बी एच ई एल BHEL	**SOLAR BUSINESS DIVISION,** **Bengaluru - 560 012**	**TENDER DOCUMENT No. 238214**

2025

BHARAT HEAVY ELECTRICALS LIMITED
SOLAR BUSINESS DIVISION, BENGALURU
TENDER DOCUMENT

Name of Works:
System Integration works for Reach 8 Kavach field execution – Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipment, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division.

Name: A K Jaiswal
Designation: Manager/WCC
BHEL- SBD, Bengaluru

BHEL ATC

TENDER DOCUMENT
VOLUME - I

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1.	**General Information**		
1.1.	Tender Reference Number:	**238214-GeM Bid Number: GEM/2025/B/6886429**	
1.2.	Tender Name:	System Integration works for Reach 8 Kavach field works	
1.3.	Tender Description	System Integration works for Reach 8 Kavach field works - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipments, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division for a period of 18 months	
1.4.	Location of Work	Baiyyappanahalli -Whitefield Panel Cabin (Ex) & Dodbelle - Kyatsandra (Ex) sections of South Western Railway (Reach-08), Bengaluru, Karnataka	
1.5.	Tender System	Single Stage, Two Part Bid (through GeM) Part-I-Technical Bid-Tender NIT includes Volume-I, II, Technical specification, GCC, Part-II-Financial Bid- Tender Price bid	
1.6.	Tender Type	**Open Tender - One-time contract**	
1.7.	Duration of contract	**Total contract period: 18 months** Zero date will be provided by BHEL based on clearance from SWR System Integrator Works 1. Survey works within 03 month from Zero date. 2. Site Engineering and Completion of Installation & Commissioning – 07 months from Zero date 3. Field testing along with other Kavach equipment – 11 months after I &C 4. Project schedule may be extended by six months over 18 months, depending upon site exigencies.	
1.8.	Qualifying Requirement	As per PQC clause 3.1 & 3.2	
1.9.	Liquidity Damage (LD)/Penalty terms	As per NIT Vol II clause 18	
1.10.	Earnest Money Deposit to accompany Tender	**Rs 2 Lakhs (refer clause 2.2 in NIT Vol II for Modes of deposit for EMD)** To be deposited in the form of a crossed Demand Draft/NEFT favoring BHEL-SBD, Bengaluru. If submitted through DD, the DD in original should reach to the office of undersigned within 7 days of Part A bid opening. NEFT favoring BHEL-SBD/ QR-CODE for EMD Submission as per BHEL SBD account details at PG no. 34 **(EMD is exempted for MSEs and Start Ups)**	
1.11.	Security Deposit	**5 % of the contract value**	
1.12.	Price Variation Clause (PVC)	Not applicable	
1.13.	Reverse Auction	Applicable as per GeM portal system	
1.14.	Splitting of Work	Not applicable	
1.15.	Dealing Officer (For any Clarifications)	i) Commercial Ajeet Kumar Jaiswal, Manager – Works Contract Cell Contact No.: 080-2218-2246 Email: ajaiswal@bhel.in Or	ii) Commercial Mr. Pragadessh T G Sr. Manager – Works Contract Cell Contact No.: 080-2218-2232 Email: pragadeeshtg@bhel.in
		(i) Technical: Mrs Hima Bindu, Manager/TCAS E-MAIL: shbindu@bhel.in Ph. No. +91-9705929595	(ii) Technical: Mr. RITESH R, DGM/TCAS E-MAIL: riteshr@bhel.in Ph No. +91- 9538084848
1.16.	Bid participation note	Firms debarred/Banned by BHEL are not eligible to participate in the tender. Any bidder on whom Show Cause Notice / Risk & Cost action	

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		initiated/action due to non-performance implemented, are not eligible for participation in this tender. The tender envelope submitted by such a firms/ bidder will not be considered for evaluation and no communication in this regard will be entertained.
2.	**SCOPE OF WORK**	
2.1.	**System Integration works for Reach 8 Kavach field works - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipments, E-learning modules, conducting FAT (CFAT, IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division for a period of 18 months** **Refer Details Scope of work as per BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001 (124 pages) enclosed with this NIT.**	
3.	**PRE- QUALIFICATION CRITERIA**	
3.1.	**For technical PQC, refer clause 49. (a, b, c & d) at page 71-72 of 124 of BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001.** **All valid supporting documents to be furnished as per technical PQC for evaluation purpose.**	
3.2.	Documentary evidence to meet Financial soundness criteria: Average Annual Financial turnover during the last 3 years ending 31st March of the previous financial year, should be at least **Rs**. **83,05,253/- Incld. of GST**. Audited Balance sheet and profit& Loss account/ Turn over Certificate from Chartered Accounted with ITR to be enclosed for the **FY 22-23, FY 23-24 & FY 24-25**. In case audited Balance sheet and profit& Loss account OR Turn over Certificate from Chartered Accounted with ITR of **FY 24-25** not available, the same shall be enclosed for **FY 21-22.**	
4.	**OTHERS ELIGIBILITY CRITERIA**	
4.1.	The bidder shall also mention the PAN Number issued by Income Tax Department, copy of the PAN card or PAN number allotment letter shall be submitted along with the tender documents.	
4.2.	A copy of GST to be submitted.	
4.3.	Bidder to submit declaration for obtaining the essential license under Contract Labor (Regulation & Abolition) Act 1970 after award of work. Form-5 will be issued to successful bidder by BHEL for applying the license. Successful bidder has to get the endorsement in the license for the areas and nature of work which they will be performing as part of the contract.	
4.4.	Bidder should have independent ESI Employer code under ESI Act 1948. Photocopy of letter from ESI Corp. to establish that bidder is independently registered as an employer under ESI to be produced.	
4.5.	Bidder should have independent PF code under Employee Provident Fund and Miscellaneous Provisions Act 1952. Photocopy of letter from PF Commissioner's Office to establish that bidder is independently registered as an employer PF to be produced.	
4.6.	There should be no litigation or charge under investigation / enquiry / trial against the Tenderer, or conviction in a court of law or suspension or blacklisting by any organization on any ground. During the course of work, if any such information comes to light, the contract may be terminated.	
4.7.	The opinion / decision of BHEL regarding the bid shall be final and conclusive. BHEL reserves the right to reject any or all the bids at any time without assigning any reason.	
4.8.	In case the bidder has a relative employed in BHEL, the authority inviting tender shall be informed of this fact in writing at the time of submission of tender, failing which the tender may be disqualified, or if such fact comes to light subsequently, the contract may be terminated.	
4.9.	If the bidder gives wrong information in his tender or creates conditions favorable for the acceptance of his tender, BHEL reserves the right to reject such tender at any stage.	
5.	**PRICE VARIATION CLAUSE: Not applicable**	
6.	**PAYMENT TERMS**	
6.1.	Payment will be made as per clause 48. PAYMENT SCHEDULE (page 69-70 of 124) under BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001on successful completion of each milestone & its certification by BHEL In-charge.	
6.2.	Payment time line shall be 45 days for Micro &Small Enterprises (MSEs), 60 days for Medium Enterprises and 90 days for Non-MSME bidders from date of certification of invoice/bill.	
6.3.	No advance payment is applicable.	
6.4.	Micro &Small Enterprises (MSEs) and Medium Enterprises can also avail the benefits of payments through TReDS platforms. Currently BHEL is empaneled with M/s RXIL, Invoicemart - M/s A.TREDS Ltd. & M/s M1xchange for payments through TReDS platforms.	

