting so provided shall not cause any incidental any danger, including that of producing glare or disturbing shadows;
c. To prevent danger to health from air contamination by dust generated during grinding, cleaning, spraying or manipulation of materials as also to provide protection against dangerous gases, fumes, vapours, mist, etc. effective arrangements shall be made for ventilation;
d. Workers shall be provided with suitable respiratory protective equipment, if it is not technically possible to have uncontaminated air. To this end, a study by a competent person shall be made to decide on the due protection. Sufficient illumination at all times for maintaining safe working conditions shall be provided where building workers are required to work or pass, and for passageways, stairways and landings such illuminations shall not be less a than 0.5 foot candles at the floor level;
e. Where natural lighting is not adequate to prevent danger, adequate and suitable lighting shall be provided as per IS: 3646 – Part II;
f. Artificial lighting shall not cause any danger due to a brightness greater than 10 foot candles per square inch, except where the angle of inclination from the eye to the source or the part pf the fitting as the case may be exceeds 20^0, including that of producing glare or disturbing shadows;
g. Where necessary to prevent danger to health from air contamination by dust from the grinding, cleaning, spraying, or manipulating of materials or objects, arrangements shall be made to limit the concentration of the pollutants by thorough ventilation, and dust generated due to movement of earthmoving machinery and other construction equipment, by spray of water in the area from time to time;
h. Adequate ventilation by the circulation of fresh air shall be maintained in such places where the concentration of pollutants is likely to affect the health of the workers;

i. Special care shall be taken to ventilate the workplace where gas cutting, welding or other operations involving generation of dangerous fumes, vapours, mists, gases etc is likely;
j. Where it is technically not possible to eliminate dust or noxious or harmful fumes or gases sufficiently to prevent injury to the health of the workers, the contractor shall provide suitable respiratory equipment like dust mask or gas/fume mask or breathing apparatus or other suitable respiratory equipment.

1.4. Dangerous and harmful environment:

a. When an internal combustion engine exhausts into confined space or excavation or tunnel or any other workplace where neither natural ventilation nor artificial ventilation system is adequate to keep the carbon monoxide content of the atmosphere below fifty parts per million, adequate and suitable measures shall be taken at such workplace in order to avoid exposure of building workers to health hazards;

b. No building worker shall be allowed to enter any confined space or tank or trench or excavation wherein there is given off any dust fumes or other impurities of such nature and to such extent as is likely to be injurious or offensive to the building worker or in which explosives, poisonous, noxious or gaseous material or other harmful articles have been carried or stored or in which dry ice has been used as a refrigerant, or which has been fumigated or in which there is a possibility of oxygen deficiency, unless all practical steps have been taken to remove such dust, fumes or other impurities and dangers which may be present and to prevent any further ingress thereof, from such workplace or tank or trench or excavation;

c. No worker shall be allowed to enter any such space unless a responsible person has certified it safe and fit for the entry of such building workers.

1.5. Fumes/gases due to Welding and gas-cutting operations: When welding or cutting operations are carried out in a confined space:

a. Adequate ventilation, by means of exhaust fans or forced draught, as the condition may require, shall be constantly provided; otherwise enough quantity of air shall be circulated by means of air compressors to dilute the contaminant within permissible limits;

b. Workers shall take necessary precautions to prevent unburned combustible gas or oxygen from escaping inside a tank or vessel or other confined space;

c. Welding or cutting operations on any container that has held explosives or where inflammable gases may have been generated, shall be undertaken after the container has been thoroughly cleaned by steam or other effective means; and

d. Gas-test shall be carried out ensure that the confined space is completely free from combustible gases and vapours.

1.6. Dust, gases, fumes

a. Concentration of dust, gases or fumes shall be prevented by providing suitable means to control their concentration within the permissible limit so that they may not cause injury or create health hazard to a building worker;

b. For protection against such hazardous substances, besides efficient and effective means of control, personal protective equipment like dust masks, breathing apparatus, other respiratory appliances, goggles, as the case may be, shall be provided.

1.7. Excessive noise:

a. Adequate measures shall be taken against the harmful effects of an excessive noise;
b. Use of earplugs/muffs and anti-vibration gloves shall be ensured to protect the workers from the impact of exposure to such dangers;
c. The noise level in no case shall exceed as prescribed in the concerned Rules and exposure in excess of 115 dBA over the period of a quarter of an hour cannot be permitted:

1.8. Corrosive substances:

a. All corrosive substances, including alkalis and acids, shall be stored and used by a person dealing with such substances at a building or other construction work in such a manner that it does not endanger the building worker and suitable protective equipment shall be provided by the employer to a building worker during handling or use of such substances at a building or other construction work and in case of spillage of such substances on the building worker, immediate remedial measures shall be taken;

b. While protection of the body could be ensured by use of corrosion resistant apparel/overalls, suitable goggles, gloves, apron, gum boots etc. shall be made available to all concerned personnel;

c. To deal with an accidental spillage of a corrosive substance on the body of a worker, the facility of eyewash fountain or water shower, as the case may be, shall be installed, within the easy reach of the workplace.

1.9. Eye protection:

a. Suitable personal protective equipment for the protection of eyes shall be provided and used by the building worker engaged in operations like welding, cutting, chipping, grinding or similar operations which may cause hazard to his eyes;

b. Goggles or face shield or welding screen with suitable shade of glass/filters etc shall be provided for the protection of the eyes.

1.10. Overhead protection:

a. It shall be ensured that at the building or other construction site, overhead protection is erected along the periphery of every building under construction that shall be of fifteen meters or more in height when completed;

b. Overhead protection shall not be less than two meters wide and shall be erected at a height not more than five meters above the base of the building and the outer edge of such overhead protection shall be one hundred fifty millimeters higher than the inner edge thereof or shall be erected at an angle of not more than twenty degrees to its horizontal sloping into the building;

c. It shall be also ensured that at the building and other construction work that any area exposed to risk of falling material, articles or objects is roped or cordoned off or otherwise suitably guarded from inadvertent entry of persons other than building workers at work in such area.

1.11. Lifting and carrying of excessive weight:

a. No building worker lifts by hand or carries overhead or over his back or shoulders any materials, articles, tools or appliances exceeding in weight the maximum limits as set out in the following table unless aided by any other building worker or a mechanical device;

b. No worker aided by other workers, lift by hand or carry overhead or over their back or shoulders any materials, articles, tools or other appliances exceeding in weight the sum total of the maximum limits as prescribed in the concerned Rules, unless aided by a mechanical devices:

1.12. Protections against fall of persons –

a. All scaffolds/working platforms at height of two metres or more shall be fenced;
b. All guard-rails for the fencing of floor openings, gangways, elevated workplaces shall be made of sound material, good construction and possess adequate strength and be between 1 m and 1.5 m above platform level, consist of two rails (two ropes or chains may be used if they are sufficiently taut) and supporting stanchions;
c. Intermediate rails, ropes or chains shall be midway between the top and lower of edges of the top rail;
d. Sufficient number of stanchions or standard poles or uprights shall be maintained to ensure the required stability and resistance;
e. Guard-rails shall be free from sharp edges and be maintained in good repair;
f. Floor openings through which persons could fall, shall be guarded by covering or fencing;
g. If the means of protection is removed to allow the passage of persons or goods or other purpose, the same shall be replaced as soon as possible, while making temporary arrangements for reasonable degree of safety in the meanwhile;
h. Covers for floor opening shall be safe to walk on and if vehicles operate thereon it shall be safe for the same. This will require the contractor to have prior assessment of expected loads;
i. Cover for floor opening shall be secured by hinges, grooves, stops or other effective means against sliding, falling down or lifting out or any other inadvertent displacement;
j. Covers for any openings shall not constitute any hindrance to traffic and, as far as practicable, be flush with the floor;
k. If covers constitute as grids, the bars shall be spread not more than 5 cm apart;
l. Elevated workplaces at more than 2 m above the floor or ground shall be protected on all open sides by guardrails. It is commonly observed that fragile barricade tapes are used as a substitute of a strong and dependable fencing. This practice is prohibited. The barricade tapes can be used as markers/route guide only;
m. Elevated workplaces shall be provided with safe means of access and egress such as stairs, ramps or ladders according to suitability;
n. Persons employed at elevated workplaces or other situations at more than 2m from which they may fall, shall be protected by means of adequate safety nets, or platforms, or be secured by

safety belts with the lanyard properly anchored above the head level of the user. All possible effort shall be made to have strong and dependable mechanical arrangement.

1.13. Protection against fall of objects and materials:

a. Materials and objects such as scaffolding materials, waste materials or tools shall not be thrown up or down from heights, as they are liable to cause injury;
b. If materials and other objects cannot be safely lowered from heights, adequate precautions such as the provision of fencing, lookout men or barriers shall be provided to protect any person from injury.

1.14. Protection against entry of unauthorized persons:

a. Construction zones in the site and built up areas alongside main traffic routes shall be barricaded;
b. Unauthorized persons shall not be allowed access to construction sites and visitors shall be provided with the required protective equipment and it be ensured that they use them effectively.

1.15. Head protection and other protection apparel:

Every building worker who is required to –

a. Pass through or working within the areas where there is hazard of his being struck by falling objects or materials, shall be provided with safety helmets of the type approved and tested in accordance with the national standards;
b. Work in water or in wet concrete or in other similar work, shall be provided with suitable waterproof;
c. Work in rain or in similar wet condition, shall be provided with waterproof coat with hat;
d. Workers using or handling of alkalis, acid or other similar corrosive substances shall be provided with appropriate protective equipment in accordance with the approved standards;
e. Every building worker engaged in handling sharp objects or materials at a building or other constriction work, which may cause hand injury, shall be provided with suitable hand gloves in accordance with the approved standards.

1.16. Stability of structures:

a. No wall, chimney or other structure or part of a structure shall be left unsupported in such condition that it may fall, collapse or weaken due to wind pressure, vibration or due to any other reason. Entry of persons into such locations where tall structures are being built shall be regulated without a let up.

1.17. Safety of Structures and equipment and other safety concerns

a. Safety of structures like scaffoldings, platforms, gangways/walkways, towers, stairs, ladders, ramps, safety in excavation, formwork, falsework, demolition work, storage, handling and use of explosives, inflammable substances and hazardous materials, gas cutting and welding, use of electricity etc.; and equipment viz. construction machinery, crushers and batching plant, boiler and other pressure vessels, transport and material handling equipment, lifting appliances, vehicles etc., shall be operated and maintained as per approved norms and –
   i. They shall be made of sound material and of good construction, free from patent defects, provided with adequate safe guards, properly maintained, periodically inspected and strong enough to withstand safely the loads and stresses to which they may be subjected;
   ii. They shall carry enough factor of safety bearing in mind that the possibility of their abuse, which otherwise shall be prevented by constant and adequate supervision, cannot be ruled out altogether;
   iii. It is incumbent on the contractor to ensure that only competent and authorized persons operate the equipment or attend to electrical and mechanical systems and repair of faults or breakdowns etc.
b. Working in the confined space may involve certain serious hazards. Strict adherence to the conditions of Permit-to-work issued for the purpose is required;
c. Control of energy sources shall be ensured through Log-out/Tag-out practices.

1.18. Slipping, tripping, cutting, drowning and falling hazards:

a. The contractor shall keep all passageways, platforms and other places free from accumulations of dust, debris or similar material and from other obstructions that may cause tripping;

b. Any sharp projections or protruding nails or similar projections which may cause any cutting hazard to a building workers shall be removed or otherwise made safe by taking suitable measures;

c. No contractor shall allow any building worker at construction work to use the passageway, or a scaffold, platform or any other elevated working surface which is in slippery and dangerous condition and shall ensure that water, grease, oil or other similar substances which may cause the surface slippery, be removed or sanded/saw-dusted or covered with suitable material to make it safe from slipping hazard;

d. Wherever building workers are exposed to the hazarded of falling into water, they shall be provided with rescuing arrangement from such hazard and if it is considered necessary, well equipped boat or launch manned with trained personnel shall be provided by the contractor at the site of such work;

e. Every open side or opening into or through which a building worker, vehicle or lifting appliance or other equipments may fall at a building or other construction work shall be covered or guarded suitably to prevent such fall except where free access is necessary by reasons of their nature of the work;

f. Wherever building workers are exposed to the hazards of falling from height while employed on such work they shall be provided by the employer with adequate equipment or means for

saving them from such hazards, Such equipments or means shall be in accordance with the standards as laid down;

g. Whenever there is a possibility of falling of any martial, equipment or building worker at a construction site relating to a building or other construction work, adequate and suitable safety net shall be provided in accordance with the above stipulation;

2.0 SAFETY IN MATERIAL HANDLING AND WASTE DISPOSAL

2.1. GENERAL PROVISIONS:

a. All building materials stored in tiers shall be stacked, racked, blocked, interlocked or otherwise secured safely to prevent sliding, falling or collapse and in an orderly manner to avoid obstruction of any passageway at the place of work. Piles of materials shall be stored or stacked in such a manner as to ensure their stability;

b. Maximum safe load limits of floors within buildings and structures in kg/cm^2 shall be conspicuously posted in all storage areas, except for floor or slab on gradient. Maximum safe load shall not be exceeded. Material or equipment shall not be stored upon any floor or platform in such quantity as to exceed its safe carrying capacity;

c. Ailes and passageways shall be kept clear to provide for the free and safe movement of material handling equipment or persons. Such areas shall be kept in good repair;

d. When a difference in road or working levels exist, means such as ramps, blocking or grading shall be used to ensure the safe movement of vehicles between two levels;

e. Material stored inside buildings under construction shall not be placed within 2 m of any hoist way or inside floor openings nor within 3.2 m of exterior wall which does not extend above the top of material stored;

f. Persons employed required to work on stored material in silos, hoppers and similar storage areas shall be equipped with lifelines and safety belts;

g. Non-compatible materials shall be segregated in storage;

h. Bagged materials shall be stacked by stepping back the layers and cross-keeping the bags at least every 10 bags high;

i. Materials shall not be stored on scaffolds or runways in excess of supplies needed for immediate operations;

j. Bricks stacks shall not be more than 2.2 m in height. When a loose brick stack reaches a height of 1.3 m it shall be tampered back 5 cm in every foot of height above the 1.25 m level;

k. When masonry blocks are stacked higher than 2 m, the stack shall be tapered back on half block per tier above the 2 m level;

l. Material or equipment shall not be stored or placed so close to any edge of a floor or platform as to endanger the safety of persons below or working in the vicinity. Where stacking, unshackling, stowing or unstaring of construction material or article, or handling in connection therewith cannot be safely carried out unaided, reasonable measures to guard against accident or dangerous occurrences shall be taken by shoring or otherwise to prevent any danger likely to be caused by such handling;

m. Stacking of material or article shall be made on firm foundation not liable to settle and such material or article and shall not overload the floor on which such stacking is made;

n. The material or articles shall not be stacked against partition or walls o f a warehouse or stores unless it is known that such partition or the wall is of sufficient strength to withstand the pressure of such materials or articles;

o. The materials or articles shall not be stacked to such a height and in such a manner as would render the pile of such stack unstable and cause hazards to the building workers or the public in general;

p. Where the building workers are on stack exceeding one point five meters in height, safe means of access to the stack shall be provided;

q. All stacking or unshackling operations shall be performed under the supervision of a responsible person for such stacking or unstacking;

r. The stacking of construction materials or articles shall not be made near the site of excavation, shaft, pit or any other such opening;

s. Stacks that may lean heavily or become unstable or collapse are barricaded shall be avoided;

t. Structural steel, poles, pipe, bar stock and other cylindrical materials, unless racked, shall be stacked and blocked so as to prevent sliding, spreading or tilting.

2.2. LUMBER:

a. Used lumber shall have all nails withdrawn before stacking;

b. Lumber shall be stacked on level and solidly supported sills;

c. Lumber piles shall not exceed 6 m in height provided that lumber is handled manually, shall not be stacked more than 5 m height;

d. Lumber shall be so stacked as to be stable and self-supporting.

2.3. STACKING OF CEMENT AND BAGS CONTAINING OTHER MATERIALS:

a. The cement or other material in bags shall be stacked in a header and stature-wise in rows alternately in not more than 10 numbers and there will be circulation of space of at least 600 mm in between two such rows;

b. While removing bags from the stack pile the stability of such stack pile shall be ensured;

c. Bags containing cement or lime shall be stored on a firm ground;

d. The materials like bricks, tiles or blocks shall also be stored on a firm ground;

e. Reinforcing steel shall be stored according to its shape, size and length and stack of reinforcing steel kept as low as possible;

f. No pipe shall be stored on rack or in stack where such pipe is likely to fall by rolling;

g. The angle of repose shall be maintained where loose materials are stacked;

h. When dust laden material is to be stored or handled, measures shall be taken to suppress the dust produced by such storing or handling and suitable personal protective equipment supplied to and used by the building workers working for such storing or handling.

2.4. DISPOSAL OF DEBRIS AND WASTE MATERIAL:

a. It shall be ensured that debris is

i. Handled and disposed of by a method, which does not cause danger to the safety of a person and not allowed to accumulate so as to constitute a hazard;

ii. Kept sufficiently moist to bring down the dust under control;

iii. Not thrown inside or outside from any height of such building or other construction work;

b. Brought down by suitable means/chutes provided for the purpose and on completion of work, leftover building material, article or other substance or debris shall be disposed off as soon as possible to avoid any hazard to any traffic or person;

c. Whenever materials are dropped more than 6 m to any point lying outside the exterior walls of the building an enclosed chute of wood, or equivalent material shall be used;

d. When debris is dropped through holes in the floor without the use of chutes, the area where the material is dropped shall be completely enclosed with barricades not less than 1.1 m high and not less than 1.9 m back from the edge of the opening above. Signs warning of the hazard of falling material shall be posted at each level;

e. All scrap lumber, waste material and rubbish shall be removed from the immediate work area as the work progresses;

f. Disposal of waste material or debris as per the guideline issued by CPCB in compliance of Rule 10 sub-rule 1(a) of C & D Waste Management Rules, 2016).

g. All bio-degradable material shall be disposed off in the pit for making compost. Pellets can also be made from bio-degradable material

h. All solvent wastes, oil rags and flammable liquids shall be kept in fire resistant covered containers until removed from the work site.

2.5. HANDLING GAS CYLINDERS:

a. Gas cylinders shall not be lifted on bare slings. For lifting the cylinders, cage of suitable size shall be used and all cylinders shall be horizontally positioned in it. Such cage shall have fencing in such a way that there is no possibility of fall of cylinders from this cage.

2.6. RIGGING EQUIPMENT FOR MATERIAL HANDLING:

a. Rigging equipment for material handling shall be inspected prior to use in each shift as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service;

b. Rigging equipment shall not be loaded in excess of its recommended safe working load, as prescribed in the Indian standards;

c. Rigging equipment, when not in use, shall be removed from the immediate work area so as not to present a hazard to persons engaged in the area;

d. Special custom designed grabs, hooks, clamps, or other lifting accessories, for such units as modular panels, prefabricated structures and similar materials, shall be marked to indicate the safe working loads shall be proof tested prior to use 125% of their rated load;

e. Welded alloy steel chain slings shall have permanently affixed-durable identification standing size, grade, rated capacity and manufacturer.

2.7. FENCING OF MOTORS ETC

a. All motors, cogwheels, chains and friction gearings, flywheels, shafting and the other dangerous and moving parts of machinery (whether or not driven by mechanical power) and steam pipes shall be securely fenced and the fencing of dangerous parts of machinery not removed while such machinery is in motion or in use;

b. No part of any machinery which is in motion and which is not securely fenced, shall be examined, lubricated, adjusted or repaired except by a person skilled and trained for such examination, lubrication, adjustment or repairs and machine parts cleaned only when such machine is stopped;

c. When a machine is stopped for servicing or repairs, adequate measures shall be taken to ensure that such machine does not restart inadvertently and not only tag-out sign is required; it is also essential that an active system of isolating the power be applied.

2.8. PROTECTION AGAINST LIGHTNING

a. Where necessary, installations shall be protected against lightning, provided further that;

b. No bare conductors or bare current-carrying parts of equipment be permitted to be installed unless adequate precautions are taken to prevent direct pr indirect contact;

c. Only flame-proof equipment and conductors shall be installed at places where explosives or inflammable substances are stored, handled or used or where explosive atmosphere exits;

d. Persons competent and authorized only shall attend to electrical breakdowns and other operational faults and give or restore power to an equipment and such persons shall be easily identifiable by their dress or special helmet worn;

e. It will constitute a standard practice to switch off portable tools while shifting from one place to another or while leaving them behind unattended;

f. The contractor shall ensure that a system is in place to always keep tools well maintained.

2.9. VEHICULAR TRAFFIC

a. Whenever any building or other construction work is being carried on, or is located in close proximity to a road or any other place where any vehicular traffic may cause danger to building workers, it shall be ensured that such building or other construction work is barricaded and suitable warning signs and lights displayed or erected to prevent such danger and if necessary, a request in writing made to the concerned authorities to control such traffic;

b. All vehicles used at construction site shall comply with the requirements of the Motor Vehicles Act, 1988 (59 of 1988) and the Rules made hereunder;

c. The driver of a vehicle of any class or description operating at a construction site shall hold a valid driving license under the Motor Vehicles Act. 1988 (59 of 1988).

2.10. USE OF SAFETY BELT OR OTHER FALL ARREST SYSTEMS:

Wherever any work at a height of 3 m or more is carried out, use of a suitable fall arrest system is mandatory if the workplace has already not been provided with an otherwise reliable means of protection for preventing the fall of persons from that height, provided further that:

a. Safety belt, lanyard, life lines and devices for the attachment of such life lines shall conform to the approved standards;
b. Every building worker shall be supplied with safety belt and safety life lines for his protection and such building worker shall use such belts and life lines during the performance of his work;
c. All building workers using safety belt and safety life lines shall have the knowledge of safe use and maintenance of such belts and life lines and shall be supplied with necessary instructions for its use;
d. The responsible person for supervising the use of safety belts and safety lifelines shall inspect and ensure that such safety belts and lifelines are fit for use before taking them into use.

2.11. SAFETY NET AND ITS USE

a. Every safety net shall be of adequate strength, made of sound material and suitable for use and conform to the approved standards;
b. The responsible person for maintenance of safety nets and their use shall ensure safe fixing of such safety nets and provide such safety nets with suitable and sufficient anchorage so that the purposes for which such safety net is intended for use is served;
c. Use of multi-layer safety net to be ensured to avoid fall of material/objects.

2.12. STORAGE OF SAFETY BELTS AND NETS, ETC:

a. Proper arrangement shall be made for the safe storage of safety belts, safety lifelines and safety nets when they are not in use and are protected against mechanical damage, damages from chemicals and damages from biological agents.

2.13. SAFETY HELMETS AND SAFETY FOOTWEAR

a. The Engineer in-charge may declare whole or part of a site as the hardhat area and in such an eventuality it shall be the responsibility of the contractor to provide safety helmet of the approved quality to all personnel engaged in construction and erection work, including the visitors to the site;
b. Accordingly, wherever safety footwear is required for the safety of the personnel, the contractor shall provide the same of the approved type free of charge.

3.0 WELDING AND GAS CUTTING OPERATIONS

3.1 GAS WELDING:

3.1.1 GENERAL PROVISIONS:

a. All welders shall be provided with fire resistant protective clothing and equipment, such as fire resistant gauntlets and aprons, helmets and goggles with suitable filter lenses and its usage shall be ensured;
b. The welders shall not be allowed to wear clothing that is not free from grease, oil and other flammable material;
c. Adequate precautions shall be taken to protect persons working or passing near welding operations from dangerous sparks and radiation;
d. When welding or cutting is being done on materials containing toxic or harmful substances or liable to produce toxic or harmful fumes, adequate precautions shall be taken to protect workers from the fumes, either by
    i) Exhaust ventilation, or
    ii) Respiratory protective equipment;
    iii) Arrangement shall be made so that welding sparks do not fall down on the persons working below or material, which are combustible in nature and may be damaged with such sparks.
e. The oxygen pressure for welding shall always be high enough to prevent acetylene flowing back into the oxygen cylinder;
f. Acetylene shall not be used for welding at a pressure exceeding 1 atmosphere gauge;
g. Adequate precautions shall be taken to prevent:
    i) Fire being stated by sparks,
    ii) Slag or hot metal; and
    iii) Damage to fibre ropes from heat, sparks, slag or hot metal;
h. Precautions shall be taken to prevent flammable vapours and substances from entering the working area;

3.2. WELDING AT PLACES WITH FIRE RISKS:

a. Unless adequate precautions are taken, no welding or cutting operations shall be allowed near the place where combustible materials are stored, or near materials or plant where explosive or flammable dusts, gases or vapours are likely to be present or given off. If hot work permit system exists at the site, the same shall be followed;
b. Combustible materials and structures that cannot be removed from the vicinity of welding operations shall be shielded by asbestos or protected by other suitable means.

3.3. WELDING IN CONFINED SPACE:

When welding or cutting operations are being carried out in a confined space;

a. Adequate ventilation, by means of exhaust fans or forced drought as the condition may require, shall be constantly provided; otherwise enough quantity of air shall be flown in by means of compressors to dilute the pollutants;

b. No blow pipe shall be left unattended inside a tank or vessel or other confined space during meal break or other interruption of the work;
c. The worker shall take all necessary precautions to prevent unburned combustible gas or oxygen from escaping inside a tank or vessel or other confined space; and
d. When necessary to prevent danger, an attendant shall watch the welders from outside.

3.4. WELDING ON CONTAINERS FOR EXPLOSIVE OR FLAMMABLE SUBSTANCES:

Welding or cutting operations on containers in which they are explosives or flammable substances shall not be allowed;

i) Welding or cutting operations on any container that has held explosive or where flammable gases may have been generated, shall only be undertaken,
ii) After the container has been thoroughly cleansed by steam or other effective means; and
iii) Found by air tests to be completely free from combustible gases and vapours; or
iv) After the combustible gas in the container has been completely replaced by an inert gas or by water;
v) If an inert gas is used as laid down in clause 4.2.3, after the vessel has been filled with gas, the gas shall continue to flow slowly into it thorough out the welding or cutting operations;
vi) Before starting any welding operations on, or otherwise applying heat to, closed or jacketed containers or other hollow parts, such containers or parts shall be adequately vented in suitable manner.

