VOLUME – IA
Part I & II

TECHNICAL CONDITIONS OF CONTRACT (TCC)

BHARAT HEAVY ELECTRICALS LIMITED

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VOLUME - IA PART – I CHAPTER – I

1.1 PROJECT INFORMATION

1.1.1	PROJECT TITLE	:	KUDANKULAM NUCLEAR POWER PROJECT UNIT 3 & 4
1.1.2	PLANT CAPACITY	:	2X 1000 MWe
1.1.3	TYPE OF PROJECT	:	GREEN FIELD
1.1.4	OWNER	:	NUCLEAR POWER CORPORATION OF INDIA LIMITED
1.1.5	PLANT LOCATION	:	KUDANKULAM PO, RADHAPURAM TALUK, TIRUNELVELI DISTRICT, TAMILNADU - 627106
1.1.6	NEAREST TOWN	:	NAGERCOIL (41KM)
1.1.7	NEAREST RAILWAY STATION	:	KANYAKUMARI (35KM)
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VOLUME-IA PART-I CHAPTER – II

1.2 SCOPE OF WORKS

AS DETAILED IN BILL OF QUANTITY (BOQ)

1.2.1 General

1.2.1.1 Handling, transportation, pre-fabrication, assembly, welding, erection, inspection & testing of piping and erection of associated equipment along with accessories, structures, insulation for Main Nuclear and Nuclear auxiliary systems in Reactor buildings.

1.2.1.2 Procurement, supply and erection of structural steel materials required for supports & structures and carrying out insulation works of piping & equipment. For further details regarding scope of work of supply and erection, clauses related to Free issue materials (FIMs), other relevant clauses and BOQ shall please be referred.

1.2.2 ABBREVIATION

The abbreviations used in this document are given below

SR NO	Abbreviation	Description
1	AERB	Atomic Energy Regulatory Board
2	BDBA	Beyond Design Basis Accidents
3	CS	Carbon Steel
4	DM water	De-mineralised water
5	ECCS	Emergency Core Cooling System
6	EP	Embedded Parts
7	FIM	Free Issue Material
8	I&C	Instrumentation and Control
9	GA	General arrangement (drawing)
10	GOST	Russian national standard
11	KKNPP	Kudankulam Nuclear Power Project
12	KKS	International coding system for identification of buildings, equipments, structures, materials and system etc. in a Nuclear power plant
13	LOCA	Loss Of Coolant Accident
14	MCP	Main Coolant Pipeline
15	MT	Metric Ton
16	NDE	Non-Destructive Examination
17	NPCIL	Nuclear Power Corporation of India Ltd.
18	NSSS	Nuclear Steam Supply System
19	NTD	Normative Technical Documentation (Russian standard)

20	PHRS	Passive Heat Removal System
21	P&IDs	Process and Instrumentation Diagrams
22	PRZ	Pressurizer
23	PSD	Pulse Safety Device
24	QA	Quality Assurance
25	QAP	Quality Assurance Plan
26	QBIS	Quick Boron Injection System
27	RCP	Reactor Coolant Pump
28	RPV	Reactor Pressure Vessel
29	RVI	Reactor Vessel Internals
30	SG	Steam Generator
31	SS	Stainless Steel
32	UFC	New Fuel Building
33	UJA	Reactor Building
34	UKC/UCA	Reactor auxiliary building & main control Room building
35	UKS	Solid Radioactive waste management & storage building
36	UU	Upper unit
37	WD	Working Document (Documents & drawings issued for installation/ work execution)
38	OD	Outer Dia
39	ID	Inner Dia
40	CCC	Construction Completion Certificate

1.2.2.1 LIST OF APPLICABLE STANDARDS

A tentative list of applicable standards are attached as Annexure-1. Hard copy of the codes and standards are available with NPCIL for reference.

1.2.2.2 BUILDINGS AND SYSTEMS

The major buildings covered under the scope of this tender are Reactor building (UJA) & Annular space (UJB), Passive heat removal system gallery (UJC), Reactor portal building (UJG), Main control room building (UCA), Steam chamber building (UJE), Piping gallery & trestle (UJY).

The detailed description of above buildings and process systems covered in this tender are elaborated in enclosed Annexure-2.

1.2.2.3 CONTRACTOR'S SCOPE OF WORK.

1.2.2.3.1 General

In general, the contractor's scope of work comprises, but not limited to the following

i. Study, Preparation and Submission of detailed work schedule such as level 3 and level 4 to meet the specific targets and agreed milestones as per contract. All work schedules and networks shall be prepared based on actual quantum of work indicating resources required by the contractor to achieve the agreed targets.

ii. Training and qualification of contractor personnel. The contractor personnel shall be conversant with Russian codes and standards. Contractor quality personnel shall be assessed before engaging them in work and execution engineers & supervisors will be checked for relevant & adequate experience for the assigned work. In addition, highly skilled workers like mill-right fitter, erection foreman, pipe fitters, welders including riggers who will be part of critical NSSS equipment erection & welding shall be qualified and assessed by the contractor.

iii. Coordinate in preparation of work procedure for the Jobs of general in nature and also separate work procedures & erection methodology for jobs of specific/critical in nature.

iv. Arranging necessary Plant & Machinery (P&M), tools and tackles for execution of the work. In addition to the regular tools and tackles, works demands arranging special P&M, slings & bow shackle for heavy equipment erection, electrical winches for movement, compact hydraulic jacks, oil free air compressors, diesel generators for Heat treatment (Induction & resistance).

v. Establishing contractor's office and other infrastructure with communication facilities, storage area (covered & open), outdoor shops, machine shop, electrode storage room with controlled atmosphere, dark room facility for Radiography testing, radiography source room, labour canteen, rest room.

vi. Receipt of free issue material from the Engineer's stores, inspect, transport the material such as equipment, pipe, pipe fittings, valves & other accessories, supports, insulation, welding electrodes/filler wires etc. to contractor's stores, preparation of Incoming materials inspection report (IMIR) for the received material. Discrepancies and defect found (if

any), shall be bought to the notice of BHEL & NPCIL to resolve the issue as per the established procedure.

vii. De-preservation, cleaning, fabrication, welding, inspection, erection and testing of pipelines & associated specialties, hangers and supports.

viii. Erection of associated equipments along with accessories, inspection & quality assurance of material & work.

ix. Erection of critical equipment of NSSS such as reactor pressure vessel (RPV), Steam Generator (SGs), Reactor Coolant pump (RCPs), Pressurizer and erection & welding of main circulation pipeline (MCP) & heat treatment.

x. Fixing of Hilti make anchor fastener wherever embedded fastener/plates are not available as per approved drawings. (Hilti anchor fasteners will be supplied by NPCIL on free issue basis)

xi. Supply of consumables (like argon gas, acetone, high quality kerosene & lubricant), welding electrode & filler wire for welding of contractor supplied material, fixtures & accessories etc. are in the scope of the contractor and cost is deemed to have been included in the quoted rates. Only NPCIL approved welding consumables shall be used.

xii. Testing of valves at Valve testing facility provided by BHEL and calibration of safety relief valves at contractor shop/NPCIL designated area including testing of valve and calibration.

xiii. Non-destructive examination (NDE), pressure and leak testing including supply of machineries, instruments and qualified manpower.

xiv. Grit blasting & application of primer on structural steel members/support elements etc.

xv. Supply and application of Epoxy paint on pipe support and metal structures.

xvi. Supply and application of special purpose high temperature & radiation resistant paint on various equipments, pipelines and support and metal structures.

xvii. Supply and application of paint as instructed by engineer on equipments and piping supplied which might have damaged during transportation & erection. Cleaning and touch-up painting of all such items shall be in contractor scope.

xviii. Supply, transportation, storage, fabrication, welding, erection and inspection of carbon steel structures for pipe supports and metal platforms.

xix. Supply, transportation, storage, fabrication, welding, erection and inspection of stainless steel and carbon steel ventilation ducting in reactor building and annular space including connected equipment and containment isolation valves and in-situ pneumatic testing.

xx. Erection of free issue modular type detachable thermal insulation blocks for insulation of NSSS equipment and piping including modification as per site conditions.

xxi. Supply, transportation, storage, prefabrication & application of hot and cold thermal insulation on equipments and piping systems.

xxii. Passivation of stainless steel components at contractors shop and in-situ as directed by the engineer.

xxiii. Fabrication, erection, welding and inspection of stainless steel liner for fuel pool, reactor cavity & inspection wells including other floor and wall liner.

xxiv. Grouting/dry packing for equipment as per Engineer's specification including supply of material.

xxv. Filling of serpentine concrete in reactor pit equipment as per drawings and specification.

xxvi. Machining of various components (turning, milling, grinding & drilling etc.) as instructed by the engineer.

xxvii. Preparation and submission of circuit release report (CRR) for taking up hydro testing of completed systems in construction management software (CMS), submission of reports concerning the quality assurance and completion of work.

xxviii. Providing qualified, skilled and unskilled manpower, experienced and qualified supervisory and technical staff and competent management fully backed by latest project management tools and facilities for efficient and safe working and committed to total quality management.

xxix. Providing qualified safety personnel as per specification to ensure incident free execution of work at site as well as at contractor shop.

xxx. Providing trained skilled and unskilled persons to upkeep the building & floors in neat and hygiene condition during execution of work.

The provision of all equipments and facilities to perform all the specified work, including any temporary or special devices that may be necessary, storage, site workshop, welding machines and apparatus, consumable supplies in general and specifically for welding, threading, hoisting and transportation of equipment, scaffolding, temporary protection where called for in specification, all equipment and consumables for destructive and non-destructive testing, examination and inspection and temporary arrangement and provisions for pressure and leak testing, facilities for clean shop with air washing and filtration facilities and cleaning of the pipelines including consumables supplies for the same and the facilities such as De-mineralized water, oil free compressed air unit.

In general, all materials and services whatsoever necessary for satisfactory completion of the work, unless specifically provided as the free issue material by the engineer, are deemed to be included in the contractor's scope of work.

1.2.2.4 Receipt, transportation and storage of free issue material

i. Free Issue Material (FIM) issued by BHEL/NPCIL. BHEL/NPCIL will issue material along with copy of SSIR (Site Store Inspection report) and packing list. The free issue material will be issued against contractor's Issue Voucher (CIV) from BHEL/NPCIL stores. The contractor shall prepare CIV either using NPCIL in house software's like IBA-CMM or other software platforms supplied by BHEL. In case BHEL/NPCIL provides the material management software, contract shall arrange all necessary infrastructures (computer terminals, network, and other hardware) and manage free issue material/contractor supplied material through the same.

ii. Briefly the scope of material transportation covers identification of material, preparation of CIV, clearance from EIC (Engineer In Charge) and its submission to BHEL/NPCIL's Stores, receipt, handling, loading on to the truck/trailer, transportation of materials from BHEL/NPCIL's stores to contractor's store or erection site, unloading the material at

contractor's store or erection site, uncrating, checking the completeness of items/physical damage(if any), preparation and submission of incoming material inspection report (IMIR) and its clearance from EIC, further shifting of materials from contractor's store to erection site and disposal of the crating/packing material at the designated place of the BHEL/NPCIL's stores, returning of un-erected (balance) materials to BHEL/NPCIL's stores. This work also includes arranging all the necessary tools and tackles, truck/trailer, plant and machinery, man power and consumables.

iii. The FIM shall be issued in a lot, in packed (as received condition) or Individual component wise. Incase if the issued package contains material belonging to other agencies/spares it shall be returned to BHEL/NPCIL stores immediately in consultation with engineer in charge.

iv. Materials are to be handled using appropriate material handling equipments and tools. Under no circumstances materials shall be dropped. Pipe handled on skid ways shall not be skidded or rolled against other pipe. Dragging of unprotected equipment on the ground shall not be permitted.

v. For measurement of transportation stage payment of pipeline & equipment, Only net weight of equipment /pipeline, pipe fitting, supports, valves (for all free issue material) will be considered. Weight of crating/packing materials will not be considered for measurement & payment. The weight mentioned in the Manufacturers passport documents only will be considered for measurement purpose. Incase if it is not available in the passport the order of priority is packing list weight, working document and physical measurement.

1.2.2.5 Storage of materials

i. The contractor shall make his own arrangements for constructing covered storage area on earmarked open space made available to the contractor at site. Attention is drawn to the fact that the environment at KK site is corrosive and therefore proper storage and its periodic monitoring by contractor has to be done at no extra cost. Contractor shall make closed warehouse shed on his own to provide appropriate storage at site for all NPCIL issued material till the completion of the work as per BHEL/NPCIL recommendations. All

the Plant & machinery, tools & tackles, hoisting equipments, manpower etc required for handling the materials at contractor's store are in the scope of the contractor. Watch and ward shall be the responsibility of the contractor.

ii. Once materials are issued to the contractor it is the responsibility of contractor to safeguard the materials and pre-fabricated items against damage, environmental effects by keeping the material inside the building or by enclosures providing adequate protection. All storage shall be orderly and executed in a way so as to eliminate mixing up of materials (through proper codification and BIN card system) and possibility of damage prior to their installation in the field. Valves shall be stored in specially designed stands to protect rubber parts/ machined surfaces. No material shall be stored directly on the floor. Supports shall be provided to ensure Gap of 250 to 300 mm from ground. For Materials received for fabrication, such as pipes and fittings, all identification marks pertaining to material specification and other details shall be retained until such time when it is inevitable to remove them during pre-fabrication stage (such as cutting). Special tags bearing system code numbers provided on equipment, pipe fittings and items like valves, etc. shall not be removed or tampered with. Lack or loss of above described identification marks shall be brought to the attention of the engineer.

iii. The Contractor shall be responsible for security of all the FIMs stored at the contractor's stores till the completion of the work and acceptance by BHEL/NPCIL. It is the responsibility of the contractor to maintain complete record of the list of materials at stores, maintain log books and entry/exit records for the material movement in and out of the contractor's warehouse/ store. BHEL/NPCIL approved committee has every right to audit Contractor stores, records and his logbooks time to time during the execution of work, for which Contractor shall ensure and provide all such information and facilities on demand.

iv. A few equipments/components require temporary locking arrangement till erection. In such cases contractor shall take adequate care to prevent damage and item shall be stored with their original locking till erection of such component.

1.2.2.6 Identification, marking and segregation of material and incoming material inspection (IMIR)

i. In BHEL/NPCIL stores, all the equipments and pipelines are identified by their KKS codes and Item nos. It is the responsibility of the contractor to get the details of KKS codes, package no's, Item no's for such materials from BHEL/NPCIL. All the FIMs shall be stored at appropriate locations in contractor's stores, tagged and identified for segregation from other goods, protected and preserved as per manufacturers recommendations, marked with their KKS code, system Code, item no. and item description like weight, material, type etc and the material locations shall be marked for easy identification and retrieval of the material at stores. Each piece of pipe, regardless of length, and each fittings or other component part, except minor fasteners, shall be clearly identified by legible marking on the part.

ii. The contractor shall visually examine all materials being erected or being used in the fabrication and shall report any defects to the engineer. Any repair of materials shall be as per approval of the engineer's instructions. Any material not conforming to the specification and subsequently rejected should be suitably identified, stocked and disposed off as per the instructions of the Engineer.

iii. All loose parts/ accessories such as gaskets, diaphragms, seals etc. of valves and other equipment shall be properly identified, stored and re-assembled by the contractor under supervision of engineer.

1.2.2.7 Preparation of work procedures, QAP and JHA

i. Contractor shall support BHEL in preparation of Quality assurance plan, erection methodology, welding & work procedures to meet the requirement specified in the Working Drawings, manufacturer document & drawings such as assembly & erection instruction & passports which will also include good & safety practices and principles. JHA for all works involving hazard shall be prepared with required precautions & actions required from the contractor.

1.2.2.8 Erection schedule and sequence of activities

i. The milestone to be achieved by the contractor is specified in the tender. Based on the project schedule engineer will issue WD, material and work front and broad sequence of activities is specified in the tender technical specification of various equipment / items. The contractor has to study and submit a detailed work schedule with network of activities such as level 3 and level 4 to meet the specified targets. All work schedule and network shall be prepared based on logical sequence of activities, quantum of work with required resources (manpower & machineries) to achieve the agreed target. ENC reserves the rights to audit and review the said resources of the contractor from time to time during the execution of the work for which contractor shall ensure and provide all such information and facilities on demand. Contractors have to submit the weekly, monthly, quarterly rolling schedule based on actual physical progress of the work.

ii. Contractor shall make all arrangements for working in round the clock basis to achieve the targets.

iii. The sequence of erection shall be decided in consultation with Engineer based on availability of erection fronts, drawings and equipments. In general the sequence of the erection shall follow the overall project schedule of KKNPP-3&4. Generally erection of equipments shall be taken up first followed with erection of piping, support and valve system. The following shall be the preferred sequence of installation.

   a. Equipment erection and inspection
   b. Erection and inspection of supports for large diameter piping.
   c. Erection of pre-fabricated large diameter piping spools (100 NB and above) and supporting them on already installed supports.
   d. Erection and field welding of the remaining piping (small diameter) and erection of their supports.
   e. Preparation of circuit release report & Testing of piping Circuits / systems.
   f. Application of Painting, thermal insulation on tested systems.

1.2.2.9 Interfacing with other agencies and terminal points

i. Civil construction work of buildings covered under this contract is already awarded by NPCIL and work is under progress by other agencies. The mechanical contractor shall note that the construction of civil works shall be continuing in other part of the same building where equipment and piping being erected, this type of parallel working shall not be considered as disturbance or hindrance to erection work. Also other mechanical/electrical agencies related to ventilation, material handling equipments, common services, cable laying, ducting etc may also work in the same area. Hence for carrying out the above activities co-ordination with other contractors/agencies working in that area will be required.

ii. The civil construction and mechanical erection works shall be done in a sequential/combined manner. The rate quoted by bidder shall consider all factors affecting progress of work due to parallel (combined) working of civil, mechanical, electrical and instrumentation agencies. No extra claim on account of any misunderstanding or not understanding the nature of work shall be entertained by BHEL.

1.2.2.10 Terminal points

i. The terminal points for the system piping with respect to the buildings shall be indicated on the working drawing. Generally terminal points shall be considered as equipment /pipe nozzle, pipe penetration or the first isolation valve. Alignment, fit-up and welding at all the terminal points and bolting in case of terminal flange joints with the other systems/agencies is included in Contractor's scope of work. Cutting/opening of existing blanks of equipment (as per Engineer's instructions) at such terminal points, if required shall be considered as part of erection and these shall be made by the contractor at his own cost.

ii. The pipelines crossing the boundary of the buildings generally will be terminated one meter away from the wall either inside or outside of the building. Contractor shall connect pipelines under his scope of work to these lines as per the WD.

1.2.2.11 Russian equipment manufacturer's instruction and supervision at site

i. Manufacturer's instructions/drawings (passport) are issued by the equipment manufacturer, in addition to the requirements specified in the working document, related

to installation at site. Such installation requirement specified by the manufacturers, such as sequence of erection, alignment, adjustments, preservation, turning of motors, mounting of accessories on the equipment etc. is included in contractor's scope of work. Similarly, for valves any instructions regarding welding in open, partially open or closed position or dismantling, storage and assembly, etc. shall be strictly adhered to and shall form part of contractor's scope of work. Adequate care shall be taken during welding of valves.

ii. NPCIL will deploy the RF design/equipment manufacturer representative to oversee the erection of specific/special equipments, piping etc, supplied by them to validate the fulfillment of the requirements specified by them in order to provide the guarantee to the supplied item. The manufacturer representative will be deputed for limited period of time, it is essential that contractor shall complete the work within schedule agreed. Also Russian representative will seek the necessary reports/methodology stage wise to proceed for subsequent activities. The contractor shall meet these requirements to get the clearance from RF representative for continuing the erection work.

1.2.2.12 Quality assurance

i. The work under this contract covers the reactor systems, which demands highest degree of quality and reliability standards. In line with these requirements, the contractor shall have documented quality assurance system to assure the quality at all stages of procurement, handling, storage, cleaning, pre-fabrication, welding, erection, inspection and testing.

ii. The Contractor shall have a dedicated group of experienced and qualified inspection engineers and inspectors responsible for assuring quality assurance and quality surveillance program at their work, their vendors/manufacturing works and fabrication, welding, inspection, erection and testing work at site. They should have adequate quality control engineers/agency to carry out inspections as per quality assurance plan.

iii. BHEL/NPCIL shall carry out audit in all phases of the work i.e. procurement, pre-fabrication, erection, inspection, examination and testing.

iv. BHEL/NPCIL or its authorized representative(s) shall carry out Quality surveillance in all phases of the work. They will have free access to all areas where works involving the concerned contracts/purchase orders are in progress. This includes access necessary to verify the implementation of all aspects of the Quality Assurance Program as well as access to Sub- contractor's facilities.

v. Quality surveillance by BHEL/NPCIL or its authorized representative includes, but is not limited to, Witness and Hold Points.

vi. Witness Points are critical steps in erection/manufacturing and examination/inspection/ testing where the contractor/supplier is obliged to notify BHEL/NPCIL or its authorized representative in advance of the start of operation/test so that it may be witnessed. The contractor/supplier may proceed with the work past a Witness Point if the NPCIL QS or its authorized representative is not available at the appointed time.

vii. Hold Points are critical steps in erection/manufacturing and examination/inspection/testing where the contractor/ supplier is obliged to notify BHEL/NPCIL or its authorized representative in advance of the start of operation/test so that it may be witnessed. The contractor/supplier is not to proceed with the work past a Hold Point except by written waiver/agreement by NPCIL.

viii. The performance (or waiver) of quality surveillance activities by BHEL/NPCIL, QS or its authorized representative does not relieve the contractor of any obligations to meet all requirements of the working document.

ix. Contractor shall offer various surveillance points to BHEL/NPCIL only after due concurrence/clearance from their execution and QA group.

1.2.2.13 Erection of NSSS equipments (Nuclear Steam Supply System)

i. Erection of Nuclear steam supply system (NSSS) equipment & piping is considered most critical, involves inspection at all stages. The contractor shall deploy qualified & experienced engineers, supervisors and skilled workmen who will understand the critical nature of work as specified in drawings, specification, manufacturers drawings & documents.

ii. The erection and welding work will be subject to periodical stage wise inspection, audit and clearance from regulatory authorities etc.

iii. Heavy duty crane will be provided by NPCIL as free of cost for equipments as per CHAPTER – VI Annexure- I. Contractor has to arrange the sling and de-shackle and other tools & tackles. All lifting tools and tackles should be load tested before put in use.

iv. Equipment initial lifting from outside RB on to transport portal trolley shall be carried out by heavy duty crawler crane/portal crane/contractors crane and further shifting to inside RB with the help of erection trolley and winch mechanism.

1.2.2.14 Non destructive examination

i. Non destructive examination shall be carried out on all the weld joint performed. The scope and extent of NDE shall be as per the working documents and manufacturer instruction.

ii. Non Destructive Examinations of equipments and pipelines shall be performed by the requirements prescribed in working documents. The quality of weld and extent of Non Destructive Examinations coverage are based on the category of weld which are defined as follows

Category I Welded joints for equipments and pipelines for Group A (Safety class I and Quality group A)

Category II Welded joints for equipments and pipelines for Group B (Safety class II and Quality group B)

Category III Welded joints for equipments and pipelines for Group C (Safety class III and Quality group C)

iii. The welded joints not categorized as above shall be termed as Quality not categorized (QNC) category and the requirements will be as per working drawings and functional requirements or as directed by engineer.

iv. With regard to the scope of inspections, the Non Destructive Examinations is subdivided into 100% inspection and selective inspection (Scope 50%, 25%, 15%, 10% & 5%) depending on category of weld.

1.2.2.15 Temporary piping, flushing and normalization of system:

i. On completion of erection, welding, inspection and testing of systems and before handing over for commissioning, flushing of piping system shall be carried out. During flushing some equipments needs to be bypassed for which temporary piping shall be carried out. Scope of this work includes receipt of material from NPCIL stores, fabrication, erection, welding and inspection of temporary piping.

ii. In addition to the bypass arrangements there may be requirements for temporary piping such as dewatering, drain collection etc.

iii. Erected piping systems shall be flushed with DM water to ensure the cleanliness of the piping. Flushing shall be carried out both on the carbon steel and stainless-steel piping systems.

iv. Prior to carrying out flushing, all the equipments such as pumps, heat exchangers, tanks etc shall be by passed with temporary piping. Approved flushing scheme shall be obtained from the respective agency, based on the flushing arrangement scheme, identify all the equipments for which by-pass arrangement is to be carried out.

v. Study the site location & layout of the equipment, marking, cutting and shifting the fabricated pipe spools to the location and erection of the spools as per approved by-pass arrangement layout. Fit up and welding of the by-pass pipes using GTAW /SMAW.

vi. All the piping material required for by pass arrangement will be issued by NPCIL on free issue basis. All the consumables including welding consumables required for erection of temporary piping is under the contractor's scope of work.

vii. Even though the piping is temporary the spools will be subjected to operating pressures and temperatures, in view of this all the welding related to temporary piping shall be carried out by qualified welders as per the applicable WPS.

viii. In case of requirement for any pipe supports required for supporting the temporary piping, the same is included in the scope of work. (Note: Payment for supports for temporary piping will be paid in the relevant BOQ item).

ix. Valves if required for erection of temporary piping will be issued on free issue basis. The same shall be deposited back with NPCIL upon completion of flushing.

x. Temporary piping ranges from Dia 25NB to 500NB and thickness of standard or heavy wall thickness. For fabrication of the big bore piping care shall be taken and thorough study shall be done so that shifting of material inside the building shall not become difficult.

xi. On completion of flushing activities, clearance shall be obtained from BHEL/NPCIL for dismantling of the temporary piping.

xii. Cutting the temporary piping, handling, shifting outside the building and handing over the material to BHEL/NPCIL stores.

xiii. After completion of flushing temporary piping shall be normalized with the permanent piping (Note: payment for permanent piping will be measured in the relevant BOQ item).

1.2.2.16 Drilling, fixing of anchor fasteners (Using hammer drilling/diamond core cutting drill bits) and core cutting of civil structures

i. Pipe supports and various metal structures inside Reactor building and other Reactor auxiliary buildings are normally mounted using the support plates pre-embedded in the concrete. Wherever such embedded parts are not available, the base plates are to be anchored using Hilti anchor bolts as per approved drawings.

ii. Hilti make HSL - 3G (heavy duty anchors) and HDA-T (under cut anchors) are mainly used to mount the pipe supports and other metal structures in Reactor building & Reactor aux. building.

iii. Also during course of contract, due to issue of any DCN/ECN/FCN there may be requirement for making additional openings in the RCC walls / floors to accommodate the pipelines, tubes, structures etc. These openings (holes) may be carried out using core cutting process, scope of work includes carrying out drilling of holes in the RCC wall/floor using core cutting process to required diameter and the depth based on the thickness of the wall.

iv. Location & type of anchor bolts will be provided in the working drawing. Contractor shall identify marking of location of anchor, drilling, fixing of anchor with EPs as per WDs,

torque tightening using wrench as recommended by the manufacturer. Scope includes erection of scaffolding at various elevation & levels, providing cooling arrangement during drilling, collection of debris and disposal.

v. Contractor shall develop a separate procedure for fixing of anchor fasteners and this procedure shall be approved by NPCIL before taking up the actual works. This procedure shall address the following.
   a) Work methodology including tools to be used for fixing different types of anchors.
   b) Details about tools required
   c) Qualification of process & applicator
   d) Arrangements to be made at site.
   e) Post installation checks.

1.2.2.17 Handling and transportation of miscellaneous items:

i. During execution of work, there may be some requirement for movement of certain material / items/ equipment from one location to other location as instructed by the engineer other than items specified in respective BOQ items. Prior approval of ENC is required for operating this item.
ii. Scope of work includes handling and shifting of material within the plant site. Maximum weight of equipment/ material envisaged to be shifted as a single unit will be less than 20MT.
iii. Collecting material issue voucher (MIV) / any other relevant document required from BHEL/NPCIL, receipt of material from BHEL/NPCIL stores/other location specified by Engineer and delivering the material to the desired location within the plant site.
iv. Arrangement of all necessary material handling equipments such as cranes, trailers, trucks, manpower, slings etc for loading and unloading is covered in the scope of contractor. All the material handling equipment shall be provided with valid load test certificates.
v. Rate of this item includes all man power, including coverage of safety personnel required along with other equipments, tools & tackles.

1.2.2.18 Passivation of stainless-steel components

i. In case of any surface contamination on SS piping and liner, the same shall be rectified by carrying out passivation with due approval of BHEL/NPCIL.

ii. If passivation is to be carried out inside the plant premises , contractor shall arrange required tanks, chemicals, consumables, manpower, tools/tackles, cleaning agents etc. and complete the work including checking and removal of Contamination with in quoted rate. If the passivation is not to be carried out inside plant premises due to various reasons. The contractor has to carry out same at outside, where the facility is available in nearby location. The cost involved for transportation; passivation cost shall be borne by the agency. No extra payment shall be allowed in this regard.

iii. Care shall be taken while handling of acids and other hazardous chemical. Also the disposal of acids and other chemicals shall be done by following guidelines issued by statutory authorities.

iv. Erection of scaffolding for carrying out passivation is in the scope of contractor. Only aluminum scaffolding shall be used in critical and SS lined area.

v. Pre-cleaning shall be carried on the surface to be passivated. This is to remove the grease, oil, soil, grit and other fabrication process marks etc. Cleaning of components / surface thoroughly using DM water. Cleaning can also be done using alkaline cleaning, which is used to remove oily, semi solid and solid contaminants and metal.

vi. Drying of the components / surface after DM water wash shall be done using oil free compressed air, required air compressor and the hoses for carrying out the job shall be arranged by the contractor.

vii. Contractor shall prepare, approve and submit procedure for acceptance of Engineer, as per applicable standard. The procedure shall also address the pre cleaning, methodology for passivation, post cleaning and testing .

1.2.2.19 Nickel gasket replacement

i. A few high pressure filters are provided with Nickel gasket, these filters are transported with temporary gasket. This gasket shall be replaced before taking the filter into commissioning / service.

ii. Filters are located in the various buildings such as reactor building and reactor auxiliary buildings, at different locations and elevations. These filters are located in congested areas. Concrete hatches are to be handled for accessing & opening the filter covers.

iii. These filters consist of a filtering medium such as titanium sorbent in granular form. Filtering medium shall be loaded into the filter before the filters are taken into service.

iv. The scope of work to be performed by the contractor is specified below,

a) Scope includes replacement of gaskets of the filters in the installed location which includes removal of hatch covers, filter covers.

b) Arranging required tools and tackles for lifting the hatch. The head room available for lifting the hatch is very less, where usual chain pulley block may not be accommodated. Special tools such as button jack with hydraulic power jacks and other suitable custom made lifting tools are to be arranged for lifting the hatch from position.

c) Chipping of concrete if required shall be carried out for clearing the recess between the cover and the opening.

d) Once hatch is lifted, the same shall be shifted suitably to access the filter. Cleaning the filter area to unscrew the studs.

e) Providing the hydraulic power pack to unscrew the filter studs. Taking the stud length initial readings. Unscrew the studs as per the sequence, by applying the required torque using hydraulic torque wrench.

f) Remove all the studs, clean the studs thoroughly using acetone, preserve the studs in safe place till the re-assembly. Match mark the cover position, lift the filter cover to the required height and support the cover with temporary supports.

g) Provide proper illumination with 24 volts power supply.

h) Inspection of filter inside area, for any kind of foreign material or any deviations. Any deviations may be recorded and corrective actions may be taken as per the BHEL/NPCIL instructions.

i) Handling, shifting of filtering medium (sorbent) from BHEL/NPCIL stores to the required location using bags of required size and quantity. Load the sorbent in the filter as per the guidelines, measure the level of the sorbent and cross check with the drawing requirement. Sorbent loading shall be done till the required level mentioned in the drawing is achieved. Once the required level is achieved report shall be prepared and submitted to BHEL/NPCIL acceptance.

j) Clean the gasket seating area & threaded area thoroughly using acetone, also clean the nickel gasket using acetone and inspect the gasket for any dents or deviations. Also dimensions of the gaskets shall be cross checked with the radius of the gasket grooves on the filter. Supply of acetone is under the scope of contractor

k) Place the gaskets in the position, and ensure the gasket is retained in position without disturbance during placing of cover, place the cover in position matching the initial markings. Apply lubricant on the threaded mating surfaces using mixture of graphite powder and the distilled water. (Note: supply of graphite powder and the distilled water is under the scope of contractor).

l) Fasten the studs in position. Care shall be taken to prevent the damage to the threaded surfaces. Measure the stud length using depth micro meter. Fasten the nut with the studs, start tightening using the hydraulic torque wrench.

m) Tightening shall be carried out in stages, over torque shall be prevented, also final torque required shall not be attained in single pass. After each pass of tightening in the sequence provided in the working drawing, stud length shall be checked using depth micrometer.

n) Tightening passes shall be continued till the final torque is achieved and the stud elongation is cross checked with the initial measurement taken. Readings obtained in all stages / passes shall be recorded and reports shall be prepared and submitted for BHEL & NPCIL acceptance.

o) Lift the hatch from the temporary position to the required location. Before placing the hatch back to the position, hatch seating area shall be cleaned thoroughly.

p) Contractor shall note that gasket material may get changed during detailed design, however changing of gasket as specified above is covered in the scope of contractor irrespective of type of gasket.

1.2.2.20 Machining works

i. Machining work is required for the packing / alignment items such as wedge pair, guide plates, EP plates etc. Work includes all kinds of machining works such as

- Turning (ID / OD).
- threading
- milling
- drilling
- Boring
- Grinding
- Combination of above process.

ii. Material will be issued by NPCIL on free issue basis.

iii. On request of engineer, contractor has to supply raw material confirming to stainless steel SA 276 - SS 321 Round bars/ Flat bars of various sizes and profiles and carbon steel SA 105 Round bars/ Flat bars of various sizes and profiles. All the raw material supplied shall be provided with necessary test certificates, BHEL/NPCIL reserve the right to take out the sample from the supplied raw material sent for testing for confirmation. Such testing shall be carried out in NPCIL approved laboratories, also the cost incurred in testing of the material is included in the contractor scope of work.

iv. Detailed scope of work involved in machining of components of carbon steel and stainless is as given below.

a) Preparation of necessary gate passes for taking out free issue material for machining activities. The same gate pass shall be surrendered after the material is brought back to the plant premises.

b) Handling and shifting of material to the contractor's work shop / other location. Contractor may establish his work shop within the plant site or he may utilize the services of the local resources. If the job demands some special lathe / milling/ drilling process, it is the responsibility of the contractor to identify such facility and carry out the job done.

c) Except threading all the machining process will be measured in the CC (Cubic centimeter) i.e. CC corresponding to the material removed from the raw material to make the finish product.

d) Whereas threading will be paid in the MM-MM i.e. MM DIA X MM LENGTH of threading (Ex 25mm thread for a length of 50mm = 1250mm -mm).

e) Threading involves combined process such as turning and threading. In such cases turning will be paid in CC and threading will be paid separately.

f) In case any NDE such as DPT that is to be carried out on the finished product the same shall be carried out. However payment for DPT will be paid in the relevant BOQ item.

1.2.2.21 Miscellaneous works (MANPOWER)

i. As the nature of work consists of various operation-based works, for which contractor has to mobilize skilled, semi skilled and unskilled manpower along with sufficient number of supervisor for successful completion of the work assigned based on the Engineer's instruction. Operation based works are works other than works covered under other BOQ items.

ii. Manpower mobilized shall be fully equipped with necessary hand tools & PPEs such as measuring tools, grinding, cutting, welding, fastening etc.

iii. Contractor shall provide supervising/drafting assistance for various miscellaneous activities (other than contractor scope of work) as instructed by

BHEL/NPCIL Engineer for carrying out site dimensional measurements, as built checking, AutoCAD drafting etc. A Qualified supervisor (Qualification given below) Performing such activity for 9 Hrs a day is considered as one operation.

iv. Contractor shall provide qualified / certified skilled/semi-skilled/un-skilled as instructed by ENC for carrying out miscellaneous works, providing office assistance, fabrication, machining activities at engineer shop etc,. Performing such activity for 9 Hrs a day is considered as one operation.

v. All the above personnel shall be provided with all safety PPEs like safety shoes, safety helmets, measuring tapes and portable long range LED rechargeable flash light (for site visits and measurements) etc., Contractor shall ensure these personnel have height passes with medical certificate, fitness certificate before employed. BHEL/NPCIL Engineer shall be part of interview/ skill test for the above personnel to find the suitability before giving clearance. During the execution of jobs also, they may be continuously evaluated and may have to be changed if the skill is found not suitable at any stage.

vi. Normal day of work for these persons taken against this BOQ will be 9 hrs. Including the breaks for Lunch, tea etc.

vii. All man power supplied shall be covered by suitable insurance policies and BHEL will not entertain any claims towards this at any stages. Contractor shall make their own arrangements for the housing, transportation, canteen facilities, medical facilities etc. for these persons also just like their other employees. BHEL will not entertain any claims towards this at any stages. Suitable transportation arrangements for the staff between Plants main security gate to working area needs to be provided by the contractor compulsorily.

Sl.No	Category	Qualification and Experience required

1	Mechanical Supervisor/AutoCAD operator	1. DME (Mechanical) 2. Persons with 3 years experience in any mechanical construction project will be preferred. 3. Should be proficient in MS office and AutoCAD drafting. 4. 3D drafting and isometric drawings preparation preferable.
2	Skilled person	ITI qualified with 2 year experience.
3	Semiskilled	Based on the skill qualification certification.
4	Unskilled	Based on in-house training certification

1.2.2.22 Grouting / Dry packing of equipment and pipe supports:

i. Grouting / Dry Packing as required shall be provided as indicated in the drawings. The proportion of grout shall be such as to produce a flowable mixture consistent with minimum water content and shrinkage.

ii. Concrete surfaces to be grouted / dry packed shall be thoroughly roughened and cleaned off all foreign matter and laitance. Anchor bolts, anchor bolt holes and the bottom of equipment and column base plates shall be cleaned and made free from oil, grease, dirt and loose material.

iii. Prior to grouting/ dry packing, the hardened concrete surfaces shall be saturated with water. Water in anchor bolt holes shall be removed before grouting is started.

iv. Forms around base plates shall be reasonably tight to prevent leakage of grout/ dry pack. Adequate clearance shall be provided between formwork and base plate, to permit grout/dry pack to be worked properly into place.

v. Grouting, once started, shall be done expeditiously and continuously to prevent segregation, bleeding and within the initial setting time. Grout shall be worked from one side to the other, to prevent, entrapment of air.

vi. Forms and shims shall not be removed and the anchor bolts shall not be tightened for at least 24 hours after placing the grout. After the removal of forms and peripheral shims

all the edges of the foundation shall be finished smooth to allow drainage away from the base.

vii. Interconnecting piping and machinery shall not be attached to the machinery before anchor bolts are tightened. It is desirable to make these connections at least after a minimum of seven days from the date of grouting. During this period, the grout shall be properly cured.

viii. The dry pack shall consist of 1: 2.5 (Cement, Sand), sand passing through No. 16 sieve. Only enough water shall be added to produce a mortar, which will stick together when moulded into a ball by a slight pressure of hand and will not extrude water but will leave the hands just damp. Dry pack material shall be placed and packed in layers having a compacted thickness of about 10mm. Each layer shall be solidly compacted over the entire surface by use of hardwood stick and hammer.

ix. The type of grout and its composition is given below.

a) Normal Grout

The Contractor shall supply and place normal grout consisting of an approved mixture of cement, normal fine aggregate, water, admixture and when specified by the Engineer, a non-shrink agent. Normal grout shall be placed as shown on the drawings or specified by the Engineer. Grouting through holes in base plates shall be made by pressure grouting. The pressure to be used for grouting shall be as directed by the Engineer. The grout proportions shall be as follows unless it is specified in the drawing

Mix Proportion	**W/C Ratio(max)**
Mix 11 Cement Sand grout with anti-shrink Compound	0.44
Mix 12 Cement Sand grout with anti-shrink Compound	0.44
Mix 112 cement sand with 6mm down stone	

chips and anti-shrink compound 0.44

The W/C ratio shall be as per the manufacturer's recommendation and in no case shall exceed the values specified above.

b) Special Grout

The Contractor shall supply and place heavy grout consisting of approved high strength cementations ready mix non-shrink grout 'Conbextra GP-2 '(M/S Fosroc make) or equivalent shall be provided at equipment bases, areas specified in the drawing. The grout shall be prepared only to the extent it can be used within the specified pot life by the manufacturer. Any leftover grout or grouts not consumed within the pot life shall not be used and shall be discarded. The shelf life of the grout shall also be checked before they are used. Expired date grouts shall not be used under any circumstances. The grouts shall be chloride free and shall be used following strictly the manufacturer's specification.

c) Heavy Grout

The Contractor shall supply and place heavy grout consisting of an approved mixture of cement, heavy fine aggregate, water, and when specified by the Engineer, a water reducing agent and a non-shrink agent. The heavy grout / dry pack of density not less than 3200 kg/cum shall be provided at equipment bases, areas specified in the drawing.

1.2.2.23 General fabrication and erection requirements:

i. All piping, equipment etc. shall be erected and joined or welded, utilizing materials in accordance with the working documentation supplied by the engineer.

ii. Pipeline shall be made with the minimum feasible number of joints. The contractor shall shop fabricate the sub-assemblies of piping, supports etc., to the maximum extent feasible.

iii. All machined surfaces shall be protected from dirt and mechanical damage. All threaded connections shall be either capped or have threaded plugs inserted until the associated equipment has been installed. No liquids of any kind, whether for cleaning, testing or other reasons, shall be admitted to the pipe lines or the equipment except when authorized by the Engineer.

iv. Loading and unloading of materials and equipment shall be done by hoisting or skidding so as to avoid shock or damage. Under no circumstances materials shall be dropped. Pipe handled on skid ways shall not be skidded or rolled against other pipe.

v. The contractor shall visually examine all materials being erected or being used in the fabrication and shall report any defects to the Engineer. Any repair of materials shall be as per approval of the Engineer. Any material not conforming to the specification and subsequently rejected should be suitably identified, stocked and disposed off as per the instructions of the engineer.

vi. The areas from which temporary attachments have been removed from equipment shall be dressed smooth and shall be examined by liquid penetrant method. Defects, if any, shall be rectified after due concurrence from Engineer and the material shall be re-inspected to ensure that the defects have been removed. If weld repairs are necessary, they shall be made using qualified welding procedures by qualified welders and shall be examined by a liquid penetrant method, or by radiographic examination.

vii. To avoid the possibility of damage all gaskets, diaphragms, seals etc. shall be removed from valves and other equipment, properly identified, stored and reassembled by the contractor under supervision of Engineer during rectification of defects by welding

viii. Gouging and gas cutting operation shall be done by qualified personnel. All material in the surrounding area should be suitably protected during welding, gouging and gas cutting operation.

ix. Adequate care shall be taken during welding of valves. Valve manufacturer's instructions, if any, shall be followed in this regard. Contractor shall take due care and adopt proper welding sequence to avoid distortions of valve seat, body and related components. The valves shall be tested in valve testing facility provided by BHEL. Any

repair work required on installed valve shall be carried out by the contractor to limit the seat leakage rates to those specified by valve manufacturer. Generally, valves should be welded in open position and heat input kept to the minimum.

x. Utmost care shall be taken while carrying out welding job on equipment nozzle, particularly heat exchangers etc. so that no weld splatter falls inside the equipment.

xi. The contractor will take adequate care to prevent damage to pipe penetrations during storage, handling and erection. The penetration shall be stored with their original shipping frame and protective arrangement and shall be brought to site as the last item, just prior to their incorporation in the system.

xii. Many room (floor & walls) are provided with stainless steel & carbon steel liner, the contractor shall take extreme care while erecting equipment and piping to avoid damage to the room liner. The scaffolding used in the area shall be made of aluminum and other areas CS scaffoldings shall have rubber bushing to avoid scratch & dents.