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7.	**Annexures**
7.1	Detailed Scope of Work – Refer BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001 (124 pages)
7.2	ANNEXURE – II TECHNO-COMMERCIAL BID APPLICATION
7.3	Bidder Information – Annexure III
7.4	CHECKLIST OF ENCLOSURES – Annexure IV
7.5	Declaration by Bidder-I – Annexure V
7.6	Declaration by Bidder-II – Annexure VI
7.7	Unpriced BID and HSN / SAC Codes - Annexure VII
7.8	PPP-MII Format- Annexure VIII
7.9	Deviations Sheet- Annexure IX
7.10	Conflict of Interest among Bidders/ Agents- Annexure X
7.11	DECLARATION LETTER BY THE TENDERER- Annexure XI
8.	**MSEs and Start Ups bidders to note the following:**
8.1	Bidders are requested to update their MSEs status in GeM before quoting. BHEL shall not be responsible for denial of benefits passed on account of MSEs status not being updated in GeM. The outcome of GeM is final and binding regarding MSEs status. It is the bidder's responsibility to get themselves registered in GeM portal as MSEs. If not done, the MSE status as per GeM shall be considered and tender shall be processed accordingly.
8.2	Micro & Small Enterprises (MSEs) can avail **purchase preference** only if they submit along with the offer, copy of Valid UDYAM Certificate. Non-submission of such document will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency is observed in the above required documents or all required documents are not submitted before price bid opening.
8.3	MSE vendors quoting within a price band of **L1 + 15%** shall be allowed to supply 100 % of the requirement against this tender provided: 1. The MSE vendor matches the L1 price. 2. L1 price is from a non MSE vendor. 3. L1 price will be offered to the vendor nearest to L1 in terms of price ranking (L2 – nearest to L1). In case of non-acceptance by the MSE vendor (L2), next ranking MSE vendor will be offered who is within the L1+ 15% band (if L3 is also within 15% band).
8.4	In this tender, the exemption of Experience and Turnover criteria for MSEs and Start-ups are NOT applicable.

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7.2 ANNEXURE – II TECHNO-COMMERCIAL BID APPLICATION

To,

Manager / WCC
Bharat Heavy Electricals Limited
Solar Business Division,
IISc Post, Malleswaram,
Bengaluru – 560 012

Dear Sir,

I / We hereby offer to carry out the contract for **"System Integration works for Reach 8 Kavach field execution - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipment, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division".**

I /We have carefully perused the all the clauses mentioned in NIT (Complete Tender documents and other T&C) and agree to abide with the same.

I/ We further agree to execute all the works referred to in the said documents.

I declare that, there was never / is no litigation or charge under investigation / enquiry / trial against me / us, nor conviction in a court of law or suspended or blacklisted by any organization on any grounds.

Signature of Tenderer
Date:

Contractors seal and Signature

7.3 ANNEXURE – III: BIDDER INFORMATION

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value/Tick)	
1	Name of the Company		
2	Name of Authorized Signatory		
3	Type Under MSE (tick mark category) OWNERSHIP STATUS (SC/ ST OR WOMEN-OWNED OR OTHERS)	1. MICRO 2. SMALL 3. SC/ST owned 4. Women Owned 5. Others (excluding SC/ST/Women owned	
4	Name of Contact person for this tender		
5	Email-id of contact person		
6	Contact number		
7	Bank Account Details (Name of Bank, Branch and Account Number). Cancelled Cheque to be enclosed		
8	Details of Relatives employed in BHEL, Name Designation and Unit - Clause 4.8	If no relative: Write NIL	
	Relative 1		
	Relative 2		
	Relative 3		

Contractors seal and Signature

7.4 ANNEXURE – IV: CHECKLIST OF ENCLOSURES

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)	Whether proof / document enclosed (YES / NO)
1	Documentary Evidence as per PQC Clause 3.1		
2	Average turnover of last 3 years – PQC Clause 3.2		
4	Copy of PAN. - Clause 4.1		
5	Copy of GST-under Cl. 4.2		
6	Declaration as per cl. 4.3		
7	ESI -Clause 4.4		
8	PF- Clause 4.5		
9	Non-Disclosure Agreement		
10	EMD Details (DD No., Amount, Date & Bank)		
11	Signed NIT including Annexure I to XI		

Contractors seal and Signature

7.5 ANNEXURE – V: BIDDER DECLARATION - I

S. No.	DETAILS REQUIRED	Requirement fulfilled (Yes / No / NA/ Value)
1	I have carefully read the Tender Terms and Conditions and I submit my agreement for the same.	
2	I have completely understood the scope of work and submit my agreement to carry out the work as per mentioned in Tender document.	
3	I have quoted rates for the total scope of work mentioned in the tender document	
5	I have understood and accepted the payment terms of BHEL as per Cl.6	
6	I am responsible for the safety of workmen deployed and agree to fulfil the requirements as per tender terms	
7	I agree to participate in the tender and carry out the work (if awarded) ethically and submit my agreement to various requirements in this contract.	
8	I have carefully read the Tender Terms and Conditions and I submit my agreement for the same.	
9	Signed and submitted the deviations sheet	

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7.6 ANNEXURE – VI, BIDDER DECLARATION - II

I, ----------, aged----------Yrs., S/o ----------,

Residing at ----------

Hereby declare as follows:

(i) That my nationality is _____.
(ii) That I am a major and eligible to enter into contract / my firm / my company is competent to enter into an agreement.
(iii) I shall employ only such personnel who have not been found unfit for employment in Organizations such as Central / state / Public undertaking by the Police Authorities.
(iv) I shall not employ persons against whom Criminal cases are pending or under investigation.
(v) I shall also not employ persons found guilty of offences involving moral turpitude for executing work in BHEL contracts.
(vi) That there are no Criminal cases/Civil/Labor pending or under investigation against me or my firm or company.
(vii) I have not been found guilty of offences involving moral turpitude nor any of the company directors / partners of my firm have been found guilty of offences involving moral turpitude.
(viii) Neither I nor my firm nor my company has been declared insolvent in the past.
(ix) I have taken due care and efforts to furnish only information which are true in the tender document.
(x) I shall employ labor who is more than 18 years of age and less than 60 years and having sound physical and mental health.
(xi) I shall keep Photograph / identity proof / residential proof of the laborers to be employed against this tender and arrange for police verification.
(xii) I shall employ and deploy suitable qualified personnel for supervision of the work in each shift and additionally as required for monitoring compliance to process requirements and compliance to contract terms & conditions.

[Signature with Name & seal of the Tenderer]

Date :
Place :

Contractors seal and Signature

7.7 ANNEXURE VII Unpriced BID-(for Reference only)- BILL OF QUANTITIES (BOQ) FOR PRICE BREAK

Estimate for System Integration works for Reach 8 Kavach Field works - Survey (Track survey by LiDAR, Cable routing survey, survey at stations), Site Engineering & Design, Installation & Commissioning, Testing & support services (for training, documentation, Liaisoning with RDSO/SWR for approval, eLearning modules & technical assistance towards FAT(CFAT, IFAT), SAT, RDSO Final Acceptance, ISA Assessment and certification) for Kavach System for a period of 18 months in SWR Bengaluru Division

A.Survey Works

S No.	Description of Item	Unit (UOM)	Qty	Unit Rate in Rs.	Total Amount in Rs.
1	Carrying out Survey using WPC approved UAV drone/LIDAR for identification of absolute location of bridges, culverts, ROB, RUB, LCs, Signal location, point locations, OHE Mast, Km Stone, IB Locations etc. for placement of RFID Tags	RMT	36000	23.89	860,040.00
2	Location survey for cable route and preparation of tentative cable route plan as per the instructions of Engineer in-Charge.	Route Kilo Meter (RKM)	2	1,535.54	3,071.08
3	Site survey for study of braking characteristic of electric /diesel loco, submission of drawings for installations of train borne and track equipments, design and installation of proto track equipments, design and installation of proto type for approval and obtaining approval of the same.	Kilometre	36	4,464.44	160,719.84

B.Testing (FAT & SAT), Design documentation & Training to Railway staff

S No.	Description of Item	Unit (UOM)	Qty	Unit Rate in Rs.	Total Amount in Rs.
1	Testing, commissioning of KAVACH system in the entire system. It includes Carrying out FAT / SAT testing, Loco dynamic trials, pre-commissioning activities as per RDSO approved Pre- Commissioning Check List, commissioning of KAVACH system in the entire section. Includes support for BHEL till Final acceptance & ISA certification	Route Kilo Meter (RKM)	36	38,529.87	1,387,075.32
2	Design & supply of cable route plan & Design documents, as per technical specification and submission of 6 sets of documents in proper binding from approved drawings shall be taken and submitted to Railways. This includes (but not limited to) as made documents o f Interface circuit diagrams and interlocking circuit diagrams (altered sheets), contact analysis, RFID tag data, Stationary KAVACH connectivity diagram, roll diagram (continuous map), RFID Tag-TIN layouts, Table of Control for entire section, Stationary and Loco KAVACH interface diagrams, power supply diagram, frequency plan, TDMA based time slot allotment chart etc. and other manuals and technical documents (1 station and adjoining block section is considered 1 set). This includes liaison support with RDSO/SWR for approval and supply of elearning modules too.	Set	5	162,097.25	810,486.25
3	Training to Railway staff on trackside KAVACH and Wayside KAVACH which includes class room, onsite, Loco shed & firm visits.	Man-Days	100	1,430.27	143,027.00

C.Relay rack Wiring and Testing

S No.	Description of Item	Unit (UOM)	Qty	Unit Rate in Rs.	Total Amount in Rs.
1	"Fixing of the following on Pre-erected Relay Racks (e) Fixing relay bases on the relay frames erected in Relay Room, Wiring of all types of relays by drawing various sizes of wires/multi core cable, fixing fuses, condensers, resistances, LEDs etc and wiring duly soldering the same as per approved circuit diagram, testing point to point before soldering and after soldering, bunching and lacing as per detailed technical specification. Numbered ferrules shall be provided for each wire. Different colour codes and sizes of wire to be used as per standard practice. This also includes, provision of all PVC sleeves required to be provided. Copper lugs to suit to 16/02 wire and neat bunching, lacing with Modi Nylon / Twine thread and using PVC dotted tape with buttons. This also includes soldering all the wires in the relay room with Rosin core of IS Spec. 1921 @ 40<37@ Tin and 40% Led). Soldering should be done as per standard practice. This also includes inserting the clips, point to point testing as per the circuit diagram and plugging relays to Relay bases (except Inter-cables, relays other materials such as Rosin core, flux, nylon thread. PVC dotted tape should be supplied by the contractor). Point to point testing should be done in the presence of Engineer-in-charge as instructed in two stages, one before soldering and the other after soldering." For 05 Stations	Numbers	720	914.63	658,533.60
2	Fixing relay bases, wiring in location boxes, bunching, fixing of relays as per circuit diagram. This includes fixing of condensers, resistance, 6 way I 1 way terminals WAGO, ND type fuses, LED indicators for fuses as per type fuses. For 05 Stations	Per Relay	80	433.24	34,659.20

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D. Item which are BHEL Supply scope - I & C support in Civil Contractor which include cable laying, termination, feruling, lugs other consumables neccessary for installation