3.5. GAS CYLINDERS

a. Gas cylinders shall be inspected, stored, handled and transported in conformity with the requirements of Gas Cylinders Rules, 1981;
b. When in use, cylinders shall be held in upright positions by straps, collars or chains;
c. Devices referred to in clause 6.2 shall be such that the cylinders can be rapidly removed in an emergency;
d. Welders shall not temper with or attempt to repair safety devices and valves on gas cylinders;
e. When acetylene cylinders are coupled, flash back arrestor shall be inserted between the cylinder and the coupler block, or between the coupler bock and the regulator;
f. Only acetylene cylinders or approximately equal pressure shall be coupled;
g. No gas shall be taken from a cylinder unless a pressure reducing regulator has been attached to the valve;
h. Only the right pressure reducing regulator shall be used for the gas in the cylinder;
i. Cylinder valves shall be kept free from gases, grease, oil, dusts and dirt;
j. Leaky cylinders charged with acetylene or liquefied fuel gas shall be taken into the open air at a safe distance from any open flame or sparks.

3.6 HOSE

a. Only hose especially designed for welding and cutting operations shall be used to connect an oxy-acetylene torch to gas outlet;
b. Hose lines for oxygen and for oxy-acetylene shall be of different colours and preferably of different size;
c. Hose connections shall be sufficiently light to withstand without leakage a pressure twice thee maximum delivery pressure of the pressure regulators in the system;

d. Care shall be taken that hose does not become kinked or tangled, stepped on or run-over or otherwise damaged;
e. Any length of hose in which a flashback has burned, shall be discarded;
f. No hose with more than one gas passage shall be used;
g. Only soapy water shall be used for testing hose for leaks.

3.7. TROCHES

a. When torches are being changed, the gases shall be shut off at the pressure reducing regulators and not by crimping hose;
b. Torches shall be lit with friction lighters or other safe source but not with matches.
c. Electric welding equipment:
d. Welding machines shall be controlled by a switch mounted on or near the machine framework that, when opened, immediately cuts off the power from all conductors supplying the machine;
e. Welding circuit shall be so designed as to prevent the transmission of high potential from the source of supply to the welding electrodes;
f. The maximum open circuit voltage shall be in accordance with Indian Standards;
g. Electrode conductors or cables shall not be excessive in length and shall not be longer that necessary to perform the work;
h. Return conductors shall be taken directly to work and securely connected mechanically and electrically to it or to the work bench, floor etc. and to an adjacent metallic object;
i. Cable shall be supported so as not to create dangerous obstruction;
j. Motors, generators, rectifiers and transformers in arc welding or cutting machines, and all current carrying parts, shall be protected against accidental contact with uninsulated live parts;
k. Ventilating slots in transformer enclosures shall be so designed that no live part is accessible through any slot;
l. Frames of arc welding machines shall be effectively earthed;
m. In hand-operated arc welding machines, cables and cable connectors used in arc welding circuits shall be effectively insulated on the supply side;
n. The outer surface electrode holders of hand-operated arc welding machines, including the jaw so far as practicable, shall be effectively insulated;
o. Electrode holders of hand-operated arc-welding machines shall, if practicable, be provided with discs or shields to protect the operator's hands from the heat of the arcs;
p. Only heavy-duty cable with unbroken insulation shall be used;
q. Circuit connections shall be waterproof;
r. When lengths of cable have to be joined, only insulated connectors shall be used on the earth line and the electrode holder line;
s. Connections to welding terminals shall be made at distribution boxes, socket outlets, etc. by bolted joints;
t. Welding terminals shall be adequately protected against accidental contact by enclosures, covers or other effective means;
u. Electrode holder shall
    i. Have adequate current capacity;
    ii. Be adequately insulated to prevent shock, short-circuiting or flashovers.

3.8. OPERATIONS

a. Arc welding and cutting operations that are carried on at places where persons other than the welders are working or passing shall be enclosed by means of suitable stationary or mobile screens;
b. Walls and screens of both permanent and temporary protective enclosures shall be provided to absorb harmful rays from the welding equipment and prevent reflection, and if necessary, be painted or otherwise treated for the purpose;
c. When arc welding is done in damp confined spaces;
    i) Electrode holders shall be completely insulated; and
    ii) The welding machines shall be outside the confined space;
d. Welders shall take adequate precautions
    i) To prevent any part of their body from completing an electric circuit
    ii) To prevent contact between any part of the body and the exposed part of the electrode, or electrode when in contact with metal; and
    iii) To prevent wet or damaged clothing, gloves and boots from touching any live part;
e. Welding circuits shall be switched off when not in use;
f. Electrodes shall only be inserted in the holder with insulating means such as insulating gloves;
g. Electrode and return leads shall be adequately protected against damage;
h. Live parts of electrode holders shall be inaccessible when they are not in use;
i. Electric arc-welding equipment shall not be left unattended with current switched on.

4.0 SAFETY IN THE USE OF ELECTRICITY

4.1. GENERAL PROVISIONS

a. Before commencement of any building or other construction work, adequate measures shall be taken to prevent any worker from coming into physical contact with any electrical equipment or apparatus, machines or live electrical circuit which may cause electrical hazard during the course of his employment and suitable warning signs shall be displayed and maintained at conspicuous places in Hindi and in local language understood by the majority of the building workers;

b. In workplaces where the exact location of underground electric power line is not known, the building workers using jack hammers, crow bars or other hand tools which may come in contact with a live electrical line shall be provided with approved insulated protective gloves and footwear;

c. As far as practicable, no wiring or cable, which may come in contact with water or which may be mechanically damaged or which may result in electric shock shall be left on ground or;

d. All electrical appliances and current carrying equipment used shall be made of sound material and adequately earthed;

e. All temporary electrical installations shall be provided with earth leakage circuit breakers;

f. It is required that all portable power-driven hand tools are provided with double insulation to secure a high degree of protection from electrical hazards;

g. Electrical installations shall comply with the requirements of any law for the time being in force, especially the Indian Electricity Act/Rules in particular with specific reference to the following:

   i) All parts of installations shall be of standard construction not lower, from the safety point of view, than the national standards, as applicable. All parts of electrical installations shall be so constructed, installed and maintained so as to prevent electrical fires, explosion and shock;

   ii) Earthing of metal work of electrical equipment, other than the parts which carry current, shall be provided and will conform to Electricity Act and IS: 3042 – 1966 (code of practice for earthing);

h. All parts of electrical installation shall be adequate size and characteristics for the work they may be called upon to do and in particular they shall:

   i) Be of adequate mechanical strength to withstand working conditions in construction operations; and

   ii) Be not liable to damage by water, dust or electrical, thermal or chemical action to which they me subjected to in construction operations;

i. All parts of electrical installations shall be so constructed, installed and maintained as to prevent the danger of electric shock; fire and external explosion;

j. It shall be made impossible for circuit breakers to be opened or closed inadvertently, by gravity or by mechanical impact;

k. Before operation of OCBs, oil level must be checked and the event of short, extra quantity must be filled;

l. Use of rubber gloves and rubber gum boots of tested quality where electric shock is likely to occur shall be provided, but these shall not be considered as providing adequate protection against the risk of electric shock in lieu of inbuilt safety arrangement in the system;

m. First-aid boxes, instruction for restoration of persons affected by electric shock shall be made;

n. Arrangement shall be made for sufficient number of CO_2/chemical powder type fire extinguishers/sand buckets etc.;

o. No electrical circuits shall ever be overloaded to the dangerous extent or beyond the rated capacity;

p. In confined areas, only 24 volt supply shall be used for every equipment, including hand-held portable tools and hand lamps;

q. All electrical appliances and outlets shall be clearly marked to indicate their purpose and voltage.

4.2. FUSES

a. Fuses shall bear markings indicating their rated current, whether they are of the fast or slow-breaking type and, as far as practicable, and their rated breaking capacity. Fuses as per need and of correct rating shall be used in the circuit;
b. Effective measures shall be taken to ensure that persons removing or inserting fuses will not be endangered, in particular by any adjacent live parts;
c. In case of blow of fuses only after finding out and correcting of the fault, new fuses shall be provided in the circuit.

4.3. SWITCHES

a. All switches shall be of enclosed type and so installed and earthed as to prevent danger in their operation;
b. Use of switches, which may connect or disconnect circuit through gravity, shall not be used.

4.4. MOTORS

a. All motors shall be equipped with a switch;
b. When a motor can be cut off from more than one place, where practicable, a stopping device shall be installed in the immediate vicinity of the motor;
c. Motors shall be so installed as to ensure that they can be adequately cooled;
d. Motors shall be effectively protected against over current;
e. Whenever the motors installed are in the open area where there is the possibility of fall of liquid corrosives or otherwise, it shall be suitably protected with covering;
f. Earthing shall be connected to all motors, generators etc. as prescribed in the Indian Electricity Rules, amended from time to time.

4.5. CONNECTIONS

a. At points where conductors are joined, branched or led into apparatus, they shall be:
    i. Mechanically protected, and
    ii. Properly maintained;

b. Conductors shall be joined, branched or led into an apparatus through junction boxes, bushings, glands or equivalent connecting devices;

c. Junction boxes or plug-out-socket couplings shall be used for joining cables wherever practicable;

d. When parts of conductors are joined together, or conductors are joined to one another or to an apparatus, the attachment shall be made by screwing, clamping, soldering, riveting, brazing, crimping, or equivalent means. Loose connections shall not be provided in any case;

e. Cable joints, junction boxes and connectors shall be protected as far as practicable, against traffic, fall of ground, water and other sources of damage;

f. Whenever armoured cables are joined, the junction boxes shall be bridged by a suitably conducive bond between the armouring of the cables.

4.6. TRANSPORTABLE AND PORTABLE ELECTRICAL EQUIPMENT:

a. The supply of electricity to portable apparatus shall not exceed 250v;

b. Hand-held and portable machines shall be equipped with a built-in switch to switch off power in case of emergency;

c. Hand-held electrically operated tools shall be provided with built-in switch to disconnect the circuit when the tool is not being used;

d. Portable electrical tools, unless flameproof, shall not be used in flammable or explosive atmosphere;

e. Only three-core cable shall be used for single-phase operated tools with the third core connected to earth

4.7. HAND LAMPS

a. Hand lamps shall be equipped with strong cover of glass or other transparent material;

b. Portable lamp holders shall have:

   i) All current –carrying part s enclosed;

   ii) Insulated handle; and

   iii) They shall operate at 24 v;

4.8. INSPECTION, MAINTENANCE

a. All electrical equipment shall be inspected before it is taken into use to ensure that it is suitable for its purpose of use;

b. At the beginning of every shift every person using electrical equipment shall make a careful external examination of the equipment and conductors for which he is responsible, especially flexible cables;

c. Periodic inspections, testing, maintenance of all electrical equipment is to be made and record of test of transformer oil and pit earthing shall be maintained;

d. Electrical conductors and equipment shall be repaired by the electrician only as far as practicable, no work shall be done live conductors or equipment;

e. Before any work is begun on conductors or equipment that does not have to remain live;

   i) The current shall be switched off;

   ii) Adequate precautions shall be taken to prevent the current from being switched on again;

   iii) The conductors or the equipment shall be tested to ascertain that they are dead;

   iv) The conductor and equipment shall be earthed and short-circuited; and

   v) Neighbouring live parts shall be adequately protected against accidental contact;

f. After work on conductors and equipment, the current shall only be switched on again on the orders of a competent person;

g. Electricians shall be provided with adequate tools, and person protective equipment, such as rubber gloves, mats etc.;

h. All conductors and equipment shall be considered to live unless there is certain proof to the contrary.

4.9. WORK IN THE VICINITY OF ELECTRICAL INSTALLATION

a. When work is to be done in the neighborhood of electrical conductors or installations, the contractor shall ascertain the voltage carried and the works shall not be allowed to reach to unsafe distance from them;
b. When any excavation is to be made or any bore-holed sunk, the contractor shall ascertain whether there are any underground conductors, in or in dangerous proximity to, the zone of operations;
c. No work shall be done in dangerous proximity to a conductor or an installation until it has been made dead;
d. Before work begins, work permit shall be obtained from the Engineer in-charge if live electricity lines/circuit are passing in close vicinity;
e. Before the current is restored, the contractor shall ensure that no work remain on the work site;
f. If conductor or an installation in the neighbourhood of which work is io be done can not be made dead, special precautions shall be taken and special instructions given to the workers so as to prevent danger by adequately enclosing or fencing;
g. If mobile equipment has to be employed in the neighbourhood of conductors or installations that cannot be made dead, its movement shall be so controlled as to keep it as a safe distance from them.

5.0 SAFETY IN THE USE OF HAND TOOLS AND POWER-OPERATED TOOLS

5.1 GENERAL PROVISIONS

a. All hands and power tools and similar equipment, shall be maintained in safe condition.

b. When power operated tools are designed to accommodate guards, they shall be equipped with such guards, when in use;

c. Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains and other reciprocating, rotating or moving parts of the equipment shall be similarly guarded;

d. Personnel using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapours, or gases shall be provided with the particular personal protective equipment necessary to protect them from the hazards;

e. All hand-held powered platen sanders, grinders, grinders with wheels of 5 cm or less, routers, planers, laminate trimmers, nibblers, shears, scroll saws and jigsaws with blade shanks of 0.5 cm wide or less shall be equipped with only a positive **on-off control**.

f. All hand-held powered drills, tappers, fastener drivers, horizontal, vertical or angle grinders with wheels greater than 5 cm in diameter, disc sanders, belt sanders, reciprocating saws, saber saws and other operating powered tools shall be equipped with a momentary contact on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.

5.2. HAND TOOLS

a. The contractor shall not issue or permit the use of unsafe hand tools;

b. Wrenches including adjustable pipe end and socket wrenches shall not be used when saws are sprung to the point that slippage occurs;

c. Impact tools such as drift pins, wedges and chisels shall be kept free of mushroomed heads;

d. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight on the tools.

5.3. POWER OPERATED TOOLS

a. Electric power operated tools shall be either of the approved double-insulated type or shall be grounded;

b. The use of electric cords for hoisting or lowering loads shall not be permitted;

c. Pneumatic power tools shall be secured to the hose or whip by some positive means to prevent the tool from becoming accidentally disconnected;

d. Safety clips or retainers shall be securely installed or maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled;

e. All pneumatically riveting machine staplers and other similar equipment provided with automatic fastener feed, which operate at more than 7 kg/cm^2 pressure at the tool a safety device on the

muzzle to prevent the tool from ejecting the fasteners unless the muzzle is in contact with the work surface;

f. Compressed air shall not be used for cleaning purposes except when the pressure is reduced to less than 2 kg/cm^2 and that too with effective chip guarding. The 2 kg/cm2 pressure requirement does not apply to concrete form, mill scale and similar cleaning purposes;

g. The manufacturer's safe operating for hoses, pipes, valves, filters and other fittings shall not be exceeded;

h. Only personnel who has been trained in the operation of the particular tool shall be allowed to operate power-actuated tools;

i. The tool shall be tested each day before loading to see that the safety devices are in proper working condition. The method of testing shall be accordance with the manufacturer's recommended procedure;

j. Any tool found not in proper working order, or that which develops a defect during use, shall be immediately removed from service and not used until properly repaired;

k. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any other person. Hands shall be kept clear of the open barrel end;

l. Loaded tools shall not be left unattended;

m. Fasteners shall not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tiles, surface hardened steel, glass block, live rock, face brick or hollow tiles;

n. Driving into materials that can be easily penetrated shall be avoided unless backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying missile hazard on the other side;

o. No fastener shall be driven into a palled area caused by an unsatisfactory fastening;

p. Only non-sparking tools shall be used in an explosive or flammable atmosphere;

q. All tools shall be used with the correct shield, guard or attachment as recommended by thee manufacturer.

5.4. ABRASIVE WHEELS AND TOOLS

a. All grinding machines shall be supplied with sufficient power to maintain the spindle speed at safe levels under all conditions of normal operation;

b. Grinding machines shall be equipped with suitable safety guards;

c. The maximum angular exposure of the grinding wheel periphery and sides shall not be more than 90^0, except that when the work requires contact with the wheel below the horizontal plane of the spindle, the angular exposure shall not exceed 120^0. In either case, the exposure shall begin not more than 65^0 above the horizontal plane of the spindle. Safety guards shall be strong enough to withstand the bursting of the wheel;

d. Floor and bench-mounted grinders shall be work-rests, which shall be rigidly supported and readily adjustable. Such work-rests shall be kept at a distance not to exceed 5 mm from the surface of the wheel;

e. Cup type wheels used for external grinding shall be protected by either revolving cup guard or a band type guard;

f. When safety guards are required, they shall be mounted as to maintain proper alignment with the wheel and the guard and the guard and its fastening shall be adequate strength to retain the fragments of the wheel in case of accidental breakage. The maximum angular exposure of the grinding wheel periphery and sides shall not exceed 180^0;

g. Portable abrasive wheel used for internal grinding shall be provided with suitable safety flanges;

h. When safety flanges are required, they shall be used only with wheels designed to fit the flanges. Only safety flanges, of a type and design and properly assembled so as to ensure that the pieces of the wheel will be retained in case of accidental breakage, shall be used;

i. All abrasive wheels shall be closely inspected and ring tested before mounting to ensure that they are free from cracks or defects;

j. Grinding wheels shall fit freely on the spindle and shall not be forced on. The spindle nut shall be tightened only enough to hold the wheel in place;

k. All employees using abrasive wheels shall be protected by suitable eye protection equipment.

5.5. WOODWORKING TOOLS

a. All fixed power driven woodworking tools shall be provided with a disconnect switch that can either be locked or tagged in the **off-position**;

b. The operating speed shall be attached or otherwise permanently marked on all circular saws over 0.5 m in diameter or operating at over 3000 peripheral rpm. Any saw so marked shall not be operated at a speed other than that marked on the blade. When a marked saw is retensioned for a different speed, the marking shall be corrected to show the new speed;

c. Automatic feeding devices shall be installed on machines wherever the nature of the work will permit. Feeder attachments shall have the feed rolls or other moving parts covered or guarded so as to protect the operator from hazardous points;

d. All portable power driven circular saws shall be equipped with guards above and below the base plate or shoe. The upper guard shall cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts. The lower guard shall cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work. When the tool is withdrawn from the work, the lower guard shall automatically and instantly return to the covering position.

6.0 SAFETY IN THE USE OF LADDERS AND STAIRS

6.1. GENERAL ASPECTS OF SAFETY RELATED TO USE OF LADDERS

a. Every ladder or step-ladder used in building or other construction work shall be of good construction, made of sound material and of adequate strength for the purpose for which such ladder or step-ladder is used;
b. When a ladder is used as a means of communication, such ladder shall be lashed to a fixed structure so that while working on such ladder it does not slip;
c. A ladder or step ladder shall not stand on loose bricks or other loose packing and have a level and firm footing;
d. No ladder shall be used which has a missing or defective rungs or rungs, which depend for support solely on nails, spikes or other similar fixing.

6.2. MATERIALS FOR LADDERS

a. Shall be constructed with upright of adequate strength and are made of straight-grained wood, free from defects and having the grain of such wood running length wise;

b. Shall have rungs made of straight-grained wood free for defects and mortised or securely notched into the upright, reinforcing metal ties, if wedges shall not secure the tenors of such ladders;

c. Where it is required, in case of use of fixed ladders, sufficient foot-hold and hand-hold shall be provided for use by the building worker;

d. Every ladder shall be -

    i. Secured so as to prevent undue swaying;
    ii. Equally and properly supported on each of its upright;
    iii. So used as not to cause undue sagging; and
    iv. Placed as nearly as possible at an inclination of four in one;

e. The use of all ladders and stepladders shall conform to the approved standards;
f. Wooden ladders shall be constructed with uprights of adequate strength as well as rungs made of wood free from visible defects and having the grains of the wood in the ladders running lengthwise and rungs mortised or rebutted into the uprights;
g. Uprights and rungs of metal ladders shall have a cross-section adequate to prevent dangerous deflection, shall be equal and not less than 25 cm or more than 35 cm;
h. Rungs of metal ladders shall be kept clean so as to prevent them from becoming slippery;
i. Portable ladders shall not exceed 9 m in length;
j. Every ladder or run of ladders rising to a height exceeding 9 m shall be provided with an intermediate landing, providing further that the intervals between landings shall not exceed 9 m. The landings shall be of suitable size and protected by railings;
k. Defective ladders that cannot be satisfactorily repaired shall be tagged Not Fit For Use and destroyed;
l. Wooden ladders shall not be painted, but oiled or covered with clean varnish or other transparent preservatives;
m. Metal ladders shall be protected against corrosion by being coated with rust-proof paint or by other means unless they are made of non-corrosive metals;

n. Every ladder shall rise at least 1 m above the highest point to be reached and have one of the uprights continued to that height to serve as a hand-rail at the top;
o. Ladders shall not stand on loose bricks or other loose packing but have a level and firm footing so that they are equally supported on each upright;
p. Every ladder shall be securely fixed so that it cannot move from its top and bottom points of rest and if it cannot be secured at the top, it shall be securely fastened at the base and if fastening at the top is also impracticable, it shall have a man stationed at the foot holding the end to prevent it from slipping;
q. Where a run of two or more ladders connects different floors, the ladders shall be staggered and a protective landing with the smallest practicable opening shall be provided at each floor;
r. A ladder having only one upright or a missing or dangerously defective rung shall not be used;
s. When a ladder is placed in position, the distance between the foot of a ladder and the base of the structure against which it rests shall be about one-quarter of its length;
t. Workers using ladders shall leave at least one hand free for climbing up and down, face the ladder, avoid wearing slippery footwear and avoid carrying heavy or bulky loads;
u. A ladder shall not be placed in front of a door that opens towards it unless the door is fastened or locked or guarded;
v. A ladder shall not be placed against a window frame unless the ladder is fitted with a board at the top so that the applied load is safely distributed over the frame;
w. Metal ladders shall not be used in the vicinity of live electrical equipment;
x. Adequate means shall be provided to prevent displacement of the ladder set up in public thoroughfare or where persons, vehicles etc. may accidentally collide with it.

6.3. PORTABLE STEPLADDERS

a. The length of portable stepladders shall not exceed 6 m and their back legs shall be adequately braced;
b. Stepladders exceeding 1.5 m in length shall have two or more cross-ties;
c. The spread between the front and back legs shall be restricted by means of hinged metal flat bars or high-grade fibre or other effective means;
d. When in the open position, treads of stepladders shall be horizontal.

6.4. PORTABLE TRESTLE LADDERS

a. The height of the trestle ladders shall not exceed 5.5 m;
b. The spread between the front and back legs shall be restricted by means of hinged metal flat bars or high-grade fibre or other effective means;
c. The front and back legs shall be joined at the top by bolted steel hinges of adequate dimensions or other effective means;
d. Both legs of trestle ladders shall be equipped with sufficient number of steel crossties.

6.5. EXTENSION LADDERS

a. The length of extension ladders shall not exceed 15 m;
b. Extension ladders shall be equipped with an effective lock and guide brackets by which the ladder can be extended, retracted or locked in any position;

c. The rungs of overlapping sections shall coincide so as to form double treads and shall be equipped with one or more extension ropes;
d. Extension ropes shall be securely anchored and run over suitable pulleys.

6.6 MECHANICAL LADDERS

a. Mechanical ladder is that ladder, which is a mechanically extendable ladder, mounted on a wheeled frame;
b. Mechanical ladder shall be equipped with guard-rails and toe-boards and a cage of heavy-gauge steel mesh;
c. If mechanical ladder has no railed platform or cage, workers using it shall be secured by suitable safety belt;
d. Mechanical ladders shall not be moved, while a person is on them, unless they have specially designed to ensure that perfect stability is maintained during movement.

6.7. FIXED LADDERS

a. Uprights of fixed ladders shall be at least 40 cm and shall be set an angle of 15^0 to the vertical;
b. Clearance at the back of the rungs shall be at least 15 cm and no obstruction within 75 cm of the face of the ladder;
c. There shall be at least 7.5 cm clearance between the ladder and the nearest fixed object;
d. When it is necessary for a ladder to pass closely through a hole in a platform or a floor, the edges of the hole shall be padded so as to prevent injury to the users;
e. The length of the runs of fixed ladder shall not exceed 9 m;
f. Landing platform shall be provided for each 9 m or fraction thereof;
g. As far as practicable, runs shall be staggered;
h. Runs from which a person could fall from more than 6 m shall be enclosed in a cage of heavy-gauge mesh or hoops;
i. Fixed ladders shall be firmly bolted or welded in position.

6.8. STAIRS

a. Stairs shall be of adequate strength to withstand safely the loads that they will have to carry;
b. Stairs used for the purpose of construction work shall have a clear width of at least 60 cm;
c. Stairs made of perforated material shall not have openings exceeding 1.2 cm in width;
d. No step of a stairway shall depend for its support solely on nails, spikes, screws or other similar fixing;
e. No stairway with missing or dangerously defective steps shall be used;
f. Every stairway that is at an angle of less than 30^0 from the vertical shall be provided with a secure handhold at the top landing place, either by extending one upright for at least 1 m or by other effective means;
g. Movable and removable stairs shall be adequately secured in the position of use;
h. In all building structures permanent stairs shall be constructed as soon as practicable;
i. When work on a building has progressed to a height of more than 18 m above the ground and it has not been practical to construct the permanent stairs, sufficient number of stairs shall be provided to ensure safe access to the working levels.

7.0 SAFETY IN THE USE OF LIFTING APPLIANCES & GEARS

7.1. CONSTRUCTION AND MAINTENANCE OF LIFTING APPLIANCES:

All lifting appliances, including their parts and working gear, whether fixed or movable, and any plant or gear used in anchoring or fixing of such appliances -

a. Shall be of sound construction, sound material, and of adequate strength to serve the purpose for which these are to be used and all such appliances shall be free from patent defects, and
b. Maintained in good repair and working condition;
c. Every drum or pulley around which the rope of any lifting appliance is carried, shall be of adequate diameter and sound construction in relation to such rope;
    i. Any rope that terminates at the winding drum of lifting appliance shall be securely attached to such drum and at least three dead turns of such rope remain on such drum in every operating position of such lifting appliance;
    ii. The flange of a drum projects twice the rope diameter beyond the last layer of such rope and if such rope and if such projection is not available, other measures like anti-slackness guards shall be provided to prevent such rope from coming off such drum;
d. Every lifting appliance shall be provided with adequate and efficient brakes which shall be:
    i) Capable of preventing fall of suspended load (including any test load),
    ii) Effectively controlling such load while it is being lowered, acting without shock and shall be attached with shoes that can be easily removed for running and which shall be simple and have easily accessible means of adjustment;
e. Provided that nothing contained above shall apply to **steam-winch** that can be operated as safely as with brakes.

7.2. CONTROLS OF EVERY LIFTING APPLIANCE SHALL BE SO;

a. Situated that the driver of such appliance at his stand or seat has ample room for operating and has an unrestricted view of building or other construction work, as far as practicable, and that he remains clear of the load and the ropes, and that no load passes over him;
b. Positioned with due regard to ergonomic considerations for proper operation of such appliance;
c. Located that the driver of such appliance remains above the appliance and shall have upon them or adjacent to them clear markings to indicate their purpose and mode of operations;
d. Provided, where necessary, with a suitable locking device to prevent accidental movement or displacement and shall move, as far as practicable, in the direction of the resultant load movement;
e. Wherever automatic brakes are provided, they shall automatically come to the neutral position in case of power failure.