1.2.2.24 Tightening of bolts:

i. All threads of bolts and nuts shall be cleaned by suitable means so as to be free from any foreign materials and suitably approved lubricant whenever specified shall be used prior to tightening of bolts.

ii. All bolts shall be engaged so that there is visible evidence of complete threading through the nut or threaded attachment. At least two threads on bolt should project beyond nut.

iii. In bolting of gasket-flanged joints, proper sequence shall be followed to ensure uniform tightness.

iv. Calibrated Torque Wrenches (both mechanical and hydraulic) shall be used for tightening of bolts to ensure controlled tightening. Torque values for various sizes of bolts for tightening shall be as per specification / drawings.

1.2.2.25 Electrode storage, control and monitoring:

Electrodes and filler wire of various specification, make, type, sizes will be supplied along with equipment and pipelines as free issue for carrying out welding of piping and

equipment as specified in the WDs. The scope of work to be done by the contractor is elaborated below

i. IMIR: The electrode and filler wire received shall be inspected, accepted and report shall be made. Deficiency if any shall be intimated to engineer.

ii. Storage: The contractor shall receive electrodes and filler wire and store them in a closed room with controlled temperature & humidity. The temperature of room shall be maintained not lower than +20°C and not more than 50°C. The relative humidity of room should not exceed 50%. Electrodes for different equipment and piping shall be identified and kept segregated till they are consumed.

iii. Electrode baking: The electrode of different type needs to be baked at different temperature. The contractor shall have baking oven of heating capacity not lower than 400°C. The baked electrode should be stored at site in a transfer oven having temperature range 150°C to 200°C. Electrode for consumption of one shift only shall be sent to site in portable oven having heating range of 100°C and above. Electrode should never be issued to site without ovens.

iv. Electrode control and calculation: Record of quantity of electrode & filler wire received by the contractor shall be updated on daily basis with details such as item no, system (KKS code), type, size, material, quantity. The status of issue to field, consumption and quantity returned shall be updated in weekly basis. Free issue electrode & filler wire shall be used only for welding of equipment / piping as supplied & issued to contractor. Using of welding consumables without approval of engineer to other system / piping is strictly prohibited. Contractor shall submit the status of welding consumables received, consumed, stock available once in fortnight.

v. Monitoring: Contractor shall employ experienced technical person as store keeper to monitor electrode receipt, storage, handling and control. The records should be maintained online with the help of construction management system.

vi. Welding consumable storage, condition of storage room, records of issue are subject to periodical audit by the engineer or his authorized representative.

1.2.2.26 Discrepancies and field changes:

i. Any discrepancies, contradictions, or omissions from drawings, specifications or other documents or any doubt arising as to the meaning or intent of any part thereof, shall be referred to the Engineer for clarifications. All dimensions shown on the drawings which are related to installed equipment or pertinent embedded parts shall be verified by the contractor by field measurement before the fabrication of relevant pipelines is started. The required dimensions of closing pieces of piping as indicated on the detailed drawings must be established by direct field measurements.

ii. Whenever the contractor is unable to comply with the Engineer's requirements, whether it is dimensional or technical, or whenever field changes are inevitable for any reason, the contractor must obtain the appropriate authorization from the engineer. In case any field changes are to be carried out, the same proposal shall be submitted in the prescribed/ established formats.

1.2.2.27 Reference drawing and documents:

i. Erection of equipments and piping shall be done as per working drawing supplied progressively during installation phase. The working documents (set of drawings and documents) will generally contain necessary information for erection and testing of pipeline and equipment. To get an idea of the nature of the documents on the basis of which the erection would be done, sample working documents of piping, piping support erection, equipment erection, general arrangement drawings for main equipment are provided.

ii. The documents and drawings indicated above are only for reference and are for guidance of contractor. The work shall be executed as per drawings and documents issued by engineer for the purpose.

1.2.2.28 Housekeeping & Cleanliness:

i. Contractor shall employ separate personnel for cleaning & up keeping of working area where work is undertaken by the contractor. Cleaning shall be done on day to day basis. All housekeeping personnel shall be provided with separate uniform.
ii. In case of work taken up in multi front like different building and elevation, the number of housekeeping personnel shall be suitably augmented to ensure up-keeping on day to day basis.
iii. The contractor shall thoroughly check and remove the extraneous materials, if any, like electrode stubs, bolts/nuts, etc. left behind in the pipelines and surrounding area.
iv. The contractor shall engage adequate vacuum cleaners at locations where welding & grinding is performed.
v. The waste collected shall be stored in closed container outside the building on daily basis at identified location and to be removed & disposed on weekly basis / as on when required.
vi. The contractor shall provide safety gear & gadgets to housekeeping personnel. The hand tools used shall not be stored inside the building.

1.2.2.29 Confidential Information:

The drawings, specifications, proto-type, samples and such other information furnished to the contractor relating to the supply/works, sub-systems/equipments etc. are to be treated as confidential, which shall be held by the contractor in confidence and shall not be divulged to any third party without the prior written consent of the engineer. The contractor, therefore, binds himself, his successors, heirs, executors, administrators, employees and the permitted assignees or such other persons or agents directly or indirectly concerned with the works/supply to the confidential nature of the drawings, specifications, proto-type samples etc. It is a further condition of the contract that the contractor shall not, without prior written permission from the Engineer, transmit, transfer, exchange, gift or communicate any such confidential information and also the component, sub-assembly, products, by-products, non-conforming/rejected equipment/ components, etc. to any third party.

1.2.2.30 Patents, Pattern, Samples And Models and Patent Right Indemnification:

All specifications, drawings, documents and other items furnished to the contractor by the Engineer are intended to be complementary and to provide for and comprise everything necessary for the completion of works/supply and are the property of the Engineer. These are not to be used for any work or purpose other than those for which these have been provided and shall be returned to the Engineer immediately on completion of work/supply in good condition.

If, during the process of execution of the contract, any improvement, refinement or technical changes and modifications are affected by the Contractor, such changes shall not affect the title to the property of the engineer and the information, specifications, drawings, etc. including the improvement/modifications affected by the Engineer. The Engineer shall also have the absolute right to assign, transfer, sublet, use and transmit all such information and details to the Engineer's consultants. Contractor shall not have any claim or rights whatsoever in respect of the Engineer's drawings, specification, patents, proto-types etc. even where improvement refinement, modifications etc. were affected by the contractor.

1.2.2.31 Records and reports:

i. The Contractor shall maintain records pertaining to the storage, fabrication, welding, erection, alignment, inspection and testing work in compliance with all drawings and technical requirements. The records shall be in a proper format as indicated by the Engineer. The Contractor shall submit the copies of such-records to the Engineer within 7 days from completion of any particular work, and prior to submitting bill for progressive payments. The report concerning welding, alignment of the equipments and flanges are included in this category. For material supplied by contractor, the contractor shall forward one copy of test certificate to the Engineer pertaining to the origin and specification of material. The Engineer shall need certain records for verification viz. weld inspection report, stress relieving report, consumable certificate, etc,. The Contractor shall establish a system to facilitate easy traceability of all such records.

ii. The contractor shall submit on weekly basis, to the engineer following reports indicating the details like system wise progress, fabrication/erection progress, system testing status, QA activities, etc.

a) Equipment erection progress report
b) Piping erection progress report
c) General statement of activities
d) Welders performance & qualification records
e) Weekly report on items on critical paths

In addition to above, the following reports shall be submitted to the engineer.

i. Daily, weekly, fortnightly and monthly progress reports
ii. Monthly planning report
iii. Three- and Six-months rolling schedules

All reports shall be statistical and on tabulated form indicated by the Engineer.

1.2.2.32 Removal of caps:

Removal of caps and other closures from all equipment nozzles supplied with temporary caps, irrespective whether equipment is erected by the contractor or the Engineer, is included in contractor's scope of work in case the piping to be connected by the contractor. The removal of caps shall be done by grinding or sawing off as approved by Engineer on case to case basis. Any damage to the equipment during the process of removal of the caps shall have to be made good by the contractor at his own cost.

1.2.2.33 Argon gas supply station for welding:

Welding of piping covered in this tender such as stainless steel and carbon steel shall be performed using GTAW process for root & stabilizing pass. In some cases all passes are welded using GTAW process. The reactor auxiliary building is building is having 10 floors and reactor building is having entry only through three air locks. Movement of argon cylinders on day to day basis is one of the most cumbersome & tedious process. Storage of cylinders in reactor building is not permitted. Large number of contractor manpower to be engaged for movement of cylinders for welding which is unproductive. It

will be advantages to supply argon gas from common points to all locations of reactor building if possible reactor auxiliary building. To make the Argon gas supply station, contractor may establish piping & tubing network with adequate control. The contractor shall consider such proposal and shall be prepared and submitted to BHEL & NPCIL for concurrence and approval.

1.2.3 CONSTRUCTION COMPLETION

The contractor's work shall be considered completed when the equipment and piping systems are installed meeting all requirements spelt out in drawings and specifications, have passed all examination, inspection and tests requirements described in technical specifications and working drawings. The contractor shall submit Construction Completion Certificate (CCC) in specified format attaching all relevant documents, to the Engineer for acceptance. Any deficiency revealed during testing or commissioning of the systems, pertaining to the portion of works executed by the contractor, shall be rectified expeditiously in consultation with the Engineer. Final completion certificate will be issued only after acceptance of all CCCs and after other provisions of general contract conditions are duly met.

ANNEXURE-1

LIST OF APPLICABLE CODES AND STANDARDS

Sl No.	STANDARD	TITLE
1	PNAE-G-7-002-86 [Book 1]	Regulations for Strength Analysis of Equipment & Pipelines of Atomic Power Plants
2	PNAE-G-7-002-86 [Book 2]	Regulations for Strength Analysis of Equipment & Pipelines of Atomic Power Plants
3	PNAE-G-7-002-86 [Book 3]	Regulations for Strength Analysis of Equipment & Pipelines of Atomic Power Plants
4	PNAE-G-7-003-87	Certification Rules for Welders of Nuclear Power Plant Equipment & Pipelines
5	PNAE-G-7-008-89 [Rev.No.1]	Regulations for Design & Safe Operation of Atomic Power Plant Equipment & Pipelines
6	PNAE-G-7-009-89 [Revision No.1]	Equipment & Pipelines of Nuclear Power Plants Welding & Weld Surfacing Guidelines
7	PNAE-G-7-010-89 [Revision No.1]	Equipment & Pipelines of Nuclear Power Plant Welded Joints & Weld Surfacing Inspection Regulation
8	PNAE-G-7-014-89	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines **Ultrasonic Control**
9	PNAE-G-7-015-89	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines

Sl No.	STANDARD	TITLE
		Magnetic Powder Control
10	PNAE-G-07-016-89	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines. **Visual & Measuring Control**
11	PNAE-G-7-017-89	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines **Radiographic Control**
12	PNAE-G-7-018-89	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines **Capillary Control**
13	PNAE-G-7-019-89	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines **Leak Control Gas & Liquid Technology**
14	PNAE-G-7-030-91 [Part I]	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines

Sl No.	STANDARD	TITLE
		Ultrasonic Control Part II Welded Connections & Cladding Control
15	PNAE-G-7-031-91 [Part III]	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines **Ultrasonic Control Part III Thickness Measurements of Mono Metals, Bi-Metals & Anticorrosive Coatings**
16	PNAE-G-7-032-91 [Part Four]	Unified control techniques of basic material (Semi – finished products), welded connections and cladding of nuclear power unit equipment and pipelines **Ultrasonic Control Part Four Testing the Austenitic Steel-Welded Joints**
17	SNIP-3.05.05-84	Construction Norms and Rules Technological Equipment and Technological Pipelines
18	SNIP-II-23-81*	Construction Norms and rules Steel Constructions
19	14-3-197-89	Seamless Pipes of Corrosion - Resistant Steels with surface elevated Quality: specifications
20	14-3P-197-2001	Seamless Pipes of Corrosion-Resistant Steels with the Surface of Elevated Quality: specifications
21	GOST-2246-70	Welding Steel Wire: specifications
22	GOST-2246-70	Welding Steel Wire: specifications
23	GOST-3242-79	Welded Joints: quality control methods

Sl No.	STANDARD	TITLE
24	GOST-3262-75 with Revs.1-6	Water-Supply and Gas-Supply Steel Pipes: specifications
25	GOST-3282-74*	General-Purpose Low-Carbon Steel Wire: specifications
26	GOST-5264-80	Manual Arc Welding Welding Joints: main types, design elements and dimensions
27	GOST-5264-80	Manual Arc Welding Welded Joints: major types, structural elements and dimensions
28	GOST-6032-89 (ISO 3651/1-76, ISO 3651/2-76)	Corrosion - Resistant Steels and alloys: methods for testing the resistance to intercrystalline corrosion
29	GOST-6996-66	Welded: methods of determination of mechanical properties
30	GOST-7268-82	Steel: Method of Determining the Tendency to Mechanical Ageing by Impact Bending Test
31	GOST-7512-82	Non Destructive Testing Welded Joints: Radiography method
32	GOST-14771-76	Welded Joints: main types, design elements and dimensions=Gas-Shielded Arc Welding
33	GOST-14771-76	Gas-Shielded Arc Welding Welded Joints: main types, design elements and dimensions
34	GOST-14782-86	Nondestructive Testing Welded Joints Ultrasonic Methods
35	GOST-14782-86	Non Destructive Testing Welded Joints: Ultrasonic methods
36	GOST-16037-80	Welded Joints in Steel Pipelines: main types, design elements and dimensions
37	GOST-16037-80 with Rev.No.1	Welded Joints in Steel Pipelines: main types, design elements and dimensions

Sl No.	STANDARD	TITLE
38	GOST-18442-80*	Non Destructive Testing: capillary methods, general requirements
39	GOST-22438-85	Enamels EP-525: specifications
40	GOST-23143-83	Enamels EP-773: specifications
41	GOST-24709-81 with Rev.Nos.1, 2	Enamels EP-140: specifications
42	GOST-24709-81with Rev. Nos.1, 2	Enamels EP-140: specifications
43	GOST-25129-82 With Revs. Nos.1,2	Primer ГФ-021: specifications
44	GOST-25718-83	Primers AK-069 and AK-070: specifications
45	GOST-27271-87 [CMEA Std. 5487-86]	Paintwork Materials: methods for control of working Life
46	GOST-27772-88	Rolled Products for Structural Steel constructions: general specifications
47	GOST-9466-75	Coated Metal Electrodes for Manual Arc Welding of Steels and Deposition: classification, dimensions and general technical requirements
48	GOST-12.1.004-91	Fire Safety: general requirements=Occupational Safety Standards System
49	OST24.125.01-89 – OST 24.125.26-89	Parts and Assembly Articles of Austenite Class Steels for Pipelines of NPP Dh = 14/325mm: types, construction and dimensions
50	OST 24.125.150-93 – OST 24.125.170-93	Branch Standards Supports of Station and Turbine Pipelines of Thermal and Nuclear Power Stations: types, constructions, dimensions and technical requirements

Sl No.	STANDARD	TITLE
51	OST 34-42-668-84 to OST OST 34-42-672-84	Industrial Standards Parts and Assembly Units for Pipe-lines of Seamless and Electric Welded Pipes made of Carbon Steel for Pw<2.2MPA (22kgf/cm2), t<350c for Nuclear Power Plants: constructions and di
52	OST 24.125.100-93 – OST 24.125.130-93	Industrial Standards Suspensions of Plant and Turbine Pipelines of Thermoelectric and Nuclear Power Stations: types, design, dimensions and technical requirements
53	OST 34-10.699-97 - 34.10.700-97 – OST 34.10.701-97	Industrial Standards Pipeline Steel Seamless Welded Parts for Pwork<2.2MPa (22kgf/cm²) for Nuclear and Thermal Power Plants
54	OST 34-10-417-90 - OST 34-10-426-90 OST 34-10-428-90 OST 34-10-431-90 - OST 34-10-433-90 OST 34-10-439-90 - OST 34-10-440-90 OST 34-10-508-90 OST 34-10-513-90	Industrial Standards Fittings and Assembly Units of Corrosion-Resistant Steel Pipelines at Ppa<2.2MPa(22kgf/cm2), t<300c for NPS
55	L8-508-000 to L8-524-000	Pipe supports and suspensions for DN<=89mm
56	VSN-361-85	Installation of Production Equipment on Foundations
57	527-80	Introduction of Designing of Technological Steel Pipe-Lines with Pnom upto 10 Mpa
58	R01.KK.0.0.TI.TT.WD001	Initial technical requirements for thermal insulating materials, articles and structures
59	GOST 17314-81	Arrangement for fastening thermal insulation of steel vessels and Apparatus
60	IS:2062-2011	Specification for hot rolled medium and high tensile structural steel

Sl No.	STANDARD	TITLE
61	IS 808:1989	Specification for dimensions for hot rolled steel beam, column, channel and angle sections
62	IS:3346-1980	Method of determination of thermal conductivity of thermal insulation material.
63	IS:15402-2003	Ceramic fibre blanket Insulation Specification
64	IS:9489-1980	Method of test for thermal conductivity of thermal insulation by means of heat flow meter.
65	IS:737-2008	Wrought Aluminum and Aluminum Alloy Sheet and Strip for General Engineering Purposes - Specification
66	IS:14656-1999	Ceramic fibre Products - Methods of Test
67	IS:7173-1989	Slotted pan head tapping screws
68	IS:14164-2008	Industrial Application and Finishing of Thermal Insulation Material at Temperature Above - 80° C and up to 750° C - Code of Practice
69	IS-10556	Code of practice for storage and handling of thermal insulation materials.

ANNEXURE -2

BUILDINGS AND SYSTEM DESCRIPTION

1. Buildings and System description:

1.1 Introduction:

In KKNPP all the Structures, Systems and Components (SSC's) are identified by a Unique non language based coding system known as KRAFTWERK KENNEZEICHEN SYSTEM (KKS). All the working documentations, drawings, technical specifications and other technical related documents issued to the contractor from time to time shall refer to these KKS codes. Complete list of KKS codes is available with Engineer In-charge which shall be made available to the Contractor on demand at the time of start of the work. For easy understanding, the descriptions of KKS codes of all the systems and structures which are part of this work were mentioned in various sections of this tender.

It is the responsibility of the contractor to train his personnel in understanding the KKS codes. The non-familiarity or ignorance of KKS coding system will not relieve the contractor from his responsibility of successfully performing the said work.

1.2 Major buildings/structures: Major buildings are Reactor building (UJA/UJB/UJC/UJG); Reactor safety building (UKA/UKB/UJE); Reactor Auxiliary building (UKC/UCA); Fresh fuel storage building (UFC), Solid radioactive building (UKS). Brief description about each building is given as below for general information of contractor.

1.2.1 Reactor Safety system Basement Building (UKA) & Ancillary systems Lean-to Building (UKB) :

i. UKA houses safety system and safety support system pumps, tanks, heat exchangers, blow down filters, associated piping, valves etc. Piping from this building will connect to the reactor building through hermetic penetrations.

ii. UKA is a two story underground building having floor elevations at -7.200m elevation, -4.250m elevation and +0.000m elevation. This basement is partitioned into four channels (trains) which are physically separated by concrete walls.

iii. UKB building houses equipment of radioactive gas filtering system and reactor annular space exhaust ventilation including UKA building exhaust ventilation systems.

1.2.2 Steam chamber building (UJE):

i. Steam chamber houses steam pipelines, feed water pipelines and respective isolation valves of dia 600NB and 400NB. Also houses steam generator pulse safety device, BRU-A for relieving the over pressure of the steam generator and steam line.

ii. These valves includes Fast acting steam isolation valves (4nos) each for each train and each valve weighing approx 6.5MT.

iii. Building starts from +0.000m elevation to +22.000m elevation. Where the subject pipelines will be accommodated from +12.00m elevation to 22.00m elevation. Steam chamber also provided with louvers for releasing over pressure in the steam chamber in case of any emergency.

1.2.3 Reactor Auxiliary and Main control room Building (UKC) & The Normal Operation building of control system (UCA)

i. Reactor Auxiliary Building is box type reinforced concrete structure of approximate size of 45 m by 72 m in plan and is approximately 31 m high.

ii. The building has two levels of basement at elevation – 8.000 m and -3.600 m levels and above ground storey at elevations 0.000, +3.600 m, +7.200m, +10.800 m, +14.400 m, +18.000 m, +20.400 m, +24.600 m and 27.6 00 m. The UKC building contains normal operation water systems, liquid waste processing systems and control room at higher elevation.

iii. UKC houses various equipments such as tanks, pumps, piping, and valves of huge number of auxiliary systems including liquid radioactive waste management systems. Also it houses various ventilation systems for supply and purification of air from and to reactor building.

1.2.4 Reactor Building / Inner containment (UJA)

i. The Reactor Building consist of cylindrical pre-stressed concrete inner containment wall (ICW) & pre-stressed concrete hemispherical dome fully lined with 6 mm thick CS liner in the wall and 8 mm liner in the bottom of the containment. Outer containment wall (OCW) and hemispherical dome of RCC surrounds the inner containment. The size of building is 72m by 42m, the containment walls start from + 6.000M onwards. The RCC outer containment wall is 0.6 m thick with 2.2 m annular gap in between the two containment walls and are supported on same slab at 5.4 m. The external containment has inner diameter of 50.8 m and height of 69.9 m to the top of the dome. Reactor Building consists of area of

accident localization (UJA) and non-hermetic part that includes basements of UKA and additional structures UKB and UJE, transport portal (UJG), PHRS gallery (UJC) and UCC.

ii. The Reactor Building houses three air locks viz. equipment (material) lock at elevation +34.193 m elevation, main service air lock at + 28.25 m elevation and emergency lock at + 21.28 m elevation, also these locks provide access to building during construction. The whole building has above ground storey at elevations +6.000m, +9.000m, +14.140m, +20.500 m, +31.700m, and +42.400 m.

iii. Reactor building houses various important equipment / components such as Reactor pressure vessel, Steam generator, Reactor coolant pumps, Pressurizer, Main coolant pipelines, refueling machine, fuel pool with SS liner, fuel racks & its associated piping for makeup and purification, reactor internals inspection wells with SS liner, emergency core cooling system accumulators (Stage-I & Stage-II) and its associated piping, Quick boron injection system tanks and its piping, safety system piping and valves, metal platforms at various elevations. A brief description of individual systems is provided in the later parts of this section.

iv. Reactor building also houses polar crane for handling various equipments during erection phase and maintenance phase. This crane is located at +44.000 m elevation, mounted on the brackets embedded in the Inner containment wall (ICW).

v. The contractor shall note that, all NSSS equipment and most of the piping and valves shall be taken through equipment (material) lock at elevation +34.193 m elevation and further lowered to lower elevations for erection.

1.2.5 Outer containment/Annulus Space(UJB)

i. As name indicates this is the space between the inner containment and the outer containment of reactor building.

ii. Annulus space houses piping of various systems, equipments related to ventilation systems, component cooling systems etc.

Piping which enter and comes out of reactor building to the auxiliary building shall pass through the annulus space through hermetic penetrations provided on inner and outer containment walls at various orientations and elevations. All pipelines are provided with quick acting isolation valves / isolation dampers which are to be tested separately at in-situ.

1.2.6 PHRS heat exchangers room gallery (UJC) / Transport Portal (UJG):

i. PHRS (passive heat removal system) gallery is a annulus space between the outer containment and the tertiary dome and starts at elevation +43.000m. Where separate brackets and beam arrangement have been provided to support 12 numbers of PHRS heat exchangers.

ii. The base of the gallery is provided with openings to pass the air from the outside atmosphere to the PHRS heat exchangers.

iii. This building (UJC) houses PHRS heat exchangers & connecting ducts (piping) from the HX to the filters located in the annulus space of outer containment dome and tertiary dome including connected piping and the valves.

1.2.7 Fresh fuel storage Building (UFC):

i. As name indicates this building is used for receiving and storing the fresh fuel assemblies.

ii. This building houses various racks for storing the fresh fuel assemblies, turner assembly etc.

iii. This building is provided with two gates on either side of the building, one is of swinging type and other is of sliding type. Also consists of a hatch for providing access to the fresh fuel assemblies.

1.2.8 Solid Radioactive waste reprocessing and storage building (UKS)

i. Solid radioactive waste building is rectangular building from +0.00m elevation to +22.000M

ii. This building houses various equipments such as tanks, heat exchangers, hydraulic press, furnaces, diesel handling system, associated piping, valves etc.

iii. The main purpose of the building is to process the solid radioactive waste collected from other buildings, those collected waste were burned and cemented as a blocks for long term storage.

1.3 System Description: The brief description & important parameters of the main systems & the equipments are described below for information. The detailed parameters & requirement of pipeline, equipment for erection purpose would be provided in working

documents to be issued in phased manner during construction. Only main system and equipment description have been included for general information of contractor

1.3.1 Nuclear steam supply system (NSSS):

Nuclear steam supply system primarily consists of a reactor assembly and four loops of reactor coolant circuit (Primary coolant circuit). Each reactor coolant loop contains a steam generator (JEA), main coolant pump (JEB) and main coolant pipeline (JEC). A pressurizer system is connected to the hot leg of loop no.3 and cold leg of loop no.4 & maintains system pressure within the required limits. Four ECCS-I stage hydro accumulators are directly connected through the piping & valve system to the Reactor pressure vessel. The system is designed for a pressure of 17.6 MPa and temp. of 350 deg. C. Following are the further details of equipments & pipeline system covered in nuclear steam supply system.

Sr No	KKS CODE	System Description	System Details	Building
1	JAA, JAB & JAC	Reactor System	Reactor system consists of Reactor pressure vessel, Reactor internals such as core barrel, core baffle, protective tube unit, reactor head. Reactor is supported by support truss and support ring assembly. Reactor is locked by thrust truss at +22.53m elevation. Reactor internals are housed in side reactor. Fuel assemblies are placed inside the internal and PTU is placed over the fuel assemblies. Reactor head is placed over the protective tube unit and fastened with reactor.	UJA
2	JEA10-40	Steam generation system	There are four steam generators inside reactor building. Steam generator is shell and tube heat exchanger which converts the feed water into live steam by transferring the heat from the reactor. Steam generator is a floating member which is free to move in X & Y axis for accounting thermal expansion & contractions during heating and cooling cycles with the help of roller supports on which steam generator is mounted. Other than the main coolant pipe, live steam and feed water connection, steam generator has connections with other piping system such as steam generator blow down system and emergency cool down system.	UJA
3	JEB	Reactor coolant pump system	There are four reactor coolant pumps assembly inside reactor building. Three main components of the reactor coolant pumps are casing , removable part (Removable part is the assembly of impeller and bearing housing) and motor. The whole assembly is supported by brackets on the casing. Casing is erected on +20.500m elevation. Reactor coolant pump also consists of piping network for cooling the radial axial bearing and thrust bearings.	UJA

Sr No	KKS CODE	System Description	System Details	Building
3	JEC	Reactor coolant piping system	Main coolant piping is a low alloy steel piping network of size OD 990 X 70MM thickness. This piping connects the reactor to the coolant pump, reactor to steam generator and coolant pump to steam generator. This piping has many nozzles on its body for connecting to various safety and auxiliary systems. System is spread in four loops with 7 weld joints in each loop i.e. 28 weld joints that are to be performed at site.	UJA
5	JEF/JEG	Pressurizing and over pressure protection system	Pressurizer system (JEF) is the system used for maintaining the pressure inside the reactor at 15.6MPa. Also this system is to take care of the pressure surges in the primary coolant system through connecting & injection piping. This system comprises of pressurizer and piping network connecting the main coolant piping for maintaining the required pressure with the help of electrical heaters. Pressurizer is the vertical pressure vessel supported by skirt at +20.050m elevation with the thrust ring located at +31.700m elevation to prevent the lateral movement of the pressurizer and allow the linear thermal expansion. Also whenever the system pressure rises more than the set limits, the pressure is relieved with the help of Bubbler tank (JEG), associated piping, and pulse safety device (PSD). Whole system is located inside the reactor building spread at various elevations.	UJA

1.3.2 Safety systems: Safety systems are provided to mitigate the consequences of an accident situation. These systems actuate on the basis of signals from primary side or secondary side. Engineered safety systems are either active systems or passive systems. All the active systems are provided with a redundancy of 4x100% and passive systems are with 4x33%. Safety classification of the elements of the systems is based on Russian standards.

Sr No	KKS CODE	System Description	System Details	Building
1	JDJ	Quick boron injection system	A passive system of 4x33% redundancy for supplying the concentrated solution of boric acid into the primary circuit under ATWS condition. This system is connected to main coolant piping along with a tank storing boron solution with 40gm/Ltr concentration across the reactor coolant pump. So that during any ATWS condition , if RCP trips the total boron solution in the tanks will be pumped to the reactor by the cost down flow of the reactor coolant pump. The total piping network of the system is of stainless steel.	UJA
2	JKM	System for retention & cooling of reactor molten core	This systems is for confining liquid and solid fragments of destroyed core, reactor pressure vessel parts and vessel internals during hypothetical accidents, connected with core melting. System consists of various equipments such as core catcher, basket with filler, truss cantilever, lower plate etc for fulfilling the said purpose. In addition to this for providing the cooling for extended hours these equipments are provided with piping network extending to outside the reactor building for passing the coolant to the required location using external pumps such as fire tenders etc. The total piping network is of stainless steel and spread in UJA and annulus space (UJB)	UJA

Sr No	KKS CODE	System Description	System Details	Building
3	JMN	Containment Spray system	This is an active system with 4 X 100% capacity, main purpose is to reduce the parameters (pressure and temperature) inside primary containment and fixing of radioactive iodine within containment after LOCA. Two numbers of sprinkler headers above +50.00m elevation fixed to the reactor building dome with 2X 25 number of sprinkler nozzles for spraying the boron solution into the reactor building. The pumps for the system are located inside the UKA at -4.200m elevation. The sprinkled water is collected into the core catcher sump and further taken back to UKA for cooling via JNA heat exchanger which is a common cooling heat exchanger for all the active safety systems.	UKA,UJA
4	JMT	Hydrogen suppression inside the containment system	To avoid the formation of the explosive mixtures inside accident localization area by maintaining the volumetric hydrogen concentration in the mixture below the safety criteria thus protecting the elements of the localizing safety systems to ensure the containment leak tightness, integrity and availability of other LSS under operating conditions, and in accidents, including beyond design basis accident. Hydrogen recombiners are installed at various locations in containment. There are 157 such hydrogen recombiners which are located in some strategic locations inside the reactor building for fulfilling the purpose.	UJA

Sr No	KKS CODE	System Description	System Details	Building
5	JNA	Emergency & planned primary circuit cooling & fuel pool cooling system.	The purpose of the system is for reactor plant shutdown cooling when heat removal through steam generators becomes less effective, to remove residual heat from fuel in the cooling pond and from reactor and maintaining coolant inventory in the reactor and introducing chemicals for fixing radioactive iodine (JNA-80) to primary coolant during loss of coolant accidents. This is an active system with 4 X 100% redundancy where the pumps and Heat exchangers are located below containment (UKA) at -4.200m elevation. System piping is connected to JNG10-40, JEC(main coolant piping) at elevation approx +20.000m, fuel pool, core catcher sump inside reactor building. Piping from UKA enter the reactor building through floor vertical hermetic penetrations. Total piping in this system is of stainless steel of various sizes ranging from 15NB to 600NB.	UJA, UKA
6	JNB10-40	Emergency SG cooling and blow down system	This is an active system with 4 X 100% redundancy, purpose is to remove reactor core residual heat and cool down reactor plant by cooling steam generator steam in emergency situations and supplying steam generators blow down water for its purification and return to steam generators in normal operation mode. Pumps and heat exchanger are located below containment (UKA) at -4.200m elevation and 0.00m elevation. This system also operates along with LCQ10-40 for blow down of steam generator during normal operation of the reactor.	UJA, UKA

Sr No	KKS CODE	System Description	System Details	Building
7	JNB 50-90	Passive heat removal system	Passive heat removal system is a passive system whose purpose is to remove residual heat from the reactor core during beyond design basis accident (BDBA) with loss of alternate current power supply sources both in conditions of intact primary circuit, and in cases of leaks in primary or secondary circuit. This is 4 X33% redundancy , In case of primary circuit leak, system operates together with stage II ECCS hydro accumulators. This system takes steam from the steam generator during station black out and is cooled by air heat exchangers which are located outside containment at elevation +43.00 m. The condensate is returned back to steam generator. Connections between the steam generator and the heat exchanger is connected with piping network of carbon steel and stainless steel.	UJA
8	JND10-40	HP emergency injection system	This is an active safety system with 4X100 % redundancy whose purpose is to restoring primary circuit coolant losses and removing heat from the core primary circuit at high pressure in case of LOCA and maintaining of the reactor core in sub critical state. Pumps are located below containment (UKA)at -4.200m elevation. This system share heat exchanger of JNA for cooling. System is connected to MCP inside reactor building through stainless steel piping network from UKA to UJA entering through vertical floor hermetic penetrations.	UJA, UKA

Sr No	KKS CODE	System Description	System Details	Building
9	JND 50-80)	Emergency boron injection system	This is an active safety system with 4 X 50% capacity whose purpose is to Pump the boron solution into the pressurizer during primary to secondary side leakage inside the SG to reduce pressure in the primary circuit and provides core sub criticality during failure of a reactor control and protection system to operate during demand (ATWS). For fulfilling the said functions piping network is connected to the main coolant piping, pressuriser inside reactor building and Pumps are located below containment. (UKA)at -4.200m elevation. The material of construction of the system is stainless steel.	UKA,UJA
10	JNG10-40	Emergency core cooling system stage -1	Emergency core cooling system stage-I, is a passive system for cooling the reactor during emergency conditions. System consist of pressurized accumulator (4X60Cum) at +31.70m elevation of reactor building. Accumulators are pressurized with nitrogen gas. Accumulators are connected to the reactor directly by piping of Dia 355mm x 40mm through a series of check valves and gate valves. Also JNG 10-40 system piping is connected to other safety systems such as JNG50-80 & JNA. (explained in later parts). Accumulator is connected with the makeup & drain line. Also the system is provided with a special valves called pulse safety device to protect the tank from getting over pressurized.	UJA

Sr No	KKS CODE	System Description	System Details	Building
11	JNG50-80	2nd stage accumulator system (supplementary passive core flooding system)	This is a Passive safety system with 4 X33% capacity whose purpose is to supply of boron solution into the reactor core at low pressure by gravity to remove residual heat and to maintain the core sub criticality state during primary circuit leak with station blackout and for storing borated water reserves for filling reactor vault and vessel internals region in shut down condition of unit during refueling. System consists of 2X4 160Cum stainless steel accumulators (details covered in respective technical specification) tanks are located inside containment at +31.700m elevation. Accumulators are connected to main coolant piping with stainless steel piping network, valves and other accessories.	UJA

1.3.3 Auxiliary Systems:

There are several systems that are provided for normal operation of reactor to maintain water chemistry of reactor coolant, provide cooling media to various heat exchangers and to maintain other related function of reactor system. Brief description & function of systems are given below: -

Sr No	KKS CODE	System Description and Details	Building
1	FKA	This system consists of CPS drives decontamination bathes (FKA20BB001,FKA30BB001)with electric pump of CPS drive units decontamination baths (FKT20AP001,FKT30AP001) and decontamination compartment (washing tank) of ISTPS (Inter station Transport Packing Set)FKA50BB001 and its associated pipelines and valves for delivery of decontaminating solutions for decontamination of equipment and rooms in buildings UJA, UJB, UKA, UKB and UKC in order to reduce personnel radiation doses during NPP operation prior to scheduled-preventive maintenance and inspections.	UJA, UKC
2	FKT	This system consists of potassium permagnet preparation tanks (FKT10BB001) with electric mixer (FKT10AM001), Acids (Oxalic acid)solutions preparation tank (FKT30BB001) with electric mixer (FKT30AM001), Decontamination solution preparation tanks (FKT40BB001,FKT50BB001) with electric mixers (FKT40AM001) & (FKT50AM001), Decontamination solution supply pumps FKT40AP001, FKT40AP002, FKT50AP001, FKT50AP002, Plate type heat exchangers (Heaters)FKT40AC001,FKT50AC001,FKT60AC001 to maintain the temperature of decontamination solutions at the level of 90 degree Celsius located at various elevation within the UKC, Reducing and cooling facility (RCF)FKT21AA201 and FKT22AA201 are located in UJY gallery. For preparation and supply of decontaminating solutions for equipment decontamination and rooms before preventive maintenance and inspections for the purpose of reducing exposure doses to maintenance personnel in a process of NPP operation.	UKC
3	GMN	This is Exhaust system for instrumentation compartment & compartment of secondary circuit emergency cooling down	UJA,UKC

Sr No	KKS CODE	System Description and Details	Building
4	JEA (50-90)	This system monitors the level in the Steam generator, steam humidity including steam generator flushing.	UJA, UKC
5	JET	This system is designed for reactor coolant controlled leak.	UJA
6	KAA	Component cooling system function is to remove the heat from the process systems, safety systems and ventilation systems and transfer the load to the ultimate heat sink. This system pumps and heat exchangers are located in -4.200m elevation at UKA . System consists of stainless steel piping of various sizes ranging from Dia 600NB to 10NB. System take care of loads in UKA i.e. travels throughout UKA, enters the reactor building through floor hermetic penetrations at +5.40m elevation. KAA system travels throughout reactor building from +5.40m elevation +40m elevation, to take care of various loads such as ventilation , reactor coolant pump etc. Also system enters UKC to cater the loads of ventilation and other process systems.	UJA, UKC, UKA
7	KBA	System is for full filling the function of feed and bleed requirements of primary circuit. Also system is intended for maintaining the primary circuit chemistry with the help of other systems such as KPJ , KBB (chemical reagents preparation system, storage system etc). System mainly consists of 3 nos of centrifugal pumps at -3.600m elevation & heat exchangers , after coolers +9.000m and de-aerator at + 18.000 m elevation of UKC . System consists of stainless steel piping with major diameter of piping 125NB and minimum diameter of 10NB. This system piping erected in UKC, UJA/UJB and having connection with other process systems.	UJA, UKC

Sr No	KKS CODE	System Description and Details	Building
8	KBB	For receiving, storing and supplying coolant for treatment in various unit operation modes with purpose of receiving clean condensate and boron concentrate for repeated use in NPP cycle for primary circuit makeup.	UKC
9	KBC10-30	For bubbler filling and makeup, boron washing, makeup of nuclear component cooling system, distillate supply to suction of hydro tests pumps	UJA, UKC
10	KBC40-60	Providing maintenance of water-chemical regime quality of primary circuit makeup water in accordance with regulations requirements to primary circuit, from the aspect of controlling reactor core reactivity during fueling campaigns by boric acid.	UKC
11	KBC-70	System is used for testing and calibration of control rods and protection drive. System consists of a reciprocating pump located inside annulus space at +9.000m elevation. Stainless steel piping 10NB enters the reactor building through inner containment hermetic penetration and travels throughout RB at various elevations and connects to vertical stand area near inspection well.	UJA
12	KBD	For maintaining water-chemical regime of primary coolant in accordance with requirements to primary circuit of NPP with ensuring minimal radioactive contamination and minimal corrosion rate of structural materials of reactor plant equipment.	UKC
13	KBE (10-40)	Continuous purification of the primary coolant to remove dispersive corrosion particles in structural materials of the primary circuit with the purpose to reduce sedimentation of these particles in the coolant and decrease radiation impact on personnel	UJA

Sr No	KKS CODE	System Description and Details	Building
14	KBE (50-60)	Removing chemical impurities of structural materials, corrosion products and radio nuclides, which are in ion form, in order to ensure coolant quality within standardized range during the whole campaign.	UKC
15	KBF	For processing boron-containing water with purpose of receiving clean condensate for primary circuit makeup and boron concentrate for repeated use in NPP cycle.	UKC
16	KLB 50-80	To ventilate annulus space and discharge air after filtration	UJA
17	KPJ	The reagent preparation and supply system used for conducting periodical washing drain water treatment system, coolant treatment system evaporating units, filling hydro accumulators of coolant storage systems.	UKC
18	KTA	Collecting drains of water containing boron within reactor building boundary, receiving and pumping the coolant through low-temperature coolant purification system filters at primary circuit low pressure, drains collecting during repair works. System consists of stainless steel piping of size ranging from 100NB to 10NB , valves a, supports. In addition to this system consists of heat exchanger inside the reactor building at +9.000m elevation and enter UKC at +9.000m elevation. System travels throughout the reactor building to collect the organized drains from the primer circuit. Major part of the piping is of small bore piping.	UJA, UKC
19	KTB	Dilution of gas blow-offs by nitrogen down to explosion-safe concentrations in primary circuit equipment and transporting of gas blow-offs into radioactive process blow-offs cleaning system KPM; Diluting and transporting hydrogen at outlet from chemical and volume control deaerator to system for burning hydrogen from radioactive process blow-offs KPL.	UJA, UKC

Sr No	KKS CODE	System Description and Details	Building
20	KTC (10-20)	This system deals with collection of boron containing water from Reactor Related system	UKC
21	KTC 50	This system deals with drains from reactor auxiliary system	UJA
22	KTC (60-70)	This system is for drain and air removal from active water treatment plant	UKC
23	KTF	All active drains are collected and disposed by this system	UJA
24	KTH	To collect drains of the special drain self-flowing system of UJA & UKC bldg and supply them for treatment and also for prevention of contaminated water transportation to the free access area.	UKC,UJA
25	KTN	This system is connected with active drainage pipe work system of UKC building	UKC
12	KTP	The system pipelines connect the upper points of the reactor cover, pressurizer and SG collectors via the shut-off valves units by means of the common pipeline of 76x7 mm. For removal of steam-gas mixture from the primary coolant circuit and decrease of pressure in PRZ in combination with PRZ PSD for the purpose of decreasing consequences under design-basis accidents and beyond design-basis accidents. The piping are located within containment.	UJA
26	KUA (10-50)	Automatic monitoring of boric acid concentration in accordance with requirements of reactor plant systems.	UJA, UKC
27	KUA (60-80)	For taking samples of primary coolant and the fuel pool water and obtaining online information about the status of water chemistry in the reactor coolant system.	UKC

Sr No	KKS CODE	System Description and Details	Building
28	KUE	Sampling system	UKC
29	KWA	Hydro testing of bubbler with the purpose to test its strength and leak tightness and blowdown of I&C sensors with distillate.	UJA, UKC
30	KWB50	KWB50 system is meant for hydro testing of the secondary circuit. system consists of stainless steel piping with pressurizing pump , fittings and valves. Pumps of KWB50 system are located at **UKC -3.600m** elevation and enters the reactor building **(UJA)** through outer and inner containment and travels trough out reactor building and connected to the secondary circuit. System consists of small bore piping with fittings, valves, pumps , flow orifices etc.	UJA, UKC
31	KWC	Hydro testing of the primary circuit pipelines, ECCS of the first stage & second stage with the purpose to test their strength and leak-tightness and blow down of I&C sensors with feed water of the primary circuit and boron solution.	UJA, UKC
32	LAB	Feed water supply to the steam generators to provide their required steam capacity in the modes of the normal operation and in the modes of the disturbed operation. System consists of piping from steam generator at +26.000m elevation inside reactor building, from steam generator piping enters the UJE at approx +20.000m though hermetic penetration of bellow compensator type. System mainly consists of carbon steel piping of Dia 400NB , valves and visco elastic dampers. From UJE system enters the turbine building from +12.00m elevation .	UJA UJE

Sr No	KKS CODE	System Description and Details	Building
33	LBA	Live steam supplying steam to Turbine starts from the steam generator headers at +29.500m elevation and travels from reactor building to the UJE (steam chamber) through inner containment hermetic bellow type penetration. From steam chamber system piping will enter the turbine building ta elevation +12.000m. System consist of carbon steel piping of size 600NB, series of valves and pipe supports . System also consists of fast action steam isolation valves which is weighing around 6000kg. System also has visco elastic dampers which are to be erected along with the pipe supports.	UJA UJE
34	LBG (10-70)	This system deals with steam line and other equipment in connection with Auxiliary steam line	UJA, UKC, UKS
35	LCM80-90	This system deals with collection and disposal of drain in the Turbine hall and other areas.	UKC
36	LCP	This system deals with de-mineralised water supply.	UKC
37	LCQ (10-40)	To maintain secondary circuit water-chemistry regime.	UJA, UKC
38	LCQ (50-80)	Continuous purification of SG blow down water at high-temperature mechanical and low-temperature ion-exchanging filters in order to assure blow down water quality within limits of standardized values during the whole campaign.	UKC,UKA
39	LFG	For chemical flush of the steam generators.	UJA, UKC
40	QUJ	This system deals with checking of leak tightness of joints in the steam generator	UJA
41	QUK	For sampling and monitoring the chemistry of SG blow down water.	UKC

Sr No	KKS CODE	System Description and Details	Building
42	QUH	This system is connected with sampling of secondary cycle and condensate polishing equipment.	UJA, UKC
43	SRG 50	Checks radioactivity of the controlled access area	UKC

1.3.4 Fuel handling systems:

i. Fuel handling system includes systems for handling fresh fuel and spent fuel. Fresh fuel storage will be done in UFC building (explained in the previous sections). Whereas systems for handling spent fuel are located inside the Reactor building.

ii. Fuel handling systems include refueling machine, fuel pool racks, fuel transport cask, decontamination pit, shock absorber, defective fuel detection system etc.

iii. Fuel pool is used for storage of the spent fuel , in which stainless steel racks are provided for holding the spent fuel assemblies. Fuel pool is filled with borated water upto elevation 30.7m elevation all the time.

iv. Refueling machine is used for handling the fuel assemblies during unloading and loading during refueling activities.