S.No	Description of Item	Unit (UOM)	Qty	Unit Rate in Rs.	Total Amount in Rs.
1	Support towards Installation and commissioning of Test Bench for Loco equipment (Diesel/Electric) as per RDSO letter No. STS/E/TCAS/ Tender/ Part -IX dated 03.02.2016 or latest" (Inspection by RDSO)	Numbers	1	616,569.49	616,569.49
2	Support towards Installation, Testing and commissioning of Test Bench for Station TCAS equipment. This should comply with RDSO/SPN/196/ 2020 Version 4.0 or latest. (Inspection : RDSO)	Numbers	1	434,094.92	434,094.92
3	Support towards Installation, Testing and commissioning of Lab Models of station equipment (2 set), loco equipment (2 set), trackside components (2 set) and simulator (2 sets) at Headquarters(For training of staff). (Inspection : RDSO)	Numbers	1	1,344,181.92	1,344,181.92
4	Support towards Installation, Testing & Commissioning of station TCAS RIU(Remote Interface Unit) with atleast 32 Field I/P's as per RDSO/SPN/196/2020 Version 4.0 or latest. The RIU should have provision of OFC I/F and should be connected to central TCAS in a Ring network .This includes modems, I/F, Earthing, Wiring & Signal functions etc. [Detailed Specification in Technical Document enclosed] (Inspection : RDSO)	Set	4	157,598.87	630,395.48
5	Support towards Installation & Commissioning of Locomotive (on board) KAVACH Equipment consisting of Vital computer & peripherals such as Driver Machine interface, 2 RFID Readers, 2 full duplex Radio modems, 4 UHF antenna, 2 GPS and GSM antenna, two number of Pulse generator/Wheel Sensor with direction sensing, and associated cabling and power supply arrangement, excluding Brake interface unit. This should comply with RDSO/SPN/196/2020 Version 4.0 or latest. (Inspection by RDSO).	Set	10	466,741.81	4,667,418.10
6	Support towards Installation, Testing & Commissioning of Station TCAS Equipment with suitable Rack consisting of Vital computer peripherals, 2 full duplex Radio modems, OFC modems, UHF antennas, GPS and GSM antenna and interfaces and their installation, wiring (including supply of Coaxial, OFC,CAT-6, power cable as per requirement) and testing as per RDSO/SPN/196/2020 Version 4.0 or latest. This also includes earthing (Earth resistance less than 1 ohm) as per RDSO RDSO/SPN/197 Ver 1.0, wiring of Electrical/Optical, relay wiring, connecting of SMOCIP from station TCAS, supply of tool kit and interlocking of relays/ Protocol Converter to suit all types of installation such as EI of any make and PI/RRI, DC-DC converter and suitable power supply arrangement for STCAS and tower equipment. (Supply of earthing material and supply of relays is covered separately). [Detailed Specification in Technical Document enclosed] (Inspection : RDSO)	Set	5	551,750.28	2,758,751.40
7	Support towards installation and commissioning of Brake Interface unit suitable for different locomotives as per RDSO/SPN/196/2020 Version 4.0 or latest. (Inspection by RDSO)	Numbers	10	148,700.56	1,487,005.60
8	Support towards transportation, Installation, Programming, Verification and Commissioning of RFID tags with enclosures and fixures at Stations and block sections(absolute/Automatic Block section). This should comply to RDSO/SPN/196/2020 Version 4.0 or latest. Inspection by RDSO	Numbers	1250	3,485.27	4,356,587.50
9	Support towards Re-programming, Re-fixing and verification of existing RFID Tags	Numbers	250	1,742.63	435,657.50
10	Support towards Re-programming of existing RFID Tags without shifting.	Numbers	230	1,352.98	311,185.40
11	Support towards Installation, Programming, Verification and Commissioning of RFID tags with enclosures and fixtures at Stations and block sections consisting of LCs, IBS & Auto signals. 1 Station & adjoining block section will be counted as one set. This should comply with RDSO/SPN/196/ 2020 Version 4.0 or latest . [Detailed Specification in Technical Document enclosed] (Inspection : RDSO)	Set	5	224,053.06	1,120,265.30
12	Support towards installation of rack mounted 24 fibre Distribution Management System (FDMS) of size 1U, of Reputed/Branded company make as per specification RDSO/SPN/TC/37/2020 Revision 4.0 with latest amendments. The FDMS shall include 24 SC- PC/Required adaptors having insertion loss less than or equal to 0.1dB and 24 numbers 900 micron 1.5m SC- PC/Required pigtails."	Numbers	18	4,828.38	86,910.84
13	Support towards installation and commissioning of Network Management System for Centralized monitoring of KAVACH station and Loco equipment as per RDSO/SPN/196/ 2020 Version 4.0 or latest.(Inspection by RDSO)	Set	1	1,154,531.71	1,154,531.71
A	**TOTAL PRICE IN INR EXCL of GST**				**23,461,167.45**
B	**GST @ 18%**				**4,223,010.14**
C	**GRAND TOTAL PRICE IN INR INCLUDING OF GST**				**27,684,178**
D	**Quoted Price (including GST) by bidder in GeM portal financial Bid**			**Do not write any values here. Quote should be given only online in GeM price bid**	
Note:	1. Bidders may quote LUMP SUM VALUE above (+) or below (-) (or) AT PAR with respect to total amount and not the individual rates for every item. 2. GST and all other taxes & duties are to be included in the quoted rate.				

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7.8 ANNEXURE- VIII, PPP-MII Format

FORMAT FOR VERIFICATION OF LOCAL CONTENT UNDER PREFERENCE TO MAKE IN INDIA ORDER
(To be submitted with the offer)
[Applicable for procurement value from Rs. 5.00 Lac to Rs. 10.00 Crore]
Self-certification giving the percentage of local content, in line with PPP-MII order, if applicable [to be submitted on the letter head of the issuer.]
Item Name : **System Integration works for Reach 8 Kavach field execution - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipment, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division**.

Enquiry No. : **As per GeM**
Project: System Integration works for Reach 8 Kavach field execution for kavach system as per project schedule in SWR Bengaluru division

Applicable percentage of Local Content……**(Bidder to indicate local content in percentage)**

We have read and understood the provisions of "Public Procurement (Preference to Make in India) Order, 2017" dated 15/06/2017, its revision dated 28/05/2018 and any subsequent modifications/Amendments, if any [hereinafter, "PPP-MII Order"] issued by Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India.
In line with the provisions of the PPP-MII Order, We, M/s. …… [Enter the name of the Bidder] [hereinafter, "Local Supplier"] submits self-certification to M/s. Bharat Heavy Electricals Limited [hereinafter, BHEL] regarding Local Content in Goods/Services/Works to be supplied by the Local Supplier for the **"System Integration works for Reach 8 Kavach field execution for kavach system as per project schedule in SWR Bengaluru division for 18 months"** (Enter the name of the Equipment/Item for Project), wherein we have agreed to abide by the terms and conditions of the PPP-MII Order.