7.3. TEST AND PERIODICAL EXAMINATION

7.3.1 Test: all lifting appliances including all parts and gears thereof, whether fixed or movable, shall be tested and examined by a competent person before being taken into use for the first time or after it

has undergone any alteration or repairs liable to affect its strength or stability or after erection on a site and also once at least in every five years, in the manner as specified;

7.3.2. Examination: all lifting appliances shall be thoroughly examined by a competent person at least in every twelve months and where the competent person making such examination forms the opinion that the lifting appliance cannot continue to function safely, he shall forthwith give notice in writing of his opinion to the contractor.

7.4. AUTOMATIC LOAD INDICATOR

a. Cut-out shall be provided which automatically arrests the movement of the lifting parts of every crane if the load exceeds the safe working load, wherever possible;

b. Wherever the above provisions cannot be applied and if it is not possible to install an automatic safe load indicator, in that case, provision of a table showing the safe working loads at the corresponding inclinations or radii of the jib on the crane shall be considered sufficient.

7.5. INSTALLATION:

Fixed lifting appliances shall be installed by a competent person in a manner that

a. Such appliances cannot be displaced by the load, vibration or other influences;

b. The operator of such appliance is not exposed to danger from loads, ropes or drums;

c. The operator can either see over the zone of operation or communicate with all loading and unloading points by signal, or other communication system;

d. Adequate clearance is provided between parts or loads of lifting appliances and between the fixed objects such as walls and posts, or electrical conductors;

e. The lifting appliances; when exposed to wind loading, are given sufficient additional strength, stability and rigidity to withstand such loading safely;

f. No structural alterations or repairs are made on any part of the lifting appliances that affect the safety of such appliances without obtaining the opinion of the competent person to this effect.

7.6. WINCHES

a. Winches shall not be used if their control levers operate with excessive friction or play;

b. Double gear winches shall not be used unless a positive means of locking the gearshift is provided;

c. There shall be no load other than the fall and the hook assembly on the winch while changing gears on a two-gear winch;

d. Adequate protection shall be provided to the winch operator against abnormal weather;

e. Temporary seats or shelters for winch operators that may pose hazard to the winch operator or any other building workers shall not be allowed to be used;

f. Control levers shall be secured in the neutral position and, whenever possible, the power shall shut off if the winch is left unattended.

7.7. IN USE OF EVERY STEAM-WINCH

a. Measures shall be taken to prevent escaping steam from obscuring any part of the construction site or other workplace or from otherwise hindering or injuring any building worker;

b. Extension control levers which tend to fall off their own weight shall be counter-balanced;

c. Winch operators shall not be permitted to use the which control extension levers except for short handles on wheel type controls and that such levers shall be of adequate strength, secure and fastened with metal connections at the fulcrum and at the permanent control lever;

d. In use of every electric winch, no building worker shall be permitted to transfer, alter or adjust electric control circuits in case of any defect in such winch;

7.8. ELECTRIC WINCHES SHALL NOT BE USED FOR BUILDING WORK WHERE

a. The electromagnetic brake is unable to hold the load; or

b. One or more control points either hoisting or lowering are not operating properly.

7.9. BUCKETS:

It shall be ensured that tip-up buckets are equipped with a device that effectively prevents accidental tipping.

7.10. IDENTIFICATION AND MARKING OF SAFE WORKING LOAD:

a. Every lifting appliance and loose gear shall be clearly marked for its safe working load and identification by stamping or other suitable means;

b. Every derrick (**other than derrick crane**) shall be clearly marked for its safe working load when such derrick is used either in single purchase with lower block or in union purchases in all possible block positions;

c. The lowest angle to the horizontal, to which the derrick may be used, shall be legibly marked;

d. Every lifting appliance having more than one working load shall be fitted with effective means to enable the operator to determine safe working load at each point under all conditions of use;

e. Means to ascertain the safe working load for lifting gears under such conditions in which such gears may be used shall be provided to enable a worker using such gears and such means safely, which shall comprise:

   i) Marking of the safe working load in plain figures or letters upon the sling or upon a tablet or ring of durable material attached securely thereto in case of chain slings; and

ii) The means specified or notices so exhibited as can be easily read by any concerned building worker stating the safe working load for the various sizes of the wire rope slings used.

7.11 LOADING OF LIFTING APPLIANCES AND LIFTING GEARS

a. No lifting appliance, lifting gear or wire rope shall be used in an unsafe way and in such a manner as to involve risk to life of building workers and they are not loaded beyond their safe working load except for testing purposes under the direction of a **competent person** in the manner as specified in schedule;

b. No lifting appliance and lifting gear, or any other material-handling appliance shall be used if the Inspector having jurisdiction under the Building and Other construction (regulation of employment and conditions of service) Act/Rules is not satisfied with reference to a certificate of test or examination or to an authenticated record maintained as provided under the Rules or if in his view the lifting appliance, lifting gear or any other material handling appliance is not safe for use in building or other construction work;

c. No pulley block shall be used unless the safe working load and its identification are clearly marked on such block.

7.12. OPERATOR'S CAB OR CABIN SHALL

a. Be made of fire resistant material;

b. Have a suitable seat, a foot rest and protection from vibration;

c. Afford the operator an adequate view of the area of operation**;**

d. Afford the necessary access to working parts in the cab;

e. Afford the operator adequate protection against the weather;

f. Be adequately ventilated; and

g. Be provided with a suitable fire extinguisher.

7.13. OPERATION OF LIFTING APPLIANCES:

Operator of every crane or lifting appliance shall possess adequate skill and training in the operation of the particular lifting appliances, provided further that

a. No person under eighteen years of age shall be in control of any lifting machine, scaffold winch, or give signals to the operator;

b. Precaution shall be taken by the trained operator to prevent lifting appliance from being set in motion inadvertently;

c. The operation of lifting appliances shall be governed by signals in conformity with the approved standards;

d. The operator's attention shall not be distracted while he is working;

e. No crane, hoist, winch or other lifting appliance or any part of such crane, hoist, winch or other lifting appliance shall, except for testing purposes, be loaded beyond the safe working load;

f. During the hoisting operation, effective precaution shall be taken to prevent any person from standing or passing under the load in such operation;

g. Operator shall not leave lifting appliance unattended while power is on or the load is suspended to such appliance;

h. No person shall ride on a suspended load of any lifting appliance;

i. Every part of a load in course of being hoisted or lowered shall bee adequately suspended and supported to prevent danger;

j. Every receptacle used for hoisting bricks, tiles, slates or other material shall be suitably enclosed as to prevent the fall of any such material;

k. The hoisting platform shall be enclosed when loose material or loaded wheel barrows are placed directly on such platform or lowering such materials or wheel barrows;

l. No material shall be raised, lowered or slewed with any lifting appliance in such a way as to cause sudden jerks to such appliance;

m. In hoisting a barrow, any wheel of such barrow shall not used be as a means of support unless adequate steps have been taken to prevent the axle of such wheel from slipping out of its bearing;

n. Long objects like planks or girders shall be provided with tag line to prevent any possibility of danger while raising or lowering such objects;

o. During the process of landing or material, a building worker shall not be permitted to lean out into empty space for finding out the loading and unloading of such material;

p. When hoisting of load is done in an enclosed space, neither the lifting material nor the boom shall project outside the enclosed space;

q. Adequate steps shall be taken to prevent a load, in the course of being hoisted or lowered from coming into contact with any object to avoid any displacement of such load and appropriate appliances provided and used for guiding heavy loads when raising or lowering heavy loads to avoid crushing of hands of building workers during such raising or lowering of loads.

7.14. HOISTS

a. Hoist towers shall be designed according to the relevant national standards;

b. Hoist shafts shall be provided with rigid panels or other adequate fencing at the ground level on all sides of such shafts and at all other levels on all sides of the access to such shafts while the walls of hoist shafts, except at approaches, extend at least two meters above the floor or platform of access to such shifts;

c. Approaches to hoist shall be adequately lit and provided with gates that shall be guarded to maintain visibility at least of two meters height; and equipped with a device, which requires such gate to be closed before the platform of such hoist can leave the landing, and prevents the gate from being opened unless such platform is at the landing;

d. The guides of hoist platforms shall offer sufficient resistance to bending and to bucking in the case of jamming, by providing a safety catch;

e. Overhead beams and their supports are capable of holding the total maximum live and dead loads that such beams and supports will be required to carry, with a safety factor of at least five;

f. A clear space shall be provided –

   i. Above the highest stopping place of a cage or platform to allow sufficient unobstructed travel of such cage or platform in case of over-winding and

   ii. Below the lowest stopping place of such cage or platform;

g. Adequate covering shall be provided above the top of hoist shafts to prevent materials from falling into such shifts;

h. Outdoor hoist towers shall be erected on adequately firm foundations and securely braced, guyed and anchored;

i. A ladder way shall extend from the bottom to the top of every outdoor hoist tower in case no other ladder way exists within easy reach and such ladder way shall comply with the relevant national standards;

j. The rated capacity of a hoisting engine shall at least be one and a half times the maximum load that such engine will be required to move;

k. All gearing on a hoisting engine shall be securely enclosed;

l. Steam piping of hoisting engine shall be adequately protected against accidental contact of such piping with a building worker;

m. Electrical equipment of a hoisting engine shall be effectively earthed;

n. A hoist shall be provided with suitable devices to stop a hoisting engine as soon as the platform of such hoist reaches its highest stopping place;

o. A hoisting engine shall be protected by suitable cover against weather and falling objects;

p. A hoisting engine set up in a public thoroughfare shall be completely enclosed;

q. All exhaust steam pipes shall discharge steam in such a manner that the steam so discharged does not scald any person or obstruct the operator's view;

r. The motion of a hoist shall not be reversed without first bringing it to rest to avoid any harm from such reverse motion;

s. A hoist not designed for the conveyance of persons shall not be set in motion from the platform of such hoist;

t. Pawls and ratchet wheels of a hoist, requiring disengagement of such pawls from such ratchet wheels, before the platform of such hoist is lowered, shall not be used;

u. A platform of a hoist shall be capable of supporting such maximum load that such platform may carry with a safety factor of at least three;

v. A platform of a hoist shall be equipped with suitable safety gear which can hold such platform with its maximum load in case its hoisting rope breaks;

w. On platform of a hoist, the wheel barrows or truck shall be efficiently blocked in safe positions;

x. A cage of a hoist or platform where the building workers are required to enter into such cage or to go on such platform at landing levels, shall be provided with a locking arrangement to prevent such cage or platform from moving during the time a worker enters or leaves such cage or platform;

y. The sides of platform of a hoist which are not used for loading or unloading, shall be provided with toe-board and enclosures of a wire mesh or any other suitable means to prevent the fall of any part of a load from such platform, further provided that

   i. The platform of a hoist, which has any probability of falling of any part of a load from it, shall be provided with an adequate covering to prevent such fall;

   ii. The counter weights of a hoist consisting of an assemblage of several parts shall be so constructed that such parts shall be rigidly connected together;

   iii. The counter weights of a hoist shall run between guides;

   iv. At every level of work the building workers shall be provided with adequate platforms for performing such work;

   v. A legible notice in Hindi as well as in a local language shall be displayed in a conspicuous place of the platform of a hoist and that such notice shall state the maximum carrying capacity of such hoist in kilograms on the hoisting engine;

   vi. On a hoist authorized and certified for the conveyance of the persons on the platform or in the cage and such notice shall state the maximum number of persons to be carried on such hoist at one time;

   vii. On a hoist carrying goods and other materials such notice shall state that such hoist is not meant for carriage of persons.

7.15. FENCING AND MEANS OF ACCESS TO LIFTING APPLIANCES

a. Safe means of access shall be provided to every part of lifting appliances;

b. The operator's platform on every crane or tip driven by mechanical power shall be securely fenced and provided with safe means of access and where access to such platform is by a ladder, the sides of such ladder shall extend to a height reasonable beyond such platform or some other suitable handhold shall be provided in the platform;

c. The handling place on such platform shall be maintained free from obstruction and slipping; and

d. In case the height of such ladder exceeds six meters, the resting platforms shall be provided on such ladder at every six meters of its height and where the distance between last platform so provided and the top end of such ladder is more than two meters then on such top end.

7.16. RIGGING OF DERRICKS:

Every derrick shall have current and relevant rigging plans and any other information necessary for the safe rigging of such derrick and its gear.

7.17. SECURING OF DERRICK FOOT:

Appropriate measures shall be taken to prevent the foot of a derrick from being lifted out of its socket or supports.

7.18. CONSTRUCTION AND MAINTENANCE OF LIFTING GEAR

a. Every lifting gear shall be –

i. of good design and construction, sound material and adequate strength to perform the work for which it is used;

ii. free from patent defects; and

iii. properly maintained in good repair and working order;

b. Components of the loose gear, at the time of its use, shall be renewed if one of its dimensions at any point has decreased by ten per cent or more;

c. A chain shall be withdrawn from use when it is stretched and increased in length which exceeds five per cent of its length or when a link of such chain is deformed or is otherwise damaged or defects in the welds have appeared on it;

d. Rings, hooks, swivels and end links attached to a chain shall be of the same materials as that of such chain;

e. The voltage of electric supply to any magnetic lifting device shall not fluctuate by more than **plus** or **minus** 10%.

7.19. TEST AND PERIODICAL EXAMINATION OF LIFTING GEARS

a. A lifting gear shall be initially tested for the manufacturer by a competent person in a manner specified as per schedule annexed before taking into use or after undergoing any substantive alterations which renders its any part liable to affect its safety and such gear alter such test shall subsequently be retested for the use of its owner at least once in every five years;

b. A lifting gear in use shall thoroughly examined once at least in every twelve months by a competent person;

c. A chain in use shall be thoroughly examined at least once every month by a responsible person for its use;

d. Certificates of initial and periodical test and examinations of loose gears shall be obtained in the form annexed.

7.20. ROPES

a. No rope shall be used for building or other construction work unless -

i) It is of good quality and free from patent defects; and

ii) In the case of wire rope, it shall be tested and examined by a competent person in the manner annexed;

iii) Every wire rope of lifting appliance or lifting gear used for building or other construction work shall be inspected by a responsible person for such use, once at least in every there month;

b. Provided that after if any such wire is broken in such rope, the responsible person shall thereafter inspect it once at least in every month and ensure that;

c. No wire rope shall be used for building or other constructing work if in any length of eight diameters of such wires, the total number of visible broken wires exceed ten per cent of the total number of wires in such rope, or such rope shows signs of excessive wear, corrosion or other defects which in the opinion of the person who inspects it, is unfit for use;

d. Eye splices and loops of ropes for the attachment of hooks, rings and other such parts to wire rope shall be made with suitable thimble;

e. A thimble or loop splice made in any wire rope sling shall conform to the following standards, namely:

   i) Wire rope sling shall have at least three tucks with full strand of rope and two tucks with one-half of the wires cut out of each of such strand in all cased, such strands shall be tucked against the lay of the rope;

   ii) Protruding ends of such strands in any splice of wire rope slings shall be covered or treated so as to leave no sharp points;

   iii) A fiber rope or a rope sling shall have at least four tucks, tail of such tuck being whipped in a suitable manner; and

   iv) A synthetic fiber rope or rope sling shall have at least four tucks with full strands followed by further tuck with one-half filaments cut out of each of such strand and final tuck with one-halt of the remaining filaments cut out from such strands. Any portion of the splices containing such tucks, with reduced number of filaments, shall be securely covered with suitable tape or other materials;

   v) Provided further that nothing contained above shall apply where any other form of splice, which may be shown to be as efficient as the splice with above standards, shall be used.

7.21. HEAT TREATMENT OF LIFTING GEARS

a. All chains other than bridle chains attached to derricks and all rings, hooks, shackles and swivels used in hoisting or lowering of such derricks shall be effectively annealed under supervision of a competent person and at the following intervals, namely:

   i) Such chains, rings, hoods, shackles and swivels which are not more than twelve and a half millimeter of length annealed at least once in every six months; and

   ii) All other such chains rings hooks shackles and swivels shall be so annealed at least once in every twelve months;

b. Provided that the clause (a) above shall not apply to -

   i) Pitched chins, working on sprocket or sprocket wheels;

   ii) Rings, hooks and swivels permanently attached to pitched chains, pulley blocks or weighing machines, and

   iii) Hooks and swivels having ball bearings or other case hardened parts;

c. A chin or a loose gear made of high tensile steel or alloy steel shall be plainly marked with a mark indicating that it is so made;

d. No chain or loose gear made of high tensile steel or alloy steel shall be subjected to any form of heat treatment except where such treatment is necessary for the purpose of repair of such chain or loose gear and that such repair shall be made under the direction of the competent person;

e. That the wrought iron gear, the past history of which is not traceable, shall be suspected of being heat treated at incorrect temperature shall be normalized before using it on any building or other construction work.

7.22. CERTIFICATE TO BE ISSUED AFTER ACTUAL TESTING AND EXAMINATION ETC:

A competent person shall issue a certificate after actual testing or examination of the apparatus specified and record of such test or examination shall be maintained for inspection.

7.23. REGISTER OF PERIODICAL TEST, EXAMINATION AND CERTIFICATION THEREOF

a. A register in the form annexed shall be maintained and particulars of such test and examination of lifting appliances, lifting gears and heat treatment as required shall be entered in such register;

b. Certificate in respect of each of the following shall be obtained from a competent person:

   i) In cases of initial and periodical test and examination of the lifting appliances such as Winches, Derricks and their accessory gears, Cranes or Hoists and their accessory gears;

   (ii) In case of test, examination and re-examination of loose gears;

   (iii) In case of test and examination of wire ropes;

   (iv) In case of heat treatment and examination of loose gears;

   (v) In case of annual thorough examination of the loose gears, except where required particulars of such exemption have been enclosed in the register referred to in Form annexed and such certificates are attached to the register referred to as above and certificates kept at such construction site in case such register and certificate relate to lifting appliances, loose gear and wire ropes and

c. Produced on demand and retained for at least five years after the date of the last entry made in such register;

d. No lifting appliance or lifting gear in respect of which an entry is required to be made in register referred to above and certificate of test and examination are required to be attached in such register in the manner as specified, shall be used for building or other construction work unless the required entries have been made in such register and certificates.

7.24. VACUUM AND MAGNETIC LIFTING GEAR

a. No vacuum lifting gear, magnetic lifting gear or any other lifting gear where the load on it is held by adhesive power, shall be used while workers are performing operations beneath such gear;

b. A magnetic lifting gear used in connection with building or other construction work shall be provided with an alternative supply of power, such as batteries, which may come into operation immediately in the event of failure of the main power supply;

c. No building worker shall work within the swinging zone of the lifting gear or load or building or other construction material suspended to such lifting gear.

7.25. KNOTTING OF CHAINS AND WIRE ROPES:

No chain or wire rope with a knot in it shall be used in building or other construction work.

7.26. CARRYING OF PERSONS BY MEANS OF LIFTING APPLIANCES ETC.

a. No building worker shall be raised, lowered or carried by a power driven lifting appliance, except
   i. On the drive's platform in the cage of a crane; or
   ii. On as hoist; or
   iii. On an approved suspended scaffold;

b. Provided that a building worker may be raised, lowered or carried by a power driven lifting appliance:
   i. In circumstances where the use of a hoist or of a suspended scaffold shall not reasonably be practicable, or
   ii. On an aerial cableway or aerial ropeway, provided further that the following requirements are met:
   iii. That the appliance referred to above can be operated from one position only and that
   iv. Any winch used in connection with the appliance shall also comply with the requirements as laid down above.

c. The appliance referred to above shall not carry any person except:
   i. In a chair or cage,
   ii. In a skip or other receptacle at least three feet deep which shall be suitable for safe carriage of a person and any such chair, cage, skip or other receptacle shall be made of good construction, sound material, and adequate strength and properly maintained with suitable means to prevent any occupant therein from falling out of it and shall be free from any material or tools which may interfere with the handhold or foothold of such occupant or otherwise endanger him; and
   iii. Those suitable measures shall be taken to prevent the chair, cage skip or other receptacle from spinning or tipping in a manner dangerous to any occupant therein.

7.27. HOISTS CARRYING PERSONS

a. No building worker shall be carried with the help of a hoist unless it is provided with a cage which:
   i) Is so constructed as to prevent, when its gates are shut, any building worker carried by such hoist from falling out of it or from being trapped between any part of such cage and any fixed structure or other moving part of such hoist or from being struck by articles or materials falling down the hoist way on which such hoist is moving; and
   ii) Is fitted on each of its side from which access is provided to a landing place with a gate which has efficient interlocking or other devices to secure so that such gate cannot be opened except when such cage is at a landing place and that such cage cannot be moved away from any such place until such gate is closed;

b. Every gate in the hoist way enclosure of such hoist used for carrying persons shall be fitted with efficient interlocking or other devices to secure so that such gate cannot be opened except when the cage of such gate is at the landing place and that such cage cannot be moved away from the landing place until such gate is closed;

c. In every hoist used for carrying building workers there are provided with suitable and efficient automatic devices to ensure that the cage of such hoist comes to rest at a point above the lowest point to which such gave may travel.

7.28. ATTACHMENT OF LOADS

a. When a sling is used to hoist long materials, a lifting beam shall be used to space the sling legs for proper balance and when a load is suspended at two or more points with slings, the eyes of the lifting legs of such slings shall be shackled together and such shackled or eyes of the shackled slings shall be placed on the hook or the eyes of such lifting legs shall be shackled directly to the hoisting block, ball or balance beam, as the case may be;

b. Every container or receptacle used for raising or lowering stone, bricks tiles, slates or other similar objects shall be so enclosed with the hoist as to prevent the fall of such objects;

c. A loaded wheel barrows placed directly on a platform of a hoist for raising or lowering of such wheel barrows shall be so secured that such wheel barrows cannot move and such platform shall be enclosed to prevent the fall of the contents kept in such wheel barrows;

d. Landings of hoists shall be so designed and arranged that building workers on such hoist be not required to lean out into empty space for loading and unloading on any material from such hoist

7.29. TOWER CRANES

a. No person other than the operator trained and capable to work at heights shall be employed to operate tower cranes;

b. The ground on which a tower crane stands shall have adequate bearing capacity;

c. Bases for tower cranes and trucks for rail mounted tower cranes shall be firm and leveled and such cranes erected at a reasonably safe distance from excavations and operated within gradient limits as specified by the manufacturer of such cranes;

d. Tower cranes shall be sited where there is a clear space available for erection, operation and dismantling of such cranes;

e. Tower cranes shall be sited in such a way that the loads on such cranes shall not be handled over any occupied premises, public thoroughfares, railways or near power cables, other than construction works for which such cranes are used;

f. Where two or more tower cranes are sited and operated, every care shall be taken to ensure positive and proper communication between operators of such cranes to avoid any dagger or dangerous occurrences;

g. Tower cranes shall not be used for loading magnet, or demolition ball service, piling operation or other similar operations which could impose excessive load stresses on the crane structure of such cranes;

h. The instruction of the manufacturer of a tower crane and standard safe practices regarding such cranes shall be followed while operating or using such cranes.

7.30. QUALIFICATION OF OPERATOR OF LIFTING WINCHES AND OF SIGNALER ETC.

a. No person shall be employed to drive or operate a lifting appliance whether driven by mechanical power or otherwise or to give signals to driver of operator of such lifting appliance or to work as an operator of a rigger or derricks unless he is

i) Sufficiently competent and reliable;

ii) Possesses the knowledge of he inherent risks involved in the operation of lifting appliance;

iii) Medically examined periodically as specified and

iv) Is above eighteen years of age.

8.0 SAFETY IN THE USE OF TRANSPORT, EARTHMOVING EQUIPMENT & OTHER CONSTRUCTION MACHINERY

8.1 EARTHMOVING EQUIPMENT AND VEHICLES

a. All vehicles and earthmoving equipment shall be made of good material, proper design and sound constructional and be sufficiently strong for the purpose for which such equipment are properly used in accordance with standard safe operating practices;

b. Provided that the truck or trailer employed for transporting freight containers shall be of the size sufficient to carry the containers, without over hanging and provided with twist locks conforming to approved standards, at all the four corners of each of such use by an authority under the relevant law for the time being in force and is inspected by a responsible person, at least once in a month and record of such inspection shall be maintained:

c. All transport or earth moving equipment and vehicles shall be inspected at least once a week by a responsible person and in case any defend is noticed in such equipment or vehicle it shall be immediately taken out of use;

d. Power trucks and tractors shall be equipped with effective brakes, headlights and tail lamps and maintained in good repair and working order;

e. Side stanchions on power trucks and trailers for crying heavy and long objects shall be

   i. Of sound construction and free from defects;

   ii. Provided with tie chains attached to the top across the loads for preventing such stanchions from spreading out; and

   iii. Kept in position while loading and unloading;

   iv. Safe gangways provided for to and fro movement of building workers engaged in loading and unloading of lorries, trucks, trailers and wagons;

   v. Trucks and other equipment shall not be loaded beyond their safe capacity and carry workers engaged in loading and unloading of lorries, trucks trailers and wagons in an unsafe condition;

   vi. Handles of trucks shall be so designed as to protect the hands of the building workers working on such trucks, or such handles provided with knuckle guards;

   vii. No unauthorized person shall ride the transport equipment employed in such work;

   viii. A driver of a transport equipment shall maneuver such equipment under the direction of a signaler;

   ix. Adequate precaution such as isolating the electric supply or erecting overhead barriers of a safe height shall be taken when earth moving equipment or vehicles are required to operate in dangerous proximity to any live electric conductor;

   x. Vehicles and earth moving equipment shall not be left on a slope with the engine of such vehicles or equipment running;

xi. All earth moving equipment, vehicles or other transport equipment shall be operated only by such person who are adequately trained and possess such skills as required for safe operation of such equipment, vehicle or other transport equipment.

8.2. POWER SHOVELS AND EXCAVATOR

a. A shovel or an excavator whether operated by steam or electric or by internal combustion, shall be constructed, installed, operated, tested and examined as per approved standards;

b. Excavator equipped for use as a mobile crane shall be examined and tested in accordance with the requirements for such mobile cranes as laid down by the manufacturer; and

c. Fitted with an automatic safe working load indicator;

d. Buckets or grabs of power shovels shall be propped to restrict the movement of such buckets or grabs while being repaired or while the teeth of such buckets or grabs are being changed.