1.3.5 Waste management systems:

i. Waste management system includes solid radioactive waste management system and liquid radioactive waste management system.

ii. Solid waste will be processed in UKC and UKS buildings, where as liquid waste will be processed in UKC and processed waste will be shifted to UKS for further processing.

iii. All these waste management systems includes various equipment such as pumps, piping, cementation units, solid waste burning furnaces, hydraulic cutter and press for compacting waste, conveyers for transferring the waste from one location to another etc.

FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT CHAPTERS IN THIS BOOK – TECHNICAL SPECIFICATION.

VOLUME IA PART – I CHAPTER – III

1.3 FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR / BHEL

(SCOPE MATRIX)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1	**PART I**			
1.3.1.1	**ESTABLISHMENT**			
1.3.1.1.1	**FOR CONSTRUCTION PURPOSE:**			
1.3.1.1.1.1	Open space for office	Yes		Free
1.3.1.1.1.2	Open space for storage	Yes		Free
1.3.1.1.1.3	Construction of bidder‘s office, canteen and storage building including supply of materials and other services		Yes	
1.3.1.1.1.4	Bidder‘s all office equipment, office / store / canteen/Consumables.		Yes	
1.3.1.1.1.5	Canteen facilities for the bidder‘s staff, supervisors and engineers etc		Yes	
1.3.1.1.1.6	Fire fighting equipment like buckets, extinguishers Etc		Yes	
1.3.1.1.1.7	Fencing of storage area, office, canteen etc of the bidder		Yes	
1.3.1.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
1.3.1.1.2.1	Living accommodation		Yes	
1.3.1.2	**ELECTRICITY**			**Chargeable Basis**
1.3.1.2.1	**Electricity For construction Purposes**			Prevailing rate of TANGEDCO
1.3.1.2.1.1	Multi Point source	Yes		
1.3.1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	

1.3.1.2.2	**Electricity for the office, stores, canteen etc of the bidder which include:**		Yes	
1.3.1.2.2.1	Distribution from single point including supply of materials and service		Yes	
1.3.1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	Calibration certificate to be provided
1.3.1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
1.3.1.2.2.4	Demobilization of the facilities after completion of works		Yes	
1.3.1.3	**WATER SUPPLY**			
1.3.1.3.1	For construction purposes		Yes	
1.3.1.3.2	Water supply for bidder‘s office, stores, canteen etc		Yes	
1.3.1.4	**LIGHTING**			
1.3.1.4.1	For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.5	**COMMUNICATION FACILITIES for site operations of the bidder**			
1.3.1.5.1	Telephone, Fax, internet, internet, email etc (min 2 Nos of PC & Printer) – 2 Data entry operator with computer knowledge		Yes	
1.3.1.6	**COMPRESSED AIR SUPPLY**			

1.3.1.6.1	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc		Yes	
1.3.1.6.2	Installation of above system and operation & maintenance of the same		Yes	
1.3.1.6.3	Supply of the all the consumables for the above system during the contract period		Yes	

(SCOPE MATRIX)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.2	**PART II**			
1.3.2.1	**ERECTION FACILITIES**			
1.3.2.1.1	Engineering works for construction	Yes		In consultation with BHEL
1.3.2.1.2	Providing the erection drawings/ documents for all the equipment covered under this scope	Yes		
1.3.2.1.3	Drawings for construction methods		Yes	
1.3.2.1.4	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	
1.3.2.1.5	Shipping lists etc for reference and planning the activities	Yes		
1.3.2.1.6	Induction heating machines	Yes		For Main Coolant Pipeline welding
1.3.2.1.7	Temporary ventilation of reactor building	Yes		During construction and mechanical erection in Reactor Building
1.3.2.1.8	Valve testing facility	Yes		Shifting, handling of valves and operation in bidders scope

1.3.2.1.9	Grit blasting & Painting shed (only empty shed)	Yes		Equipments for grit blasting & Painting in Bidder scope.
1.3.2.1.10	Coating Application Methods & Procedures	Yes		
1.3.2.1.11	Preparation of site erection schedules and other input requirements		Yes	In consultation with BHEL
1.3.2.1.12	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments		Yes	
1.3.2.1.11	Weekly erection schedules based on Sl No 1.3.2.1.9		Yes	
1.3.2.1.12	Daily erection / work plan based on Sl No 1.3.2.1.11		Yes	
1.3.2.1.13	Preparation of preassembly bay		Yes	
1.3.2.1.14	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	

1.3.3 LAND FOR SITE OFFICE

1.3.3.1 Minimum Open space as made available by customer will be provided at free of charges to the contractor, for construction of temporary office shed, storage area, storage shed, work shop and RT source storage pits etc. inside the plant area. All the arrangements will be subject to the approval of Engineer prior to setting up of such facility.

1.3.3.2 The contractor's office shall be semi permanent structure and built with standard construction materials. No make shift structures are permitted. The facilities to be built by the contractor shall be aesthetically pleasing and shall match with the general surrounding of KKNPP site.

1.3.3.3 Location and area requirement for office / storage sheds shall be discussed and mutually agreed to.

1.3.4 ELECTRICITY:

1.3.4.1 Construction power will be provided to the contractor – each Two point of requried capacity per unit in reactor building area of unit 3&4 and one point for Contractor office & storage area by BHEL on chargeable basis at the applicable rate of TANGEDCO under LT tariff The present LT tariff VI rate of TANGEDCO is

a) Consumption charges: The prevailing rate of TANGEDCO is Rs.12.00 per unit
b) Fixed MD charges as applicable per month
c) Electricity Tax on total amount

1.3.4.2 The TANGEDCO tariff and tax may vary from time to time and same shall be charged to the contractor. Digital Energy meter capable of recording KVA, KWh & Maximum demand shall be installed by the contractor on the distribution panel for measuring the consumption. Any dispute regarding consumption, the BHEL engineer's decision is final. The contractor shall make their own arrangement for further distribution to the site of work using armored Power cable and MCB distribution boards.

1.3.4.3 Contractor to maintain log sheet with BHEL engineering in charge signature for weekly/ monthly power consumption and healthiness of ELCB.

1.3.4.4 Provision of distribution of electrical power from the given points to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State/ BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.

1.3.4.5 BHEL is not responsible for any loss or damage to the contractor 's equipment as a result of variations in voltage / frequency or interruptions in power supply.

1.3.4.6 Necessary “Capacitor Banks” to improve the Power factor to a minimum of 0.9 shall be provided by the contractor at their cost. Penalty if any levied by customer on this account will be recovered from contractor’s bills.

1.3.4.7 As there are bound to be interruptions in regular power supply, power cut/load shedding in any construction sites, contractor should make their own arrangement for alternative source of power supply through deployment of adequate number of DG sets at their cost during the power breakdown /failure to get urgent and important work to go on without interruptions. No separate payment shall be made for this contingency.

1.3.4.8 All electrical installations/works shall be carried out by qualified electricians under supervision GOVT approved electrical contractor as per IE Guide lines and Safety procedure of NPCIL. The same shall be maintained properly and regular periodic maintenance shall be carried out to ensure healthiness of electrical system.

1.3.4.9 All cabling and installations shall be subject to the approval of the Engineer/Safety Engineer and shall comply in all respects to the appropriate statutory requirements given in the following.

i. Indian Electricity Act 1910 (as amended/latest)

ii. Electricity Supply Act 1910 (as amended/latest)

iii. Indian Electricity Rules 1956 (as amended/latest)

iv. iv. TNEB regulations (latest)

For this purpose, the Contractor shall provide full specifications of the equipments and the layout drawings. Approval of the Engineer does not relieve the Contractor’s responsibility from complying with any or all other conditions laid down in this section.

1.3.4.10 **DOMESTIC POWER SUPPLY FOR LABOUR CAMP**

i. TNEB/TANGEDCO established LT Power distribution arrangement in the labour camp area.

ii. The Contractor shall make his own arrangements to obtain and distribute the power supply from TNEB/TANGEDCO for the labour colony and other domestic purposes. All internal wiring shall be done as per the requirements of relevant Indian standards. Any duty, deposit involved in getting the Electricity for labour colony shall be borne by the bidder.

1.3.5 CONSTRUCTION WATER

1.3.5.1 BHEL/NPCIL will not be able to supply water at plant site to the contractor. The Contractor shall make his own arrangements to meet the desired quality and quantity of construction water demand at his own cost from outside. Bore well is not permitted inside the plant area.

1.3.5.2 Contractor shall ensure quality of water used for construction as per relevant standards and shall submit periodic test certificates from NPCIL approved laboratories for the same. Contractor shall lay and maintain water supply lines to their construction site.

1.3.5.3 Contractor to construct suitable storage tanks to meet at least four day's water requirement at site. The contractor shall provide necessary number and capacity of electrical / diesel operated high lift pumps to ensure supply of water at the highest point of the structure.

1.3.5.4 The quality of the water shall meet the domestic purpose as per relevant IS standards. Periodical checking shall be done to ensure the quality of water being supplied.

1.3.6 DRINKING WATER

Drinking water shall be arranged by the Contractor at their cost from outside of KKNPP.

1.3.7 LIGHTING FACILITY

1.3.7.1 Adequate lighting facility and illumination level in line of Rule - 11 of Atomic Energy (Factories) Rules 1996 for buildings and outside area such as flood light, hand lights and area lighting shall be provided by the contractor at his own cost at the site of erection, at the storage of his materials and equipment and at temporary access roads within the working area. The contractor shall obtain the approval of the Engineer for the lighting arrangement prior to installation. The lighting fixtures used shall be of good quality with all its systems and control gears working in good condition.

1.3.7.2 The lighting network to be established during the construction phase shall be of semi - permanent nature using pre-fabricated channels, conduiting or cleating of cables etc. Hanging or indiscriminate looping of lighting cables is not acceptable and Engineer reserves the right to disconnect any lighting network carried out in an unsafe and untidy manner. Any recommendations given by the Engineer in this regard to improve the safety and aesthetic appearance of the electrical installations shall be binding on the Contractor.

1.3.7.3 All the electrical safety requirements stipulated at site from time to time shall be adhered and complied in order to ensure complete electrical safety of all installations as well as operation, control and protection etc.,

1.3.7.4 Contractors are encouraged to explore the possibility of using renewable and green energy sources such as solar energy and LED lighting in their premises at site and labor camp.

1.3.8 LAND FOR STAFF AND LABOUR CAMP

1.3.8.1 Land will be given, by the Corporation for the Contractor's colony. Land will be made available for the period of Contract. The Contractor shall make his own arrangement for water supply, electric supply, sanitation, access road and general cleanliness of his colony. All these amenities shall be got approved by the Engineer-in-Charge of BHEL and NPCIL prior to construction of the camp. The Contractor shall not permit any of his personnel to maintain any living quarters within the Corporation's land other than the land allotted for colony. In case the land allotted for setting up the camp / colony is on lease, the contractor shall pay the appropriate municipal taxes / duties as applicable.

In respect of any land allotted to the Contractor for purposes of or in connection with the Contract, the Contractor shall be a licensee subject to the following and such other terms and conditions as may be imposed by licenser:

i) that he shall pay a nominal license fee of Rs..1 per hectare per year or part of a year for use and occupation, in respect of each and every separate area of land allotted to him.

ii) that such use or occupation shall not confer any right of tenancy of the land to the Contractor.

iii) that the Contractor shall be liable to vacate the land on demand by the Engineer-in-Charge.

iv) that the Contractor shall have no right to any construction over this land without the written permission of the Engineer-in-Charge. In case, he is allowed to construct any structure he shall have to demolish and clear the same before handing over the completed work unless agreed to the contrary. On completion of work, the Contractor shall handover the land duly cleaned to the Engineer-in-Charge. Until and unless the Contractor has handed over the vacant possession

of land allotted to him for the above purposes, the payment of his final bill shall not be made. The Contractor shall be made liable to pay at the rate of Rs. 5,000 per week as a penalty for the use and occupation of land beyond 6 months from the date of physical completion of work.

1.3.8.2 **In addition, the following Clause is applicable:**

i) The Land for labour camp provided by NPCIL is at a distance of 1.6KM (approx) from plant Main gate & out side the project area but within the the over all plant boundary.

ii) Contractor has to construct the labour camp with all required facilities in line with NPCIL/GOVT guide lines. Labour camp shall have spacious labour living rooms with adequate ventilation, toilet & both room blocks, canteen, Medical centre, common recreation hall with TV & some indoor game arrangement.

iii) Contractor shall maintain the labour camp in neat and clean condition till completion contract at his cost

iv) The contractor has to connect sewage from his labour camp to this facility through associated sewer line provided with necessary intermediate inspection chambers at his own cost.

v) After completion of works, contractor shall at his own cost promptly dismantle all structures to restore the land to the original condition and vacate the area.

vi) The Contractor shall provide adequate facilities for medical aid and treatment for his staff and workers engaged on the Project, both at work site as well as at the camp.

vii) Contractor may note that a lot of trees are planted in the Project area. It shall be the Contractor's responsibility to ensure the prevention of cutting/felling of

plantations by the workers employed by him. The Contractor will be penalized as decided by Engineer if it is found that his labours / employees are responsible for cutting /felling of plantations.

1.3.9 SECURITY OF CAMP:

The following actions shall be taken by the Contractor to have adequate security and discipline at camp area:

i) The contractor shall furnish a statement in every quarter showing the number of people permitted and occupying the area allotted by the Corporation.

ii) The contractor shall control unlawful activities in the camp.

iii) Contractor shall provide adequate security coverage and will be responsible for identification of people belonging to them and shall only allow people into the labour camp who are authorized by them.

1.3.10 WATER FOR LABOUR CAMP

BHEL/NPCIL will not be able to supply water to the contractor's labour camp. The contractor shall make his own arrangements to provide the same at his own cost. Borewell is not permitted in labour camp area.The quality and quantity of the water supplied at labour camp shall be as per WHO drinking standards.

1.3.11 STATUTORY REQUIREMENTS

Kudankulam Nuclear Power Project is guided by Central government rules and regulations. Contractor shall comply all statutory regulations of State / Central Governments and NPCIL like Pradhan Mantri Rojgar Protsahan Yojana (PMRPY) scheme, Pradhan Mantri Garib Kalyan Yojana (PMGKY) scheme etc. Any guide lines / orders/notifications/ circulars issued by statutory body of both central /state governments and NPCIL from time to time is applicable for this contract.

1.3.12 FAIR WAGES

The bidders shall note that the minimum rates of remuneration to the various categories of workmen to be deployed under this contract shall not be less than the following:

i. Higher of the minimum wages as declared by the Labour Authority of Centre/State

ii. from time to time for the respective category of workmen to be paid. The contractor

iii. shall pay to his workmen any increase in the minimum wages as notified from time to time during the period of contract.

iv. The contractor has to provide free transport facility to his workmen.

v. Bonus as per the statutory requirements (at present @ 8.33% of the wages) shall be paid to the workers separately either once or twice in a year (as per present regulation). Wage ceiling for calculation of bonus is minimum wage for the scheduled employment, as per para 15 (i) or Rs 7000/- , whichever is higher. Any changes as per statutory requirement shall be complied with from time to time.

vi. EPF shall be paid as per the statutory requirements for all the workers (at present @ 13.15% of the wages by limiting the maximum wages as Rs.15000/-, even for those whose wages is more than Rs. 15000/-). Contractor should mandatorily have EPF registration irrespective of number of workers to be engaged by him. Further, contractor has to ensure PF coverage to all his workers at KKNPP irrespective of their exemption as per rules. He shall ensure regularly depositing of EPF as per prevailing statutory norms for the workmen deployed for the subject work and proof of deposit shall be produced along with monthly R.A. bills for processing of the next R.A. bill. The contractor shall comply with all the existing/revised provisions of the employee's provident funds and

miscellaneous provisions Act, 1952. The contractor should maintain record of statutory EPF amount deposited in the respective EPF accounts of his workers and submit the same with every RA Bill. Contractor is also required to submit EPF returns details of all workers employed in this contract in the prescribed forms 3A, 6A and 12A to the EPF authority with copy to the Engineer.

vii. Contractor shall make payments to the workmen only through Bank. For this purpose, the Contractor shall ensure that all the workers are having a bank account and if not, he shall facilitate the worker for opening of an account. In isolated cases, if it is not possible to make payments to any workers through Bank account, the approval of KKNPP Unit Head shall be obtained for making the payment by cash. In the event of cash payment to any contract workers, the same shall be witnessed by an official of NPCIL HR section duly authorized by the Head of HR group of KKNPP. Every month the Contractor shall submit documentary evidence (Bank statement of deposit of amount in each worker's bank account) to Engineer for verification, in the absence of which processing of next RA bill will not be done.

1.3.13 CONTRACTOR'S OBLIGATION ON COMPLETION:

On completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at their cost. In the event of their failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

VOLUME-IA PART-I CHAPTER – IV

1.4 T&PS AND MMES TO BE DEPLOYED BY CONTRACTOR

1.4.1 The following indicative major Tools & Plants (T&P) shall be arranged by the contractor within the quoted rate for execution of the scope of works covered under this contract.

INDICATIVE LIST OF PLANT AND MACHINERY TO BE DEPLOYED		
S.no	**Description of Equipment and machinery**	**Qty (nos.)**
	Material handling	
1	Mobile Crawler crane (75MT)	1
2	Mobile crane (Upto 40MT)	1
3	Hydra 16 MT	2
4	Hydra 12 MT	2
5	Electric winch upto10T	4
6	Trailer 40ft , 60MT	2
7	Trailer 40ft , 20MT	2
8	Mini Truck capacity 7 MT	2
9	Mini Truck capacity 2MT	2
10	Fork lift (3-8 MT)	2
	Rigging	
12	BOW SHACKLE 300MT	As required
13	BOW SHACKLE 75 MT/65/55MT	As required
14	D SHACKLE 50/25/10/5 MT	As required
15	Wire rope slings 3" DIA required length 63MT	As required
16	Wire rope slings 2" DIA 12METER LONG SLING 25MT	As required

17	Wire rope slings 1" DIA 12METER LONG SLING 10MT	As required
18	Chain pulley block (Upto 20 T)	As required
19	Hydraulic power packs for jacks	As required
20	Hydraulic jacks 100T	2
21	Hydraulic jacks 50T	6
22	Hydraulic jacks 25T (button type)	As required
23	Hydraulic jacks 10T (button type)	As required
24	Hydraulic jacks 5T (button type)	As required
25	Turn buckles 10T	50
26	Screw jack 20 MT	4
27	Eye bolt	As required
28	Manila rope	As required
29	Skid roller (hillmen roller)	48
30	Web sling	As required
31	Taper wedge jack	As required
	WELDING	
33	Welding generator machine/ welding rectifier	50
34	High frequency TIG welding machine	50
35	Mother oven	5
36	Portable oven	50
37	Grinding Machine	As required
38	Fume extractors with hose.	30
39	Low clearance split type pipe beveling machine 40" pneumatic with compressor	1
40	Pipe beveling machine upto 12"	2

41	Pipe beveling machine upto 24"	2
42	Pipe bending machine	As required
43	Plasma cutting machine	As required
44	Pug cutting machine	As required
45	Gas cutting set	As required
46	Fitter tool kit	As required
47	Engraving machine	As required
48	DG sets of required capacity for Normal erection	2
49	500 KVA DG set @ 415V with acoustic enclosure with standard panel (MCP welding)	2
	NDT	
50	RT source with camera, source strength upto 90 curie	2
51	RT source with camera, source strength upto 50 curie	3
52	UT machine (Krautkrammens/panametrics etc,.)	2
53	RT film Digitization equipment	1
54	Vacuum box (of different profiles), vacuum pump along with accessories	As required
55	DPT Sensitivity crack specimens	As required
	Facilities	
56	Pickling/ passivation facility	As required
57	Painting facilities with suitable machines for grit blasting and painting (Primer, high/medium/low temperature paints)	As required
58	RT source pit, dark room, viewing facility	As required

59	Argon station for purging	As required
60	Electrode storage facility with dehumidifiers	1
	Insulation/HVAC	
61	Weaving machine/Motorized stitching machine	8
62	Shearing machine upto thickness 5mm	2
63	Forming machine for insulation	2
64	Folding machine for insulation	2
65	Plate/sheet rolling machine	1
66	battery operated hand drilling machine	As required
	Machines	
67	Tool room Lathe	As required
68	Hand Drilling machine	As required
69	Insitu boss (O-let) magnetic base drilling machine	As required
70	Air Compressor 400 cfm	2
71	Bench Grinding machine	As required
72	Flexible grinding machine	3
73	Torque wrench of various capacities	As required
74	Hydraulic torque wrench of various capacities	As required
75	Radial drilling machine	1
76	Power hacksaw	1
	Testing and Measurements	
77	Total station, LC 0.5 sec, 0.1mm	2
78	Theodalite, 1 sec	1
79	AUTO LEVEL INSTRUMENT, 0.2 mm	1

80	Precision AUTO LEVEL INSTRUMENT, LC-0.02 mm	1
81	JIG TRANSIT	1
82	VERTICAL OPTICAL INSTRUMENT	1
83	Master level with LC 0.02mm/mtr	As required
84	Surface plate	1
85	Dial gauges with magnetic base 0.01mm	30
86	Inside micrometer up to 850 mm	As required
87	Straight edge,1 mtr	2
88	Straight edge,0.5mtr	2
89	Telescopic gauge	As required
90	Feeler gauge 300 mm (0.05 to 1 mm)	1
91	Feeler gauge	As required
92	Pressure gauges (Analogue/ digital)	As required
93	Electric hydro test pump up to 250Kgf/cm^2	2
94	Electric hydro test pump up to 100Kgf/cm^1	2
95	Electric hydro test pump up to 50Kgf/cm^2	4
96	Manual operated hydro test pump up to 10Kgf/cm^2	10
97	Vernier calipers,1000 mm	1
98	Vernier calipers upto 300mm	4
99	video Boroscope for FME inspection upto 30 mtr length	4
100	Water pot with micrometer	2
101	U- tube manometer	As required
102	Elcometer for Both SS/CS	4

103	WFT gauge	As required
104	Holiday/Adhesion/Hardness tester	1
105	Scrapping tool	As required
106	Welding inspection gauge	As required
107	Inflatable purge dams of various sizes	As required
108	Surface roughness comparator	As required
	Core driling/cutting	
109	Hilti hammer/core drilling machines	As required
110	Concrete Core cutting machine	As required
	Miscellaneous	
111	Industrial Vacuum cleaner (Both wet and dry)	12
112	Silica gel regeneration oven of 50 Kg	2
113	Pump Required for filling and flushing	2
114	Hot Air blower	2
115	24V transformer	20
116	Dewatering pumps	10
117	Tap set, Die set and Reamers	As required
118	Scaffolding set	As required
119	Aluminum Scaffolding set	As required
120	Plotter and printers	As required

1.4.2 T&Ps mentioned above is tentative requirement considering parallel working in all areas mentioned in scope of work. However, mobilization schedule and quantity / numbers as mutually agreed at site for major T&Ps, have to be adhered to. Numbers / time of requirement of T&Ps will be reviewed time to time by BHEL site and contractor will provide required T&Ps / equipments to ensure completion of entire work within schedule / target date of completion without any additional financial implication to BHEL. Vendor will give advance intimation and certification regarding capacity etc. prior to dispatch of

heavy equipments. Also, on completion of the respective activity, demobilization of T&P in total or in part can be done with the due approval of engineer in charge. Retaining of the T&P's during the contract period will be mutually agreed in line with construction requirement.

1.4.3 Fill pumps shall be arranged by the contractor, wherever required.

1.4.4 For testing LP lines necessary Hydraulic Test pumps/ Hand pumps are to be arranged by the contractor.

1.4.5 For handling at store and transportation, contractor shall make his own arrangement.

1.4.6 For transportation, material handling, loading & unloading of all components / equipments, the contractor has to make his own arrangements at his own cost. All necessary T&P such as, Trailers, Cranes Winches, welding generators, Slings, Jacks, Sleepers, Rails etc. are to be arranged by the contractor.

1.4.7 All the T & P, cranes, lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be got tested by NPCIL approved competent person of statutory authority. Test certificates obtained from the statutory authority shall be submitted to BHEL/NPCIL for their review and approval. NPCIL Safety clearance shall be obtained before they are actually put on use.

1.4.8 The age of all the contractor deployed cranes shall be within 10 years as on date of deployment. Contractor has to provide documentary proof for the age of the crane at the time of deployment to the BHEL Engineer.

1.4.9 Any other T& P, special tools and measuring instruments, which are required to complete the entire scope of work shall be arranged by contractor with in the quoted rates.

1.4.10 Crane operators deployed by the contractor shall be tested by BHEL/NPCIL before he is allowed to operate the cranes. The crane load test has to be conducted before deployment as per statutory guidelines.

1.4.11 The crane operators deployed must be capable of independently operating Hydraulic/Mechanical Crawler / Tyre mounted Cranes of respective categories. The crane operators must have relevant experience in Operation of Hydraulic/Mechanical Crawler / Tyre Mounted Cranes in respective categories & hold valid HMV / TRANS license. Should be able to read and interpret the operation and maintenance manual, boom load chart, boom angle and other indicating devices. Operator shall have latest Physician's certification for their physical fitness in vision with/without Lenses & adequate hearing with or without hearing aid. The operator hired by the contractor may be tested by

BHEL/NPCIL Engineer for the suitability of the crane operation during any point of time while executing the contract.

1.4.12 Necessary electrical / water / air connection required for operation of any of the tools & tackles shall be within Contractor's account.

1.4.13 Downtime of cranes, for reasons other than normal wear and tear or routine maintenance are liable for levy of penalty.

1.4.14 In the eventuality of contractor not deploying cranes / abnormal down time in his scope during the period specified above, and BHEL arranges for the same [either BHEL's own cranes / hired cranes], prevailing BHEL Corporate Crane hire charges (may vary from time to time) shall be recovered from the contractor's running bills. Corresponding pages of Corporate Crane hire charges are enclosed in part II of Technical Conditions of Contract (Volume-I Book-I). (Please note that these charges are as valid up to May 31, 2021 and may get revised further).

1.4.15 In the event of non-mobilization of Tools, Plants, Machinery, Equipment, Material or non-availability of the same owing to breakdown and as a result progress of work suffered, BHEL reserves the right to make alternative arrangement (available or higher capacity) in line with SCC clause no. 4.2.1.7 and hire charges shall be applicable as under:

i. **Case 1: BHEL provides its own Capital T&P**: If BHEL provides owned T&P then BHEL, hire charges (as per BHEL norms) will be recovered from the contractor as per the prevailing BHEL Corporate hire charges applicable (as enclosed in Volume I Book I TCC Volume 1A Part II) as per following cases:

- In case the T&P is specifically listed in "T&Ps to be deployed by Contractor", 'Rates of hire charges applicable to outside agencies other than contractors working for BHEL' will apply.

- In case the T&P is not specifically listed in "T&Ps to be deployed by Contractor", 'Rates of hire charges applicable to contractors working for BHEL' will apply.

The hire charges of Capital Tools & Plants are exclusive of operating expenses e.g., Operator, fuel & Consumables and the same shall be arranged by the contractor at his cost.

ii. **Case 2: BHEL provides hired T&P:** In all cases other than that specified in Sl No. 1 above, actual expenses incurred by BHEL along with applicable overheads will be back charged to the contractor.

VOLUME-IA PART-I CHAPTER – V

1.5 ERECTION & TESTING FACILITIES TO BE PROVIDED BY NPCIL/ BHEL

1.5.1 Making availability of heavy-duty crawler crane, polar crane, trestle crane for handling equipment to be erected inside the containment of Reactor Building. Detailed list of the equipment that will be handled by NPCIL heavy duty crawler crane is specified in Annexure - I.

NOTE:

i. Contractor has to arrange the sling and de-shackle and other tools & tackles. All lifting tools and tackles should be load tested and due clearance from NPCIL safety before put in use.

ii. Contractor has to engage trained operator for day to day operation of polar & portal crane.

1.5.2 Transportation and delivery of NSSS (Nuclear steam supply system) equipment near Reactor building (outside building only). List of the equipment which will be delivered by NPCIL near reactor building is specified in Annexure - II.

ANNEXURE-I					
DETAILS OF EQUIPMENTS TO BE HANDLED USING NPCIL HEAVY DUTY CRANE (AS FREE ISSUE)					
Sl No	**Equipment**	**Unit weight (MT) (net) per Unit**	**Qty for Two units**	**Total weight (MT) for both units**	**BUILDING**
1	Support ring	9	2	18	UJA
2	Thrust ring	19	2	38	UJA
3	Reactor Pressure vessel	317	2	634	UJA
4	Core barrel	76	2	152	UJA
5	Core baffle	36	2	72	UJA

6	Protective Tube Unit	69	2	138	UJA
7	PTU handling structure	24	2	48	UJA
8	PTU hatch	39	2	78	UJA
9	Upper Unit (Rx Head) cover	96	2	192	UJA
10	Steam Generators	307	8	2456	UJA
11	Pressurizer	186	2	372	UJA
12	Quick Boron Injection Tank	29	8	232	UJA
13	1st Stage hydro accumulators	79	8	632	UJA
14	Second stage accumulators support	17	16	272	UJA
15	2nd Stage hydro accumulators	77	16	1232	UJA
16	Reactor core barrel transportation device (shell)	42	2	84	UJA
17	Reactor core barrel transportation device plate	22	2	44	UJA
18	Inspection wells equipment - 2 stage(Spacer 1204.01.32.040)	38	2	76	UJA
19	PHRS HX	36	24	864	UJA
20	RCP hydraulic parts (Casing)	58	8	464	UJA
21	Impeller Assembly (pull out Assembly)	24	8	192	UJA
22	RCP Motor Assembly	43	8	344	UJA

23	Rolling gate (Left)	17	2	34	UJA
24	Rolling gate (Right)	17	2	34	UJA
25	Transport lock 284.00.00.000 (including AME 284.02.01.000 Central Section with Fasteners)	53	2	106	UJA
26	Transport lock AME 284.00.00.000 (Including Adaptor with Fastener)	39	2	78	UJA
27	Transport lock AME 284.00.00.000 (Internal Section AME 284.02.03.000)	23	2	46	UJA
28	Transport lock AME 284.00.00.000 (Outer Section AME 284.02.03.000)	43	2	86	UJA
29	Transport lock AME 284.00.00.000 Inner gate parts	12	2	24	UJA
30	Transport lock AME 284.00.00.000 Outer gate parts	14	2	28	UJA
31	Hydraulic system AME 284.08.00.000 (Internal)	70	2	140	UJA
32	Hydraulic system AME 284.08.00.000 (external)	14	2	28	UJA
33	Transport lock AME 284.00.00.000 (Including Internal gate AME 284.03.00.000, Hydraulic System AME 284.08.00.000)	35	2	70	UJA
34	Fuel Pond Rack FAB10BQ703	24	2	48	UJA
35	Fuel Pond Rack FAB10BQ704	24	2	48	UJA

36	Fuel Pond Rack FAB10BQ705	24	2	48	UJA
37	Fuel Pond Rack FAB10BQ706	24	2	48	UJA
38	Fuel Pond Rack FAB10BQ707	24	2	48	UJA
39	Fuel Pond Rack FAB10BQ708	24	2	48	UJA
40	Fuel Pond Rack FAB10BQ709	20	2	40	UJA
41	Fuel Pond Rack FAB10BQ710	20	2	40	UJA
42	Fuel Pond Rack FAB10BQ701	9	2	18	UJA
43	RPV separating bellow	3	2	6	UJA
44	Protective steel structure plate	14	4	56	UJA
45	Upper Unit Thermal Insulation	9	8	72	UJA
46	Device for In-core Instrumentation Detection Withdrawal. (JIB Crane) Main column.	10	2	20	UJA
47	Mounting traverse	10	2	20	UJA
48	Universal cross piece	5	2	10	UJA
49	RPV Turning bed cradle	17	2	34	UJA
50	RPV Turning bed rest	7	2	14	UJA
51	Platform for RPV neck	5	2	10	UJA
52	Steam generator roller support	19	16	304	UJA
53	steam generator header	8	8	64	UJA
54	Pressurizer thrust ring	5	2	10	UJA
55	MCP Piping (20 blocks per unit)	260	2	520	UJA
TOTAL				**10834**	

ANNEXURE-II

TRANSPORTATION AND DELIVERY OF NSSS (NUCLEAR STEAM SUPPLY SYSTEM) EQUIPMENT NEAR REACTOR BUILDING (OUTSIDE BUILDING ONLY).					
DETAILS OF EQUIPMENTS DELIVERED OUTSIDE REACTOR BUILDING BY NPCIL					
Sl No	**Equipment**	**Unit weight (MT) (net)**	**Qty for Two units**	**Total weight (MT)**	**Building**
1	Support ring	9	2	18	UJA
2	Thrust ring	19	2	38	UJA
3	Reactor Pressure vessel	317	2	634	UJA
4	Core barrel	76	2	152	UJA
5	Core baffle	36	2	72	UJA
6	Protective Tube Unit (PTU)	69	2	138	UJA
7	PTU handling structure	24	2	48	UJA
8	PTU hatch	39	2	78	UJA
9	Upper Unit (Rx Head) cover	96	2	192	UJA
10	Steam Generators	307	8	2456	UJA
11	Pressurizer	186	2	372	UJA
12	Quick Boron Injection Tank	29	8	232	UJA
13	1st Stage hydro accumulators	79	8	632	UJA
14	Second stage accumulators support	17	16	272	UJA
15	2nd Stage hydro accumulators	77	16	1232	UJA
16	Reactor core barrel transportation device(shell)	42	2	84	UJA
17	Reactor core barrel transportation device plate	22	2	44	UJA

18	Inspection wells equipment - 2 stage (Spacer 1204.01.32.040)	38	2	76	UJA
19	PHRS HX	36	24	864	UJA
20	RCP hydraulic parts (Casing)	58	8	464	UJA
21	Impeller Assembly (pull out Assembly)	24	8	192	UJA
22	RCP Motor Assembly	43	8	344	UJA
23	Rolling gate (Left)	17	2	34	UJA
24	Rolling gate (Right)	17	2	34	UJA
25	Transport lock 284.00.00.000 (including AME 284.02.01.000 Central Section with Fasteners)	53	2	106	UJA
26	Transport lock AME 284.00.00.000 (Including Reducer with Fastener AME 284.02.02.000)	39	2	78	UJA
27	Transport lock AME 284.00.00.000 (Internal Section AME 284.02.03.000)	23	2	46	UJA
28	Transport lock AME 284.00.00.000 (Outer Section AME 284.02.03.000)	43	2	86	UJA
29	Transport lock AME 284.00.00.000 Inner gate parts	12	2	24	UJA
30	Transport lock AME 284.00.00.000 Outer gate parts	14	2	28	UJA
31	Hydraulic system AME 284.08.00.000 (Internal)	70	2	140	UJA
32	Hydraulic system AME 284.08.00.000 (external)	14	2	28	UJA

33	Transport lock AME 284.00.00.000 (Including Internal gate AME 284.03.00.000, Hydraulic System AME 284.08.00.000)	35	2	70	UJA
34	Fuel Pond Rack FAB10BQ703	24	2	48	UJA
35	Fuel Pond Rack FAB10BQ704	24	2	48	UJA
36	Fuel Pond Rack FAB10BQ705	24	2	48	UJA
37	Fuel Pond Rack FAB10BQ706	24	2	48	UJA
38	Fuel Pond Rack FAB10BQ707	24	2	48	UJA
39	Fuel Pond Rack FAB10BQ708	24	2	48	UJA
40	Fuel Pond Rack FAB10BQ709	20	2	40	UJA
41	Fuel Pond Rack FAB10BQ710	20	2	40	UJA
42	Fuel Pond Rack FAB10BQ701	9	2	18	UJA
TOTAL				**9694**	
Note: In general Over Weight Consignment (OWC) or Over Dimensional Consignment (ODC) as per above list will be transported by NPCIL from NPCIL store and delivered at crane pad area outside reactor building.					

1.5.3 List of Erection &Testing facilities to be made available by BHEL to contractor on free of cost on sharable basis for execution of works within the scope of this tender are as below.

1.5.3.1 INDUCTION HEATING MACHINE FOR MAIN COOLANT PIPING (MCP)

i. Providing induction heating heating machines along with accessories for pre heating and PWHT of MCP pipe joints.

ii. Providing automatic electrical change over panels and Power cables for auto changeover of EB & DG set supply for MCP welding will be provided by BHEL at free of cost.

1.5.3.2 TEMPORARY VENTILATION OF REACTOR BUILDING

Establishing Temporary ventilation system in Reactor Building to have clean environment inside reactor building during the erection, assembly of the critical

equipments and components like Reactor Pressure Vessel (RPV), Main Coolant Piping (MCP), Steam Generator (SG), Reactor Coolant Pump (RCP), Pressurizer (PRZ) and other important safety system piping to prevent corrosion as per equipment designer/manufacturer requirements. However, contractor has to maintain clean room condition in neat & clean, proper housekeeping, day to cleaning of erection area at his quoted rates.

1.5.3.3 Valve testing Lab will be provided on sharing basis. However, shifting, handling & testing of valves to be carried out by contractor at his quoted rates. The contractor shall deploy experienced operator for this purpose at his cost.

1.5.3.4 Grit blasting & painting shed. Only empty sheds will be provided by BHEL. Grit blasting & painting equipment's are in the scope of contractor.

1.5.3.5 Closed fabrication shed. Only empty sheds will be provided by BHEL. Equipment for fabrication are in the scope of contractor.

1.5.4 All the erection facilities mentioned in clause 1.5.3 above shall be provided to contractor on shareable basis and the allotment is made by BHEL on need basis for erection / pre-commissioning activities only.

1.5.5 Any other Tools & Plants,testing facilities. Measuring instruments which are required for satisfactory completion of the work has to be arranged by the contractor.

1.5.6 The Contractor shall be responsible for the safe and proper use of the above equipments issued to him. Day-to-day maintenance and operation of equipment's shall be the contractor's responsibility and shall be as per instructions / standard practice of BHEL Engineer

1.5.7 In case of non-availability of the above, due to any unavoidable reason, like breakdown, overhaul etc., the contractor shall make arrangement at his own cost to meet the erection schedules. No extra claim will be admitted due to the non-availability of any of the above equipment. No delay in execution of work shall be accepted on this account.

1.5.8 The contractor shall return the erection facilities provided to him by BHEL in good working condition as and when so desired by BHEL. (Completion or reduction in work load) for diversion for other work.

1.5.9 Contractor shall have at all times experienced operators and technicians for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant BHEL rectifying the defect and charging the cost to the contractor.

1.5.10 If at any time it is noticed that contractor is not using any of the facilities or equipment properly according to the instructions of BHEL, BHEL will have the right to withdraw any and all such equipment and facilities.

1.5.11 Any loss / damage to any or part of the above equipment's shall be to contractor's account and the expenditures on these accounts will be recovered from contractor's bills in case contractor fails to make good the loss.

VOLUME-IA PART-I CHAPTER – VI

1.6 TIME SCHEDULE

1.6.1 The entire work of Handling, transportation, pre-fabrication, assembly, welding, erection, inspection & testing of piping and erection of associated equipment along with accessories, structures, insulation for nuclear and nuclear auxiliary systems in reactor buildings in Kudankulam shall be completed within 42 (Forty-two) months for Unit 3 and 50 (Fifty) Months for Unit 4 from the date of commencement of work at site.

1.6.2 During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL to achieve the milestone events as programmed.

1.6.3 The erection work shall be commenced on the mutually agreed date between the bidder and BHEL engineer and shall be deemed as completed in all respect only when agreed mutually between bidder & BHEL. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

1.6.4 The contractor is required to refer Form 15 – Monthly performance evaluation of contractors in Volume-1 book-2 for all the instructions to be taken immediately after receipt of LOI.

1.6.5 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer to start the work. In case of discrepancy the decision of BHEL engineer is final.

1.6.6 **MOBILISATION FOR ERECTION AND TESTING**

1.6.6.1 The activities for erection, testing etc shall be started as per directions of Construction Manager of BHEL.

1.6.6.2 The contractor has to augment his resources in such a manner that following major milestones of erection & testing are achieved on specified schedules mentioned below.

1.6.7 **TENTATIVE MILESTONE SCHEDULE FOR UNIT 3 & 4**

Sl. No.	Milestone Description	Milestone Month (Tentative)	
		Unit 3	**Unit 4**
1.	Start of work	1st Month	8th Month
2	Erection of Reactor Pressure Vessel (RPV)	7th Month	15th Month
4	Erection of Steam Generators (SG's – 4 nos)	11th Month	19th Month
3.	Completion of Main coolant piping (MCP) welding	24th Month (M1)	32nd Month (M2)
5.	Release for Primary system Hydro test	38th Month	46th Month

1.6.8 In order to meet the schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, Contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL Engineer.

1.6.9 In case the project is to be advanced, the erection works in the scope of the contractor is to be advanced to meet the project requirement. No extra payment whatsoever shall be paid on this account.

1.6.10 **MAJOR INTERMEDIATE MILESTONES**

Sl. No.	Intermediate Milestone Description	Intermediate Milestone Month (Tentative)	Intermediate Milestone
1.	Completion of Main coolant piping (MCP) welding of **Unit 3**	24th Month	**M1**
2	Completion of Main coolant piping (MCP) welding of **Unit 4**	32nd Month	**M2**

Note: Please refer Volume IA Part II Chapter1 for Penalty for Intermediate Milestone

1.6.11 CONTRACT **PERIOD**

The contract period for completion of entire work under scope shall be **50 months** from the "COMMENCEMENT OF CONTRACT PERIOD" as specified earlier for completion of the entire work under this package.

1.6.12 **GUARANTEE PERIOD**

Guarantee period of Twelve (12) months shall commence from the date of completion of the entire work as specified in contract, as certified by BHEL Engineer.

VOLUME-IA PART-I CHAPTER – VII

1.7 TERMS OF PAYMENT

1.7.1 Secured Advance
Not applicable

1.7.2 Advance for Mobilization
Not Applicable

1.7.3 Interim Payment

1.7.3.1 Interim bills in the form of monthly running bills prepared by the contractor in soft as well as Hard copies shall be based on the quantities executed and measured.

1.7.3.2 Progressive payment against monthly running bills will be made up to 95% value of work executed on Pro-rata basis as per terms indicated in table in the next few pages.

1.7.3.3 Balance 5% payment shall be paid along with Final Bill.

1.7.4 For Retention amount –
Please refer Sl No.16 of Vol-1A Part II Chapter-1.

NO CLAIM WHAT SO EVER MAY BE, WILL BE ENTERTAINED UNDER THIS CONTRACT, AFTER DULY SIGNING THE FINAL BILL ALONG WITH MEASURMENT BOOKS AND ACCEPTED BY BHEL.