Details of location at which local value addition will be made is as follows:

_____
_____
_____
_____
We also understand, false declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

For and on behalf of, Date:

Authorized Signatory
(With Company Seal & Signature)

Note: This is a guiding format. In case the bidder submits the certificate in a format different from the above, the same may be considered provided it meets the intent and purpose, as may be ascertained by BHEL.

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7.9 ANNEXURE -IX: DEVIATION SHEET

Sl No.	Volume	Part/Clause Sl no.	NIT requirement	Bidder's Deviation

Total No. of deviations proposed by the Bidder- _____ nos.

BIDDER'S SIGN & SEAL:

Note: The Offers should be in full conformity with the terms and conditions of this tender. Incorrect and incomplete tenders are liable to be rejected. Deviations, if any, should only be mentioned as per format for Non-Technical Deviations (i.e. General Terms & Conditions, Commercial Terms etc.) & Technical Deviations (i.e. Scope of Work, Modalities of Contract etc.). BHEL at its discretion whether to give any further chance to a bidder in case of any deviation or reject the same offer.

Contractors seal and Signature

7.10 ANNEXURE -X

CONFLICT OF INTEREST AMONG BIDDERS/ AGENTS

"A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests.

The bidder found to have a conflict of interest shall be disqualified.

The bidder notes that a conflict of interest would said to have occurred in the tender process and execution of the resultant contract, in case of any of the following situations:

(i) If its personnel have a close personal, financial, or business relationship with any personnel of BHEL who are directly or indirectly related to the procurement or execution process of the contract, which can affect the decision of BHEL directly or indirectly;

(ii) The bidder (or his allied firm) provided services for the need assessment/ procurement planning of the Tender process in which it is participating;

(iii) Procurement of goods directly from the manufacturers/ suppliers shall be preferred. However, if the OEM/ Principal insists on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/ supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer/ supplier could bid directly but not both. In case bids are received from both the manufacturer/ supplier and the agent, bid received from the agent shall be ignored. However, this shall not debar more than one Authorized distributor (with/ or without the OEM) from quoting equipment manufactured by an Original Equipment Manufacturer (OEM) in procurements under a Proprietary Article Certificate.

(iv) A bidder participates in more than one bid in this tender process. Participation in any capacity by a Bidder (including the participation of a Bidder as a partner/ JV member or sub-contractor in another bid or vice-versa) in more than one bid shall result in the disqualification of all bids in which he is a party. However, this does not limit the participation of an entity as a sub-contractor in more than one bid if he is not bidding independently in his own name or as a member of a JV.

The Bidder declares that they have read and understood the above aspects, and the bidder confirms that such conflict of interest does not exist and undertakes that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder{s), in this regard. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, the same will be considered as a violation of the tender conditions, and suitable action shall be taken by BHEL as per extant policies/ guidelines.

Signature with company seal -

Name –

Company / Organization –

Designation within Company / Organization –

Address of Company / Organization –

Contractors seal and Signature

7.11 ANNEXURE -XI
DECLARATION LETTER BY THE TENDERER

Name of Work: System Integration works for Reach 8 Kavach field execution - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipment, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division.
Tender Reference: 238214

We

_____(Name of the Tenderer) hereby declare that we have at least 20 Engineers with minimum Graduate/Diploma in the Signaling and communication (with knowledge, Expertise & Experience in Railway signaling).

Date:

Thanking you.
Yours faithfully,
(Signature, date & seal of authorized Representative of the contractor)

Contractors seal and Signature

TENDER DOCUMENT

VOLUME - II

Contractors seal and Signature

	INSTRUCTION TO BIDDER
1.1.	Bidders are instructed to submit the tender document only through GeM portal. No other mode of submission is allowed.
1.2.	The tenderer shall expressly accept all the terms and conditions of the Tender. The tender which does not comply with the BHEL's Terms & Conditions may be rejected as Non-responsive/non-conforming and non-acceptable.
1.3.	BHEL shall not be liable for any expenses incurred by bidder in preparation of bid irrespective of whether it is accepted or not.
1.4.	All corrigenda, addenda, amendments and clarifications to this Tender will be hosted in GeM portal. Bidders shall keep themselves updated with all such amendments.
1.5.	The techno-commercial offer will be opened on the due date. The tenders meeting our techno-commercial requirements will be considered for online initial sealed bid auction at a later date for which eligible vendors will be intimated in due course.
1.6.	The tender forms duly filled in all respects shall be signed on each page by the tenderer. Any alteration, erasing will render the tender invalid. Corrections, over writing, cutting(s) etc. are not permitted. All entries in the tender document should be in one ink. All the columns in the tender form should be filled without leaving any column blank in any page of the tender. In case any of the relevant columns are left blank, the tender can be rejected. However, alteration neatly carried out and duly attested over with the full signature of the tenderer is permitted.
1.7.	The tenderer should submit the tender documents intact without detaching any page or pages.
1.8.	Before making the offer, the bidders are advised to carefully go through the terms and conditions, which form part of the Agreement.
1.9.	Tender documents duly sealed and signed.
1.10.	BHEL reserves the right to assess the capacity and capability of the parties for pre-qualification. The company also reserves the right to accept or reject any or all the tenders or any part thereof at any stage of process without assigning any reason whatsoever. The company has no obligation to accept the lowest tender. Offer of the Tenderer if prima-facie found not comparable with the quantum of work envisaged and the bid is a desperate effort to be L1, then the offer is liable to be rejected. BHEL's decision in this regard shall be final and binding.
1.11.	**PRICE BID** – Please refer un-priced price bid in Annexure-A to quote in GeM portal financial bid including GST. The tenderers are required to submit their quotation for all the items listed in the GeM Price Bid. The price should be quoted for each activity after careful study of the actual job requirement so that, in case the contract is awarded, contractor should not express any difficulties in execution of the contract.
1.12.	The evaluation currency for this tender shall be INR (Indian Rupees only).
1.13.	**VALIDITY OF RATES:** The rates quoted should be valid for 90 days initially from the date of opening of the Techno-Commercial bid.
1.14.	The rates shall include the payments on account of Employee contribution to PF, PF Admin. Charges, EDLI, Employer contribution to ESI, Gratuity, Bonus as per statutory requirement, applicable taxes, as per the directives issued by BHEL from time to time.
1.15.	BHEL reserves the right to reject any bid, which is technically unacceptable and unworkable. Further BHEL also reserves the right to reject any or all tenders without assigning any reasons thereof.
1.16.	BHEL reserves the right to cancel the contract at the initial stage or during the contract period without assigning any reason to the tenderer.
1.17.	Wherever prescribed formats are specified for the tenderers use, he shall use the same for making his Claims.
1.18.	Tender document should be complete in all respects.
1.19.	The Offers should be in full conformity with the terms and conditions of this tender. No contradictions are acceptable. Incorrect and incomplete tenders are liable for rejection.
1.20.	Tenders not submitted in the prescribed forms are liable for rejection.
1.21.	BHEL reserves the right to accept or reject any tender in part or full at their discretion without assigning any reason.
1.22.	If a tenderer deliberately gives wrong information in his tender or creates conditions favorable for the acceptance of his tender, then BHEL reserves the right to reject such tender at any stage.