8.3. BULLDOZER

a. Operator of every such bulldozer before leaving the dozer shall take the following steps:

i) Apply the brakes;

ii) Lower the blade and sipper and

iii) Put the shift lever into neutral;

iv) Dozer left on level ground at the close of the work for which such bulldozer is used;

v) The blade of a bulldozer kept low when such bulldozer is moving uphill;

vi) The bulldozer blades not used as brakes except in an emergency.

8.4. SCRAPERS

a. A tractor and scraper shall be joined by safety line at the time of its operation;

b. The scraper bowls shall be propped while blades of such scraper are being replaced;

c. A scraper moving downhill shall not be left in gear.

8.5. MOBILE ASPHALT LAYERS & FINISHERS

a. A mixture elevator shall be located within a wooden or sheet metal enclosure with a window for observation, lubrication and maintenance;

b. Bitumen scoops shall have adequate covers;

c. When asphalt plants are working on public road, adequate traffic control shall be established on such road and the building workers working with such plant provided with reflective jackets;

d. A sufficient number of fire extinguishers shall be kept in readiness at such workplace where fire hazards may exist;

e. The materials shall be loaded on the elevator after the drying drain has warmed up of such elevator;

f. No open light shall be used for ascertaining the level of asphalt;

g. Inspection opening shall not be opened till there is a pressure in the boiler, which may cause injury to building workers.

8.6. PAVERS:

Pavers shall be equipped with guards suitable to prevent building workers from walking under the skip of such pavers.

8.7. Road rollers: Before a road roller is used on the ground, such ground shall be examined for its bearing capacity and general safety, especially at the edges of slopes such as embankment on such grounds and shall not be moved downhill with the engine out of gear.

8.8. GENERAL SAFETY IN RESPECT OF POWERED CONSTRUCTION MACHINERY

a. Every vehicle or earthmoving equipment shall be equipped with -

i) Silencers;

ii) Tail lights

iii) Power and hand brakes;

iv) Reversing alarm; and

v) Search light for forward and backward movement, which are required for safe operation of such vehicle or earthmoving equipment;

b. The cab of vehicle or earthmoving equipment shall bee kept at least one meter from the adjacent face of a ground being excavated;

c. When cranes of shovel are traveling, the boom of such crane or shovel shall be in the direction of such travel and the bucket or scoop attached to such crane or shovel raised and without load except when such traveling is downhill.

9.0 SAFETY IN THE PROVISION OF RUNWAYS AND RAMP

9.1. USE OF RUNWAYS AND RAMPS:

a. Runway or ramps shall not be less than 430 mm in width and constructed of not less than 25 mm thick planking or any other material of adequate strength to withstand the required load, supported substantially in relation to the span and braced with such runway or ramp, and design and construction of such runway or ramp shall be in accordance with the approved standards;

b. Every runway or ramp located more than 3 m above the floor or ground shall be on open sides and provided with a guardrail of adequate strength and height of not less than 1 m.

c. Use of runways and ramps by vehicles:

   i. All runways and ramps shall be of sound construction, strength and securely braced and supported;

   ii. Every runway or ramp for the use of transport equipment like trailers, trucks or heavier vehicles shall have a width of not less than 3.7 m and provide with timber curbs or any other material of adequate strength with not less than 200 mm by 200 mm in width placed parallel to, and secured to, the sided of such runway or ramp and such runways or ramps or ramps shall be designed in accordance with the approved standards.

9.2. SLOPE OF RAMPS:

Every ramp shall have a slope not exceeding one in four and the total rise of a continuous ramp used by building workers carrying material or using wheelbarrows shall not exceed 3.7 m, unless broken by horizontal landing of at least 1.2 m in length.

9.3. USE OF RUNWAYS OR RAMPS BY WHEELBARROWS, ETC.

a. Every runway or ramp used for wheelbarrows and carts or hand trucks shall not be less than 1 m width and constructed of not less than 50 mm thick planking, and supported and braced suitably for such use;

b. Every runway or ramp located more than 3 m above the floor or ground shall be provided on the open sides with suitable guardrails of adequate strength.

10. SAFETY IN HANDLING AND USE OF EXPLOSIVES

10.1 GENERAL PROVISIONS:

a. The use of explosives shall be carried out in a safe manner to avoid injury to any person and under the direct supervision of a responsible person;

b. No person other than authorized and competent one shall be allowed to handle and use explosives;

c. Before using any explosive, necessary warning and danger signals shall be erected, at conspicuous places of such use to warn the building workers and the general public of the danger involved in such use.

d. No person other than authorized and competent one shall be allowed to handle and use explosives.

e. Smoke, open lamps, other type of hot or heat producing items and sparks shall be prohibited in or near explosives magazines or while explosives are being handled, transported or used.

f. No person shall be allowed to handle or use explosives while under the influence of intoxicating liquors or dangerous drugs.

g. The explosives shall be accounted for at all times. No explosives or blasting agents shall be abandoned.

h. No fire shall be fought where the fire is in the imminent danger of contact with explosives. All employees shall be removes to a safe area and the fire area shall be guarded against intruders.

i. Employees authorized to prepare explosive charges or conduct blasting operations shall use every reasonable precaution including but not limited to visual and audible warning signals, flags, or barricades to ensure employee safety.

j. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by induced voltage, lightning, adjacent power lines, dust storms, or other sources of extraneous electricity or otherwise. These precautions shall include:

k. Short-circuiting of detonators in holes, which have been primed and shunted until wired into the blasting circuit.

l. The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm.

m. The prominent display of adequate signs, warning against the use of radio transmitters, on all roads within 1000 ft of blasting operations. Whenever adherence to the 1000 ft distance would create an operational handicap, a competent and expert person shall be consulted to evaluate the particular situation, and an alternative provided, which are adequately designed to prevent any premature firing of electric blasting of caps. A description of any such blasting shall be reduced to writing and shall be certified as meeting the purposes of this subdivision by the competent person consulted. The description shall be maintained at the construction site during the duration of the work, and shall be available for inspection.

n. Empty boxes and paper and fiber packing materials, which have previously contained high explosives, shall not be used again for any purpose, but shall be destroyed by burning at an approved location.

o. Explosives, blasting agents and blasting supplies that are obviously deteriorated or damaged shall not be used.

p. Delivery and issue of explosives shall only be made authorized persons into authorized magazines or approved temporary storage or handling areas.

q. Blasting operations in the proximity of overhead power lines, communication lines, utility services, or other services and structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken. In such situations controlled blasting shall be restored to.

r. All loading and firing shall be directed and supervised by competent persons thoroughly experienced in this field.

s. Loaded boreholes shall not be left unattended after the end of the shift.

t. Suitable and sufficient means of egress to ground level shall be provided in all cases of excavations, trenches, all other places where explosives are handled above or below ground level.

u. At an appropriate time before the final blasting warnings, workers in the area shall be removed to a designated safe place.

v. An unmistakable, audible, final warning shall be sounded one minute prior to the detonation of explosives; after completion, when the person in charge has established that safe conditions prevail, an “all clear” shall be sounded.

w. To prevent persons entering any danger zone during blasting operations notices shall be given to all concerned.

x. Notices referred above shall indicate:

   i. that explosives are in use;

   ii. the audible warning sound and the “all clear” and state when they will be sounded; and

   iii. the warning flags in use, including an “all clear” flag.

y. Precautions against lightning shall be provided in accordance with the Indian Electricity Act and Indian Explosives Act and Rules and regulations framed there under.

z. Package containing explosives shall not be dragged, dropped or handled roughly.

aa. Non-sparking tools shall be used to open keys.

bb. The explosives shall not be carried in the box or otherwise on any individual.

cc. Nothing shall be inserted in the open end of the blasting cap except fuses.

dd. Deteriorated or damages explosives shall not be used but shall be disposed or destroyed strictly in accordance with the approved methods and in the doing so the manufacturers or the appropriate authority's instructions shall be followed.

ee. lightning shall be in accordance with Indian Electricity Act/Rules

10.2. TRANSPORTATION OF EXPLOSIVES

a. Keep safe distance and to use non-sparking tools while opening packages containing explosives;

b. Stop the use of explosives and handling thereof while the weather conditions are not suitable for such use or handling;

c. Due precautions shall be taken to prevent accidental discharge of electric blasting caps from current induced by induced voltage, lightning, adjacent power-lines, dust storms or other sources of extraneous electricity or otherwise. These precautions shall include –

   i. Suspension of all blasting operations and evacuation of persons;

   ii. All warning signs shall be displayed within 200 m of blasting operations and in case putting up a sign at 200 m is impractical, the contractor shall consult the Engineer-in-charge for alternatives;

   iii. All loading and firing shall be directed and supervised by competent persons thoroughly experienced in the field;

   iv. To prevent persons entering any danger zone during blasting operations, notices shall be given to all concerned;

d. In addition to these provisions, all measures and precautions that are required to be observed for use, handling, storing or transportation of explosives under the Rules framed under the Explosives Act, 1884 (4 of 1884) shall be observed;

e. All the relevant statutory provisions, local laws and rules and regulations shall be complied with.

f. Where the magazine is located near the construction site and blasting operation continues daily, actual requirement of explosives shall be drawn from the magazine and transported to the site. Any leftovers shall be returned to the magazine each time after the blast. In case of work at scattered places and for a small duration, portable magazines shall be used and kept within a fence in safe place and properly guarded.

g. For carrying higher quantity (more than 5 kg of explosives) specially designed insulated containers shall be used. These containers shall be constructed of finished wood not less than 5cm thick or plastic not less than 6mm thick or pressed fibre not less than 10mm thick. There shall be no metal parts (not even nails, bolts, screws etc.) and the containers shall be provided with suitable non-conductive carrying device, such as rubber, leather or canvas handle or strap.

h. Vehicles to be used for transportation explosives shall be in good working condition and shall have a tight wooded or non-sparking metal (copper, brass and the like) floor with sides and

ends high enough to prevent the explosives from failing off the vehicle. In open bodied vehicles, the explosives shall be covered with a waterproof and fibre tarpaulin.

i. Electrical wiring in vehicle shall be fully insulated so as to prevent the danger of short-circuiting and at least two fire extinguishers of carbon dioxide type shall be carried. The vehicle shall be properly marked indicating adequate warning to the public in regard to the nature of cargo.

j. No metals except approved metal truck shall be allowed to come in contact with cases of explosives, metal, flammable, or corrosive substance shall not be transported with explosives. As far as possible, transportation of any material along with explosives shall be prohibited.

k. Smoking shall be prohibited in the vehicle carrying explosives.

l. No unauthorized person shall be allowed in the vehicle, carrying explosives.

m. Loading and unloading of explosives shall be done carefully.

n. Explosives and detonators or blasting caps shall not be permitted to be transported in the same vehicle.

o. Detonators and other explosives for blasting shall be transported to the site of work in the original containers or in securely locked separate non-metallic containers and shall not be carried loose or mixed with other materials.

10.3. STORAGE OF EXPLOSIVES AND BLASTING AGENTS

a. Explosives and related materials shall be stored in approved facilities.

b. Blasting caps, electric blasting caps, detonating primers, and primed cartridges shall not be stored in the same magazine with other explosives or blasting agents.

c. Smoking and open flames shall not be permitted within 50 feet of explosives and detonators storage magazine.

d. No Explosives or blasting agents shall be permanently stored in any underground area until the area has been developed to the point where at lease two modes of exit have been provided.

e. Permanent underground storage magazine shall be at least 300 feet from any shaft or other active under ground working area.

f. Permanent underground magazines containing detonators shall not be located closer than 50 feet to any magazine containing other explosives or blasting agents.

10.4. DRILLING AND LOADING

a. Before planning out the drilling operations for blasting purposes, nature of stratum and the over burden shall necessarily be examined to avoid possibilities of landslides after blasting.

b. The face or rock shall be carefully examined before drilling to determine the presence of unfired explosives**.** No attempt shall be made to drill at a site if un-detonated explosives are suspected. In such case the boreholes shall be thoroughly cleaned before a cartridge is

inserted. Wooden tamping rods (not pointed, but cylindrical throughout) shall be used in the charging the holes. The cartridge will be on the top.

c. The borehole shall be carefully checked for length, presence of water dust, etc. with a wooden temping pole or a measuring tape before loading.

d. Surplus explosives shall not be stacked near working areas during loading/unloading.

e. The line of detonating fuse extending into a borehole shall be cut from the spool before loading the remainder of the charge.

f. A bore shall not be loaded with explosives after springing (enlarging the hole with explosives) or upon completion of drilling without making sure it is cool and it does not contain any hot smoldering material. Temperatures in excess of 65^{o} C are dangerous.

g. A bore near another hole loaded with explosives shall not be sprung.

h. No force shall be used for inserting cartridges or any explosives into a bore hold or pass any obstruction in a borehole.

i. No force shall be used for inserting a blasting cap or an electric blasting cap into explosive. The cap shall be inserted into a hole made with a pickers designed for the purpose. A hitch of the electric blasting cap leading wire shall be made on the primer cartridge so as to prevent pulling out the electric blasting cap from the explosive charge. In case of fuse, the fuse shall be tied to the explosive cartridge so that the blasting cap is not pulled out. Care shall be taken so that the blasting cap is not pulled out. Care shall be taken so that the electric blasting cap, leading wire or the length of the fuse does not get damaged during loading of the charge.

j. No attempt shall be made to slit, drop, deform or abuse the primer.

k. Blasting caps or electric blasting caps shall not be connected to detonating fuse except by methods recommended by the manufacturers of caps.

l. Explosive cartridge shall not be cut, nor explosive removed from the cartridge for use.

m. Metallic devices of any kind shall not be used in tamping. Wooden tamping tools with not exposed metal parts except non-sparking metal connectors for jointed poled shall be used. Violent tamping shall be avoided. Primer shall not be tamped.

n. Care shall be taken to confine the explosives in the bore hold with sand, earth clay or other suitable combustible stemming material.

o. Kinking or injuring of fuse or electric blasting cap wires shall be avoided when tamping.

10.5. ELECTRICAL SHOT-FIRING CIRCUIT

a. In deciding the sizes of wires, fuses, circuits, blasting switches, etc., instructions issued by the manufacturers of these articles shall be followed, if they do not contradict with Indian Explosives Act or framed under it.

b. No person shall attempt to uncoil the wires and open out the short-circuited bare leading wires of the electric blasting cap during approach of dust storm or near any source of large

charge of static electricity or near a radio transmitter. The manufacturer of the cap or the Inspectorate of Explosives shall be consulted regarding the distance from the transmitter beyond which electric short firing shall be conducted.

c. Firing circuit shall be kept completely insulated from the ground of the other conductors, such as wires, rails, pipes or other paths or stray current.

d. There shall not be any electric live wires or cables of any kind near electric blasting caps or other explosives except at the time and for the purpose of firing the blast.

e. All electric blasting caps shall be tested singly and also when connected in a circuit in series using only an approved type of circuit continuity tester or ohmmeter.

f. No attempt shall be made to use in the same circuit either electrical blasting caps made by more than one manufacturer or electric blasting caps of different design or function even if made by the same manufacturers unless such use is approved by the manufacturers.

g. No attempt shall be made to fire a circuit of electric blasting caps with less than the minimum current specified by the manufacturer of that electric blasting cap.

h. Care shall be taken to ensure that all wire ends to be connected are bright and clean.

i. The electric cap wires or leading wires shall be kept short circuited until ready to fire.

j. When energy for blasting is taken from power circuits the voltage shall not exceed 220v. The wiring controlling arrangements shall conform to the following:

k. The blasting switch shall be strictly according to the specifications, externally operated double-throw switch, which when locked in the open position will short circuit and ground the leading wires. The switch shall be installed at the location where the firing is to be controlled.

l. A 'safety' switch of the same type as the blasting switch shall be installed between the blasting switch and the firing circuit and lead lines, at a distance not to exceed 180cm from the blasting switch.

m. Both the safety switch and the blasting switch shall be locked in the open position immediately after the shot and before any person is permitted to return to the blasting area. Key to the switches shall remain in the possession of the blaster at all times.

n. Rubber covered or other adequately insulated copper wires in good condition shall be used for firing lines and shall have solid cores of appropriate gauge. Sufficient firing line shall be provided to permit the blaster to be located at a safe distance from the blast. Single conductor lead lines shall be used.

o. Blasting operations in the proximity of overhead power lines, communication lines, utility lines, or other structures shall not be carried on until the operator or the owner, or both of such lines as been notified and precautionary measures deemed necessary, have been taken.

p. All holes loaded on a shift shall be fired on the same shift.

q. As far as possible, blasting shall be carried out using suitable exploder with 25 per cent excess capacity. Electric power from the mains shall be used only when it is absolutely necessary.

10.6. SHOT-FIRING WITH SAFETY FUSE

a. The fuse shall be carefully handled to avoid damaging the covering. In very cold weather the fuse shall be slightly warmed before using so as to avoid cracking the waterproofing.

b. Short fuse shall not be used. The length of a fuse shall not be less than 120cm. The rate of burning of the fuse shall be known and it would be necessary to make sure that it will take sufficient time in burning so as to enable all persons to reach a place of safety. The burning rate of the fuse shall not be more than 60 cm/min.

c. The fuse shall not be cut until the operation to insert the fuse into a blasting cap is ready. The fuse shall be cut off about 2.5 to 5 cm to ensure a dry end. It shall be cut squarely across with a clean and sharp blade. The fuse shall be seated lightly against the cap charge and care shall be taken to avoid twisting after it has been placed in position.

d. Blasting caps shall not be crimped by any means except by a cap crimper designed for the purpose. It shall be necessary to make sure that the cap is squarely crimped to the face.

e. The fuse shall be lighted with a fuse lighter designed for the purpose. If a match is used, the fuse shall be slit at the end and the match head held in then slit against the power core and then the match head rubbed against an abrasive surface to light the fuse.

f. The fuse shall not be lighted until sufficient stemming has been placed over the explosives to prevent sparks of live match heads from coming into contact with the explosives.

g. The explosives shall not be held in hands when lighting the fuse.

10.7. UNDERGROUND WORK

a. Only permissible explosives and in the manner as specified by the appropriate authority shall be used.

b. Excessive quantities of explosives shall not be taken underground at any time. Black blasting powder or pellet powder shall not be used with any other explosive in the same borehole.

10.8. BEFORE AND AFTER FIRING

a. Before firing, sufficient warning shall be given to enable the people working in the area to get off the danger zone. The danger zone shall be suitable cordoned off and flag men posted at important points.

b. No loose materials, such as tools, drilling implements etc. Shall be left on the rock surfaces to be blasted.

c. Blasting in the open shall be carried out during the fixed hours every day or on fixed days in the week. This information shall be amply publicized and the following precautions observed:

d. On the project sites, where blasting operations are carried out, daily blasting hours shall be clearly printed on the sign-boards on all the roads approaching that area.

    i. Road closing barriers should be provided to close the traffic on these roads, at least 400 meters away when the firing is to take place.

ii. The beginning of the firing shall follow loud sirens and similarly loud sirens shall succeed the completion of the firing.

e. The shot-firer shall not be allowed to return to the blasting site after firing, until at least 5 min have elapsed. In case of electric shot firing, the shot holes shall be examined after firing and in case of misfire no person shall be allowed to approach the blasting site for at lease 5 min. In case of shot firing with safety fuse, utmost care shall be taken to count the number to ensure that all the shots have fired and in the event of misfire, no person shall be allowed to approach the blasting site for at least 30 min. In any case, a careful inspection for the remaining un-detonated explosive shall be made after firing the shots. All misfired shot holes shall be cross-marked. No other person than those duly authorized shall approach the holes until one of the following operations has been performed in respect of each of the misfired holes:

f. If the misfire is due to a faulty cable or faulty electrical connection the defect shall be remedied and the shot fired.

g. The stemming shall be floated out by use of water or air jet from hose until the hole has been opened to within 60 cm of the charge, whereupon water will be siphoned or pumped out, then a fresh new charge placed and duly detonated. Or

i. A careful search shall be made of unexploded material in the debris of the charge.

ii. If a shift charge is unavoidable, the person in-charge of one shift before leaving the work shall inform the person relieving him for the next shift of any cases misfired and shall point out their position duly cross marked and also state clearly what action has to be taken in the matter.

Note: The rules are made considering statutory provisions and other National/International standards. However, if any statutory provision overruling these laws is made, the statutory provisions shall overrule the NTPC Rules.

11.0 SAFETY IN EXCAVATION & TUNNELING WORK

SAFETY IN EXCAVATION

11.1GENERAL PROVISIONS

a. Before undertaking any activity, the soil shall be tested and in case of availability of any explosive gas, necessary arrangements must be made to remove/dilute such gases and in case they are found to be toxic or poisonous, the workplace must be purged and continuous ventilation maintaining the contamination below the permissible level ensured;

b. The position of underground installations such as sewers, water pipes and electrical cables shall be verified and in case of their existence, they must be isolated;

c. If they cannot be isolated or removed or shutdown, they shall be fenced, hung up or otherwise protected. On every part likely to be visited by persons or where transport vehicles ply, the area shall be suitably fenced, guarded or barricaded to prevent fall of persons, vehicles or livestock into the excavated area;

d. Warning signs shall be erected and the in the night hours the area shall be illuminated to warn pedestrians and vehicular traffic;

e. Arrangements shall be made to prevent external vibrations due to rail/road traffic;

f. Blasting shall be carried out in accordance with the norms applicable in this regard. Special care shall be taken to control the impact of vibrations/tremor caused by blasting to protect excavations from cave-ins;

g. Arrangements shall be made to save other buildings/structures in the affected zone or in the vicinity of the area of excavation, from collapse;

11.2 SHORING AND TIMBERING

a. Site of excavations, where workers are exposed to danger from moving ground, shall be made safe by maintaining due slope not exceeding the angle of repose of different types of soil or otherwise by shoring, portable shields or other effective means;

b. All trenches in the soil, other than rock or hard compact soil more than 1.5 m deep into which men enter, shall be securely shored and timbered under the supervision of a competent person and only the trained workers shall be allowed to substantially alter or dismantle the shoring or timbering;

c. All struts, braces and walls in excavation shall be adequately secured so as to prevent their accidental displacement;

d. In all excavations in soft or fissured rock or hard soil exceeding 2 m in depth, except those which are sloped to within 1.5 m of the bottom into which men enter, shall be securely shored and timbered;

e. Where the sides of the excavations are sloped as outlined above, but not within the 1.5 m of the bottom, vertical sides shall be shored and the shoring shall extend at least 30 cm above the vertical sides. When open spaced sheathing is used, a toe-board shall be provided to prevent material rolling down the slope and falling into the excavated.

11.3. SHEATHING

a. The sheathing should be placed against the side of the trench so that length of each piece of sheathing is vertical. It should be held securely in place against the wales by ensuring that sheathing is kept firmly pressed against the wall of the trench. Where the trench excavated is loose, sandy or soft soil or soil which has been previously excavated or soil which is under hydrostatic pressure, each piece of sheathing shall be driven into the bottom of the trench so as to firmly hold it in place;

b. Where two or more pieces of sheathing are used one above another, the sheathing shall be so arranged that the lower pieces of sheathing shall overlap the lowest wales supporting the piece of sheathing next above it. These pieces of sheathing shall be firmly driven into the soil and securely supported by wales and struts, as the trench is made deeper.

11.4. WALES

a. The wales shall be parallel to the bottom or the proposed bottom of the trench. Each wale shall be supported on cleats spiked to the sheathing or by posts set on the wales next below it and in the case of the lowest wale on the bottom of the trench itself. Where necessary, wedges may be provided between a wale and the sheathing it supports so that roughly uniformity is given to all individual pieces of sheathing.

11.5. STRUTS

a. Struts shall be horizontal and at right angles to the wales or sheathing supported thereby. Struts shall be cut to the proper length required to fit in tightly between the wales. Where necessary, the struts shall be held securely in place by wedges, driven between the struts and the wales;

b. Struts shall be placed on cleats spiked or bolted to the posts supporting the Wales.

11.6. LOOSE SITE MATERIALS:

No loose material shall be kept very close to the excavation creating possibility of its fall into the excavated area. A safe distance of at least 1 m shall be maintained.

11.7. PLANT & MACHINERY:

Movement of vehicles and heavy equipment shall be kept at a distance least equal to the depth of the excavation or at least 6 m for excavation deeper than 6 m and the workers shall be provided with proper tools.

11.8. MEANS OF ACCESS

a. For trenches deeper than 1.5 m, safe means of access and egress shall be provided at intervals of every 15 m. Where it is not possible to provide safe means of access and egress as above, ladders shall extend from the bottom of the trench to at least 90 cm above the ground;

b. Walkways, runways and sidewalks shall be kept clear of excavated materials or other obstructions and no side walls shall be undermined-undercut unless it is capable of carrying a minimum live load of 125 lbs per square feet;

c. If planks are used for raising walkways, runways or sidewalks, they should be parallel to the length of the walk and fastened together against displacement;

d. Lone worker shall not be allowed to work in the excavated area.

11.9. INSPECTIONS:

A competent person shall make inspections every day and necessary measures shall be taken to safeguard against possible cave-ins or slide or collapse of the excavations.

11.10. NOTIFICATION OF INTENTION TO CARRY OUT EXCAVATION AND TUNNELING WORK

a. Within thirty days, prior to the commencement of such excavation or tunneling work, the contractor shall inform in writing the detailed layout plans, method of construction and schedule of such excavation or tunneling work to the Engineer in-charge of NTPC;

b. In case compressed air is used in such excavation or tunneling work or any work incidental to or required for such excavation or tunneling work, the technical details and drawings of all man-locks and medical-locks together with names and addresses of all construction medical officers duly qualified and so appointed by such contractor for the purpose of such excavation or tunneling work shall be sent to the Engineer in-charge.

11.11. PROJECT ENGINEER

a. The contractor undertaking any excavation or tunneling work shall appoint a Project Engineer for safe operation of such projects;

b. Such Project Engineer shall exercise overall control of the operations and the activities at such project and be responsible for carrying out the activities safely.

11.12. RESPONSIBLE PERSON

a. The contractor undertaking excavation or tunnel ling work at construction site of a building or other construction work shall appoint a responsible person for safe operation of such excavation or tunneling work;

b. The name and addresses of such responsible persons shall be forwarded to the Engineer in-charge;

c. Duties and responsibilities of the responsible person referred to above person shall include

   i. To carry out smoothly such excavation or tunneling work;

   ii. To inspect and rectify any hazardous situation relating to such excavation or tunneling work;

   iii. To take remedial measures to avoid any unsafe practice or conditions relating to such excavation or tunneling work.

11.13. WARNING SIGNS AND NOTICES

a. Suitable warning signs or notices, required for the safety of building workers carrying out the work of an excavation or tunneling, shall be displayed or erected at conspicuous places in Hindi

and in language understood by the majority of such building workers at such excavation or tunneling work;

b. Such warning signs and notices with regard to compressed air working shall include:

   i) The danger involved in such compressed air work;

   ii) Fire and explosion hazards;

   iii) The emergency procedures for rescue from such danger or hazards.