SCHEDULE	ITEM NO	Description	Stage-1		Stage-2		Stage-3		Stage-4		Stage-5	
			%	Description	%	Description	%	Description	%	Description	%	Description
SCHEDULE-A	1	Erection and welding of Reactor, Reactor Internals, Reactor cavity and Inspection well equipments / components										
SCHEDULE-A	1.1	Erection, scraping of seating surface, blue matching, precision alignment, welding & inspection of Support Ring & its accessories, Thrust ring & its accessories and Reference specimen blocks in RPV and PTU as per drawings	5%	Establishment of procedures for erection and related activities.	60 %	Transportation, Scraping of seating surface, blue matching, handling, erection, alignment, fit up, inspection, submission of reports and acceptance by Engineer.	25 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC	5 %	On final bill

		and technical specifications.										
SCHEDULE-A	1.2 1.3 1.4	Erection of Reactor pressure vessel , Reactor internals, cavity & inspection well equipments	5%	Establishment of procedures for erection and related activities.	45 %	Handling, erection, alignment, fit up, inspection, submission of reports and acceptance by Engineer.	40 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer./ installation of core barrel and UU inside RVI wells	5 %	submission and acceptance of CCC	5 %	On final bill
SCHEDULE-A	2	Erection and welding of Steam generator assembly(JEA)										
SCHEDULE-A	2.1 2.2	Erection of steam generator assembly & accessories	5%	Establishment of procedures for erection and related activities.	45 %	Handling, assembly, erection, alignment, fit up ,inspection , submission of reports and acceptance by Engineer.	40 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance CCC of	5 %	On final bill

SCHEDULE-A	2.3	Box up of primary, secondary collector covers and man holes by changing nickel gaskets post hydro test.	30%	Handling, removal of studs, collector covers, nickel gaskets, de-preservation, safe keeping of material & submission of relevant reports.	25 %	Cleaning, Internal inspection and submission of reports.	45 %	Re-preservation of studs, nuts, washers, re-installation of nickel gaskets, collector covers, fixing of fasteners, torque tightening, preparation and submission of reports				
SCHEDULE-A	3.1 3.2	Erection and welding of Reactor coolant Pump Assembly (RCP)	5%	Establishment of procedures for erection and related activities.	50 %	Handling,assembly, erection, alignment, fit up ,inspection , submission of reports and acceptance by Engineer.	35 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC	5 %	On final bill
SCHEDULE-A	4.1 4.2 4.3	Erection and welding of Pressuriser Assembly (JEF)	5%	Establishment of procedures for erection and related activities.	50 %	Handling, assembly, erection, alignment, fit up, inspection , submission of reports and acceptance by Engineer.	35 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC	5 %	On final bill

SCHEDULE-A	5.1 5.2 5.3 5.4 5.5 5.6	Erection and welding of I & II Stage Hydro Accumulator Tank Assembly and Quick boran injection system tank.	5%	Establishment of procedures for erection and related activities.	50 %	Handling, assembly, erection, alignment, fit up, inspection , submission of reports and acceptance by Engineer.	35 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC	5 %	On final bill
SCHEDULE-A	6.1 6.2 6.3 6.4	Erection of Passive heat removal system. (PHRS) (JNB 50-90)	5%	Establishment of procedures for erection and related activities.	50 %	Handling, assembly, erection, alignment, fit up, inspection, submission of reports and acceptance by Engineer.	35 %	Completion of welding, NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC	5 %	On final bill
SCHEDULE-A	7.1 7.2 7.3	Installation of Electrical heaters (for pressurizer, emergency core cooling system, quick boron injection system)	90%	Handling, Installation of stud assemblies, torque tigheting to required stud elongation values, submission of relevant reports and acceptance of	5 %	submission and acceptance of CCC	5 %	On final bill				

				the Engineer.								
SCHEDULE-A	8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9	Assembly, testing and erection of Hydraulic shock absorbers:	5%	Establishment of procedures for erection and related activities.	35 %	Handling, erection, alignment, fit up , welding, inspection of support structures , submission of reports and acceptance by Engineer.	50 %	Testing the Hyd shock absorber piston movement, Handling , erection, alignment, fastening , Inspection, submission of relevant reports and acceptance of the Engineer .	5 %	submission and acceptance of CCC	5 %	On final bill

SCHEDULE-A	9.1	Assembly and Erection of Quick release detachable thermal insulation blocks (DTIB) on Nuclear steam supply system equipments and piping	5%	Establishment of procedures for erection and related activities.	40 %	Handling and transportation, fabrication of DTIB blocks, preparation of drawing/template and modification according to template, pre fixing of quick release fasteners at design locations	35 %	handling & erection of DTIB blocks, alignment, and acceptance by Engineer.	15 %	Installation of ceramic wool mattresses in designed openings, pre-fabrication &installation of cover sheets, and acceptance by Engineer.	5 %	On final bill
SCHEDULE-A	9.2	Modification of DTIB insulation blocks to suit to site requirements	20%	Taking site measurements of interference of DTIB insulation blocks, preparation of interference drawing and modification drawing of DTIB blocks,	60 %	Carrying out modification as per drawing, inspection and clearance for erection	15 %	Re-installation of modification blocks , check for elimination of interference, inspection, submission of reports, as built drawings for	5 %	On final bill		

								NPCIL acceptance.				
SCHEDULE-A	9.3	Removal and re-installation of DTIB blocks	30%	Removal of thermal insulation blocks from equipment/pipeline for pre service inspection (PSI) activities, Marking of blocks and loose mattresses and cover plates for easy identification, shifting to safe location	15 %	safely stacking the material at designated location, cleaning of DTIB internal & external surface	35 %	Cleaning of equipment and pipelines after PSI activities for erection of DTIB blocks, shifting of DTIB blocks back to design location, re-erection of DTIB blocks	15 %	re-installation of mattresses, cover sheets, fixing with fasteners, ensure design clearances, inspection, preparation of reports, as built drawings for NPCIL acceptance	5 %	On final bill

SCHEDULE-A	10.3	Design, supply, fabrication, welding of load testing structures for polar crane, Main coolant pipeline, transport airlock erection structure, cover plates for fuel pond area and other components	20%	Design, detailing of structures, analysis using softwares (staad/ansys or any other structural analysis software), evaluating the reaction loads transferred to embedded parts/civil structures., acceptance of design by NPCIL designers	40 %	supply of materials	30 %	fabrication, welding & inspection	5 %	after load testing/usage	5 %	On final bill
SCHEDULE-A	10.4	Erection, field welding and inspection of load testing structures for polar crane, Main coolant pipeline, transport airlock erection structure, cover plates	70%	after erection, welding , NDT, load testing and acceptance.	30 %	after dismantling of structures and handing over to NPCIL stores						

		for fuel pond area and other components										
SCHEDULE-B	1	Erection, welding, heat treatment and inspection of Main circulating pipelines(JEC)										
SCHEDULE-B	1.1	Qualification of Technology & Production welding using flexible coils Induction Heating (RPV to MCP and SG to MCP)	15%	after development of procedures	30 %	after mobilization of heat treatment equipments with all accessories and commissioning of Induction heating machines and trial heating	45 %	after welding and heat treatment & NDEs	10 %	after completion of cladding & NDEs and completion of destructive testing and qualification of technology		

SCHEDULE-B	1.2	Qualification of Technology & Production welding using Resistance Heating (MCP pipe to MCP pipe and MCP pipe to RCP)	15%	after development of procedures	30 %	after mobilization of heat treatment equipments with all accessories and commissioning of Induction heating machines and trial heating	45 %	after welding and heat treatment & NDEs	10 %	after completion of cladding & NDEs and completion of destructive testing and qualification of technology		
SCHEDULE-B	1.3	Erection of main coolent pipe (MCP) line:	5%	Establishment of procedures for erection and related activities.	25 %	Handling, Transportation, depreservation & submission of IMIR & relevant reports and Handling, shifting, lowering of MCP spools on temporary supports	60 %	Handling, erection, edge preparation, alignment, fit up ,inspection	5 %	completion of testing of system and acceptance of CCC	5 %	On final bill
SCHEDULE-B	1.4	Welding of MCP weld joints insitu:	60%	after completion of 100% of weld thickness and acceptance of NDE reports	30 %	after completion of separative and protective cladding, acceptance of NDE reports	5 %	completion of testing of system	5 %	submission and acceptance of CCC		

SCHEDULE-B	1.5	Pre-heating and Post Weld Heat Treatment (PWHT) of MCP weld joints using flexible coils Induction Heating (RPV to MCP and SG to MCP)	40%	after mobilization of heat treatment equipments, with all accessories and commissioning of Induction heating machines and successful trial heating	55 %	after completion of intermediate tempering and final PWHT, acceptance of all reports	5 %	submission and acceptance of CCC				
SCHEDULE-B	1.6	Pre-heating and Post Weld Heat Treatment (PWHT) of MCP weld joints using Resistance Heating (MCP pipe to MCP pipe and MCP pipe to RCP)	40%	after mobilization of heat treatment crew with all equipments, accessories and commissioning of Induction heating machines and successful trial heating	55 %	after completion of intermediate tempering and final PWHT, acceptance of all reports	5 %	submission and acceptance of CCC				

SCHEDULE-B	1.7	Erection, commissioning and operation of electrical automatic change over network including panels, connecting system for welding and heat treatment of MCP	85%	Erection, commissioning and operation of electrical automatic change over network including panels, connecting system for welding and heat treatment of MCP.	15 %	Dismantling, taking back all equipment after completion of heat treatment						
SCHEDULE-B	1.8.1 1.8.2 1.8.3 1.8.4 1.8.5 1.8.6 1.8.7 1.8.8	Supply of welding electrode and filler wire specified in drawings & technical specification of russian make.	95%	Supply of welding electrodes and filler wire along with Test certificates	5 %	on final bill						

SCHEDULE-C	1.1.1 1.1.2 1.1.3 1.1.4 1.1.5 1.1.6	Handling, assembly, welding, erection of Refueling machine with rail & fuel pool racks and other accessories	5%	Establishment of procedures for erection and related activities.	45 %	Handling,assembly, erection, alignment, fit up, inspection , submission of reports and acceptance by Engineer.	40 %	Completion of welding and NDEs, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC, carrying out	5 %	on final bill
SCHEDULE-C	1.2	Handling, transportation, erection and commissioning of Lock carriage, protective rolling gate with rail track:										
SCHEDULE-C	1.2.1 1.2.2 1.2.3	Rail assembly of Lock carriage, lock carriage trolley, protective rolling gate	5%	Establishment of procedures for erection and related activities.	45 %	Handling, assembly, erection, alignment, fit up ,inspection , submission of reports and acceptance by Engineer.	40 %	Completion of welding, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC, carrying out	5 %	on final bill

SCHEDULE-C	1.2.4 1.2.5	Commissioning of rolling gate and lock carriage	90%	Mechanical checks, electrical checks , trail run and commissioning approved reports	5 %	submission and acceptance of CCC	5 %	on final bill				
SCHEDULE-C	1.3	Handling, assembly, welding, erection and commissioning of transport air lock:										
SCHEDULE-C	1.3.1 1.3.2 1.3.3	Transport air lock components & other accessories	5%	Establishment of procedures for erection and related activities	45 %	Handling, assembly, erection, alignment, fit up ,inspection , submission of reports and acceptance by Engineer.	40 %	Completion of welding and NDE, submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC, carrying out	5 %	on final bill
SCHEDULE-C	1.3.4	commissioning and testing of TAL	90%	Mechanical checks , electrical checks , trail run and commissioning	5 %	submission and acceptance of CCC	5 %	on final bill				

				approved reports								
SCHEDULE-C	1.4.1 1.4.2 1.4.3 1.5.1 1.5.2	Erection of Static equipment inside Reactor building (other than equipments covered in schedule A)	10%	Handling, transportation, de-preservation, preparation of IMIR and submission of approved reports	45 %	Handling, assembly, erection, alignment, fit up, inspection, submission of reports and acceptance by Engineer.	35 %	Completion of welding, inspection, testing, submission of relevant reports & acceptance of the Engineer.	5 %	submission and acceptance of CCC, carrying out	5 %	on final bill
SCHEDULE-C	2	PIPING										
SCHEDULE-C	2.1.1.1 2.1.1.2	Cutting and Edge preparation	100 %	Cutting, edge preparation , inspection, preparation and submission of approved reports								

SCHEDULE-C	2.2.1 2.2.2 2.2.3 2.2.4 2.2.5	Erection of Carbon steel and stainless steel pipe lines	10%	Handling, transportation, de-preservation, preparation of IMIR and submission of approved reports	40 %	Stage payment will released after erection of pipe , fitup, preparation and submission of approved reports	40 %	after preparation of CRR, hydrotest , post hydrotest cleaning, preparation and submission of reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-C	2.3 2.4.1 2.4.2 2.4.3 2.4.4 2.5 2.6.1 2.6.2 2.6.3 2.6.4	Marking, cutting, fit up and welding of SS / CS pipelines	70%	Fitup and welding, NDE preparation and submission of relevant approved reports	20 %	Stage payment will released after preparation of CRR, successful completion of hydrtoest, post hydrotest cleaning, preparation and submission of the reports	5 %	submission and acceptance of CCC	5 %	on final bill		

SCHEDULE-C	3.1 3.2.1 3.2.2 3.3.1 3.3.2 3.4	NDE	90%	Completion NDE as per WD, preparation of report and submission of digitized RT film, preparation and submission of report	10 %	submission and acceptance of CCC						
SCHEDULE-C	4	Testing and Erection of Valves, Erection of Orifices										
SCHEDULE-C	4.2.1 4.2.2 4.2.3	Handling and testing of valves :	100 %	Transportation & handling & successful testing of the valves , preparation and submission of test reports								
SCHEDULE-C	4.3.1 4.3.2 4.3.3	Handling, shifting and erection of valves	10%	Handling, transportation, de-preservation, preparation of IMIR and submission of approved reports	80 %	handling, shifting, erection of valve, preparation and submission of approved reports	5 %	submission and acceptance of CCC	5 %	on final bill		

SCHEDULE-C	4.4	Handling shifting and erection of Orifices	10%	Handling, transportation, de-preservation, preparation of IMIR and submission of reports	80 %	Handling, shifting, erection of valve, preparation and submission of approved reports	5 %	submission and acceptance of CCC	5 %	on final bill		
SCHEDULE-C	5	**PIPE SUPPORTS**										
SCHEDULE-C	5.1.1 5.1.2 5.1.3	Handling, fabrication and erection of pipe supports :	35%	Handling, transportation, de-preservation, preparation of IMIR, fabrication, grit blasting, primer application, preparation of report and submission of reports	25 %	shifting, erection , fitup of the pipe supports in location , preparation of reports and submission of reports	30 %	On completion of welding, inspection and submission of relevant reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-C	5.2.1 5.2.2 5.2.3	Supply, fabrication, welding and erection of pipe supports	40%	On completion of supplying of raw material with TC , preparation of IMIR, preparation of reports and submission	20 %	On completion of fabrication, grit blasting, primer application, preparation of report and submission of reports.	35 %	On completion of erection , welding and inspection , preparation of	2 %	submission and acceptance of CCC	3 %	on final bill

								reports and submission of relevant reports				
SCHEDULE-C	5.3	Handling fabrication and erection of visco elastic damper supports	35%	Handling, transporation preparation of IMIR, fabrication, grit blasting, primer application, preparation of report and submission of reports	55 %	On completion of erection , welding, NDE , preparation of reports and submission of reports	5 %	submission and acceptance of CCC	5 %	on final bill		
SCHEDULE-C	6.1 6.2.1 6.2.2 6.2.3	Supply and application of painting on pipelines, pipe supports, metal structures and equipments	90%	Application of paint as per requirements, preparation and submission of approved reports	10 %	submission and acceptance of CCC						
SCHEDULE-C	7	INSULATION										

SCHEDULE-C	7.1.1.1 7.1.1.2 7.1.1.3 7.1.2.1 7.1.2.2 7.1.2.3 7.1.3	Supply and application of thermal Insulation with cladding of equipment and piping	40%	On completion of supply of raw material with test certificates , preparation of IMIR and submission of relevant reports	25 %	On completion of application of aluminum foil, thermal insulation mats, lagging, preparation and submission of reports	25 %	On completion fabrication, erection of cladding , inspection, preparation and submission of relevant reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-C	7.2	Cladding on pipelines and equipment	100 %	Supply & acceptance, fabrication and erection of cladding on pipeline & equipment.								
SCHEDULE-C	7.3	Hot Insulation of Passive heat removal system heat exchangers and connected ducting	40%	upon supply of raw material with all test certificates , preparation of IMIR and submission of relevant reports	25 %	upon application of thermal insulation mats of applicable thickness, laggging, preparation and submission of approved reports	25 %	after fabrication, erection of wire mesh , inspection, prepartion and submission of relevant reports	5 %	submission and acceptance of CCC	5 %	on final bill

SCHEDULE-C	7.4.1 7.4.2 7.4.3 7.4.4	Cold Insulation of Pipeline and equipment:	40%	upon supply of raw material with all test certificates , preparation of IMIR and submission of relevant reports	25 %	upon application of thermal insulation mats of applicable thickness, lagging, preparation and submission of approved reports	25 %	after fabrication, erection of wire mesh , inspection, preparation and submission of relevant reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-C	8	Erection of stainless steel temporary piping for flushing arrangement & dismantling	10%	upon Handling, transportation, depreservation, preparation of IMIR and submission of approved reports	60 %	after completion of the tempoarary piping as per the requirements including require inspection and submitting the relevant approved documents	30 %	dismantling the temporary piping and submitting the removed material to NPCIL custody and preparing and submitting relevant approved reports.				

SCHEDULE-C	9.1 9.2	Erection and welding of O-let/ thermo well lug	90%	after mounting the O-let (including piolot and final drilling) as per requirements and preparation and submitting the approved reports	5 %	after preparation of CRR and completion of Hydrotest and preparation and submitting the approved reports	5 %	submission and acceptance of CCC				
SCHEDULE-C	10	Structural Works										
SCHEDULE-C	10.1.1 10.1.2 10.1.3 10.1.4 10.1.5	Supply, fabrication and erection of carbon steel Metal structures	35%	upon supply of raw material and submitting IMIR with TC and submitting the relevant approved reports	55 %	Stage payment will be relased after fabrication and erection of the metal structure , preparation and submission of the releavant approved reports	5 %	submission and acceptance of CCC	5 %	on final bill		
SCHEDULE-C	10.2	Stainless steel structural works										

SCHEDULE-C	10.2.1	Fabrication and erection of stainless steel structural work	10%	upon handling, transportation and shifting of free issue material to contractor store, preparation of IMIR, submission of approved reports	70 %	after fabrication and erection of the structure as per the requirements , preparation and submission of approved reports	10 %	submission and acceptance of CCC	10 %	completion of material accounting.		
SCHEDULE-C	10.2.2	Supply, Fabrication and erection of stainless steel structural work	45%	upon supply of raw material and submitting IMIR with TC and submitting the relevant approved reports	45 %	Stage payment will be relased after fabrication and erection of the metal structure , preparation and submission of the releavant approved reports	5 %	submission and acceptance of CCC	5 %	on final bill		
SCHEDULE-C	10.3	Dismantling of metal structure and metal platform	90%	after completion of the intended work , preparation of reports and submitting the approved reports	10 %	after the final acceptance of the reports						

SCHEDULE-C	10.4	Fabrication, Erection and welding of Stainless steel liner for fuel pool, inspection well , reactor cavity and floors at various elevations:										
SCHEDULE-C	10.4.1	Erection of reactor cavity, fuel pool, inspection well and floor liner thickness upto 5mm.	10%	Handling, transportation, de-preservation, preparation of IMIR & get approved and submission of relevant reports	30 %	upon fabrication and erection of liner, preparation of reports and get approved, submission of reports	45 %	Completion of welding, NDE, and submission of relevant reports and acceptance of the Engineer.	10 %	Completion of fill test , submission of relevant reports and acceptance of the Engineer.	5 %	Submission and acceptance of CCC
SCHEDULE-C	10.4.2	Welding of reactor cavity, fuel pool, inspection well and floor liner thickness upto 5mm.	85%	completion of welding, NDE and submission of relevant approved reports	10 %	Completion of fill test , submission of relevant reports and acceptance of the Engineer.	5 %	submission and acceptance of CCC				

SCHEDULE-C	11.1.1 11.1.2 11.1.3 11.2.1 11.2.2 11.2.3 11.2.4	Fixing of anchor fasteners	90%	Fixing of hilti anchor fasteners as per requirements	10 %	submission and acceptance of CCC						
SCHEDULE-C	11.4.1 11.4.2	Sealing of anchor fasteners erected on steel lined areas	90%	fixing the cap and seal welding of cap over the anchor bolts as per the requirements.	10 %	submission and acceptance of CCC						
SCHEDULE-C	11.5.1 11.5.2	Marking and diamond core cutting	90%	core cutting as per requirement, removal of debris, cleaning the area , preparation of reports and submission for acceptance	10 %	submission and acceptance of CCC						
SCHEDULE-C	12	Maintenance of continuous preservation of NSSS										

		equipments using nitrogen										
SCHEDULE-C	12.1.1 12.1.2 12.1.3 12.1.4 12.2.1	Preservation activity and works by deploying qualified manpower and preservation of equipment	100 %	after successful completion of the activity and submission of relevant reports								
SCHEDULE-C	12.2.2 12.2.3	Supply and storage of silica gel as per IS 3401 in covered storage (non-indicative type)	70%	after supply of silica gel as per NPCIL requirement, preparation of IMIR and submission of reports for acceptance.	30 %	Stage payment will be released after the supplied silica gel kept under use, preparation of reports and submission for acceptance.						
SCHEDULE-C	13.1 13.2 13.3 13.4 13.5	Carrying out the activities like Multiple handling of reactor internal components	100 %	after successful completion of the respective operation , preparation of reports and submission for acceptance.								

SCHEDULE-C	14.4 14.5	Supply and E & C Split AC s and air curtains	85%	Suplly of equipments and acceptance	15 %	after dismantling and handing over the material to NPCIL as per instruction. Preparation of reports and submission for acceptance.						
SCHEDULE-C	15 16 17	Concreting of Reactor cavity equipments, Grouting, Dry packing	90%	After successful completion of the activity	10 %	submission and acceptance of CCC						
SCHEDULE-E	1	Erection of free issue equipments and valves/dampers:										
SCHEDULE-E	1.1	Erection of pre assembled ventilation equipments such as Centrifugal fans, Re-circulating cooling Plant (RCP) in UJA and UJB	10%	upon Handling, transportation, depreservation, preparation of IMIR and submission of approved reports	45 %	Handling, assembly, erection, alignment, fit up ,inspection , submission of reports and acceptance by Engineer.	35 %	Completion of welding and NDEs, submission of relevant reports and acceptance of	5 %	submission and acceptance of CCC, carrying out	5 %	completion of material accounting.

		buildings as per WD and technical specifications.						the Engineer.				
SCHEDULE-E	1.2	Assembling of stainless steel filter housing and testing	10%	upon Handling, transportation, depreservation, preparation of IMIR & get approved and submission of relevant reports	55 %	upon, shifting, handling, assembly, erection of filter housing in position, fitup & welding, preparation & submission of approved reports	25 %	for testing of housing, preparation of reports and submission	5 %	submission and acceptance of CCC, carrying out	5 %	completion of material accounting.
SCHEDULE-E	1.3	Erection of oversize ventilation equipments by Disassembly, erection and re-assembly.	10%	upon Handling, transportation, depreservation, preparation of IMIR & get approved and submission of relevant reports	30 %	upon, marking, cutting, dis assembly of equipment , shifting to the location, preparation of reports and submission	50 %	after Erection, assembly , fitup, welding, inspection , preparation of reports and submission	5 %	submission and acceptance of CCC	5 %	completion of material accounting.

SCHEDULE-E	1.4	Erection of ventilation valves/ dampers:										
SCHEDULE-E	1.4.1	Erection of ventilation containment Isolation valves and testing	10%	upon Handling, transportation, depreservation, preparation of IMIR & get approved and submission of relevant reports	15 %	after carrying out seat leak test, preparation of reports and submission	50 %	after shifting, handling, erection, preparation of reports and submission for acceptance.	20 %	after carrying out insitu pneumatic testing , preparation of reports and submission	5 %	submission and acceptance of CCC
SCHEDULE-E	1.4.2 1.4.3 1.4.4	Erection of motor operated butterfly valves assembly, motorized shut check valve assembly, fire damper, distribution terminal block etc	10%	upon Handling, transportation, depreservation, preparation of IMIR & get approved and submission of relevant reports	80 %	after shifting, handling, erection, preparation of reports and submission for acceptance.	5 %	submission and acceptance of CCC	5 %	completion of material accounting.		
SCHEDULE-E	2	Ducting										

SCHEDULE-E	2.1.1 2.1.2	SS Ducting:	25%	upon supply of SS sheets as per requirement, preparation of IMIR, submission of reports with TC.	30 %	upon completion of fabrication, fit up , welding, inspection, submission of reports	35 %	upon shifting, erection, fit up, welding, inspection, submission of reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-E	2.2.1 2.2.2	Carbon Steel Ducting : Supply fabrication, anti corrosive painting and Erection of Carbon Steel (CS) Ducting:	25%	upon supply of CS sheets as per requirement, preparation of IMIR, submission of reports with TC.	30 %	upon completion of fabrication, painting, fitup , welding, inspection, submission of reports	35 %	upon shifting, erection, fitup, welding, inspection, submission of reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-E	3.1 3.2	Stainless steel vent box/ Structures/ Plates for duct/ valves/ equipment supports:	25%	upon supply of SS sheets as per requirement, preparation of IMIR, submission of reports with TC.	20 %	upon completion of fabrication, fitup , welding, inspection, submission of reports	45 %	upon shifting, erection, fitup, welding, inspection and NDEs, submission of reports	5 %	submission and acceptance of CCC	5 %	on final bill

SCHEDULE-E	4.1 4.2	Supply, fabrication and erection of metal mesh over ducting as per the drawings and technical specifications.	90%	upon, supply, fabrication & erection of wire mesh as per requirement, preparation of reports and submission	5 %	submission and acceptance of CCC	5 %	on final bill				
SCHEDULE-E	5.1 5.2 5.3	Supply and erection of instrumentation hole setup (ih). Points over SS/ CS ducts/ vent box described under item 7.1 and 7.2 as per the specifications	90%	after successful completion of work, submission of reports	5 %	submission and acceptance of CCC	5 %	on final bill				

SCHEDULE-E	6.1.1 6.1.2 6.1.3 6.2	Thermal Insulation of Air ducts and vent Box:	30%	upon supply of raw material with all test certificates , preparation of IMIR and submission of relevant reports	35 %	upon application of aluminium foil, thermal insulation mats of applicable thickness, lagging, preparation and submission of approved reports	25 %	after fabrication, erection of cladding , inspection, preparation and submission of relevant reports	5 %	submission and acceptance of CCC	5 %	on final bill
SCHEDULE-E	7.1 7.2 7.3	Modification in erected SS Ducting	90%	after completion of modification work as per requirement, preparation of reports and submission	10 %	submission and acceptance of CCC						
SCHEDULE-E	8.1 8.2 8.3	Modification in erected CS Ducting	90%	after completion of modification work as per requirement, preparation of reports and submission	10 %	submission and acceptance of CCC						

VOLUME-IA PART-I CHAPTER - VIII

TAXES AND OTHER DUTIES

1.8.1 Goods and service Tax (GST) & Cess

1.8.1.1 The successful bidder shall furnish proof of GST registration with GSTN Portal in the State in which the Project is being executed, covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the successful bidder on BHEL for this project/ work.

1.8.1.2 Contractor's price/rates shall be exclusive of GST & Cess (if applicable) (herein after termed as GST). Contractor shall submit to BHEL the GST compliant tax invoice/debit note/revised tax invoice on the basis of which BHEL will claim the input tax credit in its return. Since this is a works contract, the applicable rate shall be @ 18% GST, as applicable presently

1.8.1.3 Bidder shall note that the GST Tax Invoice complying with GST Invoice Rules wherein the 'Bill To' details will as below:

BHEL GSTN - 33AAACB4146P2ZL
NAME - BHARAT HEAVY ELECTRICALS LIMITED
ADDRESS - KUDANKULAM NUCLEAR POWER PROJECT UNIT 3 & 4, 2X 1000 MWe KUDANKULAM PO, RADHAPURAM TALUK, TIRUNELVELI DISTRICT, TAMILNADU - 627106

1.8.1.4 GST charged in the tax invoice/debit note/revised tax invoice by the contractor shall be released separately to the contractor only after contractor files the outward supply details in GSTR-1 on GSTN portal and input tax credit of such invoice is matched with corresponding details of outward supply of the contractor and has paid the GST at the time of filing the monthly return.

1.8.1.5 In case BHEL has to incur any liability (like interest / penalty etc.) due to denial/reversal / delay of input tax credit in respect of the invoice submitted by the contractor, for the reasons attributable to the contractor, the same shall be recovered from the contractor.

1.8.1.6 Further, in case BHEL is deprived of the Input tax credit due to any reason attributable to contractor, the same shall not be paid or Recovered if already paid to the contractor.

1.8.1.7 Tax invoice/debit Note/revised tax invoice shall contain all such particulars as prescribed in GST law and comply to the timelines for issue of the same. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge.

1.8.1.8 TDS under GST (if/ as & when applicable) shall be deducted at prevailing rates on gross invoice value from the running bills.

1.8.1.9 E-way bills / Transit passes / Road Permits, if required for materials / T&P etc., bought into the project site is to be arranged by the Contractor only.

1.8.1.10 BHEL shall not reimburse any amounts towards any interest / penalty etc., incurred by contractor. Any additional claim at a later date due to issues such as wrong rates / wrong classification by contractor shall not be paid by BHEL.

1.8.2 All taxes and duty other than GST & Cess

The contractor shall pay all (except the specific exclusion viz GST & Cess) taxes, fees, license charges, deposits, duties, tools, royalty, commissions, Stamp Duties, or other charges / levies, which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract and the same shall not be reimbursed by BHEL. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

1.8.3 Statutory Variations

Statutory variations are applicable under the GST Acts, against production of proof. The changes implemented by the Central / State Government during the tenure of the contract viz. increase / decrease in the rate of taxes, applicability, etc. and its impact on upward revision / downward revision are to be suitably paid/ adjusted from the date of respective variation. The bidder shall give the benefit of downward revision in favour of BHEL. No other variations shall be allowed during the tenure of the contract.

1.8.4 New Taxes/Levies

In case Government imposes any new levy / tax after submission of bid during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract.

1.8.5 Direct Tax

BHEL shall not be liable towards Income Tax of whatever nature including variations thereof arising out of this contract as well as tax liability of the bidder and their personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act.

VOLUME-IA PART-I CHAPTER -IX

1.9.0 BILL OF QUANTITY

As mentioned in the Volume II, Price Bid, Part-C

NOTE TO BOQ:

A) The Price bid contains the consolidated list of BOQ with brief description of items. The quantity indicated in the BOQ / Price bid is approximate only and is liable for variation. Payment will be as per actual quantity executed as certified by BHEL Engineer.

B) Before filling the Rates in the Price bid, the bidder shall go through the detailed specification of all items of BOQ as well as Scope of Work as specified in relevant Clause of this document

C) Bidders shall refer Volume II, Price Bid, Part –A for Instructions.

D) Bidders shall quote 'Total Amount' in the format named 'SCT 1928 Format to quote Total Amount' available in e-Procurement portal and uploaded under 'Packet details - > Tender covers -> Finance '(Cover Type Description – Price Bid). Any other entry elsewhere in the price bid shall be treated as Null and Void. Quoting of rates in any other form/formats will not be entertained.Any other entry elsewhere in the price bid shall be treated as Null and Void. Quoting of rates in any other form/formats will not be entertained.

E) The above mentioned 'Total amount' is for the entire Bill of Quantity (BOQ) given in Part -C of the Price Bid.

F) BHEL has pre-fixed the weightages for the amount of individual items of Bill of Quantity with respect to the 'Total Amount' in Part-C.

G) Based on the pre-fixed weightages, the amount for the individual items of the Bill of Quantity shall be arrived at. This amount shall be rounded off to the nearest rupee.

H) Based on the quantities of individual item and the amount arrived in Sl.No.: G) above, unit rate of individual items shall be derived. This unit rate shall be rounded off to four decimal places.

I) Bidders to note that this is an item rate contract. Payment shall be made for the actual quantities of work executed at the unit rate arrived at as per Sl.No. H) above.

VOLUME-IA PART-I CHAPTER -X
GENERAL

1.10.0 **In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following:**

1.10.1 Payment Bidders are requested to furnish the following at PSSR-HQ, Chennai immediately after release of Letter of Intent (LOI)

I. Security Deposit and Additional Security Deposit (As applicable).
II. Unqualified Acceptance for Detailed LOI/ Work Order.
III. Rs.100/- Stamp Paper for preparation of Contract Agreement.
IV. Option (whether a or b of said clause) exercised towards Performance Security Deposit for the subject contract as per Sl. No. 16 of Volume IA Part II Chapter 1 of TCC.

1.10.2 Bidders are requested to furnish the proof of documents for the following at PSSR- Site.

I. PF Regn No.
II. Labour License No.
III. Workmen Insurance Policy No.

1.10.3 In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following.

1.10.4 BOCW Act & BOCW Welfare Cess Act

1.10.4.1 The Contractor Should Register their Establishment under BOCW Act 1996 read with rules 1998 by submitting Form I (Application for Registration of Establishment) and Form IV (Notice of Commencement /Completion of Building Other Construction Work) to the respective Labour Authorities i.e.,

a) Assistant Labour Commissioner (Central) in respect of the project premises which is under the purview of Central Govt.–NTPC, NTPL etc.

b) Appropriate State authorities in respect of the project premises which is under the purview of State Govt.

1.10.4.2 The Contractor should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL

1.10.4.3 The contractor should ensure compliance regarding Registration of Building Workers as Beneficiaries, Hours of work, welfare measures and other conditions of service with

particular reference to Safety and Health measures like Safety Officers, safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.,

1.10.4.4 The contractor irrespective of their nature of work and manpower (Civil, Mechanical, Electrical works etc) should register their establishment under BOCW Act 1996 and comply with BOCW Welfare Cess Act 1996.

1.10.4.5 Contractor shall make remittance of the BOCW cess as per Act in consultation with BHEL as per the rates in force (presently 1%). BHEL shall reimburse the same upon production of documentary evidence. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fess paid towards registration of beneficiaries and contribution of beneficiaries remitted.

1.10.4.6 Non-compliance to provisions of the BOCW act and BOCW welfare Cess act is not acceptable. In case of any non-compliance, BHEL reserves the right to withhold any sum it deems fit. Only upon total compliance to the BOCW act and also discharge of total payment of Cess under the BOCW Cess act by the contractor, BHEL shall consider refund of the amounts.

1.10.5 PROVIDENT FUND

1.10.5.1 The contractor is required to extend the benefit of Provident Fund to the labour employed by the contractor in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, the contractor is hereby required to get themselves registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to them by the Provident Fund authorities within one month from the date of issue of this letter of intent. In case the contractor is exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of contractor's failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to BHEL by the customer or paid to statutory authorities by BHEL, such amount will be recovered from payments due to the contractor.

1.10.5.2 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

1.10.6 OTHER STATUTORY REQUIREMENTS

1.10.6.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no along with the first running bill.

1.10.6.2 The contactor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

1.10.6.3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contactor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.

1.10.6.4 The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workman under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act1948 (If applicable) to BHEL along with the Final Bill.

1.10.6.5 In case of any dispute pending before the appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.

1.10.6.6 In case of any dispute prolonged/pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

1.10.7 DEPLOYMENT OF SKILLED / SEMI-SKILLED TRADESMEN

The following clause is applicable in case the contract value / contract price is Rs. Five crores and above.

The contractor shall, at all stages of work deploy skilled / semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute / Industrial Training. Institute / National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed / certified by State / Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled / semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have

inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

1.10.8 RECOVERY OF COMPENSATION PAID TO VICTIM(S) BY BHEL IN CASES OF DEATH/ PERMANENT INCAPACITATION OF PERSON DUE TO AN ACCIDENT DURING THE WORKS

BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

1.10.8.1 Victim: Any person who suffers permanent disablement or dies in an accident as defined below.

1.10.8.2 Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing / operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works /during working at BHEL Units/ Offices/ townships and premises/ Project Sites.

1.10.8.3 Compensation in respect of each of the victims:

(i) In the event of death or permanent disability resulting from Loss of both limbs: Rs. 10,00,000/- (Rs. Ten Lakh)

(ii) In the event of other permanent disability: Rs. 7,00,000/- (Rs. Seven Lakh)

1.10.8.4 Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to Section 2 (I) of the Employee's Compensation Act, 1923.

1.10.9 GENERAL

1.10.9.1 Site Visit by the Bidder

Prior to submitting his tender for the work, the bidder shall visit, examine and acquire full knowledge & information of necessary conditions prevailing at the site and its surroundings of the plant premises together with all statutory, obligatory, mandatory requirements of various authorities about the site of works at his own expense, and obtain and ascertain for himself on his own responsibility that may be for preparing his

tender and entering into a contract, and take the same into account in the quoted contract price for the work.

1.10.9.2 The bidder shall satisfy themselves about the following factors:

i) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.

ii) Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.

iii) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.

iv) Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.

v) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.

vi) The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.

vii) The type of equipment and facilities needed, for and in the performance of the work;

viii) The extent of lead and lift required for the work in complete form over the entire duration of the contract, and

ix) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

1.10.9.3 The bidder should note that information, if any, in regard to the local conditions, as contained in these tender documents, has been given to tenderer merely for guidance and is not warranted to be complete.

1.10.9.4 A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not, and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

1.10.9.5 The bidder and any of his personnel or agents will be granted permission by the Site-In-Charge or his authorized nominee, on receipt of formal application in respect thereof a week in advance of the proposed date of inspection of site, to enter upon his premises and lands for purpose of such inspection, but only on the express condition that the

tenderer (and his personnel and agents) will relieve and indemnify the Employer (and his personnel and agents) from and against all liability in respect thereof and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused which, but for the exercise of such permission, would not have arisen.

1.10.9.6 Scope of work covered under this specification requires quality workmanship, engineering and green belt management along with the supply of all consumables, tools and tackles and testing instruments. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.

1.10.9.7 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.

1.10.9.8 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost.

1.10.9.9 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.

1.10.9.10 The contractor shall carryout additional tests, if any, which the Engineer feels necessary because of site conditions and also to meet system specification.

1.10.9.11 The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.

1.10.9.12 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.

1.10.9.13 Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence.

1.10.9.14 Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.

1.10.9.15 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.

1.10.9.16 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.

1.10.9.17 Contractor shall retain all T&P / Testing instrument / Material handling equipment's etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.

1.10.9.18 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.

1.10.9.19 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.

1.10.9.20 Contractor has to work in close co-ordination with other agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and Construction program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.

1.10.9.21 The contractor must obtain the signature and permission of the security personnel of the customer / BHEL for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.

1.10.9.22 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.

1.10.9.23 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge.

1.10.9.24 The contractor is strictly prohibited from using BHEL's regular components like angles,

channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

1.10.9.25 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.

1.10.9.26 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on latest ISO 9001 Standards.

1.10.9.27 Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.

1.10.9.28 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.

1.10.9.29 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.

1.10.9.30 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

1.10.9.31 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.

1.10.9.32 If any item not covered but requires being executed, same shall be carried out by the contractor. Equivalent or proportional unit rate shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.

1.10.9.33 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors. Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.

1.10.9.34 SITE INSPECTION

1.10.9.34.1 BHEL or his authorized agents may inspect various stages of work during the currency

of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

1.10.9.34.2 BHEL / Customer will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by customer / BHEL.

1.10.9.34.3 Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work.

1.10.9.35 DOCUMENTATION

1.10.9.35.1 Record of Quantity of FREE / Chargeable items issued by BHEL must be maintained during contract execution. Also reconciliation statement to be prepared at regular intervals.

1.10.9.35.2 The under mentioned Records/ Log-books/ Registers applicable to be maintained.

a) Hindrance Register.

b) Site Order Book.

c) Test Check of measurements.

d) Steel & Cement Supply and Consumption Daily Register

e) Records of Test reports of Field tests.

f) Records of manufacture's test certificates.

g) Records of disposal of scraps generated during and after the work completion.

h) List of T&Ps and MMEs

1.10.9.35.3 Other documents / records as specified in chapter -Progress of work in PART- I of Technical conditions of Contract Volume IA (Volume I Book I).

1.10.9.35.4 Schedule as specified in chapters of Technical conditions of Contract Volume IA (Volume I Book I).

VOLUME-IA PART – I CHAPTER - XI
PROGRESS OF WORK

1.11.0 PROGRESS AND MONITORING OF WORK

1.11.1 Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume -I Book-II. Plan and review will be done as per the formats. These should be submitted on monthly basis with duly signed by BHEL and Contractor.

1.11.2 Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.

1.11.3 Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of non conformities.

1.11.4 Tenderers have to furnish a list of Tools and Plants including cranes, Tractor / Trailers etc., which they propose to deploy for this work.

1.11.5 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.

1.11.6 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

1.11.7 The contractor shall submit a report of any damage, shortage, discrepancy etc., every week detailing in this regard.

1.11.8 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

1.11.9 The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details: -

a. Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.

b. Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan.

c. Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas-cutters, electricians, crane operators and helpers.

d. Consumables report giving consumption of all types of gases and electrodes during the previous month.

e. Availability report of cranes.

f. Safety implementation report in the format.

g. Pending material and any other inputs required from BHEL for activities planned during the subsequent month.

VOLUME-IA PART- I CHAPTER-XII

1.12.0 MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

The scope of the work will comprise of but not limited to the following:

(All the works mentioned here shall be carried out within the accepted rate unless otherwise specified.)

1.12.1 Transportation and delivery of NSSS (Nuclear steam supply system) equipment near Reactor building (outside building only). List of the equipment which will be delivered by NPCIL near reactor building is specified in Annexure – II of VOLUME-IA PART-I CHAPTER – V.

1.12.2 Loading of all other items except mentioned in 1.12.1 at BHEL / Customer stores and storage yard, transport to site, unloading at site / working area of equipment placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work of contractor. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc for loading & unloading of materials will be in the scope of contractor.

1.12.3 The storage yard is located in more than one location within the Main Plant Boundary.

1.12.4 Contractor shall plan and transport equipments, components from storage yard to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.

1.12.5 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.

1.12.6 Contractor shall take delivery of the components and equipment's from the storage area after getting approval of BHEL Engineer on standard indent forms specified by BHEL. Complete and detailed account of the equipment's erected as well as progress shall be submitted to the engineer as directed.

1.12.7 Sometimes it may become necessary for the contractor to handle certain un required components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.

1.12.8 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work,

same shall be done by the contractor at no extra cost.

1.12.9 Open ends of piping valves, pipes and tubes shall be covered with plastic caps or will be closed with wooden plugs as the case may be.

1.12.10 The contractor shall provide any fixtures, concrete blocks & wooden sleepers, which are required for temporary supporting of the components at site.

1.12.11 The contractor shall take all such measures as may be reasonably necessary to ensure that its arrangements and those of its sub-contractors with respect to the transport of Goods, Materials and Labour to the site do not interfere with local traffic in the vicinity of the site and where such interference is unavoidable shall make such special arrangements as may be reasonably required to minimize the effect of such interference.

VOLUME-IA PART –I CHAPTER -XIII

1.13SAFETY CLAUSE/CONDITIONS:

In addition to the clauses in Chapter IX of Special Conditions of Contract (Volume-1B of Book-II) the contractor shall comply with the following. (The clause mentioned in this chapter will prevail in case of contradiction between the clauses in this Chapter and that of Chapter IX of Special Conditions of Contract (Volume-1B of Book-II)).

1.13.1 **PROJECT SAFETY PLAN**

1.13.1.1 A project specific Health and Safety plan shall be developed by the Contractor and submitted for approval from BHEL, prior to commencement of the work.