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1.23.	If the tenderer indulges in any unethical practice for securing the contract, the offer of such tenderer shall be rejected.
1.24.	Any written communication required to be sent to the contractor in writing shall be sent at the address mentioned on the tender form or to any other address subsequently intimated by contractor in writing to BHEL SBD for the contract purposes.
1.25.	Separate intimation regarding award of work, availability of site/input to commence the work will be given to successful bidder.
1.26.	**Evaluation of Bids**
1.27.	**Techno-Commercial Bid & PQR**: The techno-commercial bid & PQR will be evaluated based on the eligibility (PQR) criteria clause 3 and 4 and on acceptance of NIT /Tender terms and conditions. Only qualified bids will be eligible for price-bid opening.
1.28.	**Evaluation of Price-Bids:** L1 offer will be decided based on OVERALL L1 value and order will be placed on single contractor. Evaluation of the L-1 offer shall be computed on overall lowest cost to BHEL (Grand Total Price for all the items including GST). L-1 awarding shall be as per GeM system.
1.29.	In case of any conflict between the Technical specification- BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001 and tender terms-Vol I & II, provisions contained in the Technical specification shall prevail. In case of any conflict between the BHEL GCC and Tender Terms Vol I & II, provisions contained in the Tender Terms Vol I & II shall prevail. BHEL ATC terms shall prevail over GeM SLA/GTC.
1.30.	Compensation to Contractor: No compensation to contractor shall be given for prior completion/ early closure or any negative/ positive variation in contract value.
2.	**EARNEST MONEY DEPOSIT (EMD): APPLICABLE as per NIT Vol I Clause 1.10-General Information of Tender.**
2.1	Earnest Money Deposit (EMD) is to be paid by tenderers for securing fulfilment of any obligations in terms of the NIT. Earnest Money Deposit as indicated in the NIT (Ref. General Information) is to be submitted along with tender documents Part – A.
2.2	**Modes of deposit** The EMD may be accepted only in the following forms: (i) Cash deposit as permissible under the extant Income Tax Act (before tender opening) (ii) Electronic Fund Transfer credited in BHEL account (before tender opening) (iii) Banker's cheque/ Pay order/ Demand draft, in favor of BHEL (along with offer) (iv) Insurance Surety Bonds (v) Fixed Deposit Receipt 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 and duly discharged on the back)
2.3	**Forfeiture of EMD** 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 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/ contractors" and forfeited/ released based on the action as determined under these guidelines.
2.4	EMD given by all unsuccessful tenderers shall be refunded normally within fifteen days of award of work.
2.5	EMD shall not carry any interest.
2.6	EMD of successful tenderer will be retained as part of Security Deposit.
3.	**SECURITY DEPOSIT (SD) : Applicable**
3.1	Security Deposit means the security provided by the Contractor towards fulfilment of any obligations in terms of the provisions of the contract and be treated as a performance security.
3.2	The total amount of Security Deposit will be **5 %** of the contract value. EMD of the successful tenderer shall be

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	converted and adjusted towards the required amount of Security Deposit.
3.3	**Modes of deposit**: The balance amount to make up the required Security Deposit of **5%** of the contract value may be accepted in the following forms: i. Cash (as permissible under the extant Income Tax Act) ii. Local cheque of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favor of BHEL iii. Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format should have the approval of BHEL iv. Fixed Deposit Receipt 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) v. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favor of BHEL) vi. Insurance Surety Bonds (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)
3.4	**Collection of Security:** At least 50% of the required Security Deposit, including the EMD should be collected before start of the work. Balance of the Security Deposit can be collected by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected. If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor. The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of the authority competent to award the work. **Note:50% of the Security Deposit shall be collected from the contractor, before start of the work or 14 days from contract date whichever is later. The interest period shall start after the lapse of above period as per applicable rates)**
3.5	Security Deposit shall be released to the Contractor upon fulfilment of contractual obligations as per terms of the contract.
3.6	The Security Deposit shall not carry any interest.
3.7	Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. **In case of delay** in submission of performance security, enhanced performance security which would include interest **(Repo rate + 4%)** for the delayed period, shall be submitted by the bidder. Further, If performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT/contract, from the bills along with due interest.
4	**NON-DISCLOSURE AGREEMENT**. The contractor shall sign a Non-Disclosure Agreement (NDA) as per BHEL format (Copy enclosed) in compliance to Information Security Management System.
5	**CONFIDENTIALITY**: The contractor and his representatives shall, at all times, undertake to maintain and ensure complete confidentiality and integrity of all data, information, software, drawings & documents, etc. belonging to BHEL and also of the systems, procedures, reports, input documents, results and any other company documents discussed and/or finalized during the course of execution of the order/contract.
6	**STATUTORY REQUIREMENTS:**
6.1	While quoting the rate, the tenderers are advised to take note of minimum wages payable to workmen.
6.2	The tenderer will be required to comply with all the statutory provisions such as Minimum Wages prevailing at the time of payment or arrears thereof Bonus, PF, EDLI, ESI, Applicable Tax, declared Holidays, leave, etc. The contractor shall submit the documentary evidence of payment on account of submission of statutory payments made to the concerned agencies before clearance of bill of next month.
6.3	The contractor shall comply with the provisions of the, the payment of the wages Act 1936, Factories Act, Minimum wages Act 1948, Employment of children Act 1938, Employers liability Act 1938, Industrial Disputes Act 1947, & other Acts Central or States, that may be applicable to him. He shall be liable to pay all such sum, or sums that may