11.14. REGISTER OF EMPLOYMENT

a. The contractor shall ensure that at a construction site of a building or other construction work where an excavation or tunneling work is being carried on, a register of employment of building workers carrying out such excavation or tunneling work is maintained and produced on demand;

b. Periods of work of such excavation or tunneling work shall be maintained in a register on day-to-day basis and such register shall be produced on demand

11.15. ILLUMINATION

a. All contractors carrying out excavation or tunneling work at a construction site of a building or other construction work shall provide for emergency generators on such construction site to ensure adequate illumination at all work places where such excavation or tunneling work is being carried out;

b. In case of power failure, all workplaces where excavation or tunneling works are carried out shall be adequately illuminated

11.16. PNEUMATIC TOOLS:

Supply lines to pneumatic tools used within a tunnel are fitted with water trap or safety chain or safety wire, as the case may be.

11.17. STABILITY OF STRUCTURE DURING GENERAL EXCAVATION & TUNNELING:

The contractor shall ensure that where there is any doubt as to the stability of any structure adjoining the workplace or other areas to be excavated or where tunneling work is to be carried out –

a. The Project Engineer shall arrange for measures like underpinning, sheet piling, shoring, bracing or other similar means to support such structure and to prevent injury to any building worker working adjacent to such structure or damage to property or equipment adjacent to such structure;

b. Where any building worker engaged in excavation is exposed to hazard of falling or sliding material or article from any bank or side of such excavation which is more than 1.5 m above his footing, such worker shall be protected by adequate piling and bracing against such bank or side;

c. The excavation and its vicinity shall be checked by a responsible person after every rain, storm or other occurrences carrying hazards and in case a hazard is noticed at such checking, adequate protection against slides and cave-in to prevent such hazard shall be provided;

d. Temporary sheet piling installed for the construction of a retaining wall after excavation shall not be removed, except on the advice of the responsible person after an inspection carried out by such responsible person;

e. Where banks of an excavation are undercut, adequate shoring shall be provided to support the material or article overhanging such bank;

f. Excavated material shall not be stored at least 0.5 m from the edge of an open excavation or trench and the banks of such excavation or trench shall be stripped of loose rocks and other materials which may slide, roll or fall upon a building worker working below such bank;

g. Adequate and suitable warning signs shall be put-up at conspicuous places at the excavation work to avoid any person falling into the excavations or trenches;

h. The responsible person shall ensure at the excavation that no building worker is permitted to work where such building worker may be struck or endangered by the excavation machinery or material or article used in such excavation.

11.18. SAFE ACCESS AND EGRESS:

Ladders, staircases or ramps are provided, as the case may be, for safe access to and egress form excavation where the depth of such excavation exceeds one point 1.5 m and such ladders, staircases or ramps comply with the relevant national standards.

11.19. TRENCHES

a. A trench or excavation shall be protected against falling of a person by suitable measures if the depth of such trench or excavation exceeds 1.5 m and such protection shall be an improved protection in accordance with the design and drawing of a Professional Engineer, where such depth exceeds 4 m;

b. Where the depth of a trench requires two lengths of sheet piling, one above the other, the lower piling shall be set inside the bottom strings or wales of the upper piling and such sheet piling shall be driven down and braced as the excavation continues;

c. All metal sheet piles used in excavation or a trench shall be welded end-to-end and secured by other similar means.

11.20. POSITIONING AND USE OF MACHINERY:

Any machinery used in excavation and tunneling work shall be positioned and operated in such a way that such machinery will not endanger the operator of such machinery or any other person in the vicinity.

11.21. BREATHING APPARATUS:

Suitable breathing apparatus shall be provided to a building worker while working in compressed air environment for his use at excavation or tunneling work and such breathing apparatus shall be maintained in good working condition at all times.

11.22. SAFETY MEASURES FOR TUNNELING OPERATIONS

a. Where there is a danger of falling or sliding of material from the roof face or wall of a tunnel, adequate measures such as shoring, supporting by means of rock bolts, segments or steel sets shall be taken for the safety of building workers;

b. The excavated areas shall be made safe by use of suitably designed and installed steel sets, rock bolts or similar other safe means;

c. The responsible person shall examine and inspect the workplaces in a tunnel before the commencement of work in such tunnel and at regular intervals thereafter to ensure safety of the building workers in such tunnel;

d. The portal areas of a tunnel with loose soil or rock, likely to cause injury to a person shall be adequately protected with supports.

11.23. SURROUNDINGS OF A SHAFT

a. Surroundings of a shaft used in excavation or tunnel work shall be protected from being washed away by construction of sufficient height;

b. Where a building worker is required to enter a shaft at an excavation or tunneling work, safe means of access shall be provided for such entry;

c. Every shaft at excavation or tunneling work shall be provided with a steel casing, concrete piping, timber shoring or other materials of adequate strength for the safety of building workers working in such shaft;

d. Such casing and bracing shall be provided to shafts at an excavation or tunneling work according to the appropriate design for such casing and bracing;

e. A reinforced concrete raft and beam shall be provided around the opening of a shaft at an excavation or tunneling work if the ground surrounding such opening is unstable or unsafe.

11.24. LIFT FOR SHAFT:

Lift shall be provided for transport of building workers and materials or articles at an excavation or tunneling work required to descend more than 50 m in a shaft.

11.25. MEANS OF COMMUNICATION

Reliable and effective means of communication such as telephone or walkie-talkie shall be provided and maintained in working order for arranging better and effective communication at an excavation or tunneling work at the following locations, namely:

i. Working chamber of an excavation;

ii. Intervals of hundred meters along the tunnel;

iii. Working chamber side of a man lock near the door of such man lock;

iv. Interior or each chamber of a man lock;

v. Location conspicuous lock attendant's situation;

vi. A compressor plant;

vii. A first-aid station, and

viii. Outside the portal or the top of a shaft;

ix. Such number of bells and whistles shall be made available at all times at the locations as are necessary for the safety of persons at such locations.

11.26. SIGNALS:

The standard audio or video signals shall be used in excavation or tunneling work and conspicuously located or displayed near entrance to the workplace and in such other locations as may be necessary to bring such signals to notice of all building workers employed in such excavation or tunneling work.

11.27. CLEARANCES

a. The minimum lateral clearances of 0.5 m shall be maintained between any part of a vehicle and any fixture or any equipment used in an excavation or tunneling work after allowing the throw or swing of such fixture or equipment;

b. The overhead clearance for a locomotive drive at excavation or tunneling work shall not be less than 1.20 m above the seat of such driver and not less than 2 m above the platform where such driver stands or of any other dimension in accordance with the approved standard.

11.28. SHELTERS:

The adequate number of shelters for the safeguard of the building workers are provided where, in the course of working, they are liable to be struck by a moving vehicle or other material handling equipment in a tunnel.

11.29. USE OF INTERNAL COMBUSTION ENGINE:

No internal combustion engine shall be used underground in excavation or tunneling work unless such engine is so constructed that the air entering the engine gets cleared before entry and the engine emits no fumes or sparks.

11.30.INFLAMMABLE OILS:

Inflammable oils with the flash point below the working temperature that is likely to be encountered in a tunnel shall not be used in excavation or tunneling work.

11.31. COUPLING AND HOSES:

All high-pressure hydraulic hoses and couplings shall be adequately protected against any possible damage in excavation or tunneling work.

11.32. HOSE INSTALLATION:

All hydraulic lines and plants working at a temperature exceeding 750 c shall be protected by adequate insulation or otherwise against accidental human contact in excavation or tunneling work.

11.33. FIRE RESISTANT HOSES:

No fire hydraulic hoses other than fire resistant hydraulic hoses are used when hydraulically activated machinery and equipment are employed in tunnels.

11.34. FLAMEPROOF EQUIPMENT:

Only flameproof equipment of appropriate type as per approved standards shall be used where there is a danger of flammable or explosive atmosphere being prevalent inside the tunnel.

11.35. STORING OF OIL AND FUEL UNDERGROUND:

All oils, greases or fuels stored underground in excavation or tunneling work shall be kept in tightly sealed containers and in fire resistant areas at safe distances away from explosive and other flammable chemical and appropriate flameproof installation shall be used in such storage areas.

11.36. USE OF GASES UNDERGROUND

a. Petrol or liquefied petroleum gas or any other flammable substances shall not be used or stored inside the tunnel except with the prior approval of the Project Engineer;

b. After the use of the petroleum or liquefied petroleum gas, or highly inflammable substances, all remaining petroleum or liquefied petroleum gas or highly inflammable substances shall be removed immediately from such tunnel;

c. No oxy-acetylene gas shall be used in a compressed air environment in excavation or tunneling work.

11.37. WATER FOR FIRE FIGHTING

a. Adequate number of water outlets shall be provided on excavation or tunneling work and readily made accessible throughout the tunnel for fire fighting purposes and such water outlets shall be maintained for effective fire lighting;

b. All air locks shall be equipped with fire fighting facilities at excavation or tunneling work;

c. An audible fire alarm shall be provided to warn the building workers whenever a fire breaks out on an excavation or tunneling work;

d. Adequate number and types of fire extinguishers, in accordance with relevant national standards, shall be provided and made readily available to fight any outbreak of fire at an excavation or tunneling work;

e. Fire extinguishers with vaporizing liquids and high pressure carbon dioxide shall not be used in tunnels or other confined spaces;

f. The instructions regarding steps to be followed to fight outbreak of fire, at an excavation or tunneling work, written in Hindi or local language understood by the majority of the building workers employed on such excavation or tunneling work, shall be displayed at conspicuous and vulnerable places of such excavation or tunneling work.

11.38. FLOODING

a. Water tight bulkhead doors shall be installed at the entrance of a tunnel to prevent flooding during a tunneling work where more than one tunnel is driven from a shaft;

b. All necessary measures shall be taken to ensure that no building worker is trapped in any isolated section of a tunnel when any bulkhead door of such tunnel is closed;

c. Where there is likelihood of flooding or water rushing into a tunnel during a tunneling work, arrangements shall be made for immediate starting of water pumps to take out water of such flooding or water rushing and for giving alert signals to the building workers and other persons to keep them away from danger.

d. Airtight steel curtains shall be provided in areas liable to flooding at tunneling work and in case of descending tunnels, such curtains shall be provided in the top half of such tunnels to ensure the retention of pockets of air for rescue purpose.

11.39. REST SHELTERS

a. Where building workers employed in a compressed air environment in a tunneling work are required to remain at the work site for one hour or more after de-compression from pressure exceeding one bar, adequate and suitable facilities shall be provided for such building workers to rest;

    a. Every man-lock, medical-lock and any other facility inside these locks in a tunneling work shall be maintained in a clean state and in good repairs;

    b. A first-aid room shall be provided and readily available at a construction site of a tunneling work;

    c. Each man-lock attendant at the station shall be provided with a first-aid box.

11.40. PERMISSIBLE LIMIT OF EXPOSURE OF CHEMICALS

a. The working environment in a tunnel or a shaft in which building workers are employed shall not contain any of the hazardous substances in concentrations beyond the permissible limits;

b. The responsible person referred to shall conduct necessary test before the commencement of a tunneling work for the day and at suitable intervals as fixed by the Engineer in-charge, to ensure that the permissible limits of exposure are not exceeded and a record of such test shall be maintained and made available for inspection.

11.41. VENTILATION:

All working areas in a free air tunnel shall be provided with the approved ventilation system and the fresh air supplied in such tunnel shall not be less than 6 m^3 per minute for each building worker employed underground in such tunnel and the free air-flow movement inside such tunnel not less than 9 m^3 per minute.

11.42. AIR SUPPLY INTAKE POINT:

The air intake points for all air compression shall be located at places where such intake air does not get contaminated with dust, fumes, vapor and exhaust gases or other contaminants.

11.43. EMERGENCY GENERATORS

a. Every compressed air system in a tunnel shall be provided with emergency power supply system for maintaining continued supply of compressed air in such compressed air system, which shall be capable of operating air compressor and ancillary systems of such compressed air system;

b. The emergency power supply system shall be maintained and made readily available at all times.

11.45. AIR MAINS:

Every air-main supplying air to the working chamber, man-lock or medical-lock used at an excavation or tunneling work shall be protected against accidental damage and where it is not practicable to provide such protection, a stand-by air-main shall be provided.

11.46. BULKHEAD AND AIR LOCKS

a. A bulk head or air tight diaphragms retaining compressed air, when used within a tunnel or a shaft, shall be constructed to withstand the maximum pressure at 1.25 the maximum working pressure of such bulk head or diaphragm and such bulk head or diaphragm shall be tested before its each use by a responsible person to ensure that such bulk head or diaphragm is in proper working order;

b. Such responsible person shall keep the record of each test and such record shall be produced for inspection.

c. The bulk head or diaphragm shall be made of sound material of adequate strength, which shall be able to withstand the maximum pressure on which they are subjected to at any time of their use;

d. A bulkhead anchorage and air lick shall be tested at its work place at an excavation or tunneling work immediately after their installation at such place.

11.47. DIAPHRAGM:

All diaphragms, which are in the form of horizontal decks across a shaft used at excavation or tunneling work, shall be securely anchored

11.48.PORTABLE ELECTRICAL HAND TOOLS:

All portable electrical hand tools and inspection lamps used underground or in a confined space shall be operated at a voltage not exceeding 24 V.

11.49. CIRCUIT BREAKER

a. Adequate numbers of differential ground fault circuit breakers shall be installed for every electrical distribution system and its sub-systems used at an excavation or tunneling;

b. Work and the sensitivity of each of circuit breaker shall be adjusted in accordance with the requirement set out in accordance with the approved standards;

c. No semi-enclosed fuse unit shall be used in underground place.

11.50. TRANSFORMER:

The contractor shall ensure no transformer is used in any section of a tunnel under compressed air unless such transformer is of the dry type and conforms to the approved standards.

11.51. LIVE WIRES:

There shall be no exposed live wire in working areas at an excavation or tunneling work which are accessible to building workers other than those authorized to work on such live lines.

11.52. WELDING SETS:

All welding sets used in a tunnel shall be of adequate capacity and of suitable type, duly approved.

11.53. QUALITY AND QUANTITY

a. Every working chamber at an excavation or tunneling work where compressed air is used, the supply of such air shall be maintained at not less than 0.3 m^3 per minute per person working therein;

b. A reserve supply of compressed air shall be made available at all times for man-locks and medical locks used at a tunneling work;

c. The air supplied in a compressed air environment at a tunneling work shall be, as far as practicable, free from contaminants, namely, dust, fumes and other toxic substances.

11.54. WORKING TEMPERATURE:

The temperature in any working chamber at an excavation or tunneling work where building workers are employed shall not exceed 29^0 c and the arrangement shall be maintained for kipping records in which the temperatures measured by dry bulb and wet bulb inside such working chamber once in every hour and for producing such records for inspection on demand.

11.55. MAN-LOCKS AND WORKING IN COMPRESSED AIR ENVIRONMENT

a. Man-locks used at a tunneling work shall be of adequate strength, made of sound material and designed to withstand any pressure, internal or external, to which it may be subjected in the normal use or in an emergency;

b. Doors of man-locks at an excavation or tunneling work shall be made of steel and used at a tunneling work for keeping the work airtight and devices shall be provided for sealing the doors when such locks are under pressure. The anchorage of a man-lock used at tunneling work shall have adequate strength to withstand the pressure exerted by air on the man-lock. There shall be adequate room available for the workers for working in the man-locks;

c. Where work is carried out in any compressed air tunnel, a Man-lock in accordance with the approved standards shall be used;

d. Where a man-lock is used, safety Instructions in Hindi and in local language understood by majority of building workers employed there, shall be displaced at conspicuous places;

e. Except in an emergency, compression and de-compression operations shall be carried out in a man-lock and in an emergency any material-lock may be used;

f. A record of compression and de-compression shall be kept in writing and produced for inspection on demand;

g. Material lock shall be used with the permission of the Engineer in-charge where it is impracticable to install both the man-lock and the material-lock at;

h. The man-lock at tunneling work shall not be used for any purpose

i. other than compression or de-compression of building workers;

j. No de-canting of building workers at tunneling work shall be carried

k. out without prior approval of the Engineer in-charge except in an emergency;

l. In case a building worker collapses or is taken ill during his de-compression in a man-lock, the lock attendant of such man-lock shall raise the pressure to a level equal to the maximum pressure which that building worker was exposed to in the working chamber prior to such de-compression and such lock attendant shall immediately report the matter relating to such collapse to the medical lock attendant and medical officer on duty;

m. A building worker who had previously received training with a trained building worker to work in a compressed air environment at tunneling work shall be employed to work independently in such a compressed air environment;

n. A building worker who had undergone three de-compressions from a pressure exceeding one bar in a period of eight hours at tunneling work shall not be allowed to enter a compressed air environment except for the purpose of carrying out rescue work;

o. A building worker employed in a compressed air environment for a period of eight hours in a day at tunneling work shall not be employed again in such environment unless he has spent not less than twelve consecutive hours of rest at atmospheric pressure;

p. No building worker shall be engaged in a compressed air environment at a pressure, which exceeds three bars at a tunneling work unless prior permission, in writing, has been obtained from the Engineer in-charge;

q. No building worker shall be employed in a compressed air environment for more than fourteen consecutive days in a month;

r. A register of employment of all building workers in compressed air environment shall be maintained;

s. An identification badge shall be supplied to a building worker employed in compressed air environment;

t. The badge of a building worker shall contain particulars of his name, location of the medical-lock allotted to him for work, the telephone number of the Construction Medical Officer concerned for his treatment and the instructions in case of his illness of unknown and doubtful causes;

u. Record of all identification badges supplied to building shall be kept in a register;

v. Every building worker whose name appears in the register shall wear the badge supplied to him at all times during his duty hours;

w. Suitable warning signs shall be displayed in the compressed air for the prohibition of the following, namely:

    i) Use of alcoholic drinks;

    ii) Use and carrying of lighters, matches or other sources of ignition;

    iii) Smoking; and

iv) No entry to person who has consumed alcoholic drink

11.56. SAFETY INSTRUCTION:

All building workers employed in compressed air environment at tunneling work shall follow the instructions issued for their safety in the course of such employment.

11.57. MEDICAL-LOCK

a. A suitably constructed medical lock shall be maintained at tunneling work where building workers are employed in a working chamber at a pressure exceeding one bar;

b. Where more than one hundred building workers are employed in a compressed air working environment exceeding one bar at tunneling work, one medical-lock is provided for every one hundred building workers or part thereof and such medical lock shall be situated as near as possible to the main-lock used at such tunneling work.

12.0. SAFETY IN PILING WORK

12.1. GENERAL PROVISIONS

a. All pile driving equipment shall be of good design and sound construction, taking into account the ergonomic principles and properly maintained;

b. A pile driver shall be firmly supported on a heavy timber sill, concrete bed or other secured foundation;

c. In case a pile driver is required to be erected in dangerous proximity to an electrical conductor, all necessary precautions shall be taken to ensure safety;

d. The hoses of steam and air hammer shall be securely lashed to such hammer so as to prevent them from whipping in case of connection or break;

e. Adequate precaution shall be taken to prevent the pile driver from over turning and hammer from missing the pile;

f. A responsible person for inspecting pile-driving equipment shall inspect such equipment before taking it into use and takes all appropriate measures as required for the safety of building workers before commencing piling work by such equipment;

g. Where there is any question of stability of a structure for its adjoining areas to be piled, such structure shall be supported, where necessary, by underpinning, sheet pilling, shoring, and bracing or by other means to ensure safety and stability of such structure and to prevent injury to any person.

12.2. PROTECTION OF OPERATOR:

The operator of every pile driving equipment shall be protected from falling objects, steam, cinders or water by substantially covering or otherwise or by other means.

12.3. INSTRUCTION TO AND SUPERVISION OF BUILDING WORKERS WORKING ON PILE-DRIVING EQUIPMENT:

Every building worker working on a pile driving equipment shall be given instructions regarding safe work procedure to be followed in piling operation and shall be supervised by a responsible person throughout such work.

12.4. ENTRY OF UNAUTHORIZED PERSON:

The contractor shall ensure at a construction site of a buildings or other construction work that all piling areas where pile-driving equipment is in use are effectively cordoned off to prevent entry of unauthorized persons.

12.5. INSPECTION AND MAINTENANCE OF PILE DRIVING EQUIPMENT

a. Pile-driving equipment shall not be taken into use until it has been inspected by a responsible person and found to be safe for such use;

b. A responsible person for such inspection at suitable intervals to ensure safety to the building worker working on such equipment shall inspect pile driving equipment in use;

c. All pile lines and pulley blocks shall be inspected by a responsible person before the beginning of each shift of piling operations.

12.6. OPERATION OF PILE-DRIVING EQUIPMENT

a. Only experienced and trained building worker shall operate pile driving so as to avoid any probable danger from such operation;

b. Pile-driving operations shall be governed generally prevalent and accepted signals so as to prevent any probable danger from such operations;

c. Every building worker employed in pile driving operation or in the vicinity of such pile driving operation shall wear ear protection and safety helmet or hardhat and safety shoes;

d. Piles shall be prepared at a distance, at least equal to twice the length of the longest pile, from the place of pile-driving operations;

e. When a pile driver is not in use, the hammer of such pile driver shall be blocked at the bottom of the heads of such pile driver.

12.7. WORKING PLATFORM ON PILING FRAMES:

Where a structural tower supports the lead of a pile driver, leads at which it is necessary for the building workers to work and such platforms except on the hammer of such pile driver or lead sides of such platform and where such platforms cannot be provided with such railing and toe boards, a safety belt shall be provided to each such building worker.

12.8. PILE TESTING

a. The testing of pile shall be conducted under the supervision of a responsible person for such testing;

b. All practicable measures like displaying of waning notices, barricading the area and other similar measures shall be taken to protect the area where the pile testing is carried out;

c. Entry to a pile testing area shall be prohibited to general public to ensure safety.

12.9. PILING, SHORING AND BRACING

a. Planks used for sheet piling in excavation or tunneling work shall be of sound material with adequate strength;

b. Shores and braces used in excavation or tunneling work shall be of adequate dimensions and so placed as to be effective for their intended purposes;

c. Earth supported shores or braces used in excavation or tunneling work shall bear against a footing of sufficient area and stability to prevent the shifting of such shores or braces.

13.0. SAFETY IN THE ERECTION, USE AND DISMANTLING OF SCAFFOLDS

13.1. SCAFFOLD CONSTRUCTION

a. Every scaffold and every component thereof shall be of adequate construction, made of sound material and free from defects and safe for the purposes for which it is intended for use;

b. In case bamboo is used for scaffolding, such bamboo shall be of suitable quality, good condition, free from protruding knots and stripped off to avoid any injury to building workers during handling such bamboo;

c. All metal scaffolds used in building or other construction work shall conform to the approved standards;

13.2. SUPERVISION BY A RESPONSIBLE PERSON: No scaffold shall be erected, added, altered or dismantled except under the supervision of a responsible person.

13.3. Maintenance

a. The scaffold used in building or other construction work shall be maintained in good repairs and the measures taken against its accidental displacement or any other hazard;

b. No scaffold or part thereof shall be partly dismantled and allowed to remain in such a condition unless –

i) The stability or safety of the remaining portion of such scaffold has been ensured by a responsible person for the safety of such scaffolds;

ii) In case the remaining part of such scaffold cannot be used by the building workers, necessary warning notice written in Hindi and in a language understood by the majority of the building workers that such scaffold is unfit for use, shall be displayed at the place where such scaffold is erected.

13.4. STANDARDS, LEDGERS, PUTLOGS

a. Standards of a scaffold shall be plumb, where practicable, fixed sufficiently close together to secure the stability of such scaffold having regard to all the possible working situations and conditions for the intended use of such scaffold, spaced, as close as practicable, to ensure safety and stability of such scaffold;

b. Adequate measures are taken to, prevent displacement of a standard of a scaffold either by providing sole plate or a base plate, as necessary;

c. Ledgers of metal scaffold are placed at vertical intervals with due regard to safety and stability of such scaffold;

d. Bamboo ledgers are kept as nearly as possible and are placed and fastened to the standards of a scaffold with due regard to the stability of such scaffold.

13.5. WORKING PLATFORM

a. Working platform shall be provided around the face or edge of a building adjoining at every upper most permanent floor of such building under construction and at any level where construction work of such building is carried out;

b. A platform shall be designed to suit the number of building workers to be employed on each bay of a scaffold work on such platform and the materials or articles and tools to be carried with them in such bay;

c. The safe working load and the number of building workers to be employed in each bay of a scaffold shall be displayed for the information of all the building workers employed at such construction site.

13.6. BOARD, PLANK AND DECKING

a. Board, plank and decking used in the construction of a working platform shall be of uniform size and strength and shall be capable of supporting the load and number of building workers keeping in view the safety of such building workers;

b. Metal decking, which forms part of a working platform, shall be provided with non-skid surface;

c. No board or plank which forms the working platform shall be projected beyond its end support unless it is effectively prevented from tripping or lifting and board, plank or decking shall be fastened and secured;

d. At any one time, not more than two working platforms per bay, shall be used to support building workers or materials or articles at such bay;

e. Adequate measures shall be taken to prevent injury which may be caused by falling material and objects by using safety nets or other suitable means;

f. Concrete, other debris or materials shall not be allowed to accumulate at any platform on a scaffold;

g. Where a work is to be done at the end of a wall, working platform at such workplace shall be faced or, wherever practicable, at least 0.6 m beyond the end of such wall.

13.7. REPAIR OF DAMAGED SCAFFOLD

a. No building worker shall be permitted to work on a scaffold that has been damaged or wakened unless adequate safety measures have been taken to ensure the safety of such building worker;

b. Necessary warning signs shall be displayed at such places where repairs of scaffold are undertaken.

13.8. OPENING

a. There shall be no opening in any working platform except for allowing access to such working platform;

b. Wherever opening on a platform is unavoidable, necessary measures for protection against failing of objects or building workers from such platform shall be taken by providing suitable safety nets, belts or any other similar means;

c. Access from one working platform to another platform on a scaffold, if required, shall be provided with suitable and safe ladder for the use of building workers working on such platforms;

d. Every opening or shaft in the floor shall be provided with suitable means to protect the fall of a person or material by providing suitable fencing or railing of height not less than 900 mm.

13.9. GUARDRAILS: Every side of a working platform from which a person is liable to fall shall be provided with suitable and safe guardrails and toe board of adequate strength to prevent fall of any building worker, material or tools from such platform.

13.10. SCAFFOLD USED BY BUILDING WORKERS OF DIFFERENT EMPLOYERS

a. Where a scaffold or a part of a scaffold is used, which has previously been used by another employer for his building workers, such scaffold or part thereof shall be used only after its inspection and examination by a responsible person for ensuring that such scaffold or part thereof is safe and fit for such use;

b. If any rectification, alteration or modification in a scaffold or part thereof, needed to suit its use, shall be made in consultation with the responsible person.