1.13.1.2 **SAFETY ORGANIZATION OF THE CONTRACTOR:**

The following minimum requirement shall be fulfilled:

Sr. No.	Manpower per Shift	No. of Safety Officers to be appointed per shift	No. of Safety Supervisors to be appointed per shift
1	Up to 20	01	01
2	21 to 100	01	02
3	101 to 200	01	03
4	201 to 350	02	04
5	351 to 500	02	05
6	Above 500	1 for every addl. 500 workers in addition to number mentioned against Sr. No. 5	1 for every addl. 200 workers in addition to number mentioned against Sr. No. 5

1.13.1.3 **QUALIFICATION OF SAFETY PROFESSIONAL SHALL BE AS FOLLOWS:**

- **SAFETY OFFICER:**
  Degree in Engineering and Diploma in Industrial Safety, recognized by the Central / State Government
- **SAFETY SUPERVISOR:**
  Diploma in Engineering and Diploma in Industrial Safety recognized by the Central/ State Government or 6 years supervisory experience.

1.13.1.4 **TRAINING REQUIREMENTS**

i. The Contractor shall provide mandatory Industrial Safety Training to all workmen. For the works where deployment of safety supervisor is not applicable, industrial safety training shall be provided by NPCIL.

ii. For all works having manpower less than or equal to 100 persons, the safety training shall be carried out at NPCIL's safety training centre.

iii. For all works having manpower more than 100, the Contractors shall establish their own safety training centre having adequate seating capacity and infrastructure for training.

iv. Induction safety training shall be provided to all personnel of the Contractors within the first three days of entry into plant site, failing which the workmen shall not get plant entry pass for further extended period.

v. After the induction safety training, the workmen should undergo refresher training once in every six months. Safety training card in prescribed format shall be issued to all workmen after completion of training.

vi. The duration of the training shall be minimum four hours. The typical syllabus for the training is as follows:

a) Hazards at construction sites. Use of personal protective equipment and their practical demonstration. Mock drill to ensure proper use of PPEs. Need for preventing accidents.

b) Aims and Objectives of safety, pep talk, and housekeeping. Safety Work Permit and Authorization to work on system equipment. Height Pass training and briefing about hazard prompt list.

c) DOs and DON'Ts on construction activities. Briefing about location of First aid/Fire station/Safety Section and their telephone numbers. Good safety practices of NPCIL projects.

d) Films on construction safety and feedback.

vii. The safety supervisors and the safety engineers will have to undergo refresher safety training in safety supervision and accident prevention techniques conducted by National Safety Council or other recognized institutions once in a year.

1.13.1.5 **REQUIREMENTS AND SPECIFICATION OF PPES**

i. Contractor shall submit a list of PPEs that shall be used during the course of the work, to BHEL before the commencement of work.

ii. Contractors must maintain adequate stock of Personal Protective Equipment (PPE) and safety gears such as safety nets, fall arrestor systems, safety barricades, signage etc. conforming to relevant Indian standards (or relevant international standards), required to be used during execution of the work.

iii. These PPE's, tools and appliances must be inspected quarterly by Safety officer / Supervisor of Contractor and records of such inspection shall be submitted to BHEL along with monthly safety report.

1.13.1.6 PERSONAL PROTECTIVE EQUIPMENT

1.13.1.6.1 GENERAL

a) Although the primary approach in any safety effort is that the hazard to the workmen should be eliminated or controlled by engineering methods rather than protecting the workman through use of personal protective equipment (PPE). Engineering methods could include design change, substitution, ventilation, mechanical handling, atomisation etc. Under those situations when it is not possible to introduce any effective engineering methods for controlling hazards, it is necessary that workman use appropriate type of PPE. For example, in construction work there is the possibility of a hand tool, a bolt, or some loose material to fall from an elevated level and striking the head of workman working below. It is therefore necessary that construction worker wear a safety helmet. It is for such situations, both the Factories Act 1948 and the Atomic Energy (Factories) Rules, 1996 have provisions for use of appropriate type of PPE.

b) It is thus recognized that use of PPE is an important and necessary consideration in the development of a safety programme. Once the safety professional decides that PPE is to be used by workmen, it is essential to select right type of PPE and management should ensure that workman uses it and also PPE is correctly maintained.

1.13.1.6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

a) All personal protective equipment as considered necessary should be made available for the use of the persons employed on the site and maintained in a condition suitable for immediate use. Also, adequate steps should be taken by engineer-in-charge to ensure proper use of PPE.

b) All the PPEs in use should be as per relevant IS standards as referred in the AERB safety guidelines on ‘PPE’(AERB/SG/IS-3).

c) All persons employed at the construction site should use safety helmets. Safety helmet should be with BIS mark and should have its headband with back support and chin strap.

d) Workers employed on mixing asphaltic materials, cement and lime mortars should use protective goggles, protective foot wears, hand gloves and respirators as required.

e) Persons engaged in welding and gas-cutting works should use suitable welding face shields. The persons who assist the welders should use suitable goggles. Protective goggles should be worn while chipping and grinding.

f) Stonebreakers should use protective goggles. They should be seated at sufficiently safe distances from one another.

g) Safety goggles should be of shatterproof type and with zero power.

h) Persons engaged in or assisting in shot blasting operations and cleaning the blasting chamber should use suitable gauntlets, overalls, shatterproof and dust-proof goggles and self-contained breathing apparatus set.

i) All persons working at heights more than 3.5 m above ground or floor and exposed to risk of falling down should use full body harness safety belts, unless otherwise protected by cages, guard railings, etc. In places where the use of safety belts is not feasible, suitable net of adequate strength fastened to substantial supports should be used.

j) When workers are employed in sewers and inside manholes that are in use, it should be ensured that the manholes are opened and are adequately ventilated at least for an hour. After it has been well ventilated, the atmosphere inside the space should be checked for the presence of any toxic gas or oxygen deficiency by a competent person and recorded in the register before the workers are allowed to get into the manholes. A pilot team should enter the area donning self-contained breathing apparatus (SCBA). The manholes opened should be cordoned off with suitable railing and provided with warning signals or caution boards to prevent accidents. There should be proper illumination in the night. Depending upon the work situation, the facility should provide PPE including the SCBA as recommended by Head, industrial safety.

1.13.1.7 WORK PRACTICES

1.13.1.7.1 GENERAL

a) Prior to taking up the day's work, Pre-Job Briefing/Pep talks will be carried out by Contractors' Site Engineer, Safety officer, Safety Supervisor or Site in charge involving all the workers.

b) The Contractor shall make arrangements for adequate and qualified supervision during the execution of jobs.

c) The Contractor shall ensure that safety work permits are taken for each high-risk job as per project procedures.

d) Job Hazard Analysis (JHA) shall be carried out for all high-risk jobs or as advised by BHEL/NPCIL Engineer-in-charge or Safety Officer.

1.13.1.7.2 WORK AT HEIGHT

a) For carrying out work at height of more than 3.5 meters above floor/ground level, height pass should be provided for all the workers involved in the work as per procedure, which includes ascertaining medical fitness by Registered Medical Practitioner and worker's physical test etc. If any worker is found working at height without required height pass, penalty as per Sr. No.5 of Annexure -1 shall be imposed.

b) Height work permit shall be obtained for all the works carried out on temporary staging, platforms etc. above a height of 3.5 meters from stable floor or ground floor. All implements used for height work such as scaffold, access stairs/ladders, platform,

railings etc should be certified by concerned Engineer prior to its use and to the effect that they should have a display card as "Safe for use". Wood, bamboo or other combustible materials shall not be used for making staging/scaffolds.

c) The minimum 1m width of working platforms shall be maintained. All scaffolds or staging shall have guard rails, mid rails and toe boards. Safe means of access by means of portable or fixed ladders, stairways or ramps shall be provided for all workplaces at height. Cross bracings or frames of scaffold shall not be permitted as means of access.

d) Safety nets, fall arrestor system, lifelines and other such additional safety measures commensurate with the location and nature of work shall also be provided. Full body safety harness with double lanyard shall only be allowed for work at height.

1.13.1.8 **ELECTRICAL SAFETY**

a) All electric supply lines and electrical apparatus used at site shall be of sufficient ratings for power, insulation and estimated fault current and of sufficient mechanical strength, for the duty which they may be required to perform under the environmental conditions of installation, and shall be constructed, installed, protected, worked and maintained in such a manner as to ensure safety of human beings, animals and property. All such material and apparatus shall conform to requirements under relevant codes of Bureau of Indian Standards.

b) Earth pits in accordance with Rule 61 of Indian Electricity Rules,1956 and as specified in IS 3043:1987, shall be provided and maintained at Contractor's work premises. Healthiness of earthing shall be checked physically at least once in a month and earth pit resistance shall be measured at least once in 6 months.

c) All power distribution boards, electrically operated equipment/tools, cables, power extension boards etc. shall be inspected every month for ensuring their healthiness. Inspection stickers shall be affixed on all such equipment/tools.

d) Metal clad power sockets and plugs shall be used at worksites for extension of power to equipment. MCBs shall be used as isolation switch as well as overload protection device. Flexible cables used for extension of power shall be double sheathed three core type. Twisted insulated wires shall not be used for this purpose. The cables used shall be free of joints as far as practically possible. Where joints are essential, the same shall be made as per standard industrial practices. Joints made with insulating tapes shall not be allowed at workplaces.

e) Earth leakage protection shall be provided to all electrical equipment/ tools/ appliances using ELCB (sensitivity 30mA). ELCBs shall be inspected every month for their healthiness. Apart from the power distribution boards, all extension boards shall also be provided with ELCBs. The specifications for power distribution boards and extension boards shall be in accordance with the requirements of NPCIL.

f) If use of electrical energy is required for execution of the work, the Contractor shall deploy qualified and licensed electrician(s). Minimum qualification for such electrician shall be ITI in electrical trade. He should also possess electrician/wireman license issued by concerned state government authority.

g) At least one portable fire extinguisher (DCP or CO2) shall be provided near each power distribution board.

h) Rubber mats conforming to IS:15652 shall be used in front of all Power distribution boards.

i) Rubber hand gloves conforming to IS:4770 and Safety shoes shall be used by personnel working on electrical systems

1.13.1.9 **MATERIAL HANDLING**

a) All machinery, tools and tackles used for material handling such as cranes, chain pulleys, slings, shackles etc. shall be inspected at least once in 12 months by a Competent Person and records of such inspection shall be maintained. All machinery, tools and tackles used for material handling shall be conspicuously marked with safe working load, date of inspection/test and next due date for inspection/test.

b) All tools and tackles used for material handling shall be inspected once in a month at site prior to use and damaged/faulty/worn out equipment/tackles shall be immediately removed from the worksite.

c) Operation of cranes, fork lift trucks, winches etc. shall be carried out only by operators authorized for the purpose. Trained, experienced and authorized signalmen shall be deputed to give signals to the operators of material handling equipment. Except the designated signalman, no one should be allowed to give signals during material handling operations.

d) All cranes, fork lift trucks, winches etc. shall be thoroughly inspected once in a month at site by the Contractor.

1.13.1.10 **WELDING, GAS CUTTING AND OTHER HOT WORKS**

a) Welding machines, gas cutting sets, blow torches, gas cylinders and accessories etc. as well as the connections shall be inspected for their healthiness prior to use.

b) The return cable of arc welding machine shall be connected to the job. Connecting the return cable to nearest earthed structure shall not be permitted for this purpose. Standard connectors shall be used for connecting welding cables to the welding machine. The current regulator shall also be connected using standard connectors. Use of unsafe means to connect welding cables or regulator shall be avoided.

c) Welding cables shall be free from joints. In unavoidable cases, the joints shall be adequately insulated both thermally and electrically.

d) Flashback arrestors shall be provided at torch end as well as cylinder end in gas cutting sets.

e) Suitable trolleys shall be used to securely keep and shift the oxygen and DA/LPG cylinders.
f) Industrial LPG cylinders shall only be used for hot work. Domestic or commercial LPG cylinders shall not be used for this purpose.
g) At least one fire extinguisher shall be provided at each location of hot work.
h) All the gas cylinders shall be painted as per standard colour coding. Valve caps shall be provided on cylinder, when not in use.
i) Gas cylinders shall not be dropped or rolled.
j) During carrying out hot works, suitable fire preventive measures like, removal of combustible material from the work area, use of fire-resistant blankets etc. shall be strictly followed.

1.13.1.11 **SAFE STORAGE OF MATERIAL**

a) Contractors shall ensure suitable and adequate place for storage of their material as well as material issued by BHEL/NPCIL. The storage shall be done as per the standard storage requirements based on physical and chemical properties of the material.
b) Steel structural material, reinforcement rods etc. shall be properly stacked with adequate spacers. The height of the stacked material shall be restricted so as to maintain stability of the pile.
c) Gas cylinders shall not be stored in open places exposed to sunlight & rain. Storage of gas cylinders shall be done in designated sheds/rooms. Empty and filled cylinders shall be stored separately. Flammable gas cylinders shall not be stored along with oxygen cylinders. Valve caps shall be provided on the cylinders and adequate chaining arrangement shall be provided for protecting the cylinders against falling.
d) Flammable liquids shall be stored in pre-designated areas having adequate ventilation and firefighting arrangements.
e) Corrosive chemicals shall be stored in accordance with the instructions given in Material Safety Data Sheet (MSDS). First aid measures for neutralizing the effects of the chemical shall be made available near the storage area.
f) Smoking of beedi/cigarettes shall be strictly prohibited and sources of ignition shall be strictly controlled in storage areas.

1.13.1.12 **FIRE PROTECTION AND FIREFIGHTING ARRANGEMENTS**

a) In accordance with the nature of material used during the execution of the job, suitable fire protection and firefighting arrangements, shall be ensured by the Contractor.
b) Based on the fire load, sufficient numbers of portable fire extinguishers shall be made available at worksites.
c) All unwanted combustibles shall be removed from the worksites on daily basis.

1.13.1.13 **TRANSPORTATION OF MAN AND MATERIAL**

a) Contractor shall ensure safe movement of man and material as well as vehicles within site premises as per applicable rules/regulations. Non-roadworthy vehicles shall not be allowed at worksites.

b) Vehicles used for transportation of material shall not be used to transport workers.

c) Overloading of vehicles shall be strictly prohibited.

d) Protective helmets (IS 4151:1993) shall be used by all two-wheeler drivers.

e) Vehicles shall have a valid registration, fitness and PUC certificates. Drivers shall have valid driving license.

f) Vehicles shall be inspected for healthiness once in a month.

g) Material transported on flat bed trailers shall be properly lashed to prevent fall of material.

h) Transportation of ODC/OWC material shall be done only with prior permission from BHEL & NPCIL. Adequate warning flags/lights and escorts shall be provided during such movements.

i) Reversing horns shall be provided in all vehicles.

1.13.1.14 **HOUSEKEEPING**

a) The Contractor shall at all times keep his work spot, site office and surroundings clean and tidy from rubbish, scrap, surplus materials and unwanted tools and equipment.

b) Welding and other electrical cables shall be so routed as to allow safe traffic by all concerned.

c) No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Engineer-In-Charge may require the Contractor to remove any materials which are considered to be of danger or cause inconvenience to the public. If necessary, the Engineer-In-Charge may cause them to be removed at the Contractor's cost.

d) At the completion of the work, the Contractor shall have removed from the work premises all scaffoldings, surplus materials, rubbish and all huts and sanitary arrangements used/installed for his workmen on the site.

e) The Engineer-In-Charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

f) The safety requirements to be followed at worksites are not limited to those mentioned above. All statutory safety requirements mandated under various applicable Acts and Rules enacted by the Government of India shall invariably be followed at KKNPP. Violation of statutory requirements shall attract punitive/penal actions. In addition, the safety violations during the execution of the present contract will be used as one of the factors for the performance evaluation of the Contractor, which in turn will be used for evaluation of future contracts.

g) Similarly, the requirements brought out in AERB Safety Guidelines 'Control of Works', which is a part of the contract documents, shall also invariably be followed.

h) Violation of such statutory and regulatory requirements shall attract a penalty mentioned in Annexure-1 under respective categories.

i) Detailed procedures, guidelines, manuals etc. on various aspects of industrial safety periodically issued by NPCIL as a part of the continual improvement process, shall also be followed by the Contractors.

j) All concerned Section Heads/Engineers-in-charge of the works contract shall be responsible for implementation of these instructions during all stages of execution of the work.

k) The quantum of penalty to be imposed shall be recommended during monthly Sectional Safety Committee meetings, based on the status of compliance of Safety Related Deficiencies (SRD) reports issued to respective Contractors. The committee shall assess the status of compliance of SRD reports by carrying out survey of workplace. Concerned Engineers-in charge shall deduct the recommended amount of penalty from the monthly RA bill.

l) The cumulative amount of penalty shall not exceed 2% of the total work-order value.

PENALTY STRUCTURE FOR NON-COMPLIANCE OF SAFETY REQUIREMENTS

Sl. No	Safety Parameters	Penalty structure for noncompliance of safety requirement
1.0	Safety Professional Penalty for not deploying minimum nos. of Safety Professional	Safety Officer - Rs 1500 per day per Safety officer Safety Supervisor- Rs 1000 per day per Safety Supervisor *Note: The penalty will also be imposed in case of absence of deployed safety personnel without acceptable replacement. However, the work will be stopped if regular safety personnel is not deployed back within 7 days.*

2.0	Safety Training ➢ Worker found without safety induction training or refresher training ➢ Worker found without safety training card	Rs 1000 per violation
3.0	➢ Non-compliance of Pre-job Briefing, non-availability of JHA, Safety Work Permit or Safe Working Procedure for high risk jobs.	Rs 1000 per violation
4.0	➢ Not providing required PPEs to the workmen ➢ Not using PPEs or using PPEs in incorrect manner or using defective PPEs.	Rs 2000 per violation Rs 500 per violation
5.0	Work at Height ➢ Workers working at height without height pass. ➢ Working at height without Height work permit ➢ orking at height without safe means of access ➢ Width of platform less than 1m Not providing adequate handrails, mid rails & toe guards ➢ Not providing adequate anchorage point for safety harness	Rs. 10,000 per violation
	➢ Unsafe working platform ➢ Not providing safety nets, fall arrestors, life line etc. where ➢ required ➢ Using uncertified scaffolds/working platforms ➢ Not providing inspection tags on scaffolds/working platforms	Rs. 10,000 per violation
6.0	Electrical Safety ➢ Use of unsafe/damaged /nonstandard electrical equipment/ appliances ➢ Drawing power supply from power socket without plug ➢ Drawing power without or bypassing ➢ ELCB ➢ Faulty/inadequate earthing ➢ Unsafe cable joints	Rs 20,000 per violation

	➢ Use of non-standard power distribution boards, extension ➢ boards ➢ Not carrying out periodic inspection of electrical system/equipment (without inspection stickers on PDBs, extension boards, power tools etc.) ➢ Not providing fire extinguisher & rubber mat near PDBs. ➢ Using polycarbonate switches, plugs and sockets instead of metal clad sockets and plugs ➢ Non-deployment of electrician	
7.0	<u>Material Handling</u> ➢ Use of machinery, tools and tackles not having valid inspection certificate ➢ Use of faulty/damaged material handling equipment ➢ Operation of MH machine/equipment by unauthorized personnel ➢ Not deploying trained signalmen ➢ Not displaying safe working load, date of inspection and next due date on material handling equipment	Rs 15,000 per violation
8.0	<u>Welding, Gas cutting and other hot works</u> ➢ Using faulty/unsafe welding, gas cutting, hot work equipment ➢ Using earthed structure as welding return circuit ➢ Un-insulated joints in welding cable Not using flashback arrestor in gas cutting set ➢ Not ensuring colour coding or valve cap on cylinders ➢ Unsafe handling of gas cylinders Not following fire prevention measures	Rs 5000 per violation

9.0	Safe storage of material ➢ Unsafe stacking of structural steel material, reinforcement rods etc. ➢ Unsafe storage of gas cylinders, non-chaining of cylinders ➢ Unsafe storage of flammable/ corrosive liquids	Rs 1000 per violation
10.0	Fire protection and Fire fighting arrangements ➢ Not providing fire protection and fire fighting arrangements ➢ Not providing adequate numbers of fire extinguishers ➢ Not removing unwanted combustibles from worksites	Rs 5000 per violation
11.0	Transportation of man and material ➢ Using material transport vehicle for transporting people ➢ Overloading of vehicle ➢ Two-wheeler drivers not using protective helmet ➢ Vehicles used without valid certificates ➢ Unsafe transportation of material Vehicles with faulty reversing horns, head lamps, horns, brakes etc.	Rs 1000 per violation
12.0	Housekeeping ➢ Non compliance of Housekeeping requirements. ➢ Urinating/defecating in non designated places ➢ Spitting in workplaces. ➢ Smoking in workplaces ➢ Writing graffiti in workplaces ➢ Temporary sheds in unauthorized places	Rs 1500 per violation

1.13.1.15 **WORK SPECIFIC SAFETY MEASURES**

1.13.1.15.1 GENERAL

a) The occupier should ensure that safety precautions are taken during the execution of awarded work and work areas are maintained safe at all times. At the end of each shift and at all times when the work is suspended, it should be ensured that the work area is left safe in such a way that no materials and equipment that can cause damage to

existing property, personal injury or interfere with the other works of the project or station are left in an unsafe manner.

b) The occupier should ensure to provide and maintain all lights, guards, fencing, warning signs, caution boards and other safety measures and provide for vigilance as and when necessary for the protection of workers and for the safety of others. The caution boards should also have appropriate symbols.

c) Adequate lighting facilities such as floodlights, hand lights and area lighting should be provided at the site of work, storage area of materials and equipment and temporary access roads within the working area.

d) All works should be planned so as to avoid interference with other facilities, works of other contractors or sub-contractors at the site. In case of any interference, necessary coordination should be ensured for safe and smooth working.

e) It should be ensured that the instructions given by the safety officer or his designated nominee regarding safety precautions, protective measures, housekeeping requirements, etc. are complied with. The safety officer with due intimation to engineer-in-charge should have the right to stop the work, if in his opinion, proceeding with the work will lead to an unsafe and dangerous condition. Engineer-in charge should arrange to get the unsafe condition rectified and/ or provide appropriate protective equipment.

f) Engineer-in-charge should ensure that each job with a hazard whether small or big is intimated to the safety officer of the facility well before it is taken up.

g) The facility should be fully responsible for non-compliance of any of the safety measures or requirements, implications, injuries, fatalities, dangerous occurrences and compensation arising out of such situations or incidents.

h) Maximum duty hours of an individual should be as per the Factories Act 1948 or its latest amendment.

i) Illumination levels should be as per the statutory requirements.

1.13.1.15.2 ROCK BLASTING

a) All blasting operations should be carried out on the basis of procedures approved by Head, industrial safety and engineer-in charge. All works in this connection should be carried out as per BIS specification/code (IS 4081: 1986. Title: - Safety code for blasting and related drilling operations (First Revision)). Barricades, warning signs etc. should be placed on the roads/open area.

b) Blasting permit should be obtained from Head, industrial safety at least one day before the blasting operation and precautions mentioned there in shall be ensured by the engineer-in-charge before blasting operation.

c) The blaster should have a licence from competent authority under Explosive Rules, 1983 for blasting work. It should also be ensured that he knows about the risks involved.

d) Blasting should be done under the supervision of competent engineer/ supervisor.
e) Blasting in the open site should only be carried out during fixed hours every day/fixed day in the week between sunrise and sunset. Residents of adjacent area should be informed in advance about the blasting schedule.
f) No blasting should be undertaken during thunderstorm.
g) Necessary precaution should be taken to ensure the stability/integrity/ safety of the adjacent structure by limiting the peak particle velocity.
h) No loose material, such as tools, drilling equipment, etc. should be left on the surface to be blasted. Proper muffling arrangement of the blasting area should be ensured to avoid flying of blasted material.
i) Authorised blaster should personally ensure that all the personnel/ equipment has been removed from the blasting area before the blasting operations.
j) Blasting area should be free of detonating gas, inflammable objects, sparking or damaged wiring system, stray currents and static electricity.
k) All electrical lines in blasting area should be de-energised.
l) Entry of unauthorized personnel should be prevented by displaying warning signs.
m) In case of misfire, no person should be allowed to approach the blasting site unless it is inspected and cleared by a competent engineer/supervisor.
n) Explosives and blasting material should be stored only in clean, dry, well-ventilated, suitably constructed bullet/ magazine which should be fire resistant and securely locked. Stock book should be kept accurate and maintained. License should be obtained for storage of explosive as per the Explosives Act, 1884.
o) Blasting caps, electric blasting caps or primers and detonators should not be stored in the same box, container or room with other explosives.
p) Precautions against lightening should be provided in accordance with Indian Electricity Rules, 1956 (amended in 2000).
q) The explosives should be transported in specially designed vehicles bearing a special sign or inscription entitled 'DANGER EXPLOSIVES'. Also, detonators separated from other explosive should be transported in a separate compartment.

1.13.1.15.3 EXCAVATION, TRENCHING AND EARTH REMOVAL

a) Before taking up excavation work, necessary permission should be obtained from the engineer-in-charge with reference to existing underground services.
b) The engineer-in-charge of the works should exercise full care to ensure that no damage is caused by him or his workmen, during the operation/excavation etc., to the existing water supply, sewerages, power or telecommunication lines or any other services or works. He should provide and erect before construction, substantial barricades, guardrails, and warning signs around the work area. He should also furnish, place and maintain adequate warning lights, display board, signals etc., as required.

c) All trenches 1.2 m or more in depth should at all times be supplied with at least one ladder for every 30 m along the trench. Ladders shall extend from bottom of the trench to at least 1 m above the surface of the ground.

d) The sides of the trench/pit in soil, which are 1.2 m or more in depth should be stepped back to give suitable slope (angle of repose) or securely held by timber bracing or appropriate shoring/support, to avoid the danger of soil slides from collapsing. The excavated material should not be placed within 1.5 m or half of the depth of the pit whichever is more from edges of the trench/pit. Cutting should be done from top to bottom. Under no circumstances mining or undercutting should be done.

e) Workers should not be exposed to the danger of being buried by excavated material or collapse of shoring. Measures to prevent dislodgment of loose or unstable earth, rock or other material from falling into the excavation by proper shoring shall be ensured.

f) The stability and safety of the excavation, adjacent structures, services and other works should be ensured.

g) All excavated area should be fenced off by suitable railing and installation of caution board to warn the persons from slipping or/ falling into the excavation pit/ mound.

h) All excavated areas shall have an illumination level of at least 20 lux for night work and a red danger light shall be displayed at prominent place near the excavation site to warn approaching traffic and men.

i) For removal of earth from an earth mound/excavated heap a written permission should be obtained from the engineer-in-charge of the work. As far as practical, earth should be removed mechanically. Wherever manual removal of earth is involved, earth should be removed from the top by maintaining a slope equal to the angle of re-pose of the earth. Such work should be constantly supervised to ensure that no under-cutting is done and to ensure that no person is trapped.

j) Dumping of excavated soil should be done at a specified area under proper supervision with respect to signaling, illumination and safety clearance.

k) It should be ensured that at a construction site of a building or other construction work, every vehicle or earth moving equipment is equipped with a) silencers, b) tail lights, c) power and hand brakes, d) reversing alarm e) search light for forward and backward movement, which are required for the safe operation of such vehicle or earth moving equipment and f) the cab of the vehicle or earth moving equipment is kept at least one meter from the adjacent face of a ground being excavated. g) indicator etc.

l) It should be ensured that when a crane or shovel is traveling, the boom of such crane or shovel is in the direction of such travel and the bucket or scoop attached to such crane or shovel is raised and without load, except when it is traveling downhill.

m) Before loading or unloading power trucks or trailers attached to tractors, the brakes should be applied and if vehicle is on a sloping ground, the wheels should be blocked. Handcart should not be used for the transfer of construction/erection materials in the

construction area. However, if the exigency demands urgent transfer of light materials a small handcart may be permitted with the prior approval of the engineer-in-charge.

1.13.1.15.4 It should be ensured that at a construction site of a building or other construction work:

(i) All transport or earth moving equipment and vehicles are inspected at least once in a week by responsible persons and in case any defect is noticed in such equipment or vehicle, it is immediately taken out of service.

(ii) Safe gangways are provided for to and fro movement of building workers engaged in loading and unloading of lorries, trucks, trailers and wagons.

(iii) All earth moving equipment, vehicles or other transport equipment be operated only by such persons who are adequately trained and possess such skills as required for safe operation of vehicles or other transport equipment.

(iv) Trucks and other equipment are not loaded beyond their safe carrying capacity, which should be clearly marked on such trucks and other equipment.

(v) No unauthorized person rides the transport equipment employed in such work.

1.13.1.15.5 It should be ensured at a construction site of a building or other construction work that:

(i) A shovel or an excavator whether operated by steam or electric or by internal combustion used for such work is constructed, installed, operated, tested and examined as required under any law for the time being in force and the relevant national standards.

(ii) Buckets or grabs of power shovels are propped to restrict the movement of such bucket or grabs while being repaired or while the teeth of such bucket or grabs are being changed.

1.13.1.15.6 It should be ensured at a construction site of a building or other construction work that:

(i) An operator of a bulldozer before leaving – applies the brakes, lowers the blade and ripper and puts the shift lever into neutral. (

(ii) A bulldozer is parked on level ground at the close of the work.

(iii) The blade of a bulldozer is kept low when such bulldozer is moving uphill.

(iv) Bulldozer blades are not used as brakes except in an emergency.

1.13.1.15.7 It should be ensured at a construction site of a building or other construction work that:

(i) A tractor and a scraper are joined safely at the time of its operation

(ii) The scraper bowls are propped while blades of such scraper are being replaced.

(iv) A scraper moving downhill is driven in low gear.

1.13.1.15.8 It should be ensured at a construction site of a building or other construction work that:

(i) Before a road roller is used on the ground, such ground is examined for its bearing capacity and general safety, especially at the edges of slopes such as embankments on such grounds.

(ii) A roller is not moved downhill with the engine out of gear.

(iii) Vehicle carrying excavated material should have proper cover over the driver's cabin.

1.13.1.16 **SAFE MEANS OF ACCESS/PLATFORMS**

a) Adequate safe means of access and exit should be provided for all work places, at all elevations.

b) Suitable scaffolds should be provided for workmen for all works that cannot be done safely from the ground, or from solid platform except such short duration work that can be done safely from ladders. Bamboo/wooden scaffolding should not be permitted.

c) Where the platform for working is more than 3.5 m above ground, the width of the platform should be minimum 1 m.

d) Ladder should be of rigid construction having sufficient strength for the intended loads. Wooden/bamboo/rope ladders should not be permitted. All ladders should be maintained in good condition. The ladders should be fixed to the ground or rigid platforms. An additional person should be engaged for holding the ladder, if ladder is not securely fixed. Ladder shall be extended from floor to at least one meter above the platform.

e) A portable ladder should be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical). Ladders should not be used for climbing while carrying materials in hands. While climbing both the hands should be free.

f) Any working platform on scaffolding or staging more than 3.5 m above the ground or floor should have a guard rail attached, bolted, braced at least 1 m high above the floor or platform of such scaffolding or staging along with mid-rail.

g) The planks used for any working platform should not project beyond the end supports to a distance exceeding four times the thickness of the planks used. The planks should be rigidly fixed at both ends to prevent sliding, slipping or tilting. The thickness of the planks should be adequate to take load of men and materials and should not collapse. Plywood or packing wood should not be used as planks.

h) The guardrail should extend along the entire exposed length of the scaffolding with only such opening as may be necessary for the delivery of materials. Standard railing should have posts not more than 2 m apart and an intermediate rail halfway between the floor or platform of the scaffolding and the top rail. Such scaffolding or staging should be so fastened as to prevent it from swaying from the building or structure. Scaffolding and ladder should conform to IS 3696 (Part 1): 1987 and (Part II): 1996.

i) Working platforms of scaffolds should have toe boards at least 15 cm in height to prevent materials from falling down.

j) A sketch of the scaffolding proposed to be used should be prepared and approval by the engineer-in-charge obtained prior to start of erection of scaffolding. All scaffolds should be examined by engineer in-charge before use.

k) Working platform, gangways and stairways should be so constructed that they should not sag unduly or unequally and if the height of the platform or gangway or stairway is more than 3.5 m above ground level or floor level. They should have adequate width for easy movement of persons and materials and should be suitably guarded.

l) No single portable ladder should be used for access to a height of more than 4.5 m. For ladders up to 3m in length the width between styles (side bars)/width in the ladder should in no case be less than 300 mm. For longer ladders this width should be increased by at least 20 mm for each additional meter of length. Step/rungs spacing should be uniform and should not exceed 300 mm. Portable ladder should be used only for access to work place. In case work place is higher than 4.5 meters, pre-fabricated steel staircase should be used.

1.13.1.17 **WORK AT HEIGHT**

a) Person to work at height should be medically fit and should have height pass issued by safety section. (Appendix A Part A, B and C). Safety training should be imparted before working at height.

b) Safety work-permit system for working at height should be obtained from industrial safety section.

c) At elevated places, secure access and foothold should be provided. Adequate and safe means of access and exit should be provided at all work places for all elevations. Means of access may be portable or fixed ladder, ramp or a stairway. The use of crosses, braces or framework, as a means of access to the working platform should not be permitted.

d) Linear movement at height should be reduced to minimum. In case of such movement provision for anchoring the safety belt should be made.

e) Where barricades cannot be installed, a safety net of adequate strength should be installed close to the level at which there is a danger of fall of personnel/fall of objects.

f) In case where 'work at height' is on asbestos roof, crawling board, roof ladder should be used to walk across the asbestos roof.

1.13.1.18 **ELECTRICAL SAFETY**

a) All electrical installations shall comply with the appropriate statutory requirements given below and shall be subject to approval of the electrical engineer and safety officer.

   i. The Electricity Act, 2003
   ii. The Indian Electricity Rules 1956 (as amended in 2000)

iii. The National Electricity Code 2008
iv. Atomic Energy (Factories) Rules, 1996
v. Other relevant rules of statutory bodies and power supply authority
vi. Relevant standards of BIS

In addition to the above statutory provisions, the clauses indicated in this document shall also be complied.

b) It shall be the responsibility of the user seeking temporary power supply to indicate in writing, if any of the clauses (requirements noted in above regulations and in this document) are conflicting with each other and for which the user cannot decide the course of action regarding safe installation, commissioning, operation, maintenance and decommissioning of the electrical installations.

c) The electrical engineer and safety officer of the facility providing temporary power supply shall interpret the concerned conflicting clauses and approve in writing the safe course of action.

d) The Application Form-1 (Form-1A, 1B and 1C) as mentioned in Appendix-B should be submitted by the user for getting the temporary power supply.

e) After installation of temporary electrical panels, wiring works by the user, certificates as per Form-1D (Appendix-B) should be submitted to the provider.

f) Certificate of safety officer and authorisation of electrical engineer for energisation of temporary power supply should be filled as per Form-1E (Appendix-B).

1.13.1.19 **MATERIAL HANDLING AND LIFTING MACHINES AND TACKLES**

a) It should be made compulsory to supervise jobs like lifting/placing/ loading/unloading/carrying/transporting etc. of heavy material by qualified supervisor having knowledge about hazards involved and precautions to be taken for such job.

b) The line managers should ensure that the material handling equipment used is adequate to handle the load.

c) Manual pulling of heavy equipment and trolley loaded with heavy material is not to be permitted.

d) Stacking and handling of heavy materials should be done on a firm ground to prevent settlement.

e) No lifting machine and no chain, rope or lifting tackle, except a fiber rope or fiber rope sling, shall be taken into use in any factory for the first time in that factory unless it has been tested and all parts have been thoroughly examined by a competent person. A certificate of such a test and examination specifying the safe working load or loads and signed by the person making the test and the examination has been obtained and is kept available for inspection.

f) Use of lifting machines and tackles should conform to relevant BIS requirements [IS 13367 (Part 1): 1992 Reaffirmed 2003, IS 4573: 1982 (Reaffirmed 2000) and IS 13834 (Part 1): 1994 Reaffirmed 2003 etc. The accessories and the attachments, anchorages

and supports etc. should be ensured in healthy conditions by regular inspections at defined frequencies.

g) Every rope used in hoisting or lowering materials or as a means of suspension should be of good quality and adequate strength and free from any defect. This should be ensured by regular inspection as per IS 2762: 1982- Specification for wire rope slings and sling legs (first revision).

h) Every crane operator or lifting appliance operator should be authorised. No person under the age of 18 years should be in charge of any hoisting machine or give signal to an operator of such machine.

i) In case of every lifting machine (and of every chain, ring, hook, shackle, swivel and pulley block used in hoisting or as a means of suspension) the safe working load should be ascertained and clearly marked. In case of a lifting machine having a variable safe working load, each safe working load and the conditions under which it is applicable should be clearly indicated. No part of any machine should be loaded beyond the safe working load except for the purpose of testing. This should be approved by the engineer-in-charge and head, industrial safety.

j) In case of facilities machines, the safe working load should be notified by the engineer-in-charge. As regards the contractor's machines, the contractor should declare the safe working load of the machine to the engineer-in-charge whenever he brings any machinery to site of work and get it verified by the engineer-in-charge, supported by a valid test certificate by the competent person.

k) Thorough inspection and load testing of lifting machines and tackles should be done in the presence of competent person at least once in every 12 months and records of such inspections and testing should be maintained.

l) No mobile crane should be allowed to move under live high-tension power transmission line.

m) While lifting loads, cranes should be located on level ground.

n) A thorough load analysis should be carried out before using cranes in tandem.

o) Motors, gear transmission, couplings, belts, chain drives and other moving parts of hoisting appliances should be provided with adequate safeguards. Hoisting appliances should be provided with such means, which will reduce the risk of any part of a suspended load becoming accidentally displaced or lowered.

p) It should be ensured that the cabin of the lifting machine in outdoor service:
   (i) Is made of fire-resistant material,
   (ii) has a suitable seat, a footrest and protection from vibration,
   (iii) affords the operator an adequate view of the area of operation,
   (iv) affords the operator adequate protection against the weather, and
   (v) Is provided with fire extinguisher.

1.13.1.20 **WELDING AND GAS CUTTING**

a) Welding and gas cutting operations should be done by qualified and authorized persons only.
b) Safety work permit should be obtained (wherever necessary like presence of flammable or combustible material etc.) before flame cutting/welding is taken up.
c) Welding and gas cutting should not be carried out in places where flammable or combustible materials are kept and where there is danger of explosion due to presence of gaseous mixtures. In case the requirement cannot be avoided, specific approval and procedure should be ensured and adequate precautions should be taken.
d) Welding and gas cutting equipment including hoses and cables should be maintained in good condition.
e) Barriers should be erected to protect other persons from harmful rays from the work. When welding or gas cutting is done in elevated positions, precautions should be taken to prevent sparks or hot metal falling below on persons or combustible materials.
f) Suitable type of protective clothing consisting of fire resistant gauntlet gloves, leggings, boots and aprons should be provided to workers as protection from heat and hot metal splashes. Face shields with filter glasses of appropriate shade should be worn.
g) Adequate ventilation should be provided while welding, brazing and cutting the metals like zinc, brass, bronze, galvanised or lead coated material.
h) Welding and gas cutting on drums, barrels, tanks or other containers should be taken up only after ascertaining that they have been emptied, cleaned thoroughly and made free of flammable material.
i) Fire safety measures should be available as required near the location of welding/cutting operations.
j) Flash back arrestor should be provided with gas cutting and gas welding sets.
k) For electric (Arc) welding the following additional safety precautions should be taken:
    i. When electrical welding is undertaken the return lead of welding machine should be directly connected to the job invariably.
    ii. Provision must be in place in electric welding machine to prevent physical contact with live parts.
    iii. The welding cables and power cables should be routed separately to avoid entanglement.
    iv. The electric welding set should have suitable earth connections. There should be an electrical isolation device in the input power supply side on the welding machine.
    v. Double gauges should be used for all gas cylinders used for cutting/ welding. Pressure gauges/regulators should be in healthy condition.

1.13.1.21 **ROTARY CUTTERS/GRINDERS**

a) All portable cutter/grinders should be provided with the wheel guard in position.

b) Grinding wheels of specified diameter only should be used on all grinders in order to limit the prescribed peripheral speed.
c) In pedestal grinder, the gap between tool rest and grinding wheel should be maintained less than 3 mm.
d) Goggle/face shield should be used during grinding operation.
e) No grinding wheel should be used after its expiry date.
f) Ear muff/ear plug should be used during the welding/cutting jobs.
g) Portable appliances, which are powered by single phase AC supply, shall be provided with three-core cable and three pin plug, otherwise the whole body should be double insulated.
h) Safety work permit should be obtained (wherever necessary like presence of flammable or combustible material etc.) before grinding is taken up.
i) Fire safety measures should be available as required near the location of grinding operations.

1.13.1.22 **CONCRETE MIXING EQUIPMENT**

a) Cement bags should be stacked on wooden planks in dry and leak proof area, 150 mm to 200 mm from the floor and 450 mm away from walls. Height of the stack should not be more than 15 bags or 1.5 meters whichever is lower. Width of the stack should not be more than 4 bags or 3 meters. Lateral loading of the walls of the storage room by stacking should not be permitted. Stacking of the bags should not be used as a working platform.
b) Shuttering and supporting structures should be of adequate strength and approved by engineer-in-charge. This should be ensured before concrete is poured.
c) If the mixer has a charging skip the operator should ensure that the workmen are out of danger before the skip is lowered.
d) Adequate walking platforms (as per the AERB directives) are to be provided in the reinforcement area to ensure safe walking for pouring concrete on the roof.
e) When workmen are working/cleaning the inside of the drum of mixer, the power of the mixer should be switched off and “Do not operate” tag should be provided. The plant operation and cleaning of mixing pan should be carried out as per equipment supplier’s instructions.
f) Interlocks between the cover and the mixer rotor shall be established to ensure that the agitator does not start when the cover is in open condition.
g) It should be ensured that moving parts of the elevators, hoists, screens, bunkers, chutes and grouting equipment used for concrete work and of other equipment used for storing and transporting of ingredients of concrete are securely fenced to avoid contact of workers with such moving parts.
h) It should be ensured that screw conveyors used for cement, lime and other dusty material are completely enclosed.

i) Workers engaged for handling bulk cement in a confined place should be provided with tight fitting goggle, approved respirators and protective clothing, which will fit snugly around the neck, wrist and ankles.

1.13.1.22.1 The following should be ensured for every pipe carrying pumped concrete:

i. The scaffolding carrying a pipe for pumped concrete should be strong enough to support such pipe at a time when such pipe is filled with concrete or water or any other liquid and to bear safely all the building workers who may be on such scaffold at such time.

ii. Securely anchored at its end point and each curve on it.

iii. Provided with an air release valve near the top of such pipe; and securely attached to a pump nozzle by a bolted collar or other adequate means.

1.13.1.22.2 The following should be ensured while using the electric vibrators in concreting work at a construction site of a building or other construction work such that:

i. Such vibrators are earthed.

ii. The leads of such vibrators are heavily insulated.

iii. The current is switched off when such vibrators are not in use.

1.13.1.22.3 For obtaining a clearance for first pour of concrete and regular operation of ready-mix concrete (RMC) plant, checklist given in Appendix-C shall be submitted to AERB along with the application for clearance.

1.13.1.23 **PAINTING**

a) Appropriate breathing air respirators should be provided for use by the workers when paint is applied in the form of spray, or a surface having lead paint is dry rubbed or scraped.

b) Only the quantity of paint, thinner and polish required for the day's work should be kept at the work spot. Excess storage should not be permitted at the work spot.

c) Smoking, open flames or sources of ignition should not be allowed in places where paints, varnish, thinner and other flammable substances are stored, mixed or used. A caution board, with the instructions written in national language and regional language, 'SMOKING - STRICTLY PROHIBITED' should be displayed in the vicinity where painting is in progress or where paints are stored. Symbols should also be used on caution boards.

d) All electrical equipment of paint storage room should be of explosion proof design. Suitable fire extinguishers/sand buckets should be kept available at places where flammable paints are stored, handled or used.

e) When painting work/hot resin mix is done in a closed room or in a confined space, adequate ventilation should be provided and ensured. In addition, suitable respirators should be provided. No portable electric light or any other electric appliance of voltage exceeding 24 volts should be permitted for use inside any confined space. Walkie-

talkie or other means of communication should be provided. Rescue arrangement like full body harness with lifeline, tripod with pulley and extra BA sets should be available.

f) The workers should use PVC gloves and/or suitable barrier creams to prevent the skin contact with Epoxy resins and their formulations used for painting.