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	become payable as contribution, compensation, penalty, fine or otherwise, which the provision of the said acts, to or on behalf of any workmen employed by the contractor by an authority empowered under the relevant Act. Any cost incurred by the Management of BHEL in connection with any claim or proceedings under the said Acts or in respect of loss, injury or improper performance of this contract by the contractor, is workmen, servant and any money which may become payable to the management of BHEL as aforesaid shall be deemed to be deducted by the management of BHEL from any money due or accruing to the contractor by the management of BHEL or may be recovered by the management of BHEL from the contractor in the other manner.
6.4	The contractor shall fully indemnify the loss if any caused to BHEL due to any default or non-observance of any of the laws, or any omission or commission or inability on the part of the contractor or his representative.
6.5	The contractor shall, keep and produce for inspection at all times, forms, registers and other records required to be maintained under various statutes in order to enable scrutiny by the Company whenever required.
6.6	The contractor shall produce to the Company, the documentary proof of payment of the said statutory dues. Non-observance of the provisions will be construed as default by the Tenderer in making such payment, and payment of his bill will be deferred.
6.7	The Income tax as applicable will be deducted from the bill of the contractor.
6.8	Each contractor will be required to maintain the daily attendance of his labors in the prescribed Performa for accounting payment of minimum wages, deduction towards ESI & PF Contributions, payment of Bonus, leave etc.
6.9	The contractor will have to follow the provisions of Payment of Bonus Act 1965 and Rules 1975, and is liable to pay Bonus to his workers
6.10	The contractor will have to extend paid National Holidays and Festival Holidays to their workmen as per the provisions of the relevant Act and the Rules thereof. However, if due to exigencies of work the contractor engages his workmen on National Holidays or Festival Holidays contractor shall pay additional wages as prescribed under the provisions of the Act.
6.11	**COMPLAINCE WITH BOCW ACT: Compliance to be met as per applicability for construction works**
7.	**Manpower**
a.	The Contractor shall provide the minimum manpower required for executing the contracted work as per the scope of work. The contractor shall not engage a person who is less than 18 years of age and more than 58 years of age.
b.	Regarding Uniform, Washing Allowance and Safety shoes**:** The contractor at his own cost shall provide proper uniform and safety shoe including washing cost to their workmen. BHEL will not provide uniform, safety shoe and washing allowance to contractor. Contractor has to manage the same from the margin
c.	The contractor shall be responsible for safety of his laborers/security guards while they are engaged for work connected with the Contract. The Contractor shall be responsible for the appropriate usage of the said safety appliances. In the event of violation of applicable safety, health & environment related norms, a penalty of Rs.500/- per occasion shall be imposed on the contractor.
d.	The contractor, as the employer of his workmen, shall manage them. In the event of any dispute arising between the contractor and his employees, the contractor alone is solely responsible for resolving the dispute between them and BHEL will in no way be responsible for settling the dispute either statutory or otherwise.
e.	The contractor will be solely responsible for executing the agreed work and the employees of BHEL will only oversee the proper execution of work. The contractor or his representatives shall be available in the factory to control and supervise his workers and take down instructions from the designated officials of BHEL. The cost of representatives has to be borne by the Contractor.
f.	The contractor shall have full control over his employees including w.r.t determining service conditions, discharge, dismiss, or otherwise terminate their services at any time. However, the contractor shall not engage any person who has completed 58 years of age. The contractor shall be solely responsible for any claim arising out of employment or termination of employment of his employees and for statutory payments.
g.	The contractor shall employ only such personnel who are medically fit. The company has right to direct the contractor to remove from the premises such of his personnel who may be physically, hygienically, clinically or medically unfit.
h.	The contractor shall employ only such personnel who have not been found unfit for employment in Organizations such as Central/State/Public Undertakings by the Police authorities. For this purpose, contractor is required to submit the police verification report before engaging the contract labor. Persons against whom criminal cases are pending or under investigation and persons found guilty of offences involving moral turpitude shall not be engaged for executing work.

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i.	The Contractor shall comply with all the operational rules and regulations, including safety and security rules framed by the company from time to time wherein the Contractor or his workmen happen to be operating/ working. In the event of any of the workmen of the contractor violating any of the said rules and regulations, the Contractor would be required to remove forthwith such workmen from the company's premises.
j.	Deployed personnel should not be under the influence of alcohol, or misbehaving / unruly, sleeping while on duty or absent.
k.	Appropriate penalty as per government norms shall be levied if vendor fails to produce a proof of having taken a valid insurance to ensure employees' compensation and accidental cover in respect of his personnel, who are not covered under ESI Act.
8.	**PERIOD OF CONTRACT-** 1. Duration of contract is as mentioned in the General Information of NIT. 2. Also, if the both parties mutually agreed upon, the period of contract may be extended for a further period on the same terms and conditions.
iii)	**FAILURE TO COMPLY WITH CONTRACT**
a.	Notwithstanding anything contained in any other clause, BHEL reserves the right to terminate the contract due to any failure on the part of the Tenderer in discharging his obligations under the contract or in the event of his becoming insolvent or going into liquidation. The decision of the BHEL about the failure on the part of the Tenderer shall be final and binding on the tenderer.
b.	In case of any damage to the existing building, structures, materials, tools, furniture and fixtures, machines etc., caused from contractor's end, the cost of its repairs or replacement will be recovered from the contractor. If there is any work stoppage in any area of the Plant due to the fault of the tenderer, the tenderer is liable to compensate the same.
c.	**Breach of contract and Termination:** A) In case of breach of contract, 10% of the contract value shall be recovered from the contractor. This 10% of the recovery amount is other than the penalty/LD amount mentioned elsewhere in the contract. In case of breach of contract, wherever the value of security instruments like performance bank guarantee available with BHEL against the said contract is at least 10% of the contract value, the same be encashed. In case the value of the security instruments available is less than 10% of the contract value, the balance amount be recovered from other financial remedies (i.e. available bills of the contractor, retention amount, etc. with BHEL) or legal remedies be pursued. The balance scope shall be got done independently without Risk & Cost of the failed supplier/ contractor. B) Following cases shall be considered as terms of breach of contract: i. Contractor/ supplier's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor/ supplier including unexecuted portion of work/ supply 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/ Non-supply by the Contractor/ supplier within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the contractor/ supplier. iv. Termination of Contract on account of any other reason (s) attributable to Contractor/ Supplier. If at any time the Contractor defaults in proceeding with the work with due diligence and continues to do so or commit any default in complying any of the tender terms and conditions even after the notice in writing is given, BHEL may, without prejudice to any other right to remedy which shall have accrued or shall accrue thereafter to BHEL, to terminate the contract by giving 30 days' notice in writing. The notice will be deemed to have been served as and when sent to the address given in the tender. v. Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL. vi. Non-compliance to any contractual condition or any other default attributable to Contractor/ Supplier. C) The following sequence shall be applicable for recoveries from contractor/ supplier, who has breached the contract: i. Dues available in the form of Bills payable to contractor/ supplier, Security deposits, Bank Guarantees against the same contract in BHEL SBD. ii. Dues payable to contractor/ supplier against other contracts in BHEL SBD or any other units/regions of BHEL shall be considered for recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor/ supplier. iii. In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor/supplier.
iv)	**SUB-CONTRACTING**