13.11. PROTECTION AGAINST ELECTRIC POWER LINE:

The contractor shall ensure that all necessary and practical measures for protection are taken to prevent any building worker, working on a scaffold, from coming into contact with the electric wires or dangerous equipment.

13.12. SCREENING NET AND WIRE NETS:

Where a scaffold is erected in an area where the construction activities may pose hazards to pedestrians or vehicular traffic nearby from the falling of objects, wire nets or screening nets shall be used to envelope such scaffold.

13.13. TOWER SCAFFOLD

a. The height of every tower scaffold used in building or other construction work shall not be more than eight times the lesser to the base dimension of such scaffold;

b. A tower scaffold shall be lashed to a building or a fixed structure before being used by the building workers;

c. Any tower scaffold which can be moved or castered shall be –

   i) Constructed with due regard to the stability and, if necessary, adequately weighted at the base;

   ii) Used only on plain and even surface; and

   iii) Has casters provided with positive locking devices to hold such scaffold in position;

d. No building worker shall remain on board scaffold or leave behind tools and material when it is being shifted from one position to another position.

13.14. GEAR FOR SUSPENSION OF SCAFFOLD

a. Chains, ropes or lifting gears used for suspension of a scaffold shall be of adequate strength, made of sound material and suitable for the purpose of their use and maintained in good repairs;

b. Chains, wires, ropes or metal tubes used for the suspension of a scaffold shall be:

i) Properly and securely fastened to every anchorage point and to the scaffold ledgers of other main supporting members used for the support of such scaffold; and

ii) So positioned as to ensure stability of the scaffold.

13.15. TRESTLE SCAFFOLD AND CANTILEVER SCAFFOLD

a. No trestle scaffold shall be constructed with more than three tiers or if its working platform is more than 4.5 m above the ground or floor or other surface upon which such scaffold is erected;

b. Trestle scaffold shall be designed by professional engineer and shall have the approval of the Engineer in-charge before being taken into use.

c. No trestle scaffold shall be erected on a suspended scaffold;

d. No cantilever or jib scaffold shall be used unless it is adequately supported, fixed and anchored on opposite side of its support and have out triggers of adequate length and, where necessary sufficiently, supported and braced to ensure safety and stability of such scaffold;

e. No working platform resting on bearers let into a wall at one end and without other support shall be used unless such bearers are of adequate strength, braced through the wall and securely fastened on the other side.

13.16. SCAFFOLD SUPPORTED BY BUILDING

a. No part of a building shall be used as support or part of a scaffold unless such part of the building is made of sufficient strength and made of sound material to afford safe support;

b. Overhanging eaves gutters shall not be used for supporting scaffold;

c. Suspended scaffold shall be made of in accordance with the approved standards before being used by the building workers.

13.17. USE OF WINCHES AND CLIMBERS FOR SUSPENDED SCAFFOLD

a. No scaffold shall be raised or lowered by winches or climbers unless such scaffold is made of sound material, adequate strength and has been tested and certified safe for use of winches or climber by a competent person before being taken into use;

b. All suspended scaffolds counter-balanced by counter weights shall be of approved types before being taken into use for building or other construction work;

c. The working platform of a suspended scaffold shall be securely fastened to the building or structure as to be safe and to prevent such platform from swing;

d. The safe working load that a suspended scaffold can carry, shall be displayed where such scaffold is being used

13.18. SAFETY DEVICES FOR SUSPENDED SCAFFOLD

a. Every suspended scaffold, raised or lowered by the winches or climbers, shall be provided at each of its suspension point with a safety rope with automatic safety device mounted on each of such rope so that such safety rope with such automatic safety device support the platform of such

scaffold in the event of failure of the primary suspension wire ropes, winches, climbers or any part of the mechanism used for raising or lowering such suspended scaffold;

b. Provided that the clause (a) shall not apply -

i) Where the platform of such scaffold is supported at two independent suspension wire rope at or near each end of such platform so that in the event of failure of one of such suspension wire rope, the other wire rope is capable of sustaining the weights of such platform and its load and prevent it from tilting; or

ii) Where a system is incorporated which operates automatically to support the platform of such scaffold and its load in the event of failure of the primary suspension wire rope of such scaffold.

14.0. SAFETY IN THE ERECTION OF STRUCTURAL FRAME & FORMWORK

14.1. GENERAL PROVISION

a. The trained building worker under the direct supervision of a person, responsible for structural frame and formwork, shall be employed for erection of such structural frame or formwork, dismantling of building and structure and performance of and engineering work formwork, false work and shoring work;

b. Adequate measures shall be taken to guard against hazards arising from any temporary state of weakness or unsuitability of a structure.

14.2. FORMWORK, FALSE WORK AND SHORING

a. Formwork and false work shall be so designed, constructed and maintained that such formwork and false work are able to support the load that may be imposed on them;

b. Such formwork shall be so erected that working platform, means of access, bracings, means of handling and stabilizing could easily be fixed with such formwork.

14.3. ERECTION OR DISMANTLING OF STEEL AND PREFABRICATED

a. Erection or dismantling of any pre-fabricated structure shall be made safe against danger by using appropriate means such as ladders, gangways or fixed platforms, buckets, boatswains chair or other appropriate means suspended from lifting appliances, safety harness, life lines, catch nets or catch platforms, power-operated mobile working platforms etc.;

b. The work of erection or dismantling of buildings or structures or formwork or false work or shoring or any other civil engineering work shall be carried out by trained building workers under the supervision of a person responsible for such work;

c. Steel or prefabricated structures shall be so designed and made that such structures can be safely transported or erected; and weight of each unit of such structures shall be clearly marked on such unit;

d. The design of each such part shall maintain stability of each part of the structures referred to in clauses above when erected, and to prevent danger, the design shall explicitly take into account –

   i) The relevant conditions and methods of attachment in the operations of stripping, transport, storing and temporary support during erection of such parts;

   ii) Safeguards, such as provision of railings with working platforms, and for mounting such railings and platforms easily on the structural steel or prefabricated parts;

e. The hooks and softer devices built in or provided on the structural steel or prefabricate parts that are required for lifting and transporting such parts shall be so shaped, dimensioned and positioned to withstand the stresses to which such hooks or other devices are subjected;

f. Prefabricated parts made of concrete shall not stripped or erected before such concrete has set and hardened sufficiently to the extent provided for in the plans, and such parts are examined by the responsible person for any sign of damage before their use;

g. Store-places shall be so constructed that –

   i) There shall be no risk of structural steel of prefabricated parts falling or overturning;

   ii) Storage conditions shall generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions; and

   iii) Racks shall be set on firm ground and designed so that units cannot move accidentally in such store-places;

h. Structural steel or pre-fabricated parts shall not be subjected to stresses prejudicial to their stability while they are stored or transported or raised or set down;

i. Tongs, clamps and other appliances for lifting structural steel and prefabricated part shall be:

   i) In such shape and dimensions as to ensure a secure grip without damaging and marked with the maximum permissible load in the most unfavourable lifting conditions; and

   ii) Structural steel or pre-fabricated parts shall be lifted by such methods and appliances that prevent them from spinning accidentally;

j. Structural steel or pre-fabricated parts shall be provided with railings and working platforms before raising such parts to prevent any danger of falling of building workers, materials or articles at the time of any work with such parts;

k. All reasonably practical measures shall be taken to avoid injury to building workers, building structure or equipment while structural steel or pre-fabricated parts are handled or stored or transported or raised or lowered;

l. Structures shall not be worked on during violent storms or high winds or any other such hazardous situation;

m. The risk of falling to which building workers, moving on high or sloping girders, may be exposed is limited by all means of adequate collective protection or by the use of a safety harness which shall be well secured to a sufficiently strong supports;

n. Structural steel parts, which are to be erected at a great height, shall, as far as practicable, be assembled on the ground;

o. When structural steel or pre-fabricated parts are being erected, a sufficiently extended area underneath the workplace shall be barricaded or guarded;

p. Steel trusses, which are being erected, shall be adequately shored, braced or guyed until they are permanently secured in position;

q. Structural members shall not be forced into place by the hoisting machine while any building worker is in such a position that he is likely to be injured by such operation.

14.4. FORMWORK

a. All formwork shall be properly designed keeping in view the safety of building workers, buildings or structures;

b. A responsible person for structural frame and formwork shall –

   i. Inspect and examine the material, timber, structural steel and scaffolding for its strength and suitability before being taken into use;

   ii. Lay-down procedures to cover all stages of such structural frame and formwork;

   iii. Supervise such structural frame and formwork;

   iv. Take all necessary steps or measure to correct any situation with a view to prevent accident or dangerous occurrence during performances of such structural frame and formwork.

14.5. DE-SHORING

a. When shoring is removed, sufficient props shall be left in place of such shoring to prevent any possible hazard; and

b. Deshoring shall be adequately braced and tied together with support to prevent any hazard.

15.0. SAFETY IN CONCRETE WORK

15.1. GENERAL PROVISIONS REGARDING USE OF CONCRETE

a. All construction with the use of concrete or reinforced concrete shall be based on plans including specification of steel and concrete and other material to be used in such construction –

   i. Giving technical details regarding methods for safe placing and handing of such materials and indicating the type, quality and arrangement of each part of a structure of such construction; and

   ii. Explaining the sequence of steps to be taken for completion of such construction;

b. Formwork and shores used for concrete work shall be structurally safe and properly braced or tied together so as to maintain position and shape of formwork or shores;

c. Formwork structure used shall have sufficient catwalks and other secure access for inspection of such structure if such structure is in two or more tiers;

d. No machinery or any object should fall below by using wire nets, screen nets etc.

15.2. PREPARATION AND POURING OF CONCRETE AND ERECTION OF CONCRETE STRUCTURE

a. A building worker handling cement or concrete shall –

   i) Wear close-fitting clothing, gloves, helmet or hardhat, safety goggles, proper footwear and respirator or mask to protect himself from danger in such handling;

   ii) Keep as much of his body covered as is required to protect himself from danger in such handling;

   iii) Take all necessary precautions to keep cement and concrete away from his skin in such handling;

b. Lime pits shall be fenced or enclosed and filled and emptied by such devices, which do not require workers to go into the pit;

c. Moving parts of the elevators, hoists screens bunkers, chutes, grouting equipment used for concrete work and of other equipment used for storing, transport and other handling ingredients of concrete shall be securely fenced to avoid contact of building workers with such moving parts;

d. Screw conveyors used for cement, lime and other dusty materials shall be completely enclosed.

15.3. BUCKETS

a. Concrete buckets used with cranes or aerial cableways shall be free from projections from which accumulations of concrete could fall;

b. Movements of concrete buckets shall be governed by signals necessary to avoid any danger by such movements.

15.4. PIPES AND PUMPS

a. A scaffolding carrying a pipe for pumped concrete shall be strong enough to support such pipe at a time when such pipe is filled with concrete or water or any other liquid and carry the combined load of the all the building workers who may be on such scaffold at such time, safely;

b. Every pipe for carrying pumped concrete shall be –

   i) Securely anchored at its end point and at each curve on it;

   ii) Provided near the top of such pipe with an air release valve;

   iii) Securely attached to a pump nozzle by a bolted collar or other adequate means;

c. The operation of concrete pumps shall be governed by standard signals;

d. Building workers employed around a concrete pump shall wear safety goggles;

15.5. MIXING AND POURING OF CONCRETE

a. The concrete mixture shall not contain any material, which may unduly affect the setting of such concrete, weaken such concrete or corrode steel used with such concrete;

b. When dry ingredients of concrete are being mixed in confined spaces such as silos –

   i) The dust shall be exhausted at the time of such mixing and

   ii) In case the dust the dust cannot be exhausted, as specified, the workers shall wear respirators at the time of such mixing;

c. When concrete is being tipped from buckets, building workers shall be kept out of the range of any kickbacks of such buckets;

d. Loads shall not be dumped or placed on settling concrete.

15.6. CONCRETE PANELS AND SLABS

a. All parts of a concrete panel or concrete slab shall be hoisted uniformly;

b. Concrete panels shall be adequately braced in their final positions and such bracings shall remain in such positions until such panels are adequately supported by other parts of the construction for which such panels are used;

c. Temporary bracings of concreter panels shall be securely fastened to prevent any part of such panels from falling when such panels are being moved.

15.7. STRESSED AND TENSIONED ELEMENTS

a. Building workers shall not stand directly over jacking equipment while stressing of concrete girders and beams is being done;

b. A pre – stressed concrete unit shall not bee handled except at points on such unit and by the devices specified for such work by the manufacture of such devices;

c. During transport, pre-stressed concrete girders or concrete beams shall be kept upright by bracing or other effective means;

d. Anchor fittings for pre-tensioned strands of pre-stressed concrete girders of concert beams are kept in a safe condition in accordance with the instruction of manufacturer of such anchor fittings;

e. Building workers shall not stand behind jacks or in line with tensioning elements and jacking equipment during tensioning operations of pre-stressed concrete girders of concrete beams;

f. Building workers do not cut wires of pre – stressed concrete girders or concrete beams under tension before such concrete used of such girder or beams is sufficiently hardened.

15.8. VIBRATORS

a. A building worker, who is in good physical condition, shall operate vibrators used in concreting work;

b. All practical measures shall be taken to reduce the amount of vibration transmitted to the operators working in concreting work and

c. When electric vibrators are used in concreting work

   i) Such vibrators shall be earthed;

   ii) The leads of such vibrators shall be heavily insulated; and

   iii) The current shall be switched off when such vibrators are not in use.

15.9. INSPECTION AND SUPERVISION

a. A person responsible for a concreting work shall supervise the erection of the formwork, shores, braces and other supports used for such concreting work, make a through inspection of every formwork to ensure that such formwork is safe, regularly inspect the formwork, shores, braces, reshores and other supports during the placing of concrete, keep all records of inspections referred to above at the workplace relating to such inspection and produce them for inspection upon the demand.

b. Any unsafe condition, which is discovered during the inspections, shall be remedied immediately.

15.10. BEAMS, FLOORS AND ROOFS

a. Horizontal and diagonal bracings shall be provided in both longitudinal and transverse direction as may be necessary to provide structural stability to formwork used in concreting work and shores used in such concreting work shall be properly seated on top and bottom and secured in their places;

b. Where shores used in concreting work rest upon the ground, base plates shall be provided for keeping such shores firm and in level;

c. Where the floor to ceiling height of a concreting work exceeds 9 m or where the formwork deck used in such concreting work is supported by shores constructed in two or more tiers, or where the dead, live and impact loads on the formwork used in such concreting work exceed 700 kilogram per m^2, the structure of such formwork shall be designed by a professional engineer in the relevant field and the specifications and drawings of such formwork kept at such construction site and produced on demand.

d. Where a professional engineer designs the structure of the formwork used in concreting work, such engineer shall be responsible for the supervision of construction and the stability of such structure.

15.11. STRIPPING

a. Stripping of formwork used in concreting work shall not commence until the concrete on such formwork is fully set, examined and certified to this effect by the responsible person and record of such examination and certification is maintained;

b. Stripped forms in concreting work shall be removed or stock piled promptly after stripping from all areas in which building workers are required to work or pass;

c. Protruding nail, wire ties and other formwork accessories not required for subsequent concreting work shall be pulled, cut or otherwise made safe.

15.12. RE-SHORING

a. Re-shoring used in concreting work shall be provided to a slab or beam for its safe support after its stripping or where such slab or beam is subjected to superimposed loads due to construction above such slab or beam;

b. The provisions applicable to shoring in a concreting work shall also be applicable to reshoring in such work or pass.

16.0. SAFETY IN CONSTRUCTION, REPAIR & MAINTENANCE OF STEEP ROOFS

16.1.WORK ON STEEP ROOFS:

All practicable measures shall be provided to protect the building workers against sliding when carrying outwork on steep roofs.

16.2. CONSTRUCTION AND INSTALLATION OF ROOFING BRACKETS

a. Roofing brackets shall be constructed to fit the pitch of steep roof and such brackets shall be used to provide level working platform;

b. Roofing bracket shall be secured in its place by nailing pointed metal projections attached to the underside of such bracket and securely driven into a steep roof on which it is used or secured by a rope passed over the ridgepole and tie of such roof.

16.3. CRAWLING BOARDS

a. All crawling boards used for work on steep roofs shall be of adequate strength, made of sound material and of the type approved for the purpose of their use;

b. Crawling boards shall be kept in good repairs and inspected by a responsible person before being taken into use;

c. Crawling boards shall be secured to a steep roof on which it is used by ridge hooks or other effective means;

d. A firmly fastened lifeline of adequate strength shall bee strung beside each crawling board throughout its length while using such crawling boards.

17.0. SAFETY IN CATCHES PLATFORMS, HOARDINGS & CHUTES

17.1. CATCH PLATFORM

a. Catch platform shall not be used for storage of material or as a working platform;

b. Catch platform shall at least be of 2 m wide and inclined so that the position of outer edge of such platform is 1500 mm higher than the inner edge;

c. The open end of catch platform shall be properly fenced to the height not less than 1 m.

17.2. HOARDINGS:

Hoardings shall be constructed when the Registering Authority / Assistant Labour Commissioner considers it necessary for protection of building workers and directs such employer to construct such hoardings**.**

17.3. CHUTES, ITS CONSTRUCTION AND USE

a. Wooden or metal chutes which are at an angle of more than 45^0 to the horizontal and used for the removal of materials shall be closed on all sides except at their openings used for receiving or discharging of materials or articles;

b. All openings of chutes except their top openings shall be closed when not in use;

c. Every chute –

   i. Shall be constructed of sound material, adequate strength and suitable for the purpose it is intended for use;

   ii. Exceeding 12 m in height shall be constructed in accordance with the design and drawings of professional engineer for such;

   iii. A suitable warning notice shall be displayed at conspicuous locations, written in Hindi and in a local language, at the discharge end of every chute;

   iv. Shall be cleared when debris has accumulated to a height, which can pose danger to building worker, but such clearance shall be done in no case less frequently than once a day.

18.0. SAFETY IN WORK ON OR ADJACENT TO WATER

18.1. TRANSPORT OF WORKERS BY WATER

a. When any building worker has to proceed to or from any workplace by water for purposes of carrying on a building or other construction work, proper measures shall be taken to provide for his safe transportation and vessels used for such purpose shall be in charge of a responsible person, properly equipped for safe navigation and maintained in good condition;

b. Maximum number of persons which can be safely carried in a vessel shall be marked plainly and conspicuously on such vessel and such number shall not be exceeded during use of such vessel for carrying persons;

c. Adequate protecting shall be provided to the building workers in such vessel from inclement weather;

d. Such vessel shall be manned by adequate and experienced crew;

e. In case the bulwarks of such vessel are lower than 60 cm from the level of the deck of such vessel, the open edge of such bulwarks shall be fitted with suitable fencing to a height of at least 1 m above such deck and the post and stanchions and similar parts used in such fencing shall not be spaced more than 2 m;

f. The number of life buoys on deck of such vessel shall at least be equal to the number of crew members of such vessel and shall not be less than two;

g. All life buoys on deck of such vessel shall be kept in good state of maintenance and so placed that if such vessel sinks then they will remain afloat and one of such buoys shall be within the immediate reach of the Steersman of such vessel and another is situated after part of such vessel; and

h. The position of the steersman of the vessel shall be such that he has a reasonably free view of all sides.

18.2. PREVENTION FROM DROWNING

a. Where, on or adjacent to the workplace of any contraction site, there is water into which a building worker employed for work on such site, in the course of his employment, may fall and has the risk of drowning, suitable rescue equipment shall be provided and kept in an efficient state of ready use and measures shall be taken to arrange for the prompt rescue of such building worker from the danger of drowning and where there is a special risk of such fall from the edge of adjacent land or from a structure adjacent to or above the water, or from floating stage on such water, secure fencing shall be provided near the edge of such land, structure or floating stage, as the case may be, to prevent such fall, and such fencing may be removed or allowed to remain unerected for the time and to the extent necessary for the access of building workers to such work or the movement of material for such work;

b. For handling rescue equipment, at least two persons knowing diving should be available at such sites.

19.0 SAFETY IN COFFERDAMS & CAISSONS

19.1 EVERY COFFERDAM AND CAISSON SHALL BE

19.1.1 Of good construction, sound material and of adequate strength, provided with adequate means for workers to reach safely at the top of such cofferdam or caisson in the event of an in rush of water and safe means of access to every place where workers shall be employed;

19.1.2 Work relating to construction, positioning, modification, dismantling of cofferdams or caissons shall be carried out under the supervision of a responsible person and inspected by the responsible person at the specified intervals;

19.1.3 A worker shall be allowed to work in a cofferdam or caisson after such cofferdam or caisson has been inspected and found safe by responsible person within such preceding period as approved and a record of such inspection maintained.

19.2 WORK IN COMPRESSED AIR IN A COFFERDAM OR CAISSON SHALL BE

19.2.1 Carried out in accordance with the procedure laid down;

19.2.2 Carried out by such building workers who have completed eighteen years of age and are medically examined and found fit for the work;

19.2.3 Carried out under the supervision of a responsible person;

19.2.4 If the work in cofferdam or caisson is carried out in shifts, a record of the time spent by each worker in each such shift for carrying out the wok shall be maintained in a register with particulars or time taken for the compression of such building worker, if any;

19.2.5 At every work site or project in a cofferdam or caisson, where workers are employed to work in compressed air environment, a construction medical officer assisted by a nurse or trained first-aid attendant, shall be available at all times and there shall be one standby reserve compressor to meet the emergency.

19.3 PRESSURE PLANT AND EQUIPMENT

19.3.1 Pressure plant and equipment for which it is used shall be –

19.3.2 Properly maintained in good repairs and working condition and fitted with a suitable safety valve or other effective device to provide maximum safe discharge pressure from being exceeded at any time; a suitable pressure gauge with a dial range not less than 1.5 time and not exceeding twice the maximum working pressure, easily visible and designed to show at all times, the internal pressure in kilogram per square centimeter and marked with the maximum safe working pressure, a suitable stop valve or valves by which the pressure plant or the system of the pressure plant may be isolated from the source supply of pressure or otherwise;

19.3.3 Every pressure plant or equipment shall be thoroughly examined by the competent person, externally, once in every period of six months; internally, once in every period of twelve months; and by hydraulic test, once in a period of four years.

20. SAFETY IN DEMOLITION WORK

20.1 PREPARATION

20.1.1 All glass or similar material or article in exterior openings shall be removed before commencing any demolition work and all water, steam, electric, gas and other similar supply lines put off and suitably capped and the concerned department of the appropriate authority informed and permission obtained wherever required before commencing;

20.1.2 Wherever it is necessary to maintain water, gas or electric line or power during such demolition, such line shall be so located or protected with substantial coverings so as to protect it from damage and to afford safety to the building workers and the general public.

20.2 PROTECTION OF ADJACENT STRUCTURES

20.2.1 Examination of walls etc. of adjacent structures –

i) During demolition process, the contractor shall examine the walls of all structures adjacent to the structure to be demolished to determine the thickness, method of support to such adjacent structures and;

ii) In case, such employer has reason to believe that any of such adjacent structure is unsafe or may become unsafe during such demolition process, he shall not perform demolition activity unless stability to such unsafe adjacent structu4e from collapsing has been taken. All roads and open spaces adjacent to the site of demolition work shall be closed or suitably protected by bracketing.

20.3 DEMOLITION OF WALLS, PARTITIONS, ETC.

20.3.1 Any demolition of walls or partitions shall be proceeded in a systematic manner as per the standard safe operating practices approved and all work above each tier of any floor beams shall be completed before the safety of the supports of such beam is impaired;

20.3.2 Masonry shall be neither loosened nor permitted to fall in such masses or volume or weight as to endanger the structural stability of any floor or structural supports;

20.3.3 No wall chimney or other structure or part of a structure shall be left unguarded in such a condition that it may fall, collapse or weaken due to wind pressure or vibration;

20.3.4 In the case of demolition of exterior walls by hand, safe footing shall be provided for the workers employed in, such walls or partitions, which are to be demolished by hand shall be not left standing more than one storey high above the uppermost floor on which persons are working.

20.4 **METHOD OF OPERATION:** The contractor shall ensure that debris, bricks and other materials or articles are removed by means of chutes, buckets or hoists and through openings in the floors.

20.5 ACCESS TO FLOOR

20.5.1 Safe access to and egress from every building shall be provided at all times in the course of demolition by means of entrances hallways, stairways or ladder runs which shall be so protected as to safeguard the workers using such means from falling material or articles;

20.5.2 Demolition of structural steel etc. shall be demolished column by column and tier by tier and every structural member, which is being demolished, shall not be under any stress, and such structural member shall be suitably lashed to prevent it from any uncontrolled swinging, dropping or falling or falling;

20.5.3 Large structural members shall not be thrown or dropped from the building, but carefully lowered by adopting suitable safe method;

20.5.4 Where a lifting appliance like a derrick is used for demolition, the floor on which such lifting appliance rests shall be completely planked over or supported and such floor shall be of adequate strength to sustain bearing load for such lifting appliance and its operation.

20.6 STORAGE OF MATERIAL OR ARTICLE

20.6.1 No materials or articles shall be not stored or kept on platform, floor or stairways of a building being demolished, provided that this clause shall not apply to the floor of a building when such floor is of such strength as to support safely the load to be superimposed by storing such material or articles;

20.6.2 No access to any stairway or passageway shall be affected or blocked by storing any material or article;

20.6.3 Suitable barricades shall be provided so as to prevent materials or articles from sliding or rebounding into any space used by the workers.

20.7 FLOOR OPENINGS:

Every opening used for the removal of debris from every floor which is not closed to access, except the top or working floor, shall be provided with an enclosure from such floor to its ceiling, or such opening is so barricaded that no building worker shall access to within a horizontal distance of 6.0 m from such opening through which debris is being dropped.

20.8 INSPECTION:

A person responsible for demolition work shall make continuous inspections during demolition process so as to detect any hazard resulting from weakened or deteriorated floors or walls or loosened materials or articles, and that no building worker shall be permitted to work where such hazard exist unless remedial measured like shoring or bracing shall be taken to prevent such hazards.