1.13.1.24 **DEMOLITION**

a) Before any demolition work is commenced and also during the progress of the work, all roads and open area adjacent to the work site should either be closed or suitably cordoned. Appropriate warning signs should be displayed for cautioning approaching persons/ vehicles.

b) Before demolition operations begin, it should be ensured that all the service lines are de-energized.

c) Persons handling demolition operations shall use appropriate PPE.

d) All demolition operations should be carried out with safe and duly approved procedures which shall include following but not limited to:

   i. No masonry/material should be permitted to fall in such masses or volume or weight so as to endanger the structural stability of any floor or structural support.
   ii. No wall, chimney or other structure or part of a structure is left unguarded in such a condition that it may fall, collapse or weaken due to wind pressure or vibration.
   iii. No floor, roof or other part of the building should be overloaded with debris or materials as to render it unsafe.

e) After the demolition, the debris and other materials collected should be disposed safely and not permitted to be dropped freely.

f) Entries to the demolition area shall be restricted to authorized persons wearing safety helmets and safety shoes.

1.13.1.25 **TRAFFIC**

a) All the vehicles moving at sites should conform and comply with the requirements of Motor Vehicles Act, 1988 and the Rules made there under. All the drivers/operators of vehicles should possess valid driving license as per Motor Vehicles Act, 1988 or its latest amendment.

b) The facility should conduct operations so as to interfere as little as possible with the use of existing roads at or near locations where the work is being performed. When interference to traffic is inevitable such as road cutting or transit unloading of heavy equipment etc. notice of such interference should be given to the engineer-in-charge and safety officer well in advance with the details of start of the work and time required.

c) A cleaner/assistant must be available for all heavy vehicles whenever vehicles move forward as well as in the reverse direction. All vehicles should be fitted with proper reverse horns, back view mirrors and indicator signals.

d) Facility should ensure that the assessment of the driver's visual ability is carried out as per Rule 55 of the Atomic Energy (Factories) Rules, 1996/guidelines of advisory committee on occupational health (ACOH), AERB or as per the latest amendments in statutes.

e) Effective speed breakers with yellow stripes on the roads to regulate the speed at the vulnerable points should be installed. Effective barricading with adequate caution signs should be placed to warn the vehicle drivers whenever the jobs are carried out on the road.

f) All vehicles moving at the site should have roadworthiness certificate issued by the concerned authority.

g) Special limit boards and caution boards indicating turns should be installed wherever necessary.

h) In general, the following maximum speed limits should be specified and implemented. Vehicles speed limits should be as per Motor Vehicle Act or 20 Km/h. Extra precautions and care should be exercised particularly during heavy material/equipment movements.

i) Safety awareness programmes should be conducted for all the drivers of the light, medium and heavy vehicles.

1.13.1.26 **WORK IN RADIATION AREA**

The facility should follow the stipulated procedure under Atomic Energy Radiation Protection Rules, 2004 and AERB safety manual on 'Radiation Protection for Nuclear Facilities' (AERB/NF/SM/O-2) regarding work in the radiation area and other works related with radiography.

1.13.1.27 **WORK IN AND AROUND WATER BODIES**

a) When work is done at a place where there is risk of drowning, all necessary rescue equipment such as life buoys and life jackets should be provided and kept ready for use.

b) All necessary steps shall be taken for prompt rescue of any person in danger and adequate provision should be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work. Proper record of entry/exit to and from water bodies shall be maintained on shift basis and search operation shall be conducted as soon as any person is detected to be missing.

c) Caisson Work

(i) Safe means of access should be provided to the place of work in the caisson and adequate means should be provided to safely reach the top of caisson in the event of inrush of water

(ii) The work relating to construction, positioning, modification or dismantling of caisson shall be done under the supervision of a responsible person.

1.13.1.28 **FIRE SAFETY**

a) All provisions for fire safety shall be complied as per AERB safety standard on 'Fire Protection Systems for Nuclear Facilities' [AERB/ NF/SS/FPS (Rev. 1)].

b) All necessary precautions should be taken to prevent outbreak of fires at the construction site. It should be ensured that all hot work is carried out under valid work permit.

c) Combustible materials such as wood, cotton waste, oil, coal, paints, chemicals etc., should be segregated and kept to the required bare minimum quantity at work place.

d) Containers of paints, thinners and allied materials should be stored in a separate room which should be well ventilated and free from excessive heat, sparks, flame or direct rays of the sun. The containers of paint should be kept covered or properly fitted with lid and should not be kept open except while using.

e) Adequate number of trained persons from approved fire training centre required to extend fire safety coverage should be ensured.

f) Fire extinguishers as approved by the engineer-in-charge/in-charge of fire station/safety-in-charge should be located at the construction site at appropriate places.

g) Adequate number of trained workmen in fire fighting who can operate fire extinguishers should be ensured.

h) Portable fire extinguishers with periodic inspection, maintenance and re-filling complying with the mandatory requirements should be ensured.

i) Availability of adequate water for fire fighting should be ensured.

j) Implementation of the provisions of various statutory licenses for storing gas cylinders, petroleum products, explosives etc. as per the relevant acts and rules should be ensured wherever required.

1.13.1.29 **ENVIRONMENTAL SAFETY**

Relevant provisions of the state/central statutory authority regarding environment protection should be adhered to.

1.13.1.30 **PUBLIC PROTECTION**

The Facility should make necessary provisions to protect the public. He should be bound to bear the expenses in defence of every action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of any precaution required to be taken to protect the public. He should pay for the any such damage and cost which may be awarded in any such suit, action or proceedings to any such person, or the amount, which may be fixed as a compromise by any such person.

1.13.1.31 **SAFETY OF VISITORS**

a) Visitors for the project shall be given health and safety induction before they are allowed in to the construction project. It shall include the minimum PPE to be used, hazards and risks at the work area, restricted areas of entry, emergency response arrangements, etc.
b) Visitors shall always be accompanied by one of the employees of the project site.
c) Visitors shall not be allowed in the hazardous areas unless they are competent and trained to work in such areas.

1.13.1.32 **HOUSEKEEPING**

a) It should be recognised that a proper place for everything and everything in its place is maintained for a good housekeeping.
b) The material required for immediate use only should be brought to the designated workplace and stacked properly and labelled suitably.
c) All work spots, site office and surroundings should all times be kept clean and free from debris, scrap, concrete muck, surplus materials and unwanted tools and equipment. A day-to-day collection and disposal of scraps/debris should be done safely at designated place.
d) Electrical cables, leads and hoses should be so routed as to allow safe traffic by all concerned. Cable should be preferably supported on the brackets fixed along the wall to maintain safe access. Wherever routing on the floor cannot be avoided, care should be taken to ensure mechanical protection of these cables and safe access is not disturbed.
e) No material on any work place should be so stacked or placed or disposed off as to cause danger, inconvenience or damage to any person or environment.
f) All unused scaffoldings, surplus/scrap materials and equipment/ systems like temporary electrical panels etc. should not be allowed to accumulate and shall be removed from the premises at the earliest.
g) Accumulation of water/oil spillages on the floor or any other workplace should be avoided.
h) Proper aisle space marking should be provided in all workplaces.

1.13.1.33 **OTHER STATUTORY PROVISIONS**

Notwithstanding the clauses in the above subsections, there is nothing in these clauses to exempt the Facility from the provisions of any other act or rules in force in the Republic of India. In particular, all operations involving the transport, handling, storage and use of explosives should be as per the standing instructions and conform to the Indian Explosives Act, 1884 and the Explosives Rules, 1983. Handling, transport, storage and use of compressed gas cylinders and pressure vessels should conform to the Gas Cylinder Rules 2004 and Static and Mobile Pressure Vessels (Unfired) Rules 1981. In addition, The Indian Electricity Act 2003 and Indian Electricity Rules 2005, the

Atomic Energy Act, 1962, the Radiation Protection Rules, 2004, the Atomic Energy (Factories) Rules, 1996 and AERB safety manual on 'Radiation Protection for Nuclear Facilities' (AERB/NF/SM/O-2) should be complied with.

APPENDIX-A

APPLICATION FOR HEIGHT PASS

PART- A

Group/Section: _____

Agency: _____

1. Applicant's Name : _____
2. Facility address : _____
3. Residential address : _____
4. Age : _____
5. Sex : _____
6. Height : _____
7. Gate Pass No. : _____
8. Name of contractor/agency with whom engaged at present : _____
9. Height pass required for work at _____ m. Height
10. Description of present job : _____
11. Previous experience of working at height :

S.No.	Name of the Employer	Duration of Employment	Work Experience
1.			
2.			

12. Does the applicant suffer from any of the following ailments? (If yes details to be given):

(a) Blood pressure _____ (b) Epilepsy _____

(c) Flat foot _____

(d) Frequent headache or reeling sensation _____

(e) Mental depression _____ (f) Limping gait _____

(g) Aerofobia _____

Declaration:

I hereby declare that the above information furnished by me is true and correct. I shall always wear the safety belt and tie the life-line whenever working at unguarded heights of 3 m and above. I shall not misuse the height pass issued to me or transfer it to any other person. I shall never come to duty or work at height/depth under the influence of alcohol/drugs.

Date: Name:

Sign:

(Applicants name and signature or loss time injury (L.T.I) incase he cannot sign. In case of LTI an authorised person shall explain each point/item to the individual and certify on that behalf below the LTI)

I certify that I am satisfied with the above certification of the individual for the application of height pass and request for issue of height pass to him.

Name :

Sign :
(Agency Concerned)

Countersigned by:

Section Head (Facility)

PART- B

MEDICAL FITNESS CERTIFICATE

Certified that I, Dr. _____ have examined Shri _____ _____ aged_____ on (date) _____ who has signed below in my presence. General & physical examinations of Shri. _____ _____ do not reveal any abnormality. He does not suffer from any acute/ chronic skin disease or any contagious or infectious disease. His eye sight is normal with/without glasses. In my opinion, Shri _____ is physically and mentally fit for working at height.

Details of examinations are given below:

Personal attributes:

1. Height: _____
2. Chest: _____
3. Weight: _____
4. Hearing: _____
5. Sight: _____
6. Skin: _____
7. Heart beating: _____

Medical aspects:

1. Urine: _____
2. Blood pressure: _____
3. Epilepsy: _____
4. Flat foot: _____
5. Frequent headache or reeling sensation: _____
6. Mental depression: _____
7. Limping gait: _____
8. Aerophobia: _____

Name:

Sign :

Rubber Stamp of Medical Practitioner with Reg. No.

Signature of workman:

PART-C

INDUSTRIAL SAFETY SECTION

(Considering the above medical certificate, the applicant has appeared on the following practical tests conducted by industrial safety section and the results are given below (strike off whichever is in-applicable)

(a) Wearing a safety belt and tying the rope knot : Pass/fail

(b) Walking over a horizontal structure at 3 m. height wearing a safety belt : Pass/fail

(c) General physique (OK/Not OK)

The above applicant's performance in the above tests has been satisfactory/ unsatisfactory due to the following.

So I certify and issue this height pass to Shri _____ with Registration No._____ in the height pass register. This is valid for one year from the date of issue i.e. up to _____

Date:

Name:

Sign.:
Scientific Assistant (Safety)

Safety Officer

APPENDIX-B

FORM - 1

APPLICATION FOR TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION

[Prescribed under clause 4.6(d)]

1.	Name and address of user.	
2.	Reference of tender or work order (if applicable)	:
3.	Name & designation of tender/work order issuing authority.	:
4.	Power supply application number†	:
5.	Name and designation of tender/work order/work supervising authority (engineer-in-charge).	:
6.	Expected date of commencement of temporary supply	:
7.	Expected date of decommissioning of temporary supply	:
8.	Voltage level (LV/MV/HV)	
9.	Type of connection (1Ph/3Ph)	
10.	Connected load (Kw)	
11.	Maximum demand (KVA)/Power factor	
12.	Single line diagram* of proposed power distribution scheme along with equipment data sheet (downstream installation after point of connection).	Enclosed (Form-1A)/Not enclosed
13.	Name of overall supervisor and available qualified Staff	Enclosed (Form-1B)/Not enclosed
14.	Auxiliary equipment data sheet (meters, fire extinguisher, first aid box etc)	Enclosed (Form-1C/Not enclosed
15.	Name and designation of provider's representative to whom the application is addressed.	:
16.	Name and designation of authorized signatory of user, who had submitted this application	:

† Power supply application number shall be different for same user with multiple applications for temporary supply

* All the drawings and tables shall be signed by user's representative indicated against 16 above.

Signature of authorised signatory of user

Signed endorsement of work order supervising authority indicated against 5 above.

FORM - 1A

EQUIPMENT DATA SHEET FOR OBTAINING TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION

(Prescribed against item-12 of form-1)

Name and address of user:

Power supply application Number:

Amendment No:-

References:- Single line diagram (SLD) of the power distribution scheme with all equipment details (Attach the SLD)

1. Identity	2. Type	3. Make & model	4. Manufacturer's S.No	5. Fixed/ Portable	6. Size	7. Last used date	8. Last test date	9. Latest test data	10. Rating

Signature of authorised signatory of user

Explanation of column headers:

1. Identity:- Identification mark/number/tag of equipment in single line drawing and layout drawing. Every equipment in single line drawing and layout drawing shall have suitable identification mark/number/tag.
2. Type:- Cable/CB/MCB/MCCB/ELCB/transformer/lightning arrestor/earthing station/ earthing connection/motor/lighting fixture/switch/fuse/switch, socket box etc.
3. Make and model:- manufacturer's name and corresponding model no.
4. Manufacturer's S. No:- serial number and date in name plate if available. Else NA
5. Fixed/portable:- Equipment is installed/laid/anchored to surface or portable.
6. Size:- depending upon type of equipment and as desired by provider representative e.g. length for cables or all dimensions if heavy equipment like transformer.
7. Last used date. date of last use else NEW
8. Last test date. latest test date by user or by manufacturer if NEW
9. Latest test data:- IR, HV, resistance, functional test data depending upon the type of equipment as desired by provider's representative.
10. Rating:- name plate rating of equipment like voltage, current, power (apparent, active, reactive), IP of enclosure, size(cable cross section) etc. depending upon the type of equipment and as desired by provider's representative.

FORM - 1C

AUXILIARY EQUIPMENT DATA SHEET FOR OBTAINING TEMPORARY POWER SUPPLY AND USE OF ELECTRICITY AT WORK SITE DURING CONSTRUCTION
(Prescribed against item-14 of form-1)

Name and address of user:

Power supply application Number:
Amendment No:-

Reference:- Layout drawing No. / _____

1. Identity	2. Type	3. Make and model	4. Manufacturer's S. No	5. Fixed/ Portable	6. Size	7. Last used date

Signature of user's representative

Explanation of column headers:

1. Identity:- identification mark/number/tag of equipment in layout drawing.
2. Type:- earthing rod/megger/multi meter/earth resistance meter/fire extinguisher/s and bucket/first aid box/resuscitation chart/rubber mat etc.
3. Make and model:- manufacturer's name and corresponding model no.
4. Manufacturer's S. No:- serial number and date in name plate if available. Else NA
5. Fixed/portable:- equipment is installed/laid/anchored to surface or portable.
6. Size:- depending upon type of equipment and as desired by provider representative.
7. Last used date. NEW for new equipment. NA for passive devices like chart/mat etc.

FORM-1D

[Prescribed under clause 4.6(e)]

Name of user agency _____ **Power supply application number:-** _____

CERTIFICATE BY THE LICENSED ELECTRICAL CONTRACTOR

Certified that subject installations have been carried out by us or checked by us and is in accordance with I.E. Rules. The documents submitted with subject temporary power supply application (Form-1) is verified by us and the complete installation confirms to these documents.

We shall periodically inspect/check the installation so that no unsafe situation arises during use of this temporary power supply system. We understand that for the entire duration of existence of this temporary power supply system we shall be responsible for any unsafe installation, operation, maintenance, testing of the same which results into any loss of life or material. We shall immediately report to the provider's representative and ensure de-energisation of supply if any unsafe situation arises during use of this temporary power supply system.

Signature of the authorised signatory of licensed electrical contractor

Rubber seal of licensed electrical contractor

Date

CERTIFICATE BY THE USER

Certified that my/our installations have been carried out in accordance with the I.E. Rules and that I/We have employed competent agency/staff to handle the installations which is strictly as per the staff data sheet submitted in Form-1B.

We understand that for the entire duration of existence of this temporary power supply system we shall be responsible for any unsafe installation, operation, maintenance, testing of the same which results into any loss of life or material. We shall immediately report to the provider's representative and ensure de-energisation of supply if any unsafe situation arises during use of this temporary power supply system.

Signature of the authorised signatory of user

Name of signatory

Date

FORM -1E

[Prescribed under clause 4.6(f)]

CERTIFICATE BY THE SAFETY OFFICER

Certified that I have inspected the electrical installation referred here in after satisfying myself about the safe condition of the installation, I hereby recommend that the service connection be given to the contractor.

Signature of the safety officer

Name:

Date:

AUTHORISATION BY THE ELECTRICAL ENGINEER

The subject power supply application along with completed installation, necessary certificates (as per Form-1 of Appendix-B) is scrutinised by us. The proposal found to be in order and the installation can be energised on _____ in presence of your designated overall supervisor as indicated in Form-1B. Enclosed herewith the test report data sheet Form-1F. You are requested to carry out the periodic testing of equipment and submit the test report periodically as per this form.

Signature of the electrical engineer
of provider

Name of signatory

Date

FORM - 1F

TEST/MAINTENANCE REPORT DATA SHEET OF EQUIPMENTS OF TEMPORARY POWER SUPPLY SYSTEM AT WORK SITE DURING CONSTRUCTION

(Prescribed against form-1E)

Name and address of user:

Power supply application Number:

Amendment No:-

1. Identity	2. Type	3. Last tested date	4. Next due date of any test	5 Frequency of IR test	6 Frequency of HV test	7. Frequency of earth resistance test	8. Other tests

Signature of electrical engineer of provider

Explanation of column headers:

1. Identity:- identification mark/number/tag of equipment in single line drawing and layout drawing. Every equipment in single line drawing and layout drawing shall have suitable identification mark/number/tag.
2. Type:- Cable/ CB/ MCB/ MCCB/ ELCB/transformer/lightning arrestor/earthing station/ earthing connection/motor/lighting fixture/switch/fuse/switch, socket box etc.
3. Last test date: - latest test date indicated in Form-1A.
4. Next due date of any test:- as worked out by frequency of tests indicated in subsequent columns.
5. Frequency of IR test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
6. Frequency of HV test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
7. Frequency of earth resistance test:- required frequency depending upon type of equipment and location of installation. NA if not required after installation.
8. Other tests: - name and description of any other essential tests/maintenance activity and required frequency depending upon type of equipment and location of installation. NA if not required after installation.

VOLUME - IA PART – I CHAPTER – XIV

1.14NPCIL SECURITY RULES & MEDICAL MANAGEMENT

1.14.1 SECURITY RULES

It may be noted that the construction site is within the purview of the Central Industrial Security Force / other security agency engaged by NPCIL. The contractor shall follow all security rules as may be framed by Corporation from time to time regarding removal / movement of materials, equipment and personnel to and from site.

1.14.2 ENTRY/ EXIT OF MANPOWER

To ensure traceability/identity each and every person engaged by the contractor will be required to furnish bio-data of labourers / staff in standard format which includes individual photograph, name, present and permanent address, identification mark, and any of the following identity proofs for issue of temporary pass for period of maximum 15 days.

a) Voter ID
b) Aadhar Card
c) Ration Card
d) Passport
e) Bank Account Passbook of any Nationalized Bank
f) Any document certified by a Gazetted Officer which provides photo identity and address of the individual
g) Driving License
h) Identity certificate from Native Village Administrative Officer or Elected Panchayat President
i) PAN Card

Within 15 days of issue of temporary pass the Contractor shall submit the police verification certificate and Medical fitness certificate along with standard application format for issue of Regular pass (RFID).

For regular entry pass, the contractor engineer / supervisor / staff & labors must obtain the Police verification certificate and regular pass cannot be issued without police verification. The police verification must be carried out by the Police under the Police Station area(s) where the contract person was staying for the last two to three years. The police verification shall be valid for only three years.

Minors or physically unfit persons shall not be deployed for the work. On completion of work or on leaving of labour, the RFID cards shall be returned back to NPCIL. **Penalty of Rs 3000 per RFID card (or as revised from time to time) will be levied for non-return / loss of RFID cards/ Damage of RFID. The RFID passes not used for a period of 30 days will be disabled in the system preventing entry of said person. This can be re-validated only through separate approval.**

The contractor and his personnel shall abide by all security measures imposed by the NPCIL from time to time. Contractor shall also follow all rules and regulations applicable to the area being declared / pronounced from time to time by the authorities of existing Nuclear Power Station in the vicinity or any other statutory orders. The contractor, his employees and agents shall not disclose any information or drawings furnished to him by Corporation. Any drawings, reports and other information prepared by the contractor / by Corporation or jointly by both for the execution of the contract shall not be disclosed without prior written approval of the NPCIL. **No mobile phone with camera is allowed inside the plant premises.**

On completion of the contract, it shall be the responsibility of contractor to collect the regular passes (RFID) from labourer and return to the Security Section. The contractor

shall obtain a certificate in this regard from SECURITY and submit it to EIC along with submission of the final bill.

1.14.3 **ENTRY/ EXIT OF MATERIALS**

During the entry and exit of all the materials brought by contractors at KKNPP 3&4 Project site, the details shall be entered in the Material entry/exit register maintained at security gate. One copy of documents pertaining to materials being taken inside shall be kept with security. While taking the material out, this shall be cross-checked with the inward documents and confirmed.

Contractors will be allowed to take their materials in/ out of the construction areas from/ to their workshops inside plant premises through material movement format approved by the Project Manager/ Site- in-charge of the contract. For taking materials onward/outward of KKNPP-3&4 Project Site areas (in/ out of the main plant boundary), gate pass in standard format shall be approved through NPCIL. The contractor shall print gate pass book in quadruplicate in approved format of NPCIL for the entry/exit of materials to/from project premises.

Loading of materials belonging to contractors inside plant premises, on to trucks/ tractor-trailers/ any other vehicles for taking out of plant premises shall be carried out in the presence of security personnel. A formal request for deployment of security personnel stating the time of loading of materials should invariably be sent to security through Engineer well in advance. Contractor's Project Manager/ Site in-charge shall issue a certificate certifying that contractor's materials are only being loaded / shifted out of plant premises.

1.14.4 **Entry/ Exit of Vehicles**

Entry and exit of contractor's vehicles at KKNPP-3&4 Project site shall be controlled through vehicle pass and the application shall be submitted in standard format.

Free issue materials could be loaded/ unloaded at Central Stores/ Warehouse between 0900 hours and 1700 hours with the approval of Engineer on the request submitted by the Contractor.

Entry pass for contractor's vehicles will be issued on submission of valid registration, insurance and driving license of driver.

1.14.5 **Mobile Passes**

Contractors' staff / labour shall be allowed to carry basic model mobile without camera/data card /internet facility in to KKNPP-3&4 Project site areas only on approval. However, entry of mobile in main plant area will be limited / not permitted. The mobile pass issued shall be restricted from time to time. They shall submit the application for mobile pass in standard format through Engineer.

1.14.6 **Photography in Project Premises**

Photography in Project Premises is strictly Prohibited.

1.14.7 **EMERGENCY PREPAREDNESS DRILL**

KKNPP- 3 to 4 is in the vicinity of operating units KKNPP 1&2. KKNPP Unit 1&2 performs annual mock emergency exercises in accordance with the stipulations of Atomic Energy Regulatory Board as a part of emergency preparedness plan.

All the contractor’s workmen engaged for KKNPP 3 to 4 works may have to undergo awareness program on emergency preparedness which shall be arranged by NPCIL. The contractor’s workmen may require assembling in the identified areas and registering their presence for accounting purpose as on when required. The rates quoted by contractor shall include the cost of delay due to such interruptions.

1.14.8 **LABOUR EMPLOYMENT**

EMPLOYMENT OF UNSKILLED PERSONS FROM AMONG THE DISPOSSESSED FAMILIES

In addition to Contractor's own labour force, he shall also employ unskilled laborers out of suitable persons from the families within Kudankulam Nuclear Power Project areas whose lands have been acquired for setting up the Project. It is also encouraged to employ the local labour /staff from the neighbourhood of the Project to the maximum possible extent.

1.14.9 **CORPORATE SOCIAL RESPONSIBILITY**

The contractor shall note the fact that Kudankulam Project is located in an area which is surrounded by many villages. The contractor may have to carry out welfare activities in these villages to generate goodwill among the people. A few projects may be taken up in the villages under Corporate Social Responsibility Scheme of Contractor's organization as per provisions of section 135 of Company's Act 2013.

1.14.10 **MEDICAL MANAGEMENT**

FIRST AID CENTRE & AMBULANCE FACILITY

One First aid centre and Ambulance service are equipped by BHEL inside the Plant Premises. Services of the same will be extended to the workers/ staff injured /ill, while working, in side plant area. Running expenditure to be shared among contractors of BHEL on proportionate basis of contract value. BHEL engineer decision is final in this regard.

In addition to above the contractor has to make following own arrangements with in their quoted rates

MEDICAL FACILITIES

a) Medical facilities conforming to the provisions of the Atomic Energy (Factories) Rules, 1996 should be provided at all work sites.
b) Well maintained first aid boxes should be kept at each location of the work by the contractor and availability of the personnel trained in first aid should be ensured.

c) The facility management/contractor shall make arrangements for the first aid and medical services for the injured or ill persons for prompt attention or aid.

d) The arrangement can be made by the contractor or an agreement can be in vogue with the facility.

e) Display of emergency contact numbers of important persons and hospitals and route map of site shall be maintained at designated places.

f) It should be ensured by the occupier that occupational health monitoring of contract workers is carried out as per provisions of the Factories Act 1948 as per the latest amendment and the stipulations/directions given by Atomic Energy Regulatory Board from time to time.

1.14.11 **MEDICAL MANAGEMENT OF SERIOUS INJURIES**

a) In case of serious injuries, the injured should be shifted to the nearest first-aid centre at site immediately. The opinion of medical officer/ certifying surgeon should be sought immediately for medical management.

b) After providing the first aid treatment the injured should be shifted to designated medical facility of the site/hospital for further medical assistance, in an ambulance along with a nursing attendant.

c) The doctor at the medical facility of the site/hospital attending the case shall assess the extent of injuries and render immediate medical aid. If the situation warrants trauma/special care the injured shall be shifted to the referral hospital, having all the requisite facilities for specialised treatment in ambulance along with a medical attendant.

d) A list of such referral hospitals for specialised medical management facilities for the injured persons should be available with the project management/Head, industrial safety and Head, medical services of the site for ready reference.

VOLUME - IA PART – I CHAPTER – XV
1.15 SUPPLY OF MATERIAL BY NPCIL & CONTRACTOR SUPPLY MATERIALS

1.15.1 SUPPLY OF MATERIALS:

Materials required for the work covered under this tender such as equipment, pipelines, tubes, pipe fittings, valves, supports, and other connected components of systems including welding electrode and filler wire (Russian make) will be supplied as free issue as specified in respective items of BOQ. The actual quantities to be issued will be indicated in working documentation or to be worked out from the drawings by the contractor. The materials shall be released in phased manner depending on the planning / availability of areas based on the schedule of project.

1.15.2 GENERAL:

The free issue supply materials issued to the contractor for the work shall not be used or diverted for any other work either on temporary basis or in a replacement basis. Contractor shall ensure that clear and distinct markings made on the free issue items are not obliterated. Contractor shall provide separate area in his works for stocking and storing these materials while these are in his custody.

1.15.3 MATERIAL SUPPLIED BY NPCIL (Free issue) :

1.15.3.1 SYSTEM EQUIPMENT :

All the equipment to be erected is supplied by the engineer. The equipment to be erected by the contractor in general will be supplied with edge preparation for piping connection work in accordance with specification for respective system. In the event of equipment being supplied by the manufacturer with no/wrong edge preparation for welding, contractor shall prepare/rectify the same.

1.15.3.2 PIPE LINES MATERIALS

Pipe line materials such as pipe, pipe fitting, valves, supports, inline instruments such as orifices, strainers etc., for all systems will be supplied by the engineer.

The pipeline above 80 NB shall be supplied in pre-fabricated condition with weld edge prepared for further welding with pipeline, valve, equipment etc. Prefabricated pipelines will normally be supplied with field cutting allowance. Contractor shall carry out necessary field measurements, marking, and cutting and weld edge preparation.

The pipeline 80 NB and below shall be supplied in random / standard length. Cutting to required sizes, edge preparation, fit up & welding shall be done by contractor within the quoted rate.

All pipe fittings and valves are normally supplied with edge preparation for piping work in accordance with specification for respective systems.

1.15.3.3 **HANGERS & SUPPORTS MATERIALS :**

Equipments and pipelines support & its components will be supplied by the engineer. These items shall be incorporated by the contractor into support assemblies which are to be fabricated and installed by the contractor.

1.15.3.4 **FOUNDATIONS & EMBEDMENTS :**

Foundations for equipment will be provided by the engineer. Embedment in concrete (Building) i.e. pipes penetration; plates called for on the drawings are mostly installed by the engineer at the time of concreting.

Wherever embedment is not provided, Hilti make anchor fasteners shall be installed by the contractor. Rectification of foundations bolts embedded in concrete or rectification of the corresponding holes in the equipment as directed by the engineer, wherever found necessary shall be done by the contractor.

Filling of concrete/dry packing for equipment foundation, filling grout in foundation bolt pockets as per specification and drawings are included in the scope of the contract including supply of grouting/dry packing materials.

1.15.4 **WASTAGE ALLOWANCE FOR MATERIAL ISSUED TO THE CONTRACTOR**

S. No.	Particulars	Unit	Rate at which Material will be issued	Maximum invisible wastage (Non-Returnable) (%)	Maximums permissible wastage (Returnable in case of free issue) (%)	Qty. to be issued (approx.)
1	Equipment					
1.1	Static and rotary equipments including NSSS equipments	MT	Free Issue	0%	0%	15500
2	Pipeline Parts					
2.1	Stainless steel pipe material	MT	Free Issue	2%	3%	1677
2.2	Carbon steel pipe material			3%	4%	
2.3	Carbon Steel and stainless steel pipe fittings			0%	0%	
3	Valves					
3.1	Carbon steel and stainless steel valves of various types, orifice, traps, remote drives	MT	Free Issue	0%	0%	783
4	Pipe support material	MT	Free Issue	3%	4%	739
5	Stainless steel Liner and other SS	MT	Free Issue	2% *	3% *	140
6	Detachable thermal insulation blocks	MT	Free Issue	Nil	Nil	147
7	Welding Consumables					
			Free			

7.1	Suitable size and types of	MT	Issue	#	#	100

* This percentage can vary as per the cutting plan approved by Engineer-in-Charge.

Note: Cost towards materials wasted over and above the wastage allowance as mentioned above shall be recovered from the contractor as per NPCIL rates.

Electrode and filler wire consumption for various diameters and thickness of pipes of different joint configuration shall be established after award of work by carrying out mock-up test jointly by both the sides and accordingly approval will be obtained from competent authority. The wastage shall be approved based on established mock up /trail test.

Note: Cost towards electrode and filler wire wasted/ consumed over and above the approved percentage shall be recovered from the contractor as per NPCIL rates.

1.15.5 SERVICES PROVIDED BY THE ENGINEER ON FREE ISSUE BASIS: MATERIAL HANDLING EQUIPMENTS:

The material handling equipments as given below will be issued to the contractor only for handling & erection of NSSS equipment and connected heavy components.

a) Heavy duty crawler crane outside reactor building.
b) Portal (trestle) crane if available.
c) Polar crane inside reactor building.
d) Special tools & tackles specially designed for erection of main equipments of NSSS as supplied by manufacturer.

Note: Contractor has to engage trained operator for day to day operation of polar & portal crane.

1.15.6 MATERIAL & SERVICES TO BE ARRANGED BY THE CONTRACTOR :

a. Specific Construction Equipment :

The list of Plant & Machineries, construction equipments, tools and tackles are indicated in VOLUME - IA PART – I CHAPTER – VII. The list is indicative and it is the responsibility

of contractor to assess the work and arrange to deploy adequate equipments and facilities to meet the target scheduled.

Any other equipment, tools, fasteners which are not listed above but required for completion of work should be procured by the contractor.

b. Site workshop :

Site workshops shall be set up by contractor which should have sufficient space and capacity for carrying out the required works. The shop should have concreted and painted floors, and provided with adequate weather protection. The workshops shall consist of pickling shop, general fabrication shop & clean shop for S.S and CS fabrication shop. The size, arrangement of the machines, washing plant and detergent washing plant shall be got approved from the engineer.

1.15.6.1 **WELDING & CUTTING GAS :**

Contractor shall arrange welding & purging argon gas of purity 99.98% as per specification and cutting gases as required for work with the quoted rates of respective items.

The contractor is proposed to establish argon gas station outside of building for welding of piping work in reactor & reactor auxiliary building and avoid movement of cylinders.

Use of domestic LPG for the works at plant site is not permitted.

1.15.6.2 **CONSUMABLE FOR WELDING:**

For welding of free issue equipment, pipeline, supports as mentioned above, welding consumables manufactured & conforming to Russian standard will be issued as free of cost for welding. Contractor shall be responsible for storage and accounting.

For welding of material supplied by the contractor such as CS / SS structural work, CS/SS ducting work, NPCIL approved brand welding consumables as specified by the engineer shall be used.

Welding consumables such as grinding wheel, cutting wheel, wire brush, Tungsten electrode, NDE consumables for entire work is included in the scope of contractor without extra cost.

1.15.6.3 **MATERIAL SUPPLY FOR SUPPORT AND OTHER WORKS:**

Generally the structural steel material indicated in piping & support drawings shall be provided by NPCIL for equipment & piping hangers and supports. Based on the work requirement with the approval of engineer, contractor may supply these materials as per equivalent approved for Russian steel. Material Test certificate for the material supplied by contractor are to be produced. Contractor shall arrange for testing without any extra charges for all the materials supplied by him if requested by the engineer.

Supply of structural steel material for metal structure is included in the scope of contractor.

1.15.7 MATERIAL ACCOUNTING :

1.15.7.1 RETURN AND ACCOUNTING OF MATERIAL :

a) The contractor shall maintain material accounting from the day one of starting of work so that material received from BHEL/NPCIL, issued to erection, consumption is updated on day to day basis.

b) The contractor has to return / deposit the empty wooden & metal crate on which equipment, pipeline & other components issued on monthly basis.

c) Contractor is responsible for accounting of materials issued to them on monthly basis. The consumption of material on system wise shall be compared with respective items as per CIV.

d) Welding consumables such as filler wire & electrodes issued as free of charges shall be used only for the items / systems issued. Use of welding consumables on other work / systems is totally prohibited without engineer approval. The consumption shall be available to the engineer on weekly basis with respective quantum of welding completed.

e) The contractor shall submit piping & supports material accounting based on “as built drawings” approved by the engineer. These drawings shall form basis for material consumption during the contract period.

f) Quantity of welding consumables shall be established and approved for various joint configuration & size of weld joint for respective thickness from start of work and same shall be used for material consumption & accounting purpose.

g) The contractor shall segregate all category of material including scrap rendered surplus in order to enable the engineer to determine whether or not permissible cutting wastages were exceeded.

h) No wastage will be allowed on the materials issued other than specified and approved.

i) The requirement of materials shall be worked out from based on detailed shop drawings approved by the contractor.

j) Weights of materials shall be obtained on the basis of unit weights as per relevant standard (Indian /Russian) / drawing in case of materials issued in measurement other than weight. Whenever the weight could not be ascertained from the available drawings/documents, the same shall be obtained by actual weighment of a number of sections of the item and working out the unit weight.

k) Periodical check may be exercised by the Engineer on materials issued to the Contractor for which all assistance shall be given by the Contractor.

l) All the materials to be returned to the Corporation by the Contractor shall be returned at his own cost. No payment on account of loading, carting and unloading as directed etc. will be made to the Contractor.

m) On completion of work, the contractor shall return all surplus material available with him to engineer's stores within a period of one month of completion of the works. The material account shall be furnished progressively during the course of the contract and the complete material account must be submitted, within three months of the contract. The contractor must account for the material issued to him as free issue as per the agreement, failing which he shall be charged for loss, misuse and for exceeding permissible cutting wastage limits. He must also account for the piping material, steel/structural, etc. issued on chargeable basis to establish that no material was utilized for unauthorized purposes.

n) Permissible wastage should not be exceeded. Waste generated shall be accountable subject to the following :

o) Permissible wastage (Accountable + Un-accountable) allowed towards cutting and fabrication of pipes/structures are as follows

1. CS Pipes : 7%

2. SS pipes / SS plate : 5%

3. Structural : 7%

Out of the above unaccountable / irretrievable wastage shall be allowed upto a maximum of 3% in case of CS structural and plates & 2% in case of SS structural and plates, 3% in case of CS pipes and 2% in case of SS pipes of installed quantity. These figures shall be treated as limits and not as the guidelines for the material account.
Balance wastage shall be accountable by weight for pipe /structural.

1.15.7.2 **DEFINITION OF PIPE/STRUCTURAL SCRAP :**

a) CS/SS pipes 80mm dia and below – pipe pieces less than 2 meters shall be treated as scrap.
b) CS/SS pipes, all sizes above 80mm dia - pipe pieces below 1 meter shall be considered as scrap.
c) Pipe fittings and valves shall not be accepted as scrap. However, the welded fittings and valves, which are rendered surplus by virtue of change in layout, drawings, errors, etc. shall be deposited to engineer's stores after the edges have been prepared by the contractor without any extra charges.
d) Structural steel member less than 1 meters shall be treated as scrap.
e) CS / SS plate of less than 0.25 SqM will be treated as scrap.

1.11.7.1 CUTTING SCHEDULE :

The contractor shall furnish the cutting schedule for the acceptance of the engineer prior to starting fabrication of free issue liner work. This is required to cut down the amount of scrap at the end of the contract. Wastage (scrap and surplus) shall be calculated as per approved cutting schedule.

1.15.7.3 **MATERIAL SUPPLY FROM CONTRACTOR:**

The following items are required to be supplied as per specification and drawings.

a) Structural steel (carbon steel & stainless steel) such as plate, angle, channel, beams, structural pipes of various sizes including gratings for metal platform work.
b) Ceramic blankets, glass cloth, foil, aluminum & stainless steel cladding for thermal insulation including connected ancillaries.
c) Elastomeric rubber for cold insulation including connected ancillaries.
d) Epoxy paints of Russian and Indian make.
e) NDE consumables, Welding consumables like gases and other erection related consumables.

1.15.8 **NPCIL approved Vendors for Material supply:**

The Contractor shall supply all materials required for the work as specified in the drawings from reputed manufacturers as given below in table.

The Engineer shall have the right to test random samples to prove authenticity of the test certificates produced by the Contractor at no extra cost to BHEL. Any material not found meeting the requirements shall be rejected and such rejected materials shall be removed from the site.

LIST OF REPUTED MANUFACTURES OF VARIOUS MATERIALS

Sl.No	Name of Suppliers / Manufacturer	Confirming to Standards
I	**STRUCTURAL STEEL**	
1	M/s. TATA Iron & Steel Co. Ltd.	Rolled Sections confirming to IS:2062 Gr.B0 & BR Pipe upto 150 mm IS:1239. Pipes above 150mm IS:3589.
2	M/s. Steel Authority of India Ltd.	
3	M/s. Indian Iron & Steel Co. Ltd.	
4	M/s. Rashtriya Ispat Nigam Ltd.	
II	**STAINLESS STEEL**	
1	M/s Steel Authority of India Ltd	Plates A-240 type 304/ 304L/321 Pipes A-312 type 304/304L/321
2	M/s TATA Iron & Steel Co	
3	M/s India Iron & Steel Co, Ltd	
4	M/s Rashtriya Ispat Nigam Ltd	
5	M/s. MIDHANI	
III	**EPOXY PAINT**	
1	M/s. Asian paints	For specifications refer Sec.V.
2	M/s. Berger paints	

3	M/S Akzo Nobel India Limited	
4	OC-51-03 high temp. radiation resistant paint	Russian Make
IV	**INSULATION**	
1	M/s Lloyd Insulation M/s Simonds Ceramics M/s Aarvi Industrial Materials M/s FURNACE INDIA	HOT INSULATION-Ceramic Wool
2	M/s- ARMACELL M/s K Flex M/s Aero flex	Cold Insulation-Nitrile rubber
3	M/s Urja Fabrics	Glass Fabric

Note:

Pre-qualification of materials is not required for the materials, where indicated above. However, material test certificates shall be submitted during supply. For any other materials as well as for the listed materials where new vendor is proposed, the contractor has to make arrangement to pre-qualify the vendor well in advance. The materials are to be procured from the vendors approved by NPCIL. Contractor shall strictly follow this condition, if any materials are found procured from UN -approved vendors of NPCIL are straight away rejected.

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1.16 FOUNDATIONS, GROUTING AND CIVIL WORKS

The scope of the work will comprise of but not limited to the following:

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

1.16.1 Foundation for the equipments to be erected shall be provided by BHEL/ clients of BHEL. The dimension of the foundation and anchor bolt pits shall be checked by the contractor for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench mark etc. Contractor should log before taking over the foundations for erection. All adjustments of foundations surfaces, enlarging the pockets in foundations etc. as may be required for the erection of equipments, plants shall be carried out by the contractor within the quoted rate.

1.16.2 Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., de-watering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form / shuttering work are within the scope this work.

1.16.3 It shall be contractor's responsibility to check the various equipment foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Also minor chipping, dressing of foundations up to 25 mm for obtaining proper face / elevation for packer plates/shims, and may be required for the erection of the equipment/plants shall have to be carried out as per BHEL Engineers instructions by the contractor within the quoted rate.

1.16.4 Preparation of foundation: Providing necessary skilled and other labour to BHEL / Customer for checking of dimensional accuracy, axis, elevation, levels etc., with reference to bench marks of foundations and anchor bolts pits shall be in the scope of the work. Contractor should log before taking over the foundations for erection.

1.16.5 The concrete foundation, surfaces shall be properly prepared by chipping, dressing of foundations up to 25 mm as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment.

1.16.6 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments. All minor adjustments up to 25 mm of foundation level, dressing, chipping of foundation surface enlarging the

pockets in foundations and grouting of equipments etc. as may be required for the erection of equipments / plants shall be carried out by the Contractor.

1.16.7 Foundation pockets are to be cleaned thoroughly before placing the columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.

1.16.8 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment.

1.16.9 Packer plates should not only be blue matched with foundation but also with foundation frame, inter-packer contact surfaces between the packers and foundation frame etc. Blue matching shall be by Prussian blue match checks and required percentage contact shall be achieved by chipping and scrapping as per BHEL Engineers instructions.

1.16.10 The contractor shall ensure perfect matching of packer plates with foundation by dressing the foundation and between the packer plates and the base plate of structural column / equipment to the satisfaction of BHEL Engineer. Matching of packer shall be carried out by the Contractor at his cost.

1.16.11 Contractor shall carry out scrapping and blue matching of embedment plates / packers of rotating equipments so as to achieve prescribed percentage of contact. Chipping and bedding of concrete surfaces, finely dressing up to the extent required to obtain contact between packer and concrete, is also covered in the scope of the work. The fine dressing of concrete shall be with blue matching checks.

1.16.12 Shims and packer plates required for temporary use are to be arranged by the contractor within the quoted rate.

1.16.13 BHEL will provide only shims and packer plates (either machined or plain), which will go as permanent parts of the equipment at free of cost.

1.16.14 Certain packer plates and shims over and above the quantity received as part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / sheets at site by the contractor to meet site requirement. Contractor shall cut and prepare packers and shims by gas cutting or chiseling, grinding and filing for de-burring the packers at his own cost. Raw materials required for the above will be arranged by BHEL free of cost.

1.16.15 Works such as minor rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin etc. are covered in the scope of work.

1.16.16 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification as advised by the Engineer or BHEL after preparing the foundation surface for grouting. The contractor has to arrange, a representative from the supplier of special cement for witnessing the grouting and other works at their cost including any miscellaneous expenditure for this activity. BHEL will not

pay any service and incidental charges for arranging the supplier representative. The contractor to take note of this aspect and quote accordingly.

1.16.17 Grouting of equipments is included in the scope of contractor. All the materials required for grouting including special cements like CONBEXTRA- GP2 or its equivalent grade free flow cement as approved by BHEL/Customer and other materials like Portland cement, sand, gravel etc., are to be arranged by the contractor within the quoted rate. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.

1.16.18 Contractor shall arrange the required nos. of mixing machines and vibrators at their cost for carrying out the grouting operation. All the materials like cement and cleaning consumables shall also be arranged by the contractor at his cost.

1.16.19 The certificates of the grout are to be submitted BHEL. If necessary, test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.

1.16.20 Any additional quantity of grouting materials required for above and also for all other equipments to be arranged by the bidder within the quoted cost.

1.16.21 PROCEDURE FOR GROUTING:

Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per supplier's recommendation / IS standard. Copy of these recommendations to be submitted to BHEL for records.

VOLUME - IA PART- I CHAPTER - XVII

1.17 HOUSE KEEPING

1.17.1 MAINTENANCE OF CLEAN SITE CONDITIONS AND HOUSEKEEPING

1.17.1.1 CONSTRUCTION MATERIALS AND DEBRIS

During the execution of work the Contractor shall keep the entire site in neat and tidy conditions always by proper housekeeping and stacking of construction materials at site and by removing all debris and waste material regularly, on day to day basis if necessary.

Contractor shall arrange suitable portable metallic storage bins to store construction materials at site. No material shall be allowed to be spread at site directly on roads / floors. All the garbage and waste material shall be disposed off regularly at the designated area as specified by the Engineer.

Accumulation and piling up of construction materials /debris/ tool boxes will not be permitted except only at the locations approved for this purpose. Material required for use for next 3 days only shall be stacked in the building keeping a clear passage for movement of personnel.

1.17.1.2 CONTRACTOR'S CONSTRUCTION SITE OFFICE

Contractor's site office within the construction area for his engineers and labour shall be established using the standard Porta Cabins or containers and no site office shall be allowed inside the building. No make shift structures are permitted. The facilities to be built by the contractor shall be aesthetically pleasing and shall match with the general surrounding of KKNPP site.

1.17.1.3 OTHER REQUIREMENTS

It is also essential that contractor keeps all his moving machinery viz. vehicles etc. in neat and clean condition during entry & exit to/ from plant

site and to achieve this contractor shall keep suitable arrangement for washing at his own cost.

The service lines viz. water, air, power cable, welding lead etc. shall not run on the floor but shall be routed by providing hangers on the walls and ceiling.

Smoking, chewing of tobacco/Pan etc is not permitted in the Project premises; hence these shall not be brought into the project site. Identity card/Entry pass of any person found indulging in any such activities will be confiscated and will be removed from site without any explanations.

1.17.1.4 **TOILET FACILITY AT WORK SITE**

Contractor shall establish toilet facility comprising of urinals and IWCs outside the construction site near rest room at site and labour camp along with water supply arrangements, disposal of waste, lighting, ventilation, washing facility, drainage arrangement, cleaning facility, etc., and shall maintain them in clean condition at all times by deploying suitable persons.

In addition, Contractor shall establish mobile toilet facility comprising of urinals and IWCs within the nuclear island along with provisions for water supply, lighting, ventilation, washing facility, cleaning facility, etc., and shall maintain them in clean condition at all times by deploying suitable persons. The numbers and the location of these toilet blocks shall be decided with the consent of Engineer. These mobile toilet blocks shall be shifted as and when required as the work progresses. As guidance contractor may adopt the design of public toilet facilities provided by M/s.Sulabh International.

For disposal of the sewage, contractor shall make his own arrangement to connect / dispose the sewage to the STP established by NPCIL at plant site/ labour camp.

Workers are not permitted to take their lunch in work spot and other erection area of plant. They shall use the covered lunch shed provided by BHEL

Note: BHEL Provide Lunch shed for workers for taking lunch inside the plant area at free of cost. However agency, workers and all concerned are to co- operate with BHEL for Maintaining the shed in clean condition

1.17.1.5 **USE OF STORAGE AREAS AND LAND**

Warehouse, shed, workshop and office facilities as required by the Contractor shall be provided by him at his own expenses. Prior approval of the Engineer shall be obtained in respect of location layout and details of these buildings. After the work is completed, these temporary facilities shall be removed by the Contractor at his own expense to the satisfaction of the Engineer.

1.17.2

HOUSEKEEPING ORGANIZATION OF THE CONTRACTOR

With reference to deployment of housekeeping supervisor, the following minimum requirement shall be fulfilled:

Sr. No.	Manpower per Shift	Housekeeping In charge	No. of Supervisors to be appointed	No. of workmen to be appointed
1	Up to 100	0	01	one sweeper per 200 Sq Mtrs of allotted area
2	100 to 500	01	02	
3	Above 500		1 for every addl. 500 workers in addition to number mentioned against Sr. No. 2	

1.17.3 **QUALIFICATION OF HOUSEKEEPING SUPERVISOR SHALL BE AS FOLLOWS:**

- Housekeeping In charge:

  Any Degree / Diploma in engineering with two years project/ Industrial experience

- Housekeeping Supervisor:

  +2 with one-year Project/ Industrial experience or Any diploma

1.17.4 **TRAINING REQUIREMENTS**

a) Along with the induction safety training, the workmen should undergo housekeeping training along with safety training.

b) Housekeeping workers shall undergo training in usage of housekeeping equipments and tools such as vacuum cleaners.

c) The typical syllabus for the training is as follows

- Aims and Objectives of housekeeping.
- DOs and DON'Ts on construction housekeeping activities.
- Films on construction housekeeping and feedback.

1.17.5 **REQUIREMENTS AND SPECIFICATION OF TOOLS**

a) Contractor shall submit a list of housekeeping tools that shall be used during the course of the work, to BHEL before the commencement of work.

b) Contractors must maintain adequate stock of housekeeping tools (HKT) and as given below conforming to relevant Indian standards (or relevant international standards), required to be used during execution of the work.

c) These tools and appliances must be inspected quarterly by housekeeping supervisor of Contractor and records of such inspection shall be maintained.

Sl. No.	Description	Minimum Qty. required/available at any given time (in nos) for one major building.

1	Industrial vacuum cleaner (with wet mopping facility)	1
2	Cob webs remover	2
3	Brooms	8
4	CS / Plastic Dustbin	8
5	Trolley	2
6	Ladders (3mtrs)	2
7	Waste carrying baskets	4
8	Ladders (6mtrs)	1
9	V type ladders	1
10	Cleaning brushes	10
11	Caution board (wet cleaning and cleaning in progress)	16
12	Wet and dry-cleaning duster/cloths	4

Additional quantity of above equipment and any other item required for works shall be arranged by Contractor without any extra cost. Different major buildings shall be equipped with above tools and for smaller building and structures tools form a pool shall be used.

1.17.6 **HOUSE KEEPING WORK PRACTICES:**

Housekeeping is very essential to provide safe working area for construction personnel and for movement of the machineries. In order to achieve this objective; a two-part housekeeping policy is adopted. As first part Contractor has to maintain certain housekeeping practices for his own works. In addition to this, for up keeping of overall plant area and areas where multiple agencies work simultaneously, different

package Contractors shall be responsible for maintaining general housekeeping in the allocated specific area to them.

1.17.7 **HOUSEKEEPING OF OWN WORKS:**

a) The Contractor shall at all time keep his work spot, site office, workshops and surroundings clean and tidy from rubbish, scrap, surplus materials and unwanted tools and equipment.

b) Welding and other electrical cables shall be so routed to allow safe traffic by all concerned. Cables shall not be spread on floor; it shall be properly supported / clamped along the wall.

c) No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Engineer-In-Charge may require the Contractor to remove any materials which are considered to be of danger or cause inconvenience to the public. In case Contractor fails to comply with the instruction of Engineer-In-Charge, he may get the work done at the risk and cost of the Contractor.

d) The Contractor shall on day to day basis remove from the work place all unwanted scaffoldings, surplus materials, rubbish, etc.

e) The Engineer-In-Charge has the right to stop work if the Contractor fails to improve upon the housekeeping after having been notified.

f) Contractor shall keep supervisor and supporting staff exclusively for housekeeping of own works.

g) Contractor shall submit the minimum manpower deployment schedule on monthly basis based on the approved housekeeping plan/ schedule for the approval of the ENC.

1.17.8 **HOUSEKEEPING OF THE ASSIGNED AREA / BUILDING:**

From the time of release of area/fronts Contractor is responsible for maintaining and up keeping of the all the areas/ SSC under this contract. He shall ensure his sub-contractors maintain proper housekeeping. While handing over the area from the civil Contractor, it shall be ensured that civil works have been substantially completed. This point of time onwards till all works of the Contractor in the building is completed, notwithstanding the fact that other Contractors are also working in the same area; it shall be the responsibility of the Contractor to maintain general cleanliness in the area assigned to him. In order to maintain general cleanliness in the area, the Contractor may take the help / assistance from the agencies working in the same area and he shall also extend all cooperation to other Contractors for such works. However, overall responsibility of housekeeping of the assigned area shall lie with the Contractor.

1.17.9 **GENERAL DESCRIPTION OF WORK**

SL NO	OPERATION	MINIMUM FREQUENCY OF OPERATION
1	Cleaning and Sweeping of construction area, all floors, staircase, platform, and wiping of handrails, equipment, JBs, pipes and etc	Daily
2	Wet mopping of floors	Weekly
3	Vacuum cleaning of floors	Monthly or as and when required
4	Debris removal from dust bin, baskets placed in the respective building.	weekly or as and when required

1.17.10 **SCOPE FOR EXECUTION OF HOUSEKEEPING WORK:**

a) Cleaning and sweeping of construction area, storage area, floors, staircase, platform, anything and everything up to ceiling height and ceiling, as per the frequency indicated in the table.

b) Removal of cobwebs, putting the collected debris other than structural materials in the dustbin kept at the specified location on every day basis for the different areas as per agreed schedule. Disposal of collected structural materials within a distance of 2Km on regular intervals.

c) Cutting of bushes and up keeping of open storage areas

d) Lifting, carrying and disposal of all generated debris such as structural pieces, cable pieces, cable trays, ducts, wooden pieces, packing materials, piping material etc. and all other generated scrap from allotted building within a distance of 2 Km on regular intervals.

e) Disposal of debris from dust bins/baskets placed in the respective building within a distance of 2 Km on once in a week basis or as and when required.

f) The Contractor shall arrange his own equipment's and tools required for this work like trolleys, ladders, buckets, dust bins, brooms, industrial vacuum cleaner, brushes, wiping cloths or any other material required for the cleaning.

g) The storage and security of his materials and equipment shall be the sole responsibility of the Contractor and shall have no right to claim for any loss/theft or damage of the same.

h) The exclusive work force shall be deputed for the this work and work force deployed for this general housekeeping shall not be diverted for any other job or for his own house keeping jobs.

i) All deployed work force shall be provided with dress (with proper code), safety and cleaning gears and in no case work should stop for want of gears.

1.17.11 **PROVIDING WORK FORCE / STAFF:**

The Contractor shall deploy adequate manpower as per clause 1.15.2 at his own account & responsibility. At the time of allotment of the area for up keeping, the name of contractor's officials in charge for housekeeping, herein after referred as "Housekeeping in charge" (HIC) of the area shall be conveyed by the Contractor to the ENC. These HIC shall report the daily performance to the ENC or his authorised representative.

1.17.12 **REPORTING:**

a) The Housekeeping Supervisor(s) should report daily to the AIC (Area in charge) & take day-to-day instructions.
b) The Contractor shall make sure that Housekeeping Supervisor(s) is necessarily available during working hours for receiving & implementing the Instructions of the AIC.
c) It shall be the responsibility of the Contractor to get the attendance of the housekeeping staff verified by AIC.
d) The weekly / fortnightly / monthly jobs should be planned by Housekeeping Supervisor(s) in consultation with AIC in such a manner that these are spread over the entire week and done during office hours.
e) However, certain jobs will necessarily be carried out during Sundays, for which instructions should be taken by the Housekeeping Supervisor(s) from AIC.

f) Proper registers/records of the jobs carried out on daily, weekly, fortnightly and monthly basis will be maintained by the Housekeeping Supervisor(s) and

g) will be countersigned by the AIC on daily basis and finally at the end of each month by ENC. Approval of ENC shall be obtained for the report formats.

h) Housekeeping Supervisor shall remain in his area most of the time and shall have information about agencies working/ material stacked in his area. Suitable control system may be devised for the same.

i) The Contractor shall be equipped to handle the special/emergency services even at short notice.

j) All equipment deployed shall be of quality standard.

k) Housekeeping Supervisor shall not allow those materials which affect the up keeping and fire hazards to building. Ex: wooden planks, drums, and scaffolding materials which are not painted.

1.17.13 **SANITATION / TOILET FACILITY AT WORK SITE**

Contractor shall establish toilet facility comprising of urinals and IWCs within the construction site along with water supply arrangements, disposal of waste, lighting, ventilation, washing facility, drainage arrangement, cleaning facility, etc., and shall maintain them in clean condition at all times by deploying suitable persons.

The numbers and the location of these toilet blocks shall be decided with the consent of Engineer and in line with GCC guidelines. As guidance, contractor may adopt the design of public toilet facilities provided by M/s. Sulabh International. For disposal of the sewage, NPCIL STP may be used.

1.17.14 **DISPOSAL OF WASTE AND DEBRIS**

During the execution of work, the Contractor shall keep the entire site in neat and tidy conditions always by proper housekeeping and stacking of construction materials at site and by removing all debris and waste material regularly, on day to day basis if necessary.

Contractor shall arrange suitable portable metallic storage bins to store construction materials at site. No material shall be allowed to be spread at site directly on roads / floors. All the garbage and waste material shall be disposed off regularly at the designated area as specified by the Engineer.

The curing water shall be constantly removed from various areas / floors by adopting temporary dewatering scheme in the buildings and maintain the site in hygienic condition.

All soil, filth or other matter of an offensive nature taken out of any trench, sewer, drain, cesspool or other place shall not be deposited on the surface, but shall at once be carried away by contractor, from the site of work for suitable and proper disposal.

VOLUME - IA PART- I CHAPTER - XVIII

Tentative Weight Schedule for Kudankulam Nuclear Reactor Works in Unit 3 & 4

(NPCIL Free Issue)

S.No.	Particulars	Unit	Qty (approx.)
1	**Equipment**		
1.1	Static and rotary equipment's including NSSS (Nuclear Steam supply system equipment's)	MT	15500
2	**Pipeline Parts**		
2.1	Stainless steel pipe material	MT	1677
2.2	Carbon steel pipe material		
2.3	Carbon Steel and stainless-steel pipe fittings		
3	**Valves**		
3.1	Carbon steel and stainless-steel valves of various types, orifice, traps, remote drives	MT	783
4	**Pipe support material**	MT	739
5	**Stainless steel Liner and other SS structural steel**	MT	140
6	**Detachable thermal insulation blocks**	MT	147
7	**Ventilation package**		
7.1	Equipment erection	MT	183

Note: For scope of supply by contractor kindly refer BOQ.

TENTATIVE LIST OF EQUIPMENT (NSSS - Nuclear Steam Supply System)

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SL. NO	SCHEDULE	BOQ ITEM NO	BUILDING	NAME OF THE EQUIPMENTS	QUANTITY UNIT-3 & COMMON	UOM	MASS (Per Unit)	MASS (For Both Units)	LOCATION (ELEVATION)	TYPE OF EQUIPMENT
1	SCHEDULE-A	1.1	UJA	Support Ring and accessories	1	Kg	20240	40480	UJA+17,100	Special
2	SCHEDULE-A	1.1	UJA	Thrust Truss ,Thrust Ring and accessories	1	Kg	24444	48888	UJA+22,510	Special
3	SCHEDULE-A	1.1	UJA	Reference Specimen	1	Kg	372	744	UJA + 15,500 +17,110	Special
4	SCHEDULE-A	1.2	UJA	Reactor Pressure Vessel (RPV)	1	Kg	316700	633400	UJA +17,110	Special
5	SCHEDULE-A	1.2	UJA	RPV separating bellow	1	Kg	2060	4120	UJA +22,510	Special
6	SCHEDULE-A	1.2	UJA	Core Barrel assembly	1	Kg	75200	150400	UJA inside the reactor vessel	Special
7	SCHEDULE-A	1.2	UJA	Core Baffle assembly	1	Kg	35100	70200	UJA inside the reactor vessel	Special
8	SCHEDULE-A	1.2	UJA	Protective Tube Unit assembly	1	Kg	68200	136400	UJA inside the reactor vessel	Special
9	SCHEDULE-A	1.2	UJA	Upper Unit assembly	1	Kg	131889	263778	UJA +22,514	Special
10	SCHEDULE-A	1.2	UJA	parts of main seal(RPV main stud , washer & Nut)	1	Kg	22964	45928	UJA +22,514	Specia

										l
11	SCHEDULE-A	1.3	UJA	Upper unit alignment device	1	Kg	6853	13706	UJA from +22,700 to +31,840	Specia l
12	SCHEDULE-A	1.3	UJA	Protective steel structure	1	Kg	35874	71748	UJA from +28,000 to +31,840	Specia l
13	SCHEDULE-A	1.3	UJA	Electric equipment and heat control of reactor	1	Kg	2953	5906	UJA from +28,000 to +31,840	Specia l
14	SCHEDULE-A	1.3	UJA	Thermal insulation and biological shielding of nozzle area	1	Kg	23893	47786	UJA from +17.100 to +22.00	Specia l
15	SCHEDULE-A	1.3	UJA	Upper unit thermal insulation	1	Kg	11450	22900	UJA +22,510 to 25.000	Specia l

TENTATIVE LIST OF EQUIPMENT (NSSS - Nuclear Steam Supply System)

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SL. NO	SCHEDULE	BOQ ITEM NO	BUILDING	NAME OF THE EQUIPMENTS	QUANTITY UNIT-3 & COMMON	UOM	MASS (Per Unit)	MASS (For Both Units)	LOCATION (ELEVATION)	TYPE OF EQUIPMENT
16	SCHEDULE-A	1.3	UJA	Detection unit motion mechanism	1	Kg	3720	7440	UJA +31.700	Special
17	SCHEDULE-A	1.3	UJA	Device for removal of control and protection system device(jib crane)	1	Kg	8900	17800	UJA from +31,700 to	Special
18	SCHEDULE-A	1.4	UJA	Core barrel transportation device	1	Kg	69480	138960	UJA from +10,530 to +31,840	Special
19	SCHEDULE-A	1.4	UJA	PTU transportation platform	1	Kg	24200	48400	UJA from +10,530 to +31,840	Special
20	SCHEDULE-A	1.4	UJA	PTU spacer	1	Kg	37360	74720	UJA from +10,530 to +31,840	Special
21	SCHEDULE-A	1.4	UJA	PTU hatch	1	Kg	38652	77304	UJA from +10,530 to +31,840	Special
22	SCHEDULE-A	1.4	UJA	Racks for electromagnet Unit	1	Kg	9060	18120	UJA from +10,530 to +31,840	Special

23	SCHEDULE-A	1.4	UJA	Racks for drive Housing	1	Kg	6700	13400	UJA from +10,530 to +31,840	Special
24	SCHEDULE-A	1.4	UJA	Racks for moving units and CPS drive examination shafts	1	Kg	9420	18840	UJA from +10,530 to +31,840	Special
25	SCHEDULE-A	1.4	UJA	Racks for pitch position indicator	1	Kg	2100	4200	UJA from +10,530 to +31,840	Special
26	SCHEDULE-A	1.4	UJA	Platform for examination of upper Unit	1	Kg	6880	13760	UJA from +10,530 to +31,840	Special
27	SCHEDULE-A	1.4	UJA	Ladder, Pulley Assembly, Cone and cover centering block.	1	Kg	588	1176	UJA from +10,530 to +31,840	Special
28	SCHEDULE-A	1.4	UJA	Guide alignment system of PTU	1	Kg	2568	5136	UJA from +10,530 to +31,840	Special

TENTATIVE LIST OF EQUIPMENT (NSSS - Nuclear Steam Supply System)

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SL. NO	SCHEDULE	BOQ ITEM NO	BUILDING	NAME OF THE EQUIPMENTS	QUANTITY UNIT-3 & COMMON	UOM	MASS (Per Unit)	MASS (For Both Units)	LOCATION (ELEVATION)	TYPE OF EQUIPMENT
29	SCHEDULE-A	1.4	UJA	Guide alignment system of Core Barrel	1	Kg	2836	5672	UJA from +10,530 to +31,840	Special
30	SCHEDULE-A	1.4	UJA	Air duct	1	Kg	332	664	UJA + 26.00 Meter	Static
31	SCHEDULE-A	1.5	UJA	Mounting traverse	1	Kg	20708	20708	UJA +31.700	Special
32	SCHEDULE-A	1.5	UJA	Universal traverse	1	Kg	9612	19224	UJA +31.700	Special
33	SCHEDULE-A	1.5	UJA	Bed for turning reactor vessel	1	Kg	24245	24245	UJA +22,510 to 24.000	Special
34	SCHEDULE-A	1.5	UJA	Platform for the reactor vessel neck	1	Kg	4216	4216	UJA +22,510	Special
35	SCHEDULE-A	1.5	UJA	Container for stud, nut and washer	1	Kg	3260	6520	UJA +31.700	Special
36	SCHEDULE-A	1.5	UJA	Cross-piece for SG mounting	1	Kg	8319	8319	NA	Special
37	SCHEDULE-A	2.1	UJA	steam generator & steam generator support assembly	4	Kg	1692000	3384000	UJA, +20 m EL	Special

38	SCHEDULE-A	2.2	UJA	steam generator accessories	4	Kg	35000	70000	UJA, +20 m EL	Special
39	SCHEDULE-A	3.1	UJA	Reactor coolant pump and its support assembly	4	Kg	600000	1200000	UJA, +20 m EL	Special
40	SCHEDULE-A	3.2	UJA	Reactor coolant pump accessories	4	Kg	70000	140000	UJA, +20 m EL	Special
41	SCHEDULE-A	4.1	UJA	pressurizer and its supporting shell.	1	Kg	218000	436000	UJA, +20 m EL	Special
42	SCHEDULE-A	4.2	UJA	Pressurizer thrust ring assembly	1	Kg	8000	16000	UJA, +20 m EL	Special
43	SCHEDULE-A	4.3	UJA	pressurizer accssories	1	Kg	1000	2000	UJA, +20 m EL	Special
44	SCHEDULE-A	5.1	UJA	Emergency core cooling system tank (1st stage)	4	Kg	313500	627000	UJA ,+29.7m EL	Special
45	SCHEDULE-A	5.2	UJA	Hydro accumulators accessories	4	Kg	1104	2208	UJA ,+29.7m EL to + 41.5 M EL	Special

TENTATIVE LIST OF EQUIPMENT (NSSS - Nuclear Steam Supply System)

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SL. NO	SCHEDULE	BOQ ITEM NO	BUILDING	NAME OF THE EQUIPMENTS	QUANTITY UNIT-3 & COMMON	UOM	MASS (Per Unit)	MASS (For Both Units)	LOCATION (ELEVATION)	TYPE OF EQUIPMENT
46	SCHEDULE-A	5.3	UJA	ECCS 2nd Stage Hydro Accumulator Tanks, supports,	8	Kg	754776	1509552	UJA ,+31m EL	Special
47	SCHEDULE-A	5.4	UJA	ECCS 2nd Stage Hydro accumulators accessories	8	Kg	300	600	UJA ,+31.7 m EL to + 42.5 M EL	Special
48	SCHEDULE-A	5.5	UJA	Quick boron injection system Tank	4	Kg	113550	227100	UJA ,+14.14m EL	Special
49	SCHEDULE-A	5.6	UJA	Quick boron injection system Tank accessories	4	Kg	1344	2688	UJA ,+14.14m EL TO 18 M EL	Special
50	SCHEDULE-A	6.1	UJA	Passive heat removal heat exchanger shell (casing) including beams, front panel, back panel, side panels, central panel, dome covers, crossbar etc,.	12	Kg	182040	364080	UJA 43.5 m EL	Special
51	SCHEDULE-A	6.2	UJA	heat exchanger including spline plate,pin etc,.	12	Kg	413350	826700	UJA 43.5 m EL	Special
52	SCHEDULE-A	6.3	UJA	Inlet dampers, expansion duct, reducing duct, duct of bottom & top part, regulating device, electro magnets, outlet dampers, shell members, transision members, compensator group, sealing gland Power pack, operating mechanism, distributing panel etc,.	12	Kg	460000	920000	UJA 43.5 m EL	Special
53	SCHEDULE-A	6.4	UJA	PHRS round duct including KLB pipeline support assembly	12	Kg	322760	645520	UJA ,+44.2M .EL TO 64 M .EL	Special

54	SCHEDULE-A	7.1	UJA	Pressurizer heaters	28	Kg	5398	10796	+23.0 M EL	Special
55	SCHEDULE-A	7.2	UJA	Emergency core cooling system heaters	4	Kg	800	1600	+31.7 M EL	Special
56	SCHEDULE-A	7.3	UJA	quick boron injection system heaters	4	Kg	800	1600	+14.140 M EL	Special
57	SCHEDULE-A	8.1	UJA	Hydraulic shock absorbers (R-450) of Steam generators	32	Kg	56000	112000	+23.0 M EL	Special
58	SCHEDULE-A	8.2	UJA	Hydraulic shock absorbers (R-300) of Reactor coolant pumps	8	Kg	9000	18000	+25.0 M EL	Special
59	SCHEDULE-A	8.3	UJA	Hydraulic shock absorbers (R-100) of Pressurizer pipelines	14	Kg	8500	17000	UJA ,+17m EL to + 41.5 M EL	Special
60	SCHEDULE-A	8.4	UJA	Hydraulic shock absorbers (R-50) of Pressurizer pipelines	4	Kg	1400	2800	UJA ,+17m EL to + 41.5 M EL	Special
61	SCHEDULE-A	8.5	UJA	Hydraulic shock absorbers (R-100) of ECCS pipelines	3	Kg	4600	9200	UJA ,+17m EL to +20 M EL	Special
62	SCHEDULE-A	8.6	UJA	Hydraulic shock absorbers (R-50) of ECCS pipelines	6	Kg	1500	3000	UJA ,+17m EL to +20 M EL	Special

TENTATIVE LIST OF EQUIPMENT (NSSS - Nuclear Steam Supply System)										
Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2. (2) The quantities of KKNPP Unit-3&4 is subject to change.										
SL. NO	**SCHEDULE**	**BOQ ITEM NO**	**BUILDING**	**NAME OF THE EQUIPMENTS**	**QUANTITY UNIT-3 & COMMON**	**UOM**	**MASS (Per Unit)**	**MASS (For Both Units)**	**LOCATION (ELEVATION)**	**TYPE OF EQUIPMENT**
63	SCHEDULE-A	8.7	UJA	Hydraulic shock absorbers (R-50) of JDJ pipelines	16	Kg	6500	13000	UJA ,+15m EL to +22 M EL	Special
64	SCHEDULE-A	8.8	UJA	connected tubing, level indicators for hydraulic shock absorbers of various types (R-	83	Kg	1245	2490	UJA ,+14.15 m TO + 44 m EL.	Special
65	SCHEDULE-A	8.9	UJA	Installation of position indicators for hydraulic shock absorbers of various types (R- 450,R-300,R-100,R-50)	83	Kg	498	996	UJA ,+14.15 m TO + 44 m EL.	Special
66	SCHEDULE-A	9	UJA	DTIB PRE FABRICATED INSULATION BLOCKS	3500 Sqmtr (4370 nos)	Kg	73500	147000	UJA ,+14.15 m TO + 44 m EL.	Special
67	SCHEDULE-B	1	UJA	Main coolant pipelines	1	Kg	260000	520000	UJA +18.7	Special
TOTAL						**Kg**	**6687813**	**13318138**		

TENTATIVE LIST OF EQUIPMENT (OTHER THAN NSSS)

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SL.NO	SCHEDULE	BOQ ITEM NO	BUILDING	NAME OF THE EQUIPMENTS	QUANTITY UNIT-3 & COMMON	UOM	MASS (Per Unit)	MASS (For Both Units)	LOCATION (ELEVATION)	TYPE OF EQUIPMENT
1	SCHEDULE-C	1.1	UJA	Refuelling Machine	1	Kg	80677	161354	+31.700	STATIC
2	SCHEDULE-C	1.1	UJA	Fuel Pool Equipments	1	Kg	235031	470062	+12.000	STATIC
3	SCHEDULE-C	1.1	UJA	Fuel Cask Shock Absorber	1	Kg	34480	68960	+12.000	STATIC
4	SCHEDULE-C	1.1	UJA	Universal Seat	1	Kg				STATIC
5	SCHEDULE-C	1.1	UJA	Vertical Stand	1	Kg	4140	8280	+31.700	STATIC
6	SCHEDULE-C	1.1	UJA	Bath For Decontamination Of Cpsr	1	Kg	2250	4500	+31.700	STATIC
7	SCHEDULE-C	1.1	UJA	Transport (Equipment) Air Lock	1	Kg	280000	560000	+31.700	STATIC
8	SCHEDULE-C	1.1	UJA	Fuel Cask Lifting Travers	1	Kg	10800	21600	+31.700	STATIC
9	SCHEDULE-C	1.1	UJA	Lock And Carriage	1	Kg	39120	78240	+31.700	STATIC
10	SCHEDULE-C	1.1	UJA	Protective Rolling	1	Kg	64760	129520	+31.700	STATIC
11	SCHEDULE-C	1.4.2	UJB	Submersible Pumps	1	Kg	220.00	440.00	5.400 M	STATIC
12	SCHEDULE-C	1.4.2	UJB	Submersible Pumps	1	Kg	220.00	440.00	5.400 M	STATIC

13	SCHEDULE-C	1.4.2	UJA	Submersible Pumps	1	Kg	220.00	440.00	5.400 M	STATIC
14	SCHEDULE-C	1.4.2	UJA	Submersible Pumps	1	Kg	220.00	440.00	5.400 M	STATIC
15	SCHEDULE-C	1.4.2	UJA	Submersible Pumps	1	Kg	220.00	440.00	1.500 M	STATIC
16	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
17	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC

TENTATIVE LIST OF EQUIPMENT (OTHER THAN NSSS)										
Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2. (2) The quantities of KKNPP Unit-3&4 is subject to change.										
SL.NO	**SCHEDULE**	**BOQ ITEM NO**	**BUILDING**	**NAME OF THE EQUIPMENTS**	**QUANTITY UNIT-3 & COMMON**	**UOM**	**MASS (Per Unit)**	**MASS (For Both Units)**	**LOCATION (ELEVATION)**	**TYPE OF EQUIPMENT**
18	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
19	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
20	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
21	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
22	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
23	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	25.1000	50.2000	10.000M	STATIC
24	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
25	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
26	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC

27	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
28	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
29	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
30	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
31	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
32	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
33	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	22.1000	44.2000	10.000M	STATIC
34	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	160.00	320.00	9.000M	STATIC

TENTATIVE LIST OF EQUIPMENT (OTHER THAN NSSS)										
Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2. (2) The quantities of KKNPP Unit-3&4 is subject to change.										
SL.NO	**SCHEDULE**	**BOQ ITEM NO**	**BUILDING**	**NAME OF THE EQUIPMENTS**	**QUANTITY UNIT-3 & COMMON**	**UOM**	**MASS (Per Unit)**	**MASS (For Both Units)**	**LOCATION (ELEVATION)**	**TYPE OF EQUIPMENT**
35	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	160.00	320.00	9.000M	STATIC
36	SCHEDULE-C	1.4.2	UJA	Sampling Heat Exchanger	1	Kg	160.00	320.00	9.000M	STATIC
37	SCHEDULE-C	1.4.2	UJA	Fuel Pool Leak Collection Tank	1	Kg	254.000	508.000	5.400M	STATIC
38	SCHEDULE-C	1.4.2	UJB	Hydrotest Pump	1	Kg	126.000	252.000	10.000M	STATIC
39	SCHEDULE-C	1.4.2	UJA	Heat Exchanger	1	Kg	1090.00	2180.00	20.500M	STATIC
40	SCHEDULE-C	1.4.2	UJA	Heat Exchanger	1	Kg	1090.00	2180.00	20.500M	STATIC
41	SCHEDULE-C	1.4.2	UJA	Tank For Ilrt	1	Kg	500.0	1000	35.450M	STATIC
42	SCHEDULE-C	1.4.2	UJA	Trap Filter	1	Kg	580.00	1160.00	7.000M	STATIC
43	SCHEDULE-C	1.4.2	UJA	Trap Filter	1	Kg	580.00	1160.00	7.000M	STATIC

44	SCHEDULE-C	1.4.2	UJA	Trap Filter	1	Kg	580.00	1160.00	7.000M	STATIC
45	SCHEDULE-C	1.4.2	UJA	Trap Filter	1	Kg	580.00	1160.00	7.000M	STATIC
46	SCHEDULE-C	1.4.2	UJA	Hydrogen Recombiner	1	Kg	7752.000	15504.000	5.400M-61.00M	STATIC
47	SCHEDULE-C	1.4.2	UJA	Hydrogen Recombiner	1	Kg	46.000	92.000	35.000M	STATIC
48	SCHEDULE-C	1.4.2	UJC	Annulus Passive Filteration System	6	Kg	6980	13960	UJC + 70 M. EL	STATIC
49	SCHEDULE-C	1.4.3	UJA	Sump filter	1	Kg	6000	12000	UJA +1.70 Mtr	STATIC
50	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +27.2 M EL.	STATIC
51	SCHEDULE-C	1.5	UJA	Relief Devieces Pyt 10/2000X1500	1	Kg	800	1600	UJA +27.2 M EL	STATIC

TENTATIVE LIST OF EQUIPMENT (OTHER THAN NSSS)

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SL.NO	SCHEDULE	BOQ ITEM NO	BUILDING	NAME OF THE EQUIPMENTS	QUANTITY UNIT-3 & COMMON	UOM	MASS (Per Unit)	MASS (For Both Units)	LOCATION (ELEVATION)	TYPE OF EQUIPMENT
52	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +23 M EL.	STATIC
53	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA + 22.6M EL	STATIC
54	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA + 22.6M EL	STATIC
55	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA + 21.5M EL.	STATIC
56	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +22.2 M EL	STATIC
57	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +21.5M EL	STATIC
58	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +20.45 M EL.	STATIC
59	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +25.2 M EL.	STATIC
60	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X1500	1	Kg	1010	2020	UJA +27.5 M EL.	STATIC
61	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2000X3000	1	Kg	1530	3060	UJA +21.5 M	STATIC

									EL.	
62	SCHEDULE-C	1.5	UJA	Relief Devieces Pyt 10/2000X3000	1	Kg	1350	2700	UJA + 22 M EL.	STATIC
63	SCHEDULE-C	1.5	UJA	Relief Devieces Pyt 10/2000X3000	1	Kg	1350	2700	UJA +26M EL.	STATIC
64	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/1000X2500	1	Kg	920	1840	UJA +25 M EL.	STATIC
65	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/1000X2500	1	Kg	920	1840	UJA +41.5 M EL.	STATIC
66	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2200X3650	1	Kg	1900	3800	UJA +41.5 M EL.	STATIC
67	SCHEDULE-C	1.5	UJA	Relief Devieces Pyb 10/2200X3650	1	Kg	1900	3800	UJA +41.5 M EL.	STATIC
68	SCHEDULE-C	1.5	UJE	Relief Devices Leaf With The Supports	3	Kg	6330	12660	UJE +26.2 M. EL	STATIC

TENTATIVE LIST OF EQUIPMENT (OTHER THAN NSSS)										
Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2. (2) The quantities of KKNPP Unit-3&4 is subject to change.										
SL.NO	**SCHEDULE**	**BOQ ITEM NO**	**BUILDING**	**NAME OF THE EQUIPMENTS**	**QUANTITY UNIT-3 & COMMON**	**UOM**	**MASS (Per Unit)**	**MASS (For Both Units)**	**LOCATION (ELEVATION)**	**TYPE OF EQUIPMENT**
69	SCHEDULE-C	1.5	UJE	Relief Devices Leaf With The Supports	1	Kg	1987	3974	UJE +26.2 M. EL	STATIC
70	SCHEDULE-C	1.5	UJE	Relief Devices Leaf With The Supports	3	Kg	8976	17952	UJE +26.2 M. EL	STATIC
71	SCHEDULE-C	1.5	UJE	Relief Devices Leaf With The Supports	3	Kg	8976	17952	UJE +26.2 M. EL	STATIC
72	SCHEDULE-C	1.5	UJE	Relief Devices Leaf With The Supports	3	Kg	6405	12810	UJE +26.2 M. EL	STATIC
73	SCHEDULE-C	1.5	UJE	Relief Devices Leaf With The Supports	1	Kg	1987	3974	UJE +26.2 M. EL	STATIC
TOTAL						**Kg**	**834849**	**1669698**		

LIST OF PIPING SYSTEMS WITH WEIGHT AND WELDING SCOPE

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	BUILDING	SCHEDULE	ITEM NO	WD NO	Material of construction	UOM	Weight of Piping		Weight of pipe supports		Small bore Inch Dia		Big Bore Inch dia	
							Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4
1	UJA	SCHEDULE-C	2	R01.KK.1UJA.FAK.TM.OK.WD002	SS	MT	11.9	11.9	8.2151	8.2151	85	85	2060	2060
2	UJA	SCHEDULE-C	2	R01.KK.1UJA.FAL.TM.OK.WD002	SS	MT	4.3186	4.3186	2.1816	2.1816	28	28	588	588
3	UJA	SCHEDULE-C	2	R01.KK.1UJA.FBA50.TM.OK.WD001	SS	MT	2.3831	2.3831	1.529	1.529	1017	1017	0	0
4	UJA	SCHEDULE-C	2	R01.KK.1UJA.FKA.TM.OK.WD002	SS,CS	MT	4.21	4.21	3.934	3.934	2860	2860	0	0
5	UJA	SCHEDULE-C	2	R01.KK.1UJA.JDJ.RP.MC.WD038	SS	MT	9.357	9.357	3.1	3.1	108	108	612	612
6	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEA01.TM.OK.WD001	SS	MT	0.6632	0.6632	0.744	0.744	354	354	0	0
7	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEA50.TM.OK.WD001	SS	MT	1.1229	1.1229	4.466	4.466	604	604	0	0
8	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEB10.TM.OK.WD001	SS	MT	1.3	1.3	0.5	0.5	320	320	0	0
9	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEB10.TM.OK.WD001	SS	MT	6.4565	6.4565	4.022	4.022	2379	2379	522	522
10	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEF.RP.MC.WD009	SS	MT	7.404	7.404	NIL	NIL	4	4	160	160

11	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEF.RP.MC.WD015	SS	MT	6.7	6.7	0.317	0.317	1.25	1.25	386	386
12	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEG.RP.MC.WD021	SS	MT	8.5	8.5	3.163	3.163	58	58	242	242
13	UJA	SCHEDULE-C	2	R01.KK.1UJA.JEV50.TM.OK.WD001	SS	MT	0.7364	0.7364	0.7951	0.7951	271	271	0	0
14	UJA	SCHEDULE-C	2	R01.KK.1UJA.JKM.TM.OK.WD001	SS	MT	1.844	1.844	1.6528	1.6528	355	355	330	330
15	UJA	SCHEDULE-C	2	HERMETIC PENETRATION MOUTING DRAWINGS	SS,CS	MT	85	85	0	0	800	800	5293	5293
16	UJA	SCHEDULE-C	2	R01.KK.1UJA.JMN.TM.OK.WD001	SS	MT	39.324	39.324	2.6	2.6	34	34	1836	1836
17	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNA.TM.OK.WD004	SS	MT	105.58	105.58	15.789	15.789	176	176	3416	3416
18	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNA.TM.OK.WD005	SS	MT	53.175	53.175	10.988	10.988	10	10	2504	2504

LIST OF PIPING SYSTEMS WITH WEIGHT AND WELDING SCOPE

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	BUILDING	SCHEDULE	ITEM NO	WD NO	Material of construction	UOM	Weight of Piping		Weight of pipe supports		Small bore Inch Dia		Big Bore Inch dia	
							Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4
19	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNB10.TM.OK.WD002	SS	MT	22.578	22.578	4.725	4.725	50	50	1823	1823
20	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNB50.TM.OK.WD001	SS	MT	2.5441	2.5441	3	30	0	0	284	284
21	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNB50.TM.OK.WD002	CS	MT	9.1601	9.1601	3.3418	3.3418	0	0	441	441
22	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNB50.TM.OK.WD003	SS	MT	4.4508	4.4508	6.27	6.27	272	272	520	520
23	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNB50.TM.OK.WD004	CS	MT	16.206	16.206	3.3559	3.3559	135	135	1064	1064
24	UJA	SCHEDULE-C	2	R01.KK.1UJA.JND10.TM.OK.WD003	SS	MT	11.572	11.572	4.3	4.3	107	107	806	806
25	UJA	SCHEDULE-C	2	R01.KK.1UJA.JND50.TM.OK.WD003	SS	MT	4.1936	4.1936	5.329	5.329	1010	1010	343	343
26	UJA	SCHEDULE-C	2	R02.KK.1UJA.JNG.RP.MC.WD025	SS	MT	33.146	33.146	9.784	9.784	0	0	784	784
27	UJA	SCHEDULE-C	2	R02.KK.1UJA.JNG.RP.MC.WD035	SS	MT	0.324	0.324	0.785	0.785	76	76	0	0
28	UJA	SCHEDULE-C	2	R02.KK.1UJA.JNG.RP.MC.WD046	SS	MT	0.841	0.841	0.892	0.892	101	101	0	0

29	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNG50.TM.OK.WD001	SS	MT	3.6438	3.6438	6.3	6.3	600	600	1377	1377
30	UJA	SCHEDULE-C	2	R01.KK.1UJA.JNG50.TM.OK.WD002	SS	MT	26.724	26.724	13.416	13.416	2253	2253	3169	3169
31	UJA	SCHEDULE-C	2	R01.KK.1UJA.KAA.TM.OK.WD002	SS	MT	62.232	62.232	23.874	23.874	5134	5134	7172	7172
32	UJA	SCHEDULE-C	2	R01.KK.1UJA.KAA51.TM.OK.WD001	SS	MT	0.688	0.688	1.6	1.6	940	940	0	0
33	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBA.TM.OK.WD001	SS	MT	7.8564	7.8564	4.72567	4.7257	686	686	620	620
34	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBA.TM.OK.WD002	SS	MT	5.1024	5.1024	5	5	1819	1819	90	90
35	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBC10.TM.OK.WD002	SS	MT	2.676	2.676	2.2	2.2	970	970	0	0
36	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBC70.TM.OK.WD001	SS	MT	0.643	0.643	0.604	0.604	214	214	0	0

LIST OF PIPING SYSTEMS WITH WEIGHT AND WELDING SCOPE

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	BUILDING	SCHEDULE	ITEM NO	WD NO	Material of construction	UOM	Weight of Piping		Weight of pipe supports		Small bore Inch Dia		Big Bore Inch dia	
							Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4
37	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBE10.TM.OK.WD001	SS	MT	13.483	13.483	5.93	5.93	0	0	1335	1335
38	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBE10.TM.OK.WD002	SS	MT	2.4707	2.4707	6.8	6.8	1130	1130	0	0
39	UJA	SCHEDULE-C	2	R01.KK.1UJA.KBE10.TM.OK.WD003	SS	MT	1.4062	1.4062	2.418	2.418	999	999	0	0
40	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTA.TM.OK.WD001	SS	MT	1.1293	1.1293	1.98	1.98	231	231	252	252
41	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTA.TM.OK.WD002	SS	MT	1.207	1.207	2.5	2.5	2000	2000	0	0
42	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTB.TM.OK.WD001	SS	MT	3.1057	3.1057	2.48	2.48	1070	1070	0	0
43	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTB.TM.OK.WD002	SS	MT	3.1057	3.1057	3.8	3.8	2240	2240	0	0
44	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTC10.TM.OK.WD002	SS	MT	0.2	0.2	0.604	0.604	41	41	0	0
45	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTF.TM.OK.WD002	SS	MT	1.867	1.867	4.9	4.9	615	615	0	0
46	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTH.TM.OK.WD002	SS	MT	0.5436	0.5436	0.77	0.773	300	300	0	0