20.9 WARNING SIGNS, BARRICADES, ETC.

20.9.1 Barricades and warning sign shall be erected along every side throughout the length and breadth of a building or other construction work to be demolished to prevent unauthorized persons from entering into the during demolition operations;

20.9.2 During the demolition of an exterior masonry wall or a roof from a point more than 12 m above the adjoining ground level of such wall or roof, if persons below such wall or roof are exposed to falling objects, suitable and safe catch platform shall be provided and maintained at a level not more than 6 m below the working level except where an exterior built-up scaffold is provided for safe and adequate protection of such persons;

20.9.3 Suitable and standard warning signs shall be displayed or erected at conspicuous places or position at the workplace;

20.10 MECHANICAL METHOD OF DEMOLITION

20.10.1 The following requirements shall be fulfilled in case the mechanical method of demolition like use of swinging weight, clamshell bucket, power shovel, bulldozer or other similar mechanical methods are used for the purpose of demolition namely –

i) The building or structure or structure or remaining portion thereof shall be not more than 12 m in height;

ii) Where a swinging weight is used for demolition, a zone of such demolition having a radius of at least 1.5 times the height of the structure of portion thereof being demolished shall be maintained around the points of impact of such swinging weight;

iii) Where a clamshell bucket is being used for demolition, a zone of demolition shall be maintained within eight metres of the liner of travel of such bucket;

iv) Where other mechanical methods are being used to affect total or partial collapse of a building or other construction work, there shall be maintained, in the area into which the affected portion of such building or other construction work may fall, a zone of demolition at least 1.5 times the height of such affected portion thereof; and

v) No person other than building workers or other persons essential to the operation of demolition work shall be permitted to enter a zone of demolition, which shall be provided with substantial barricades.

21. FIRE EXTINGUISHERS & OTHER APPLIANCES OF FIRE FIGHTING

21.1 FIRE EXTINGUISHERS & OTHER MEANS OF PREVENTION AND PROTECTION

21.1.1 Every contractor shall have a fire protection and prevention plan developed and implemented keeping in view the following:

i) The specific work practices requiring fire control measures;

ii) Response measures to be taken in case of fire;

iii) Equipment required;

iv) Personnel requirements and responsibilities;

v) Schedules of daily and weekly inspection;

vi) Open flames and fires are prohibited in all underground construction;

vii) Readily visible signs to be posted in the fire prone/inflammable/explosive areas prohibiting smoking use of open flames and other hot work.

viii) A system of Permit-to-Work.

27.1.2 For the protection of the workers from the outbreak of fire, the contractor shall Provide, maintain and regularly inspect the Fire extinguishing equipment, which shall be sufficiently provided to extinguish any probable fire;

Suitability of portable fire extinguishers			
Class of fire	**Type of extinguisher**		
	Water	**DCP**	**CO_2**
A	**Yes**	**Yes**	**Yes**
B	**No**	**Yes**	**Yes**
C	**No**	**Yes**	**Yes**
D	**No**	**Yes**	**Yes**
Electrical	**No**	**Yes**	**Yes**

27.1.3 Ensure availability of an adequate supply of water at ample pressure;

27.1.4 Make available

i. Adequate number of trained persons required to operate the fire extinguishing equipment;

ii. Properly maintain Fire extinguishing equipment and inspect them at regular intervals of not less than once in a year by the responsible person and a record of such inspections maintained;

27.1.5 Portable fire extinguishers provided in the operator's cabin of earthmoving machinery, material handling systems, construction equipment etc. shall be regularly inspected, maintained and replenished/refilled;

27.1.6 The operators and the helpers of such equipment shall be trained in the methods operating the equipment and fighting the fire effectively;

27.1.7 All combustion engine power equipment shall be so located that the exhausts are well away from combustible material;

27.1.8 No smoking shall be allowed at or in the vicinity of operations, which constitute fire hazards and shall be conspicuously posted with No smoking or open flame **signs**;

27.1.9 In the flammable environment as described in IS: 9570, the electrical fittings and equipment shall be of flame proof type conforming to IS: 2206 & IS; 2148;

27.1.10 Arrangements shall be made to contain sparks generated during welding, cutting or other operations and spark shall not be allowed to fall down on combustible material kept below; All means of exit shall be kept free of obstruction at all times;

27.1.11 Appropriate type of fire extinguishers according to IS: 5698 shall be kept in fully charged condition at the places which have potential risk of fire;

27.1.12 The contractor shall educate his or his sub-contractors' men working in the vicinity of fire risk, on how to operate these equipment and know in particular circumstances which type of extinguishers is to be used;

27.1.13 The contractor shall take full responsibility for the upkeep and replenishment/refilling of the fixed and portable fire extinguishers.

APPENDIX

Annexure I

IMPORTANT INDIAN STANDARDS RELATED TO SAFETY

Personal Protection

IS: 1179-1967 Equipment for eye and face protection during welding
IS: 4770-1991 Rubber gloves for electrical purposes
IS: 8519-1977 Guide for selection of industrial safety equipment for body protection
IS: 8520-1977 Guide for selection of industrial safety equipment for eye, face & ear protection
IS: 8807-1978 Guide for selection of safety equipment for protection of arms and hands
IS: 1224-1985 Safety shoes
IS: 2925-1984 Safety helmets
IS: 8940-1978 Code of practice for maintenance and care of industrial safety equipment eye and face protection
IS: 8990-1978 Code of practice for maintenance and care of industrial safety clothing
IS: 10667-1983 Guide for selection of industrial safety for protection of foot and leg
IS: 816-1969 Code of practice for safety and health requirements in electric and gas welding and cutting operations
IS: 818-1968 Code of practice for safety and health requirements in electric and gas welding and cutting operations
IS: 7194-1994 Assessment of noise exposure during work for hearing conservation purposes

Civil Engineering Construction

IS: 2750- 1967(Part II) Steel scaffolds
IS: 875-1987 Structural safety of building: loading standards
IS: 4014-1967 Code of practice for steel tubular scaffolding
IS: 3696 Safety code of scaffolds and ladders
IS: 4138-1977 Safety code for working in compressed air
IS: 4912-1978 Safety requirements for floor and wall openings, railings and toe boards
IS: 7293-1974 Safety code for working with construction machinery
IS: 9944-1992 Recommendations on safe working load for natural and man-made rope slings
BS: 1129 Portable timber ladders, steps, Trestles & lightweight staging
BS: 1139 Metal scaffolds
BS: 5973 Code of practice for access & working scaffolds
BS: 5974 Code of practice for temporary installed scaffolds and access equipment
BS: 5975 Code of practice for falsework

Fire Protection

IS: 2190-1992 Code of practice for selection, installation and maintenance of portable first-aid fire extinguishers
IS: 5896 Code of practice for selection, operation and maintenance of fire-fighting appliances

IS: 8433-1984 Code of practice for dissolved acetylene cylinders

Electrical

IS: 3043-1987 Code of practice for earthing
IS: 5424-1969 Rubber mats for electrical purposes
IS: 3646 (Part II) Artificial lightings
IS: 2148 & IS: 2206 Flame proof electrical fittings

Machinery

IS: 1860-1980 Code of practice for installation, operation and maintenance of electric passenger and goods lifts
IS: 1991-1987 Safety requirements for the use, care and protection of abrasive grinding wheels
IS: 5903-1970 Safety devices for gas cylinders
IS: 8216-1976 Guide for inspection of lift wire ropes
IS: 8964-978 Recommendations for safety conditions for woodworking machines
IS: 9474-1980 Principles of mechanical guarding of machinery
IS: 11461-1985 Code of practice for compressors safety
IS: 13367-1992 Code of practice for safe use of cranes

Annexure - II

BASIC STRUCTURE OF SAFETY PLAN

01- Safety Policy
02- When was the Safety Policy last reviewed
03- Details of implementation procedure / methods to implement Safety Policy / Safety Rules
04- Qualification & Experience of Safety Officers
05- Review of Accidents analysis - Methods to ensure safety & health and steps identified for prevention of accidents
06- Unit/site Executive responsible for ensuring safety at various levels in the workplace
07- List of Employees trained in safety at the commencement of execution of the job; details of training – its module and contents
08- Safety Training Targets, Schedules, Methods to be adopted for providing safety training to all employees
09- Details of checklists for different jobs/ work & responsible persons to ensure Compliance
10- Regular Safety Inspection Methods and Periodicity and the list of members authorized
11- Risk Assessment, Safety Audit by professional agencies, their Periodicity
12- Implementation of recommendations of Audit / Inspections. - Procedures for implementation & follow-up
13- Provision for treatment of Injured persons at work site
14- Review of overall safety by top Management and Periodicity
15- System for implementation of statutory provisions.
16- Issue of PPE to employees, Periodicity / stock on hand, etc.

Signature

Head of Organization

With Date & Stamp

Annexure - III

CONFINED SPACE WORK PERMIT

Date of Work :	Initiator:	Permit No.:	
Description of work :			
Name of person supervising:		Dept./Function:	
Names of workmen involved in the job :			
1		2	
3		4	
Exact Location of Work:			
JSA Referance No.			
Job Instruction & Confirmation Sheet Ref. No			
Valid From : Time ……. Date: ……. To Time: ……. Date: …….			
Other relevant information (if any)			
Initiated by Engineer / Supervisor of Agency		Checked by Agency Safety Representative	
Name		Name	
Signature		Signature	
Date		Date	

Check list for Authorization of Work Permit		
Minimum and Mandatory Precautions		Y/ N / NA
1	Permit form filled in completely?	
2	Have wind, atmospheric, and work area conditions (e.g. cold, hot, snow, poor lighting & Ventilation etc.) been considered throughout the job so that work can be done safely?	
3	All necessary Personnel Protective Equipment like Breathing Set, Waist Rope, Light Mounted Helmet etc. is put on by all the workmen?	
4	A lifeline, a rope tied on the safety belt of the person entering the confined space is provided?	
5	All practicable measures are taken to ensure that the atmosphere inside is not deficient in oxygen and does not contain flammable vapors and no hazardous gases like H2S. (Open at least 2 manholes & keep for 2 hours)?	
6	One fully trained person is stationed at ground level/outside to assist the inside workers and emergency contact No's available?	
7	All the workers trained for emergency?	

8	Safe means of access and egress provided?	
9	Is the suitable fire extinguisher available at work location?	
10	Are they Using only 24V lamps & working tools inside the confined space?	

Following additional precautions need to be taken before the start of the work

Permit Issued By:

	Approved by Principal Agency work in charge	Endorsed by Principal Agency HSE Dept
Name		
Signature		
Date		

Permit Close Out by: Name & Signature (Principal Agency)

Date :	Time :

Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.

HOT WORK PERMIT

Date of Work :	Initiator:	Permit No.:
Description of work :		
Name of person supervising:	Dept./Function:	
Names of workmen involved in the job :		
1	2	
3	4	
Exact Location of Work:		
JSA Referance No.		
Job Instruction & Confirmation Sheet Ref. No		
Valid From : Time ……. Date: ……. To Time: ……. Date: …….		
Other relevant information (if any)		

Initiated by Engineer / Supervisor of Agency		Checked by Agency Safety Representative	
Name		Name	
Signature		Signature	
Date		Date	

Exact location of work		
Relevant information		
Check list for Authorization of Work Permit		
Minimum and Mandatory Precautions		Y/ N / NA
1	Permit form filled in completely?	
2	Form filled in correctly and in full.	
3	Has the work area been inspected for any abnormalities - specify on wind, atmosphere, surroundings, etc.	
4	Are the necessary PPE provided and do the workmen know their use?	
5	Is the fitter, experienced and knowledgeable enough to carry out the job?	
6	Area has to be cleared of any flammables and combustible material.	
7	Electrical equipment to be protected and grounded.	
8	Are fire-fighting equipment - extinguishers, water, sand buckets etc, located nearby for ready in case of any mishap?	
9	Gas cylinders in upright state/ trolleys/ flash-back arrestors/ hose condition/ NRVs, etc.	
10	Is the area easily accessible?	

Additional precautions to be taken:		
This permit is valid only for one week. A fresh hot work permit has to be taken for continued works for the next week.		
Permit Issued By:		
	Approved by Principal Agency work in charge	Endorsed by Principal Agency HSE Dept
Name		
Signature		
Date		
Permit Close Out by: Name & Signature (Principal Agency)		
Date :		Time :
Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.		

PERMIT FOR LIFTING OF MATERIAL

Date of Work :	**Initiator:**	**Permit No.:**
Description of work:		
Name of person supervising:	**Dept./Function:**	
Names of workmen involved in the job :		
Exact Location of Work:		
JSA Reference No.		
Job Instruction & Confirmation Sheet Ref. No		
Valid From : Time ……. Date: ……. To Time: ……. Date: …….		
Other relevant information: (If any)		

Initiated by Engineer / Supervisor of agency		**Checked by Agency Safety Representative**	
Name		Name	
Signature		Signature	
Date		Date	

Check list for Authorization of Work Permit	
1	Details of type of crane(s) to be used?
2	Name of Lift Co-ordinator, Rigger/Crane Operator?
3	Adequate and suitable lifting gears available and in good condition
4	Have soil, wind, atmospheric, and work area conditions (e.g. cold, hot , snow, poor lighting & Ventilation etc.) been considered throughout the job so that work can be done safely?
5	Lifting Equipments, Lifting gears and Slings are tested and certified?
6	Are all operators trained, competent and healthy (Having Licenses / Experience Certificate)?
7	Are all the examinations and tests carried out on the equipment (Crane) and certified by competent persons?
8	Is the safe working load (SWL) marked on all lifting tools & tackles?
9	Lifting area cordoned off?
10	Tag lines provided to control the swing of load?
11	Load tied properly and secured against toppling and falling?
12	Signalman/Rigger is provided and competent?
13	Proper communication available between operator and rigger?
14	Is the vehicle for transportation adequate for the load?

Following additional precautions need to be taken before the start of the work:			
Permit Issue b By:			
Approved by Principal agency work incharge		**Endorsed by main agency HSE Dept**	
Name		Name	
Signature		Signature	
Date		Date	
Permit Close Out by: Name & Signature (Main agency)			
Date :		**Time :**	
Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.			

WORKING AT HEIGHT PERMIT

Date of Work :	Initiator:	Permit No.:
Description of work :		
Name of person supervising:	Dept./Function:	
Names of workmen involved in the job :		
1	2	
3	4	
Exact Location of Work:		
JSA Referance No.		
Job Instruction & Confirmation Sheet Ref. No		
Valid From : Time ……. Date: ……. To Time: ……. Date: …….		
Other relevant information		

Initiated by Engineer / Supervisor		Checked by Agency Safety Representative	
Name		Name	
Signature		Signature	
Date		Date	

Check list for Authorization of Work Permit		
Minimum and Mandatory Precautions		Y/ N / NA
1	Permit form filled in completely?	
2	Work area below is temporarily cordoned/barricaded	
3	The scaffold erected has pipes and clamps in good condition.	
4	Diagonal / lateral bracings pipes are provided to ensure stability	
5	Access ladder is provided to reach the work location	
6	Planks / sheet used in temporary platform are in good condition	
7	Planks / sheets are tied properly using binding wire	
8	Temporary platform is having temporary side railing	
9	Workers are wearing Helmet, Shoes & Safety belt in good condition.	
10	For Anchoring of safety belt at height rigid support / life rope line is provided	
11	Experienced workers are engaged for work	
12	Portable elect equip/fibre body checked for its healthiness including earthing	
13	The sling / pulley blocks / ropes are tested for fitness	

14	Workers are briefed on Safety Precautions to be taken	
	Power hand tools used at eight are connected through 30mA ELCB.	

Following additional precautions need to be taken before the start of the work

Permit Issued By:

	Approved by Principal Agency work in charge	Endorsed by Principal Agency HSE Dept
Name		
Signature		
Date		

Permit Close Out by: Name & Signature (Principal Agency)

Date :	Time :

Note: All extra information on preparation and precautions to be provided on the reverse side of this PTW.

Annexure - IV

DEFINITIONS

1. **Building or other construction work:** means the construction, alteration, repairs, maintenance or demolition, of or, in relation to, buildings, streets, roads, railways, tramways, airfields, generation, transmission and distribution of power, water works, oil and gas installations, electric lines, tunnels, bridges, viaducts, pipelines, towers, cooling towers and such other work as may be specified.

2. **Building worker:** means a person who is employed by a contractor to do any skilled, semi-skilled or manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment be expressed or implied, in connection with any building or other construction work;

3. **Establishment:** means an establishment who or which employs building workers in any building or other construction work, and includes an establishment belonging to a contractor;

4. **Contractor:** means a person who undertakes to produce a given result for any establishment, other than a mere supply of goods or articles of manufacture by the employment of building workers or who supplies building workers for any work of the establishment, and includes a sub-contractor or any other agency engaged on his behalf;

5. **Employer:** in relation to an establishment, means the owner thereof that is the contractor himself.

6. **Competent Person:** means a person so approved by the Central Government who belongs to a testing establishment in India possessing adequate qualification, experience and skill for the purpose of testing, examination or annealing and certification of lifting appliances, lifting gears, wire ropes or pressure plant or equipment;

7. **Responsible Person:** means a person appointed by the employer to be responsible for the performance of specific duty or duties and who has sufficient knowledge and experience and the requisite authority for the proper performance of such duties;

8. **Danger:** means danger of accident or of injury or danger to health;

9. **Hazard:** means danger or potential danger;

10. **Hazardous substance:** means any substance, which due to its explosiveness, inflammability, radioactivity, toxic or corrosive properties and similar hazardous characteristics may Cause injury; or Affect adversely the human system; or Cause loss of life or damage to property or environment;

11. **Hazardous Process:** comprises roof work, steel erection, and work under and over water, demolition and work in confined space;

12. **National Standard:** means standards as approved by the Bureau of Indian Standards (BIS) and in the absence of such standards, the standards approved by the Central Government for a specific purpose;

13. **Lifting Appliance:** means a crane, hoist, derrick, winch, jack, pulley block or other equipment used for lifting materials, objects or building workers;

14. **Lifting gear:** means ropes, chains, hooks, slings and other accessories of a lifting appliance;

15. **Safe Operating Practice:** Means the practice followed in building and construction activities for the safety of workers and for safe operation of machinery and equipment used in such activities. Such practices shall conform to all or any of the following:

    Relevant Standards approved by BIS;

    National Building Codes;

    Manufacturer's instruction on safe use of equipment and machinery;

    Code of practice on safety in construction industry published by International Labour Organization .

16. **Safe working load**: in relation to an article of lifting gear or lifting appliance, means the load which is the maximum load that may be imposed on such article or appliance with safety in the normal conditions as assessed and certified by a competent person;

17. **Workplace**: means all places where building workers are required to be present or to go for work and which are under the control of an employer;

18. **Personal Protective Equipment (PPE):** are the protective devices made available for individual or collective use of the workers likely to be affected by the hazards of the workplace or process;

19. **Construction & Erection Manual (E&C) Rules**: all references to E&C Manual shall mean the Construction & Erection Rules that are detailed hereunder;

20. **Engineer in-charge**: All references to the Engineer in-charge shall mean the person in-charge of a building and construction of the NTPC.

21. **Interpretation of words not defined: words and expressions not defined or used in this Manual shall have the same meaning as generally assigned in common engineering practices**

DOCUMENT ISSUE SHEET

(DOCUMENT REF. NO. ER:HSE:DVC-RTPS-SG(PH-II):SUP:01/25)

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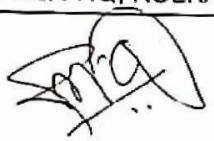
SIGNATURE			
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THIS HSE DOCUMENT IS BASED ON AND IS AIMED AT ADDRESSING SPECIFIC HSE NEEDS & CONCERNS OF THE CUSTOMER AND INCORPORATING NECESSARY HSE REQUIREMENTS AS CONTAINED IN THE CUSTOMER DOCUMENT **DVC/C&M/ENGINEERING/RTPS Ph-II/EPC/SG** AND IN VARIOUS SECTIONS OF THE NTPC SAFETY RULES ADOPTED BY THE CUSTOMER. IT IS A SUPPLEMENT TO BHEL HSE DOCUMENT **HSEP-14 (REV. 02) - HEALTH, SAFETY & ENVIRONMENT PLAN FOR SITE OPERATIONS BY SUBCONTRACTORS,** THE APEX DOCUMENT FOR HSE MANAGEMENT AT SITE BY BHEL SUB-CONTRACTOR(S).

THE PRESENT DOCUMENT IS TO BE READ, UNDERSTOOD AND ITS PROVISIONS TO BE IMPLEMENTED IN CONJUNCTION WITH **HSEP-14 (REV. 02) - HEALTH, SAFETY & ENVIRONMENT PLAN FOR SITE OPERATIONS BY SUBCONTRACTORS.** WHEREVER THERE IS A CONFLICT AND/OR DISPARITY BETWEEN THE TWO DOCUMENTS ON ANY HSE ISSUE THE PROVISIONS HELD IN THE PRESENT DOCUMENT IS TO SUPERSEDE.

WHILE EVERY ATTEMPT HAS BEEN MADE TO INCLUDE ALL RELEVANT HSE GUIDELINES & REQUIREMENTS IN THE PRESENT DOCUMENT, HOWEVER, THE DOCUMENT IS BY NO MEANS EXHAUSTIVE AND IF ANY FURTHER CLARIFICATION/INTERPRETATION IS REQUIRED ON ANY HSE ISSUE THE SAME SHALL BE AT THE DISCRETION OF BHEL SITE MANAGEMENT.

THE AMENDMENTS/MODIFICATIONS, ADDITIONS, REVISION ETC. TO THE EXTANT RULES, REGULATIONS & GUIDELINES AS INCLUDED IN THE PRESENT DOCUMENT OR THE APEX DOCUMENT (HSEP:14/REV.02) OR ANY OTHER RELATED DOCUMENT ISSUED BY BHEL, CUSTOMER (DVC, RAGHUNATHPUR THERMAL POWER STATION) OR ANY STATUTORY BODY AT ANY LATER DATE DURING THE COURSE OF EXECUTION OF THE JOB THE SAME SHOULD ALSO BE COMPLIED WITH.

CONTENTS

SECTION-A

FOREWORD

This document is developed as a supplement to BHEL HSE Document **HSEP-14 (REV. 02) - Health, Safety & Environment Plan for Site Operations by Subcontractors**, the Apex Document for HSE Management at Site by BHEL Contractor(s) and is primarily aimed at addressing specific HSE needs & concerns of the Customer & incorporating relevant HSE requirements as contained in the Customer document No. : **DVC/C&M/ENGINEERING/RTPS Ph-II/EPC/SG**. This document briefly outlines the specific HSE (Health, Safety & Environment) requirements of Customer over and above the requirements as covered amply and extensively in **HSEP-14 (REV. 02)**.

The eligible Contractor and their Employees and Workmen including outsourced manpower/workforce, if any, deployed and/or visiting the project site shall comply with the applicable HSE provisions held in this document along with those covered under **HSEP-14 (REV. 02)** as well as any revision, amendment, modification or addition affected at a later date during the validity of the contract period. Additionally, the Contractor shall abide by and comply with all safety rules and guidelines framed from time to time by the Customer (Principal Occupier/Owner), State Government, Central Government or any appropriate Statutory Body that are relevant to and conducive of safe execution of the project ensuring adequate safety to man, material, asset and environment.

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
1.0	**Cl. B of Safety Rules under Annexure IV to SCC (P. 244-245)** Roles & Responsibilities of the work-force are mentioned in details under the heading ***RESPONSIBILITIES AND DUTIES OF WORKERS***	**Cl. 5/Section B** under the heading ***ILLUSTRATIVE HSE RESPONSIBILITIES OF VARIOUS SUBCONTRACTOR OFFICIALS (P. 24)***	(a) It shall be the responsibility of the worker to comply with the requirements of safety as laid down for him and the group of workers to which he belongs and fully cooperate in the discharge of the responsibility that has been assigned to the contractor. (b) If he discovers any defects in the lifting appliance, lifting gear, lifting device or those concerning any transport equipment or other construction equipment or tools as well as the physical work conditions, he will report such defects promptly to his/her Area Supervisor/Engineer, Employer, BHEL Safety Personnel or any other person in authority; (c) No building worker shall, unless duly authorized or in case of absolute necessity, remove or interfere with any fencing, guards, gangways, gear, ladder, hatch covering, life saving appliances, lighting or other things whatsoever required and provided for safety and health. If any of the aforesaid things is removed, the persons engaged in the work shall restore such thing at the end of the period during which its removal was necessary; (d) Every worker shall use only means of access provided in accordance with the approved norms and no person shall authorize or order another to use such means of access or method other than those approved; (e) Workers shall use such means of access and egress for going to and exiting from the workplace as provided.
2.0	**Cl. 1.2 NTPC Safety Rules-Safety Manual and Safety Policy**	**Cl. 6.1/Section B (Page. 27)**	Point of Work Risk Assessment (PoWRA) for each job to be done as applicable in addition to HIRA, JSA & Method Statement
3.0	**Cl. 22.3.3(i) of Customer Bidding Document- Site Regulations and Safety** **Cl. 2.0 of NTPC Safety Rules-Appointment of Safety Officer/Safety Supervisor**	**Cl.5.0/Section - A** HSE Personnel to be provided solely by the Sub-contractor) **(P. 8 & 9)**	When number of Workers is more than 4000 the deployment of Safety Manpower will be as follows- a. **Safety Supervisor**- 18 + 01 additional Supervisor up to every additional 250 workers b. **Safety Officer**- 05 + 01 additional Supervisor up to every additional 1000 workers

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
4.0	**Cl. 3.0 NTPC Safety Rules- Meeting for Safety After Award of The Contract**	**No related clause**	Representatives of contracting agency along with Safety Officer/Executive shall meet the concerned EIC of the particular activity prior to start of construction activities for the purpose of discussing safety standards and requirements applicable to the work under contract. The person representing the agency should be a responsible person for all their site activities.
5.0	**Cl. 22.3.3(ii) of Customer Bidding Document- Site Regulations and Safety** **Cl. 4.0 of NTPC Safety Rules- Personal Protective Equipment**	**Cl. 9/Section-B (Page 29)**	i. The Contracting Agency should ensure sufficient inventory of Personal Protective Equipment (PPEs) prior to initial mobilization as specified in the Bidding Documents. After identifying the need of the required PPEs for various activities performed at the site, an additional inventory of approx. 20% of required PPEs should be maintained during the execution of the work. A PPE Plan shall be prepared which gives fair idea regarding issue of PPEs to various personnel as per the 'PPE Selection Matrix'. Refer Annexure 'A' for **Suggestive List of Minimum HSE Equipment/PPEs** to be maintained at site. ii.The above-mentioned PPEs should be made available with contractor at site and issued to the concerned workers on the day of employment. All PPEs shall comply with ISI standards with valid test certificates. iii. At least 02 (Two) Breathing Apparatus sets (complying requirement as per IS: 10245) shall be provided at each site where excavation/tunneling works and Welding/ Cutting operations in confined areas are being carried out, to rescue the victims under exposure to harmful gases/vapors, if any.
6.0	**Cl. 5.0 of NTPC Safety Rules- Safety Committee**	**Cl. 20 (Sl. No. 19)/ Section-B (Page 54)**	i. Safety Committee shall be constituted if there are 500 or more construction workers employed at the site in line with the provisions of BOCW Act (as per Factories Act for 250 workers & above). ii. The Safety Committee shall be represented by equal number of representatives of Employer and Construction Workers. iii. Coordinated by the Safety Officer the Safety Committee shall meet at least once in every month. iv. Package-in-charges, Execution Engineers, Job Supervisors, Foremen of Agencies shall also contribute to the cause of safety & join Safety Meetings as & when required.