47	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTP.RP.MC.OK.WD03 1	SS	MT	1.0857	1.0857	2.172	2.172	318	318	0	0
48	UJA	SCHEDULE-C	2	R01.KK.1UJA.KTQ.TM.OK.WD001	SS	MT	1.791	1.791	2.326	2.326	58	58	0	0
49	UJA	SCHEDULE-C	2	R01.KK.1UJA.KUA10.TM.OK.WD002	SS	MT	1.41	1.41	5.8	5.8	562	562	0	0
50	UJA	SCHEDULE-C	2	R01.KK.1UJA.KWC.TM.OK.WD001	SS	MT	0.209	0.209	1.62	1.62	173	173	0	0
51	UJA	SCHEDULE-C	2	R01.KK.1UJA.LAB.TM.OK.WD001	CS	MT	26.836	26.836	4.6	4.6	384	384	1656	1656
52	UJA	SCHEDULE-C	2	R01.KK.1UJA.LBA.TM.OK.WD001	CS	MT	39.027	39.027	2.429	2.429	12	12	888	888
53	UJA	SCHEDULE-C	2	R01.KK.1UJA.LBA.TM.OK.WD002	CS	MT	72.983	72.983	10.31	10.31	40	40	1728	1728
54	UJA	SCHEDULE-C	2	R01.KK.1UJA.LBA.TM.OK.WD004	CS	MT	0.6276	0.6276	5.7	5.7	190	190	0	0

LIST OF PIPING SYSTEMS WITH WEIGHT AND WELDING SCOPE

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	BUILDING	SCHEDULE	ITEM NO	WD NO	Material of construction	UOM	Weight of Piping		Weight of pipe supports		Small bore Inch Dia		Big Bore Inch dia	
							Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4	Unit-3	Unit-4
55	UJA	SCHEDULE-C	2	R01.KK.1UJA.LBA.TM.OK.WD003	SS	MT	37.652	37.652	2.143	2.143	375	375	1344	1344
56	UJA	SCHEDULE-C	2	R01.KK.1UJA.LBG.TM.OK.WD001	CS	MT	0.1819	0.1819	0.65	0.65	169	169	0	0
57	UJA	SCHEDULE-C	2	R01.KK.1UJA.LCQ10.TM.OK.WD00 1	SS	MT	11.887	11.887	7.2	7.2	3714	3714	750	750
58	UJA	SCHEDULE-C	2	R01.KK.1UJA.LFG.TM.OK.WD001	SS	MT	1.4793	1.4793	2.41	2.41	127	127	240	240
59	UJA	SCHEDULE-C	2	R01.KK.1UJA.LFG.TM.OK.WD002	SS	MT	1.5792	1.5792	0.5	0.5	0	0	252	252
60	UJA	SCHEDULE-C	2	R01.KK.1UJA.QFA.TM.OK.WD002	SS	MT	1.915	1.915	4.9	4.9	900	900	0	0
61	UJA	SCHEDULE-C	2	R01.KK.1UJA.0QKJ.TM.OK.WD00 1	CS	MT	23.559	23.559	11.85	11.85	1250	1250	3435	3435
62	UJA	SCHEDULE-C	2	R01.KK.1UJA.0QKJ.TM.OK.WD00 2	CS	MT	3.6183	3.6183	4.6	4.6	1232	1232	688	688
63	UJA	SCHEDULE-C	2	R01.KK.1UJA.QKJ.TM.OK.WD002	CS	MT	5.6888	5.6888	2.42297	2.423	4231	4231	85	85
64	UJA	SCHEDULE-C	2	R01.KK.1UJA.QUH.TM.OK.WD001	SS	MT	0.6887	0.6887	3.17	3.17	138	138	0	0

65	UJA	SCHEDULE-C	2	R01.KK.1UJA.SCC.TM.OK.WD001	CS	MT	2.908	2.908	0.179	0.179	0	0	176	176
66	UJA	SCHEDULE-C	2	R01.KK.1UJA.SCD.TM.OK.WD001	CS	MT	3.0024	3.0024	2.4	2.4	1018	1018	0	0
67	UJC	SCHEDULE-C	2	R01.KK.1UJA.KLB.TM.OK.WD001	CS	MT	20.6	20.6	7.6	7.6	0	0	3020	3020
TOTAL						**MT**	**851.8**	**851.8**	**280.7**	**307.7**				

SYSTEM & BUILDING WISE TENTATIVE QUANTITY OF VALVES

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	SCHEDULE	ITEM NO	BUILDING	DRAWING NO	DESCRIPTION	Valves(D<=50NB)		Valves (50NB<D<=200NB)		Valves(D>200NB)	
						Nos	Weight (MT)	Nos	Weight (MT)	Nos	Weight (MT)
1	SCHEDULE-C	4	UJA	R01.KK.1UJA.FAK.TM.OK.WD0 02	Pipelines of fuel pool cooling system and fuel handling equipment shafts above elevation +5,400. Ss, LP.	5	0.01	13	3.986	1	0.36
2	SCHEDULE-C	4	UJA	R01.KK.1UJA.FAL.TM.OK.WD0 0 2	Pipelines of fuel pond water supply for purification system above elevation +5,400. Ss, LP	9	0.02	8	2.56	0	0
3	SCHEDULE-C	4	UJA	R01.KK.1UJA.FBA50.TM.OK. W D001	Pipelines of media supply to bottles of defective assemblies identification system. SS Pp<2,2 MPa above el. +5,400	16	0.11	0	0	0	0
4	SCHEDULE-C	4	UJA	R01.KK.1UJA.FKA.TM.OK.WD0 0 02	Pipelines of decontamination system above elevation +5,400. Ss, LP.	60	0.33	0	0	0	0
5	SCHEDULE-C	4	UJA	R01.KK.1UJA.JDJ.RP.MC.WD0 3 8	QBIS Connecting Pipelines Mounting Drawing	0	0.00	0	0	16	13.5
6	SCHEDULE-C	4	UJA	R01.KK.1UJA.JEA01.TM.OK.W D 001	Pipelines of the system for removing air from the SG secondary coolant side. Cs, HP	24	0.32	0	0	0	0
7	SCHEDULE-C	4	UJA	R01.KK.1UJA.JEA50.TM.OK.W D 001	Pipelines of control system of SG level and steam humidity control in steamlines. SS Pp>2,2 MPa	40	1.38	0	0	0	0
8	SCHEDULE-C	4	UJA	R01.KK.1UJA.JEB10.TM.OK.W D 001	REACTOR BUILDING PIPELINES OF RCPU GTsNA - 1391PIPING SYSTEM ABOVE	36	0.34	12	0.9	0	0
9	SCHEDULE-C	4	UJA	R01.KK.1UJA.JEF.RP.MC.WD 01 5	Injection Pipeline Mounting Drawing	1	0.03	7	2.667	0	0
10	SCHEDULE-C	4	UJA	R01.KK.1UJA.JEG.RP.MC.WD0 2 1	Discharge Pipeline Mounting Drawing	2	0.09	3	2.238	0	0

11	SCHEDULE-C	4	UJA	R01.KK.1UJA.JEV50.TM.OK.WD 001	Pipelines of lubricant supply system to RCPS oil tanks	2	0.03	0	0	0	0
12	SCHEDULE-C	4	UJA	R01.KK.1UJA.JKM.TM.OK.WD 0 01	Pipelines of system for retention & cooling of reactor molten core above elevation +5,400. Ss, LP.	12	0.09	8	1.212	0	0
13	SCHEDULE-C	4	UJA	R01.KK.1UJA.JMN.TM.OK.WD0 01	Pipelines of spray system above elevation +5,400. Ss, LP.	6	0.02	0	0	2	0.132 4
14	SCHEDULE-C	4	UJA	R01.KK.1UJA.JMY20.TM.OK.W D001	Reactor building pipelines of leakage measurement systems from sealed enclosures under leak maintenance tests. Ss, LP	6	0.07	0	0	0	0
15	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNA.TM.OK.WD0 0 4	Pipelines of emergency & planned primary circuit cooling & fuel storage pool cooling system above elevation +5,400. Ss, HP.	56	1.11	0	0	47	52.68 4
16	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNA.TM.OK.WD0 0 5	Pipelines of emergency & planned primary circuit cooling & fuel storage pool cooling system above	0	0.00	2	0.18	17	19.35 9
17	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNB10.TM.OK.W D 002	Pipelines of emergency SG cooling and flushing system above elevation +5,400. Ss, HP.	8	0.05	20	9.192	8	13.05 6
18	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNB50.TM.OK.W D 003	Pipelines of passive heat removal system in UJC. Ss, HP.	28	0.56	8	2.984	0	0
19	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNB50.TM.OK.W D 004	Pipelines of passive heat removal system in UJC. Ss, HP.	20	0.23	8	4.16	0	0

SYSTEM & BUILDING WISE TENTATIVE QUANTITY OF VALVES

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	SCHEDULE	ITEM NO	BUILDING	DRAWING NO	DESCRIPTION	Valves(D<=50NB)		Valves (50NB<D<=200NB)		Valves(D>200NB)	
						Nos	Weight (MT)	Nos	Weight (MT)	Nos	Weight (MT)
20	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNB51.TM.OK.WD 001	PHRS Control devices piping Ss, HP	7	0.01	0	0	0	0
21	SCHEDULE-C	4	UJA	R01.KK.1UJA.JND10.TM.OK.WD003	Pipelines of HP emergency injection system above elevation +5,400. Ss, HP.	28	0.62	12	3.06	0	0
22	SCHEDULE-C	4	UJA	R01.KK.1UJA.JND50.TM.OK.WD003	Pipelines of emergency boron injection system above elevation +5,400. Ss, HP.	65	2.89	0	0	0	0
23	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNG10.TM.OK.WD001	Emergency core cooling system (passive part) Mounting drawings of the binding pipelines of check	32	0.67	0	0	0	0
24	SCHEDULE-C	4	UJA	R02.KK.1UJA.JNG.RP.MC.WD04 6	Emergency core cooling system (passive part) Mounting drawings of the binding pipelines of check	8	0.68	0	0	0	0
25	SCHEDULE-C	4	UJA	R02.KK.1UJA.JNG.RP.MC.WD02 5	Emergency core cooling system (passive part). Mounting drawings of the emergency core cooling system pipelines from HA (hydroaccumulators) to reactor vessel, pipeline fasteners	0	0.00	0	0	16	20.776
26	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNG50.TM.OK.WD001	Pipelines of passive heat removal system (2nd stage Hydrotanks) above elevation +5,400 (discharge). Ss,	64	1.29	16	4.632	0	0
27	SCHEDULE-C	4	UJA	R01.KK.1UJA.JNG50.TM.OK.WD002	Pipelines of passive heat removal system (2nd stage Hydroaccumulators) above elevation +5,400 (steam	27	0.63	26	4.6728	0	0
28	SCHEDULE-C	4	UJA	R01.KK.1UJA.KAA.TM.OK.WD0 02	Component cooling circuit pipelines above elev. +5.400m . Ss, LP.	147	1.20	55	6.4495	8	7.92

29	SCHEDULE-C	4	UJA	R01.KK.1UJA.KAA51.TM.OK.W D001	Component cooling circuit pipelines above elev. +5.400m. Ss, LP.	68	1.53	0	0	0	0
30	SCHEDULE-C	4	UJA	R01.KK.1UJA.KBA.TM.OK.WD 0 01	Pipelines of primary volume control system above elevation +5,400. Ss, HP, Ss, LP Dnom100	11	0.36	12	4.163	0	0
31	SCHEDULE-C	4	UJA	R01.KK.1UJA.KBA.TM.OK.WD 0 02	Pipelines of primary volume control system above elevation +5,400. Ss, HP Dnom<100	38	2.37	0	0	0	0
32	SCHEDULE-C	4	UJA	R01.KK.1UJA.KBC10.TM.OK.W D002	Pipelines of distillate system above elevation +5,400. Ss, LP	28	0.57	0	0	0	0
33	SCHEDULE-C	4	UJA	R01.KK.1UJA.KBC70.TM.OK.W D001	Pipelines of CMS drives hydrotest system of Reactor Building above el. +5,400	11	0.13	0	0	0	0
34	SCHEDULE-C	4	UJA	R01.KK.1UJA.KBE10.TM.OK.W D002	Pipelines of uncooled reactor coolant purification system above elevation +5,400. Ss, HP. Dnom<100	75	3.61	0	0	0	0
35	SCHEDULE-C	4	UJA	R01.KK.1UJA.KBE10.TM.OK.W D003	Pipelines of uncooled reactor coolant purification system above elevation +5,400. Ss, LP.	12	0.20	0	0	0	0
36	SCHEDULE-C	4	UJA	R01.KK.1UJA.KLB50.TM.OK.W D001	Reactor building pipelines of passive filtration system pipelines of annulus Cs, LP	8	2.82	0	0	0	0
37	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTA.TM.OK.WD 0 01	Pipelines of primary drains and controlled leaks system above elevation +5,400. Ss, HP,Ss,LP.	6	0.07	2	0.33	0	0

SYSTEM & BUILDING WISE TENTATIVE QUANTITY OF VALVES											
Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2. (2) The quantities of KKNPP Unit-3&4 is subject to change.											
SR NO	SCHEDULE	ITEM NO	BUILDING	DRAWING NO	DESCRIPTION	Valves(D<=50NB)		Valves (50NB<D<=200NB)		Valves(D>200NB)	
						Nos	Weight (MT)	Nos	Weight (MT)	Nos	Weight (MT)
38	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTA.TM.OK.WD 0 02	Pipelines of primary drains and controlled leaks system above elevation +5,400. Ss, HP,Ss,LP.	56	1.64	0	0	0	0
39	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTB.TM.OK.WD 0 01	Pipelines of gaseous blow-offs system. Ss, HP.	30	0.67	0	0	0	0
40	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTB.TM.OK.WD 0 02	Pipelines of gaseous blow-offs system. Ss, LP.	72	1.02	0	0	0	0
41	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTC10.TM.OK. W D002	Pipelines of collecting system of boron-containing water from reactor systems above elevation +5,400.	1	0.00	2	0.0905	0	0
42	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTF.TM.OK.WD 0 03	Pipelines of active drainage pipework system for containment above elevation +5,400. Ss, LP.	1	0.01	0	0	0	0
43	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTH.TM.OK.WD 0 02	Pipelines of active drainage pipework system above elevation +5,400 (delivery part). Ss, LP.	17	0.36	0	0	0	0
44	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTP.RP.MC.OK. W D031	Emergency gas removal system. Mounting drawings on pipelines, pipeline fasteners	10	0.35	6	1.2282	0	0
45	SCHEDULE-C	4	UJA	R01.KK.1UJA.KTQ.TM.OK.WD 0 01	Pipelines of fuel storage pool lining integrity monitoring system above elevation +5,400. Ss, LP.	6	0.04	0	0	0	0
46	SCHEDULE-C	4	UJA	R01.KK.1UJA.KUA10.TM.OK. W D002	Pipelines of sampling system for nuclear equipment above elevation +5,400. Ss, HP.	76	2.01	0	0	0	0

47	SCHEDULE-C	4	UJA	R01.KK.1UJA.KWC.TM.OK.WD 0 01	Pipelines of hydrotesting of primary system pipelines & blowdown of I&C sensor with boron	10	0.19	0	0	0	0
48	SCHEDULE-C	4	UJA	R01.KK.1UJA.LAB.TM.OK.WD 0 01	Pipelines of main feedwater system above elevation +5,400. Cs, HP.	5	0.15	0	0	16	20.256
49	SCHEDULE-C	4	UJA	R01.KK.1UJA.LBA.TM.OK.WD 0 02	Pipelines of live steam line system above elevation +5,400 in UJE. Cs, HP	4	0.04	0	0	16	55.072
50	SCHEDULE-C	4	UJA	R01.KK.1UJA.LBA.TM.OK.WD 0 03	SG PSV associated pipework. Cs, HP, Ss, HP	16	1.84	0	0	0	0
51	SCHEDULE-C	4	UJA	R01.KK.1UJA.LBA.TM.OK.WD 0 04	Associated pipework of fast-acting stop and shutoff valves 1LBA10-40AA501. Ss, HP, Cs, HP	28	1.86	0	0	0	0
52	SCHEDULE-C	4	UJA	R01.KK.1UJA.LBG.TM.OK.WD 0 01	House loads pipelines above elev. +5.400m. Cs, LP.	2	0.10	0	0	0	0
53	SCHEDULE-C	4	UJA	R01.KK.1UJA.LCQ10.TM.OK.W D001	Pipelines of SG drain and blowdown system above elevation +5,400. Ss.	30	0.70	66	16.189	0	0
54	SCHEDULE-C	4	UJA	R01.KK.1UJA.LFG.TM.OK.WD 0 01	Pipelines of steam generators chemical flush above elevation +5,400. Ss, HP.	16	0.35	8	2.712	0	0
55	SCHEDULE-C	4	UJA	R01.KK.1UJA.LFG.TM.OK.WD 0 02	Pipelines of steam generators chemical flush above elevation +5,400. Ss, LP.	0	0.00	2	0.124	0	0
56	SCHEDULE-C	4	UJA	R01.KK.1UJA.QFA.TM.OK.WD 0 02	Compressed air pipelines for valve pneumatic drives above el. +5,400 . Ss, HP	131	0.57	0	0	0	0

SYSTEM & BUILDING WISE TENTATIVE QUANTITY OF VALVES

Note: (1) The quantity mentioned below is indicative based on the quantity of KKNPP Unit-1&2.

(2) The quantities of KKNPP Unit-3&4 is subject to change.

SR NO	SCHEDULE	ITEM NO	BUILDING	DRAWING NO	DESCRIPTION	Valves(D<=50NB)		Valves (50NB<D<=200NB)		Valves(D>200NB)	
						Nos	Weight (MT)	Nos	Weight (MT)	Nos	Weight (MT)
57	SCHEDULE-C	4	UJA	R01.KK.1UJA.0QKJ.TM.OK.WD0 01	Chill supply pipelines for conventional loads above el.+5,400 in the hermetic area. Dnom>100. Cs, LP	117	0.82	42	5.832	4	2.48
58	SCHEDULE-C	4	UJA	R01.KK.1UJA.0QKJ.TM.OK.WD0 02	Chill supply pipelines for conventional loads above el.+5,400 in the hermetic area. Dnom>100. Cs, LP	69	1.67	4	0.36	0	0
59	SCHEDULE-C	4	UJA	R01.KK.1UJA.QKJ.TM.OK.WD0 0 2	Pipelines of cold supply system for ventilation systems in secured area (safety chilling machine and	178	1.92	14	0.465	0	0
60	SCHEDULE-C	4	UJA	R01.KK.1UJA.QKJ.TM.OK.WD0 0 2	Pipelines of cold supply system for ventilation systems in secured area (safety chilling machine and	6	0.03	0	0	0	0
61	SCHEDULE-C	4	UJA	R01.KK.1UJA.QUH.TM.OK.WD0 01	Pipelines of sampling system for secondary cycle and condensate polishihg plant in UJA. Ss, HP.	21	1.09	0	0	0	0
62	SCHEDULE-C	4	UJA	R01.KK.1UJA.SCC.TM.OK.WD0 01	Pipelines of compressed air system for containment testing above elevation +5,400. Cs, LP.	0	0.00	0	0	2	1.283
63	SCHEDULE-C	4	UJA	R01.KK.1UJA.SCD.TM.OK.WD0 01	Pipelines of compressed air system for maintenance above elevation +5,400. Cs, LP.	31	0.08	0	0	0	0
64	SCHEDULE-C	4	UJC	R01.KK.1UJA.KLB.TM.OK.WD0 0 01	Passive Filtration Pipelines System Of Annulas	0	0.00	8	2.82	0	0

VOLUME-IA PART – II CHAPTER 1

CORRECTIONS / REVISIONS IN SPECIAL CONDITIONS OF CONTRACT, GENERAL CONDITIONS OF CONTRACT AND FORMS & PROCEDURES

Sl No: 1

Clause 4.1.11 of SCC is deleted.

Sl No: 2:

OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME

The following clauses in Occupational Health, Safety & Environment Management / Quality Assurance Programme published in Chapter-IX of Special Conditions of Contract (Volume I Book-II) is revised as under.

Chapter IX Clause 9.1 is modified as below:

Contractor will comply with HSE (Health, Safety & Environment) requirements of BHEL as per the "HSE Plan for Site Operations by Subcontractor" (Document No. HSEP: 14 Rev01) enclosed.

Chapter IX Clause 9.1.1 to 9.1.25 stands deleted.

Chapter IX Clause 9.2 to 9.62 stands deleted.

Sl No: 3:

Clause No. 10.5 on RA Bill Payments, in Special Conditions of Contract (SCC), Volume-IB, Book-II, is revised as under:

The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc., and other dues in the meanwhile.

Sl No: 4

The EARNEST MONEY DEPOSIT (EMD) clause 1.9 published in General Conditions of Contract (Volume I Book-II) is revised as under.

1.9 EARNEST MONEY DEPOSIT

1.9.1 Every tenderer must furnish the prescribed amount of Earnest Money Deposit (EMD) to BHEL PSSR, only in the following forms: -

i. Electronic Fund Transfer credited in BHEL account (before tender opening).

ii. Through Online EMD payment portal, before tender opening, by following these steps.
    1. Visit www.onlinesbi.com -> Go to State Bank Collect (In the tab section)
    2. Click Check box to proceed for payment -> Click on Proceed
    3. Under State of Corporate/Institution ->Select Tamilnadu
    4. Under Type of Corporate/Institution -> Select PSU – Public Sector Undertaking ->Go
    5. Under PSU – Public Sector Undertaking Name -> Select BHEL PSSR CHENNAI and Submit
    6. Under Select Payment Category ->-> SCT Tender EMD & Tender Fees
iii. Banker's cheque or Pay order or Demand Draft in favour of 'Bharat Heavy Electricals Limited' (along with offer) and payable at Chennai.
iv. Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) along with the offer.
v. In case EMD amount is more than Rs. Two Lakhs, Tenderer has the option to submit Rs. Two lakhs in the forms described above in clause no. 1.9.1. (i) to (iv) and the remaining amount over and above Rs. Two Lakhs in the form of Bank Guarantee from Scheduled Bank (along with the Offer).

Note:

a) Proforma for Bank Guarantee for EMD- Form WAM 23 is enclosed with this Tender in Volume-1A Part II Chapter 9.
b) The Bank Guarantee shall be valid for at least six months from the due date of tender submission mentioned in the Notice Inviting Tender.
c) Date of Expiry of Claim shall be as given in Proforma of Bank Guarantee (in lieu of Earnest Money)-Form WAM 23.

Bank Details for the purpose of Taking EMD BG

Name and Address of Beneficiary:	Bharat Heavy Electricals Ltd. Tek Towers, No.11, Old Mahabalipuram Road, Okkiyam Thoraipakkam, Chennai - 600097.
Name of Bank of Client :	State Bank Of India
Bank Branch Address:	SBI Saidapet Branch, EVR Periyar Building, Nandanam, Anna Salai, Chennai - 600035
IFSC Code :	SBIN0000912
Account No. :	10610819499

Details for SFMS (Structured Financial Messaging System) transmission of BG

Bank and Branch	SBI TFCPC Branch
Branch Code	5056
IFSC Code	SBIN0005056

1.9.2 EMD shall not carry any interest.

1.9.3 EMD by the Tenderer will be forfeited as per NIT Conditions, if:

i. After opening the tender and within the offer validity period, the Tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL.

ii. The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/Contract

1.9.4 EMD given by all unsuccessful tenderers will be refunded normally within 15 days of award of work.

1.9.5 EMD of successful tenderer will be retained as part of Security Deposit.

1.9.6 EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant" Guidelines on Suspension of Business dealings with suppliers/contactors" and forfeited / released based on the action determined under these guidelines.

Sl No: 5

SECURITY DEPOSIT: The SECURITY DEPOSIT (SD) clause 1.10 published in General Conditions of Contract (Volume I Book-II) is revised as under.

1.10 Security Deposit:

1.10.1 Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work, as given below:

1.10.2 The total amount of Security Deposit will be 5% of the contract value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.

1.10.3 The security Deposit should be furnished before start of the work by the contractor.

1.10.4 Modes of deposit:

1.10.4.1 The balance amount to make up the required Security Deposit of 5% of the contract value may be furnished in any one of the following forms

i. Cash (as permissible under the extant Income Tax Act)

ii. Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL

iii. Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats.

iv. Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.

v. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL and discharged on the back)

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

1.10.5 At least 50% of the Security Deposit including the EMD should be deposited in any form as prescribed before start of the work and the balance 50% of the Security Deposit will be recovered by deducting 10% of the gross amount progressively from each running bills of the contractor till the total amount of the required Security Deposit is collected.

1.10.6 The recoveries made from running bills (cash deduction towards balance SD amount) will be released against submission of equivalent Bank Guarantee in the prescribed formats, but only once, before completion of work.

1.10.7 The Security Deposit shall not carry any interest.

1.10.8 If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the excess Security Deposit due the enhancement shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor.

1.10.9 The validity of Bank Guarantees towards Security Deposit shall be initially upto the completion period as stipulated in the Letter of Intent/Award + 3 months, and the same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL Date of Expiry of Claim shall be as given in the prescribed formats for Bank Guarantee towards Security Deposit.

1.10.10 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of

contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.

1.10.11 Penalty for Delayed Remittance of Security Deposit

If the contractor fails to furnish SD before start of work, in line with 1.10.3 above, Simple Interest against delayed remittance of the Security Deposit shall be deducted from the sub-contractor at the rate of SBI PLR + 2% on the value of 50% SD of the contract, for the delayed period (i.e., period between start of work and date of remittance of Initial SD, i.e., atleast 50% of SD). In case, the delayed period has different SBI PLR rates, Simple Interest shall be calculated based on different rates by considering the corresponding time period. On similar lines Penalty shall be levied for delayed remittance of Additional Security Deposit (if applicable).

Note: - Bank details & SFMS details provided above in Sl. No. 04 Earnest Money Deposit) may be used for the purpose of arranging Bank Guarantees towards Security Deposit / Additional Security Deposit also.

Sl No: 6

Clause 2.7.1, 2.7.2 and 2.7.3 in GCC regarding Rights of BHEL is revised as under:

2.7.1 In case of inadequate manpower deployed by the contractor, BHEL reserves the right to deploy additional manpower through any other agency for expediting the activities in the interest of the project. Supplied manpower shall be put on job by the contractor and payments and other statutory compliances related to manpower shall be the contractor's responsibility. In case of contractor's failure to fulfill his obligations in respect of manpower, BHEL reserves the right to take necessary action as per contract obligations. To withdraw any portion of work and / or to restrict / alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons / BHEL's obligation to its customer.

2.7.2.

2.7.2.1 To terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor after due notice of a period of 14 days' by BHEL in any of the following cases:

i. Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.
ii. Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.
iii. Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.
iv. Termination of Contract on account of any other reason (s) attributable to Contractor.
v. Assignment, transfer, subletting of Contract without BHEL's written permission.
vi. Non-compliance to any contractual condition or any other default attributable to Contractor.

Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,

A= Value of Balance scope of Work (*) as per rates of new contract

B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.

H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

* Balance scope of work (in case of termination of contract):

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for

'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount. Contract quantities are the quantities as per original contract. If, Contract has been amended,

quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items

total Quantities as per issued drawings would be deemed to be contract quantities. Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: Incase portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line with LD clause no. 2.7.9 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of "LD against delay in executed work in case of termination of contract" is given below.

i). Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1

ii). Let the value of executed work till the time of termination of contract= X

iii). Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y

iv). Delay in executed work attributable to contractor i.e. T2=[1-(X/Y)] x T1

v). LD shall be calculated in line with LD clause (clause 2.7.9) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.7.2.2 In case Contractor fails to deploy the resources as per requirement, BHEL can deploy own/hired/otherwise arranged resources at the risk and cost of the contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

2.7.3 **Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor**

Following sequence shall be applicable for recoveries from contractor:

a) Dues available in the form of Bills payable to contractor, SD, BGs against the same contract.

b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.

c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:

   i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery.

   ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.

   iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

SL No: 7

In addition to clause 2.7.9 of General Conditions of Contract (GCC), a New clause 2.7.9.1 is added as below.

2.7.9.1 Penalty for Intermediate Milestones

2.7.9.1.1 M1 and M2 shall be intermediate Milestones for this work.

2.7.9.1.2 In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to Form 14.

2.7.9.1.3 Incase delay in achieving M1 milestone is solely attributable to the contractor,0.5% per week of executable contract value* limited to Maximum 2% of executable contract value will be withheld.

2.7.9.1.4 Incase delay in achieving M2 milestone is solely attributable to the contractor,0.5% per week of executable contract value* limited to maximum 3% of executable contract value will be withheld.

2.7.9.1.5 Amount already withheld, if any, against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 milestone.

2.7.9.1.6 Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.

2.7.9.1.7 Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of intermediate milestones shall be adjusted against LD or released as the case may be.

2.7.9.1.8 In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted in to recovery.

Note: *Executable contract value-value of work for which inputs/fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.

SL No: 8

OVERRUN COMPENSATION (ORC)

The **OVERRUN COMPENSATION (ORC)** clause 2.12 published in General Conditions of Contract (Volume I Book-II) is revised as under.

2.12 OVERRUN COMPENSATION (ORC)

2.12.1 **ORC during original contract period:** No ORC shall be applicable during the original contract period.

2.12.2 **ORC during extended period for the reasons solely attributable to contractor:** No ORC shall be applicable during the extended period granted for the reasons solely attributable to contractor and work executed during this period shall be paid as per original contract rates.

2.12.3 **ORC during extended period for the reasons not attributable to contractor:** ORC shall be payable as per following procedure:

2.12.3.1 For initial period of twelve months of extended period, ORC rate applicable over executed value shall be 5%. For every subsequent period of twelve months, ORC rate

shall be further increased by 5% over the previous rate. For example, ORC rates applicable for initial period of 12 months and subsequent period of 12 months are given below.

Sl. No.	Extended Period for the reasons attributable to BHEL	ORC rate applicable over executed value
1	First 12 months	5%
2	13th-24th month and so on	10.25% {[(1.05 x 1.05)-1] x 100}

This process of increasing ORC rate for each subsequent period of 12 months shall continue till applicability of ORC.

2.12.3.2 On completion of original contract period as well as on completion of each subsequent period of twelve months i.e. at the time of change in applicable ORC rate, Delay Analysis shall be carried out and percentage shortfall attributable to both BHEL & Contractor shall be calculated.

2.12.3.3 For the purpose of calculation of ORC, executed value of work in the month shall be divided in Part-1 and Part-2 in proportion of percentage shortfall attributable to BHEL and contractor respectively, based on the last delay analysis as worked out in 2.12.3.2.

ORC shall be payable only on Part-1 and no ORC shall be payable on Part-2.

Value of Part-1 shall be further limited to the value of actual inputs provided by BHEL i.e. "Plan - Shortfall attributable to BHEL" for the month, as per Form-14 for calculation of ORC.

2.12.3.4 Payment of ORC amount shall be further regulated as follows:

(i) 50% of the ORC is allocated for deployment of matching resources (with weightages) agreed as per the joint programme drawn vide 2.11.4. ORC Payment against resources shall be calculated in proportion to percentage of resources actually deployed w.r.t. planned resources, as per Form-14.

(ii) 50% of ORC is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. ORC Payment shall be reduced in proportion to percentage shortfall attributable to contractor w.r.t.–"Plan - Shortfall attributable to BHEL" for the month, as per Form-14.

2.12.3.5 The maximum amount of ORC payable for the month shall be limited to Rs. 5,00,000/- .

2.12.3.6 In case, there is no shortfall attributable to contractor for the month and also contractor has deployed the resources as agreed in Form-14 but ORC amount payable for the month worked out as per procedure mentioned in clause 2.12.3.3, 2.12.3.4 and 2.12.3.5, is less than Rs.1,00,000/-, then ORC amount payable for the month shall be Rs.1,00,000/- otherwise ORC amount payable for the month shall remain same.

2.12.3.7 In case execution is on **HOLD** (Other than Force Majeure), ORC shall be payable as per following:

i). Contractor has not been permitted by BHEL to de-mobilize

a) ORC amount of Rs. 1,00,000/- per month shall be applicable during the period of HOLD provided resources as planned are deployed (not demobilized) during the period of hold.

b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

ii). Contractor has been permitted to demobilize and to remobilize after lifting of HOLD

a) No ORC shall be payable to contractor for the period of HOLD.

b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.3.8 In case **Force Majeure** is invoked:

i). No ORC shall be applicable during the period of Force Majeure.

ii). Subsequent to revocation of Force Majeure, period of Force Majeure shall be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.4 Applicability of ORC: ORC shall not be applicable for following activities.

(i) Area cleaning, removal of temporary structures and return of scrap.

(ii) Punch list points / pending points liquidation pending due to reasons attributable to contractor

(iii) Submission of “As built Drawing”

(iv) Material Reconciliation

(v) Completion of Contract Closure formalities like HR Clearance/ No dues from various dept./ Statutory Authorities etc.

2.12.5 Total Over Run Compensation shall be limited to 10% of the cumulatively executed contract value till the month (excluding Taxes and Duties if payable extra). For this purpose, executed contract value excludes PVC, ORC and Extra/Supplementary Works.

Sl No: 9

Clauses 2.13.1, 2.13.6 & 2.13.7 in GCC on Interest Bearing Recoverable Advances,

9.1 Clauses 2.13.1,2.13.6 & 2.13.7 in GCC is revised as under:

9.1.1 Clause 2.13.1 in GCC is revised as "Normally no advance payment shall be payable to the contractor. Mobilization advance payment in exceptional circumstances shall be interest bearing and secured through a Bank Guarantee and shall be limited to a maximum of 5% of contract value. This 'Interest Bearing Recoverable Advance' shall be payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance".

9.1.2 Clause 2.13.6 in GCC is revised as "The rate of interest applicable for the above advances shall be the Base rate of State Bank of India prevailing at the time of disbursement of the advance + 6%, and such rate will remain fixed till the total advance amount is recovered".

9.1.3 Clause 2.13.7 in GCC is revised as "Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made progressively from each Running Bill such that the advance amounts paid along with the interest is fully recovered by the time the contractor's billing reaches 90% of contract value."

Sl. No: 10: Void

Sl No: 11

PRICE VARIATION COMPENSATION (PVC)

The PRICE VARIATION COMPENSATION (PVC) clause 2.17 published in General Conditions of Contract (Volume I Book-II) is revised as under.

2.17 PRICE VARIATION COMPENSATION

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable (for works executed during contract period and for works executed during extended period, if any, subject to other conditions as described in this section).

2.17.2 **85%** component of executed Contract Value shall be considered for PVC calculations and remaining 15% shall be treated as fixed component. The basis for

calculation of price variation in each category, their component, Base Index, shall be as under:

Sl. No.	CATEGORY	BASE INDEX	PERCENTAGE COMPONENT ('K')				
			CIVIL PACKAGES (See Note A/B/C)			MECHANICAL PACKAGES	Electrical, C&I, Material Management / Handling and other labour oriented packages
			A	**B****	**C**		
i)	LABOUR (ALL CATEGORIES)	'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (Website: labourbureau.nic.in)	**40**	**25**	**30**	**65**	**80**
ii)	HIGH SPEED DIESEL OIL	Name of Commodity: HSD Commodity code: 1202000005 (**See Note E**)	**5**	**3**	**5**	**5**	**5**
iii)	WELDING ROD	Name of Commodity: MANUFACTURE OF BASIC METALS Commodity code:1314000000 (**See Note E**)				**15**	
iv)	CEMENT	Name of Commodity: ORDINARY PORTLAND CEMENT Commodity code: 1313050003 (**See Note E**)		**20**	**30**		
v)	STEEL (Structural and Reinforcement Steel)	Name of Commodity: MILD STEEL: LONG PRODUCTS Commodity code: 1314040000 (**See Note E**)		**25**			
vi)	ALL OTHER MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Commodity code: 1000000000 (**See Note E**)	**40**	**12**	**20**		

Note: A) Cement & Steel: Free Issue (BHEL Scope)
B) Cement & Steel: In Contractor Scope
C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)

D) For Composite packages (i.e. Civil + Mechanical + Electrical and / or CI or Civil + Mechanical or Mechanical + Electrical and / or CI), the Component ('K') for various categories shall be as per respective packages as above

E) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website: http://www.eaindustry.nic.in/download data 0405.asp). Revisions in the index or commodity will be re adjusted accordingly.

2.17.3 **Void**

2.17.4 Payment / recovery due to variation in index shall be determined on the basis of the following notional formula in respect of the identified component ('K') viz LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS.

$$P = K \times R \times \frac{(X_N - Xo)}{Xo}$$

Where

P = Amount to be paid/recovered due to variation in the Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

K = Percentage component ('K') applicable for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

R = Value of work done for the billing month (Excluding Taxes and Duties if payable extra)

XN = Revised Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration

Xo = Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date.

2.17.5 **Base date shall be calendar month of actual commencement of work at site.**

2.17.6 PVC shall not be payable for the ORC amount, Supplementary / Additional Items, Extra works. However, PVC will be payable for items executed under quantity variation of BOQ items under originally awarded contract.

2.17.7 The contractor shall furnish necessary monthly bulletins in support of the requisite indices from the relevant websites along with his Bills.

2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as

published can be considered for payments and arrears shall be paid/recovered on getting the final values.

2.17.9 PVC shall be applicable for works executed during contract period and for works executed during extended period, if any, and for the portion of work delayed/backlog for the reasons not attributable to the contractor.

However, the total Quantum of Price Variation Amount payable/recoverable shall be regulated as follows:

i) For the portion of shortfall/backlog not attributable to contractor, PVC shall be worked out on the basis of indices applicable for the respective month in which work is done. Base index shall be applicable as defined in clause 2.17.5

ii) In case of Force Majeure, the PVC shall be regulated as per (a) or (b) below.

a) Force Majeure is invoked before "Base Date" / "revised base date" (as explained below) OR immediately after "base date" / "revised base date" in continuation (i.e. during the period when PVC is not applicable):

vii. Base date shall be revised: Revised Base date = Previous base date + duration of Force Majeure.

No PVC will be applicable for the work done till revised base date.

viii. PVC will be applicable for the work done after "base date"/" revised date" as the case may be (during extended period when delay is not attributable to contractor). PVC shall be worked out on the basis of indices applicable for the respective month in which work is done with base index as on "base date"/ "revised base date" as the case may be.

b) Force Majeure is invoked after "base date"/ "revised base date" as the case may be (during extended period when delay is not attributable to contractor).

2. PVC shall be applicable for the work done after revocation of Force Majeure.

3. PVC for the work done after revocation of Force Majeure shall be worked out on the basis of indices applicable for the respective month on which work is done excluding the effect of change in indices during total period of Force Majeure(s) invoked after "base date" / "revised base date" as the case may be. Base index shall be taken as on "base date" / "revised base date" as the case may be.

The total amount of PVC shall not exceed 15% of the cumulatively executed contract value. Executed Contract value for this purpose is exclusive of PVC, ORC, Supplementary / Additional items and Extra works except items due to quantity variation

Sl No: 12

Clauses 2.21 in GCC regarding Arbitration is amended as below

2.21 ARBITRATION & CONCILIATION

2.21.1 ARBITRATION:

2.21.1.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 2.21.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or. in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall contain the particulars of all claims to be referred to arbitration in sufficient detail and shall also indicate the monetary amount of such claim. The arbitration shall be conducted by a sole arbitrator to be appointed by the Head of the BHEL Power Sector Region issuing the Contract within 60 days of receipt of the complete Notice. The language of arbitration shall be English.

The Arbitrator shall pass a reasoned award.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder as in force from time to time shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be **Chennai** (the place from where the contract is Issued). The Contract shall be governed by and be construed as per provisions of the laws of India. Subject to this provision 2.21.1.1 regarding ARBITRATION, the principal civil court exercising ordinary civil jurisdiction over the area where the seat of arbitration is located shall have exclusive jurisdiction over any DISPUTE to the exclusion of any other court.

2.21.1.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018 as amended from time to time.

2.21.1.3 The cost of arbitration shall initially be borne equally by the Parties subject to the final allocation thereof as per the award/order passed by the Arbitrator.

2.21.1.4 Notwithstanding the existence of any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner unless the dispute inter-alia relates to cancellation, termination or short-closure of the Contract by BHEL.

2.21.2 CONCILIATION:

If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Procedure 2.3 enclosed in Vol 1A Part II. The Procedure 2.3 together with its Formats

will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this GCC.

The Contractor hereby agrees that BHEL may make any amendments or modifications to the provisions stipulated in the Procedure 2.3 enclosed in Vol 1A Part II from time to time and confirms that it shall be bound by such amended or modified provisions of the Procedure 2.3 with effect from the date as intimated by BHEL to it.

2.21.3 No Interest payable to Contractor

Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.

Sl No: 13: Reverse Auction

The chapter Reverse auction procedure published in Forms and Procedures' of Volume I Book-II stands deleted. **Reverse Auction is not applicable for this tender.**

Sl No: 14

Existing format on Monthly Performance Evaluation of Contractor, as available in Form No F-14 of Volume ID Forms and procedure stands Deleted. Form No.- F-14 (Rev 01) is enclosed.

Sl No: 15

Existing format on Monthly Performance Evaluation of Contractor, as available in Form No F-15 of Volume ID Forms and procedure stands Deleted. Form No.- F-15 (Rev 02) is enclosed.

Sl No:16

Clause 2.22 in GCC regarding Retention Amount is revised as under:

2.22 Performance Security Deposit

2.22.1 After award of work, Vendor shall submit 5% of the contract value towards Performance Security Deposit, in the form of (a) or (b) below.

(a) CASH (DD/ Online payment), 5% of the contract Value towards Performance Security Deposit, before commencing the contract

(or)

(b) Recovery 5% from Each Running Bill towards Performance security deposit.

(Note: Subcontractor has to choose either Option (a) or (b) before issue of Detailed LOI).

(c) However, Performance Security Deposit on part of PVC will be recovered at the rate of 5% from every running bill towards performance security deposit.

2.22.2 Refund of Performance Security Deposit:

a) 50% of Performance Security Deposit shall be released along with the final bill.

b) Balance 50% will be released after completion of Performance Guarantee Period (i.e., after expiry of Guarantee period), provided all the defects noticed during the guarantee period have been rectified to the satisfaction of BHEL Site Engineer/ BHEL Construction Manager, and after deducting all expenses/ other amounts due to BHEL under the contract/ other contracts entered into by BHEL with them. This portion of Performance Security Deposit, amount can be released on commencement of the Guarantee Period, on submission of equivalent Bank Guarantee.

The performance security deposit mentioned herein above, is in addition to Security Deposit as per Sl No. 5 above.

Sl No: 17

Existing format for Integrity Pact, as available in Volume ID Forms and procedure stands Deleted. Revised Format is enclosed in NIT.

Sl No: 18

Existing format for BANK GUARANTEE FOR SECURITY DEPOSIT, as available in Form No. F-11 (Rev 00) of Volume ID Forms and procedures stands deleted. Refer Proforma of Bank Guarantee (in lieu of Security Deposit)-Form WAM 22 provided in Chapter-10, Part-II of Volume-IA Technical Conditions of Contract.

Sl No: 19

Clause 2.15.5 of GCC in Extra Works is revised as under:

2.15.5: After eligibility of extra works is established and finally accepted by BHEL engineer / designer, payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS:

Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out

any major rework / repairs / rectification / modification / fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 108/- per man hour.

VOLUME-IA PART – II

CHAPTER 2-9

In the next 715 pages as below:

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