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
7.0	**Cl. 10 of NTPC Safety Rules-Safety Audit**	**Cl. 19.5.9/Section-B (Page 52)**	i. All agencies shall conduct on their own & also assist in conducting- a. Periodical Safety (HSE) Audit by the Agency (at least haf-yearly). b. Internal Safety (HSE) Audit once in every six months by BHEL HQ HSE Dept. c. Internal Safety (HSE) Audit by BHEL Site HSE Dept. d. BHEL Corporate Safety (HSE) Audit e. External Safety (HSE) Audit once in a year by Third Party Auditing Agency. The External Auditing Agency should either be a reputed safety institution or a certified Safety Auditor under any statutory legislation. f. Quarterly Electrical Safety Audit by a team comprising of Customer Repre-sentative, BHEL HSE Representative and Representatives of Agency HSE Dept. & Electrical Dept. covering the following among other issues- i) Electrical incidents investigation findings and remedial measures implemented. ii) Adequacy of power supply requirements iii) Power distribution system in place iv) Updated electrical single line diagram including the IP44 DBs arrangement. v) Electrical protection devices – ELCBs, O/L protections etc. vi) Earth or ground connection and earth pit maintenance details vii) Education and training of electrical personnel undertaken viii) Any other point appropriate to the site conditions. All Audit Reports along with time bound Action Plan & subsequent Compliance status shall be submitted to BHEL Site HSE Dept. within the stipulated time.
8.0	**Cl. 11 of NTPC Safety Rules-Safety Budget**	**No related clause**	Every Contracting Agency shall prepare estimate and allocate a separate budget head for HSE requirements every year and make the Site HSE Activity Plan for the year. Budget allocations should be practically adequate to the site HSE requirements. The detailed plan along with budget allocation is to be submitted to BHEL Site HSE Management for review before start of the work & subsequently, every year by 15th of April.

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
9.0	**Cl. 22.3.3(iv) of Customer Bidding Document- Site Regulations and Safety** **Cl. 13 of NTPC Safety Rules- Medical and First Aid Amenities (Sub. Cl. 13.2, 13.4 & 13.8)**	**Cl. 10.5/Section-B (P. 32), Annexure-A(P.57) & Annexure-K (P. 131)**	i. Deploy one (01) trained and certified First Aider/Male Nurse for every twenty (20) workers in each shift. ii. Deploy one (01) full time Construction Medical Officer (qualification as per Schedule XI of BOCW Central Rules-1998) where 500 or more workers are employed (up to one thousand workers) and one additional Construction Medical Officer for additional one thousand workers or part thereof. iii. Refer Annexure 'C' for Health Check-up Matrix.
10.0	**Cl. 19 of NTPC Safety Rules- Interference with Moving Vehicles and Pedestrians**	**Cl. 17./Section-B (P. 45-46)Traffic Management System**	Provisions of Cl. 19 of NTPC Safety Rules including the following ones shall be adhered to in addition to provisions held under **Cl. 17/Sec. B** of **HSEP-14 (Rev.02)** i. Appropriate measures shall be implemented in order to prevent collision between pedestrians & vehicles at pedestrian crossings. This may include, but shall not be limited to: - Mirrors, Lighting; Speed Breakers before the crossing point. ii. Vehicle and pedestrian ways shall be physically separated with Hard-barriers, so far as is reasonably practicable, and be indicated with signs. iii. When it is not reasonably practical to implement a physical segregation, pedestrians shall maintain safety distance of at least 2 meters from moving/operating vehicles at all times. iv. All pedestrians on Project sites shall wear high-visibility garments.
11.0	**Cl. 21. of NTPC Safety Rules- Stacking and Storage Practice**	**No related clause**	i. Contractor Agency shall ensure stacked material is bonded on a stable and level footing capable of carrying the mass of the stack. Adequate clearances shall be provided between the sides of the stack and top to facilitate unimpeded access to service equipment like overhead wiring, cranes, forklifts and firefighting equipment, and hoses. Circular items shall be sufficiently choked with wedges not with odd bits of materials. Free-standing stacks of gunny bags and sacks such as Cement bags shall be stacked to prescribe safe stacking heights with layers formed for stable bonding, preventing slippage causing accidents. Stacking against walls shall not be permissible. ii. Contractor shall maintain the premises and surrounding areas in clean and clear manner with safe access and egress.

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
11.0	**Cl. 21. of NTPC Safety Rules-Stacking and Storage Practice**	**No related clause**	There shall be sufficient and adequate storage racks, shelving, bins and pallets and material handling equipment to stack his construction materials such as Pipes, Structural and his construction enabling materials. Unwanted materials shall be promptly moved away for efficient material movement. iii. Any temporary store shed will be built in conformity with fire safety requirements. The stores must be provided with adequate lighting arrangement (Flame proof / intrinsically safe depending upon the Zone category) and must be equipped with sufficient fire extinguishing arrangement. “No Smoking” and other relevant signage must be displayed conspicuously at strategic locations and safety precautions must be strictly enforced. iv. All material should be kept at least 150mm above from the ground by providing wooden packing below. Maximum height of material stacking should not be greater than 3 meter. All loose material must be kept in wooden box or in sharp edge protected drum and material identification details to be displayed. Materials inside store room should be kept on scaffold rack. V. Gas cylinder storage area must be 30m away from the hot work zone and separate storage facility must be available for empty and full cylinder with proper shed. Storage area must be design in a way that 6 meter distance between LPG/DA and oxygen maintained.
12.0	**Section-II of NTPC Safety Rules-Safety at Workplace and Equipment**	**Annexure I-Activity-Specific Precautions/ Controls (Page 84-127)**	All provisions held in **Section-II of NTPC Safety Rules** including those specifically mentioned below shall be complied with in conjunction with the provisions held in **Annexure-I** as well as other relevant sections of **HSEP 14 (Rev. 02.** **2.0** Safety in Material Handling And Waste Disposal **8.0** Safety in The Use Of Transport, Earthmoving Equipment & Other Construction Machinery **9.0** Safety in The Provision of Runways And Ramp **11.0** Safety in Excavation & Tunneling Work **14.0.** Safety in The Erection of Structural Frame & Formwork

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
12.0	**Section-II of NTPC Safety Rules-Safety at Workplace and Equipment**	**Annexure I-Activity-Specific Precautions/ Controls (Page 84-127)**	**16.0.** Safety in Construction, Repair & Maintenance of Steep Roofs **17.0**. Safety in Catches Platforms, Hoardings & Chutes **18.0.** Safety in Work on or Adjacent To Water
13.0	**Cl. 22.6.3 Customer Bidding Document- Disposal of Scrap** **Cl. 20/Section-I of NTPC Safety Rule** **Cl. 1.1/Section-II of NTPC Safety Rule**	**Cl. 10.8 (Scrap Yard), Cl. 15 (Housekeeping) & Cl. 16 (Waste Management) of Section 'B'-Operational Requirements** **(Page No. 33,44,45)**	i. The Contractor shall, with the agreement of the Employer/Principal Owner of the premises, promptly remove from the site any scrap/waste generated during the course of any work-activity at site including such wastes/left-overs generated after completion of a job. ii. The ownership of such scrap shall vest with the Contractor except in cases where the items have been issued by the Employer/ Principal Owner from its stores for their installation. iii. The removal of scrap shall be subject to the Contractor producing the necessary clearance from the relevant authorities (Custom, GST, Environment Management Bodies etc.), if required by the law, in respect of disposal of the scrap. The liability for the payment of the applicable taxes/duties shall be that of the Contractor. iv. The Contractor shall also indemnify to keep the Employer harmless from any act of omission or negligence on the part of the Contractor in following the statutory requirements with regard to removal/disposal of scrap. The Indemnity-cum-Undertaking Agreement shall be furnished by Contractor as per proforma enclosed as Annexure-B of this document. Further, in case the law requires the Employer to take prior permission of the relevant Authorities before handing over the scrap to the Contractor, the same shall be obtained by the Contractor on behalf of the Employer. v. All scraps/wastes should be disposed off in environment friendly manner.
14.0	**Cl. 22.7 of Customer Bidding Document- Watching and Lighting** **Cl. 1.3 of NTPC Safety Rule (Illumination)** **Cl.11.5 of NTPC Safety Rule (Illumination)**	**Illumination** **Cl. 10.9 (Illumination), 19.5 (Indicative List of Inspection & Periodicities) of Section 'B'-Operational Requirements** **(Page No. 34 & 50)**	Watching and Lighting i. The Contractor shall provide and maintain at its own expense all lighting, fencing, and watching when and where necessary for the proper execution and the protection of the Facilities, or for the safety of the owners and occupiers of the adjacent property and for the safety of the public.

Clause No.	Description	Related Clause in HSEP 14 (Rev. 02)	Remarks
14.0	**Cl. 22.7 of Customer Bidding Document- Watching and Lighting** **Cl. 1.3 of NTPC Safety Rule (Illumination)** **Cl.11.5 of NTPC Safety Rule**	**Illumination** **Cl. 10.9 (Illumination), 19.5 (Indicative List of Inspection & Periodicities) of Section 'B'-Operational**	ii. Sufficient illumination at all times for maintaining safe working conditions shall be provided where workers are required to work or pass, and for passageways, stairways and landings such illuminations shall not be less than 0.5 foot-candles at the floor level.
15.0	**Cl. 38 of Customer Bidding Document- War Risks**	**No related clause**	**"War Risks"** shall mean any of the following events occurring or existing in or near the country (or countries) where the Site is located- (a) War, hostilities or warlike operations (whether a state of war is declared or not), invasion, act of foreign enemy and civil war (b) Rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion and terrorist acts, and (c) Any explosion or impact of any mine, bomb, shell, grenade or other projectile, missile, munitions or explosive of war. If during the execution of the Contract any War Risk shall occur that financially or otherwise materially affect the execution of the Contract by the Contractor, the Contractor shall use its reasonable efforts to execute the Contract 'with due and proper consideration given to the safety of its and its Subcontractors' personnel engaged in the work' on the Facilities, provided, however, that if the execution of the work on the Facilities becomes impossible or is substantially prevented for a single period of more than sixty (60) days or an aggregate period of more than one hundred and twenty (120) days on account of any War Risks, the parties will attempt to develop a mutually satisfactory solution, failing which the dispute will be resolved in accordance with GCC Clause 6.
16.0	**Cl. 39 of Customer Bidding Document- Change in the Facilities**	---	The Contractor may from time to time during its performance of the Contract propose to the Employer (with a copy to the Project Manager) any Change that the Contractor considers necessary or desirable to improve the quality, efficiency or **safety** of the Facilities. The Employer may at its discretion approve or reject any Change proposed by the Contractor.

SECTION-B

ANNEXURE 'A'

In reference to Annexure 'C' (HSE Tools/ Equipment/ Devices) of HSEP14 (Rev.2), Contracting Agency should maintain at the project site a certain quantity of various HSE Equipment/PPEs (Personal Protective Equipment) to ensure personal safety as well as work-place safety compliance at all times. Following is a suggestive, though not exhaustive, list of HSE Equipment/PPEs that should be maintained in fully functional/usable condition (validated by appropriate authority wherever applicable) at site as part of **Mandatory Minimum Stock** (combining individual stocks of all agencies/sub-agencies of BHEL available at the site and working for this project at any given time) at all times during project execution. The minimum quantity to be maintained for each item shall be as per the requirement of the site. If any agency, partially or completely, fails to comply with the obligation of providing their share of this mandatory requirement BHEL shall provide the same at the risk and cost of the concerned agency/agencies.

List of Suggestive HSE Equipment/PPEs to be included in List of minimum T&P:-

Sl. No.	List of Safety Equipment/Personal Protective Equipment	Minimum Quantity To Be Maintained
1	**Safety Net** (Conforming IS 11057:1984) Net Size: 10m x 5m, Mesh Size: 25 mm, Mesh Rope: 2mm double cord, Border/Tie Cord: 12mm diameter polypropylene rope (Tested as per IS: 5175). each of 2 metres length shall be provided at all four corners.	As per requirement at site
2A	**Fall Arrester (Rope Grab Fall Arrester)** Rope Grab Fall Arrester: Openable & Guided type Fall Arrestor (on flexible line) conforming EN 353-2 & works on 14-16 mm diameter polyamide rope Material: Nickel Chrome plated Steel	
2B	**Connector** Karabiner conforming to EN 362 (Minimum Strength 22 KN) Material: Steel	
2C	**Anchorage Line (30 mtrs. length)** 14mm- 16 mm diameter, 3 strand, twisted Polyamide Rope	
2D	**Anchorage Line (40 mtrs. length)** 14mm- 16 mm diameter, 3 strand, twisted Polyamide Rope	
3A	**Horizontal Lifeline (40 mtrs. length)** Stainless Steel Wire rope of 8mm diameter. Minimum 06 nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end)	
3B	**Horizontal Lifeline (25 mtrs. length)** Stainless Steel Wire rope of 8mm diameter. Minimum 06 nos. of steel U-bolt clips are required for clamping each wire rope to a rigid support (03 nos. of U-bolt clips at each end)	
3C	**Lifeline Post/Stanchion**	
4	**Ladders on Column** The minimum design live load on metallic ladder shall be a single concentrated load of 100 kilograms. All rungs shall have a minimum diameter of 1.90 centimetres and minimum clear length of rungs shall be 40.6 centimetres. The distance between rungs shall not exceed 30.5 centimetres. Each ladder shall have maximum height of 9.0 metre. The ladder shall have proper fastenings for attaching it to a column using positive means such as bolt, weld or other type of fasteners.	
5	**Safety PPEs (Personal Protective Equipment)**	
5A	Industrial Safety Helmet (IS:2925-1984 marked)	
5B	Industrial Safety/Electrical Shoes (IS:15298-2002 marked)	
5C	Full Body Safety Harness (conforming IS:3521)	

ANNEXURE 'B'

SAMPLE FORM OF INDEMNITY-CUM-UNDERTAKING AGREEMENT
(FOR REMOVAL / DISPOSAL OF SCRAP / SURPLUS MATERIAL)

FORM OF INDEMNITY-CUM-UNDERTAKING AGREEMENT WITH REGARD TO REMOVAL/DISPOSAL OF SCRAP/SURPLUS MATERIAL
(TO BE EXECUTED ON STAMP PAPER OF APPROPRIATE VALUE)

INDEMNITY-CUM-UNDERTAKING AGREEMENT

THIS INDEMNITY-CUM-UNDERTAKING AGREEMENT executed this .....day of..... 20 ..... between .....(Name of Company) ..... a Company /Partnership Firm / Proprietary Concern incorporated under the laws of ……. having its Registered Office(s) at ..... (Office Address) ..... hereinafter called the 'Contractor' (which expression shall, unless excluded by or repugnant to the context, be deemed to mean and include its successors, administrators, executors and permitted assigns) AND M/s. ..... having its registered office at ..... (hereinafter referred to as 'Employer'). 1. 'Employer' has awarded the 'Contractor', contract for execution of work ("Scope of Work") as mentioned in the contract agreement no. ..... dated ....., entered into between 'Employer' and 'Contractor', relating to ..... (Name & Address of Project/Station) ..... (hereinafter called 'the Project'). 2. The 'Contractor' for the purpose of execution of its Scope of Work had from time to time procured and stored ..... (Details of Material) ..... at the Project Site. 3. After completion of the Scope of Work by 'Contractor', it has been identified that scrap ..... (Details of Scrap Material & its quantity) ..... and/or surplus ..... (Details of Surplus Material & its Quantity) ..... belonging to 'Contractor' is lying at the said Project Site. 4. Now, the scrap ..... (Details of Scrap Material & its Quantity) ..... and/or surplus ..... (Details of Surplus Material & its Quantity) ..... belonging to the 'Contractor', requires to be removed by 'Contractor' from the Project Site. NOW THEREFORE THIS INDEMNITY-CUM-UNDERTAKING AGREEMENT WITNESSETH AS UNDER:

1. That 'Contractor' by way of this Indemnity-cum-Undertaking Agreement requests 'Employer' to issue necessary exit gate pass(es) in favour of 'Contractor' for removal of scrap..... (Details of Scrap Material & its Quantity) ..... and/or surplus ..... (Details of Surplus Material & its Quantity) ..... belonging to 'Contractor', from the project.

2. That as per Employer's procedure, 'Contractor' shall ensure loading of trucks for clearing of its scrap ..... (Details of Scrap Material & its Quantity) ..... and/or surplus

..... (Details of Surplus Material & its Quantity) ..... by itself, as aforesaid, under the supervision of CISF personnel.

3. That 'Contractor' in consideration of the premises above, for itself and its respective, executors, administrators and assigns, jointly and severally agree and undertake from time to time and at all times hereafter to indemnify 'Employer' and keep 'Employer' indemnified from and against all claims, demands, actions, liabilities and expenses which may be made or taken against or incurred by 'Employer' by reason of the issue of necessary gate pass(es) by 'Employer' and permitting 'Contractor' to remove scrap ..... (Details of Scrap Material & its Quantity) ..... and/or surplus ..... (Details of Surplus Material & its Quantity) ..... belonging to 'Contractor', from the project.

4. That 'Contractor' undertakes to indemnify and keep 'Employer' harmless from any act of omission or negligence on the part of the 'Contractor' in following the statutory requirements with regard to removal/disposal of scrap and surplus belonging to 'Contractor', from the Project Site aforesaid, by the 'Contractor'. Further, in case the laws require 'Employer' to take prior permission of the relevant Authorities before handing over the scrap and/or surplus to the 'Contractor', the same shall be obtained by the 'Contractor' on behalf of 'Employer'.

IN WITNESS WHEREOF, the 'Contractor' and the 'Employer', through their authorized representative, have executed these presents on the Day, Month and Year first mentioned above at ..... (Name of the Place) .....

For and on behalf of	For and on behalf of
.....	.....
(Contractor's Name)	(Employer's Name)
Signature	Signature .....
Name	Name .....
Designation of Authorised Representative *	Designation of Authorised Representative * .....
<u>WITNESS</u> :	<u>WITNESS</u> :
1. Signature	1. Signature .....
2. Name	2. Name .....
3. Address	3. Address .....

ANNEXURE 'C'

Site Management of all Contracting Agencies shall conduct routine Health Check-up of all Personnel working under them & deployed at the site as per the following matrix-

Types of Health Examination	Target	Frequency
General Health Examination	All Workers	At the time of Induction & subsequently Annual
Occupational Health Examination (Audiometric, PFT, Vision etc.)	Worker engaging in noise, dust, vibration, harmful light generating work	Annual
Occupational Health Examination (Vision)	Personnel involved in operation of Cranes, Heavy Vehicles	Annual
Occupational Health Examination (Vertigo/Height Pass)	Workers engaged at Height Works	At the time of Induction Training and every year

Record of Revision/Amendment:

Date	Type of Revision	Clause No.	Details of Revision	Signature

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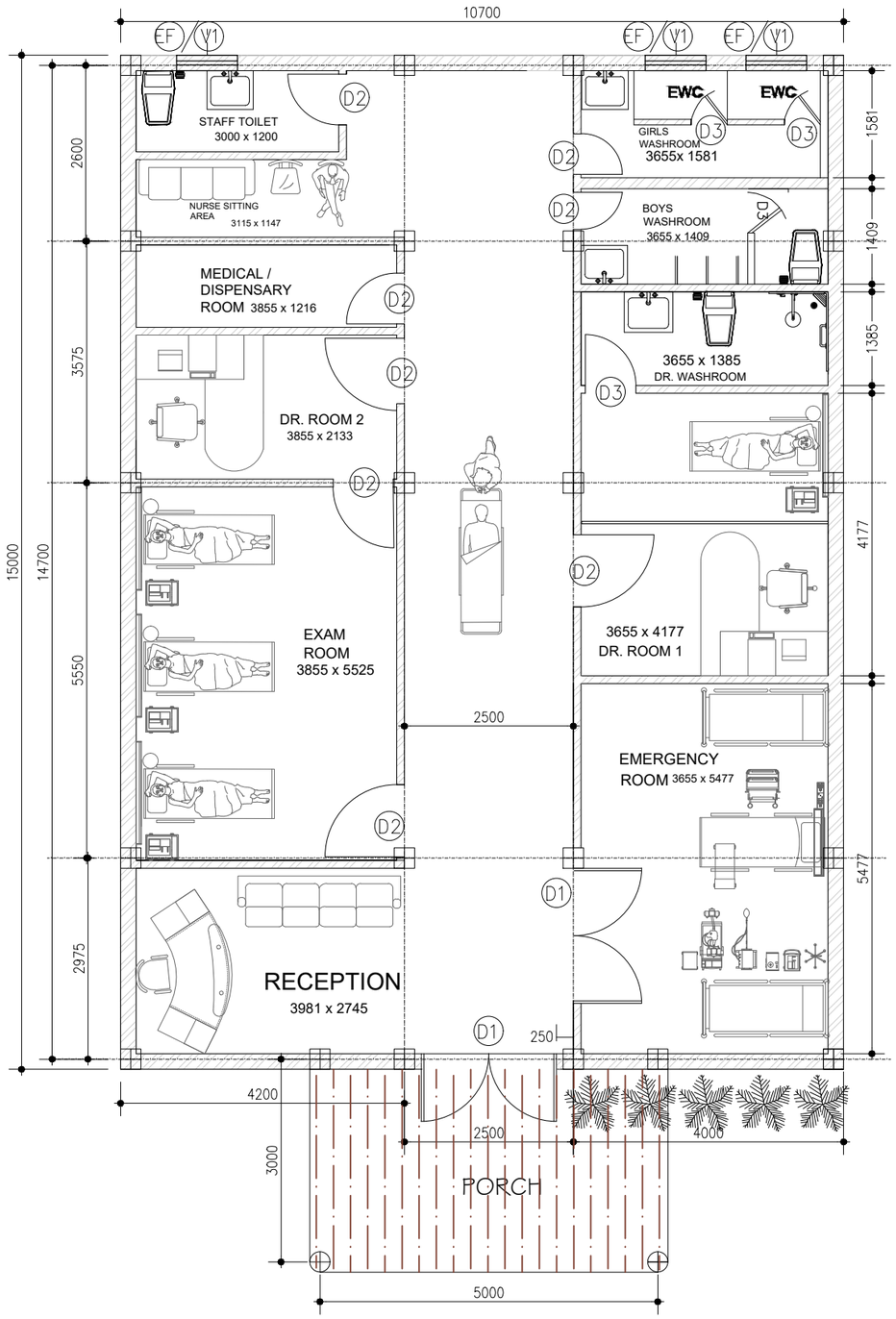
Reference:-

i. CUSTOMER BIDDING DOCUMENT (Ref. No. DVC/C&M/ENGINEERING/RTPS Ph-II/EPC/SG
ii. NTPC SAFETY RULES FOR CONSTRUCTION AND ERECTION OF POWER PLANTS
iii. HSEP-14 (Rev-I) BHEL HEALTH, SAFETY & ENVIRONMENT PLAN FOR SITE OPERATIONS BY SUBCONTRACTORS



NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRE AND ELEVATIONS ARE IN METRE U.N.O.
2. DRAWING SHALL BE READ IN CONJUNCTION WITH THE TERM & CONDITIONS, AS SPECIFIED IN ANNEXURE A–STANDARD GUILDELINES.
3. THIS SHALL BE AN RCC BUILDING WITH BRICKWORK.OUTER WALLS SHALL BE 230MM THICK & PARTITION/INNER WALLS SHALL BE 115MM THICK.
4. THE CLEAR CEILING HEIGHT SHOULD BE MINIMUM 3.5 METRES.
5. WATER & ELECTRICITY FOR MEDICAL CENTER SHALL BE SUITABLY ARRANGED BY THE AGENCY WITH PROPER ELECTRICAL WIRING AND FITTING. FITTINGS LIKE FANS, LIGHTING, ALL SWITCHES AND SOCKETS, ETC.
6. SEPTIC TANK/BIO–DIGESTER WITH PROPER INLET/OUTLET CONNECTION TO BE PROVIDED.
7. THERE SHOULD BE PROPER APPROACH ROAD TO THE MEDICAL CENTER & ITS CONNECTIVITY WITH EACH BARRACK WITH NECESSARY HARD SURFACING PREFERABLY WITH BRICK FLAT SOLING/PAVER BLOCKS/PCC PAVING TO BE ENSURED.
8. WINDOWS SHALL BE OF METAL MAKE, OPENABLE WINDOW WITH MIN. 6mm THK. TOUGHENED GLASS. SUITABLE NO. OF EXHAUST FANS TO BE PROVIDED AS PER THE SCHEDULE FURNISHED IN DRAWING.
9. DOORS SHALL BE OF METAL DOOR FRAME WITH SOLID CORE FLUSH DOOR SHUTTER. DOOR HEIGHT 2100MM MIN. AND DOOR WIDTH 1200MM MIN.(D2) DOORS FOR TOILETS (D3)SHALL BE 900MM(W)X2100(H) ENTRANCE DOOR AND EMERGENCY ROOM DOOR SHALL BE DOUBLE DOOR. DOOR SIZE SHALL BE 2000MM(W)X2100(H)
10. TILING SHALL BE OF VITRIFIED FLOOR TILES OF SIZE 600 X600 / 300 X 300 OF MINIMUM THICKNESS 7 MM PROVIDED.TILES HAVE TO BE LAID OVER A BED OF CEMENT MORTAR 1:4, 20 MM THICK.
11. ROOF SHALL BE OF METALLIC COLOR COATED PROFILED SHEET WITH PROPER. UNDER DECK INSULATION & FALSE CEILING (B.O.False Ceiling 3.5m).
12. ALL STRUCTURAL WORKS FOR THE ROOF TRUSS AND THE RCC WORKS TO BE CARRIED OUT AS PER RELEVANT INDIAN STANDARD CODES.

SCHEDULE OF WINDOWS

TYPE	SIZE	SILL LVL.	REMARKS
V1	900(W)X600(H)	1800	FIXED GLASS STEEL VENTILATOR
EF	330ø	CL. OF EXHAUST FAN EL(+)2.80	EXHAUST FAN OPENING

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
CENTRAL PROCUREMENT CELL (CPC)
PSHQ

TITLE
TYPICAL LAYOUT FOR MEDICAL CENTRE

SCALE 1:100 | DRAWING NO. | SHEET OF REV

SIZE-A3