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a.	The contractor shall not sub-contract or transfer or assign the contract in full or any part thereof to any other person or firm or company without the previous express written approval of BHEL.
v)	**LAWS GOVERNING THE CONTRACT**
a.	The contract will be governed by the Laws of India for the time being in force and as amended or made from time to time.
b.	All disputes shall be settled in accordance with the Laws of India for the time being in force and as amended from time to time.
c.	All disputes arising out of or in relation to this contract or Agreement shall be settled by mutual discussions and in the event of failure such disputes shall be referred to the Arbitrator.
vi)	**LEGAL JURISDICTION:**
a.	In respect of all matters arising out of or pertaining to the contract, the cause of action thereof shall be deemed to have arisen only at Bengaluru, where BHEL – SBD is situated. All legal proceedings pertaining to the above matters or dispute shall be instituted only in courts having territorial jurisdiction over the place where BHEL-SBD is situated and no other court shall have the jurisdiction.
13.	**CARTEL FORMATION:** The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies/ guidelines.
14.	**SETTLEMENT OF DISPUTES** If any dispute or difference of any kind whatsoever shall arise between BHEL and the Supplier/Vendor, arising out of the contract for the performance of the work whether during the progress of contract termination, abandonment or breach of the contract, it shall in the first place referred to Designated Engineer for amicable resolution by the parties. Designated Engineer (to be nominated by BHEL for settlement of disputes arising out of the contract) who within 60 days after being requested shall give written notice of his decision to the contractor. Save as hereinafter provided, such decision in respect of every matter so referred shall forthwith be given effect to by the Supplier/Vendor who shall proceed with the work with all due diligence, whether he or BHEL desires to resolve the dispute as hereinafter provided or not. If after the Designated Engineer has given written notice of this decision to the party and no intention to pursue the dispute has been communicated to him by the affected party within 30 days from the receipt of such notice, the said decision shall become final and binding on the parties. In the event the Supplier/Vendor being dissatisfied with any such decision or if amicable settlement cannot be reached then all such disputed issues shall be resolved through conciliation in terms of the BHEL Conciliation Scheme 2018 as per Clause 14.1
15.	**ARBITRATION:**
a)	Except as provided elsewhere in this contract, in case Parties are unable to reach an amicable settlement (whether by Conciliation to be conducted as provided in Clause 14.1 herein above 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, refer the disputes to Arbitral Institution **"Arbitration & Conciliation Centre, Bengaluru (Domestic and International)"** and such dispute to be adjudicated by Sole Arbitrator appointed in accordance with the Rules of the said Arbitral Institution.
b)	A Party willing to commence arbitration proceeding shall invoke Arbitration Clause by giving notice to the other party in terms of section 21 of The Arbitration and Conciliation Act, 1996 (hereinafter referred to as the 'Notice') before referring the matter to arbitral institution. The Notice shall be addressed to the Head of the Region, Power Sector/ Unit, BHEL, executing the Contract and shall contain the particulars of all claims to be referred to arbitration with sufficient detail and shall also indicate the monetary amount of such claim including interest, if any.

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c)	After expiry of 30 days from the date of receipt of aforesaid notice, the party invoking the Arbitration shall submit that dispute to the **Arbitration & Conciliation Centre, Bengaluru (Domestic and International)** and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd. Judge having considerable experience in commercial matters to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to **Arbitration & Conciliation Centre, Bengaluru (Domestic and International)** for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.
d)	The fee and expenses shall be borne by the parties as per the Arbitral Institutional rules.
e)	14.2.5 The Arbitration proceedings shall be in English language and the seat and venue of Arbitration shall be in Bengaluru, Karnataka only.
f)	Subject to the above, the provisions of The Arbitration & Conciliation Act, 1996 and any amendment thereof shall be applicable. All matters relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at Bengaluru, Karnataka only.
g)	Notwithstanding any reference to the Designated Engineer or Conciliation or Arbitration herein, the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree. Settlement of Dispute clause cannot be invoked by the Contractor, if the Contract has been mutually closed or 'No Demand Certificate' has been furnished by the Contractor or any Settlement Agreement has been signed between the Employer and the Contractor.
h)	It is agreed that Mechanism of resolution of disputes through arbitration shall be available only in the cases where the value of the dispute is less than Rs. 10 Crores.
i)	In case the disputed amount Claim, Counter claim including interest is Rs. 10 crores and above, the parties shall be within their rights to take recourse to remedies other than Arbitration, as may be available to them under the applicable laws after prior intimation to the other party. Subject to the aforesaid conditions, provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications or re-enactment thereof as amended from time to time, shall apply to the arbitration proceedings under this clause.
j)	In case, multiple arbitrations are invoked (whether sub-judice or arbitral award passed) by any party to under this contract, then the cumulative value of claims (including interest claimed or awarded) in all such arbitrations shall be taken in to account while arriving at the total claim in dispute for the subject contract for the purpose of clause 14.2.9. Disputes having cumulative value of less than 10 crores shall be resolved through arbitration and any additional dispute shall be adjudicated by the court of competent jurisdiction.
k)	**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. 05/0003/2019-FTS-10937 dated 14-12-2022 as amended from time to time.
16.	**COMPENSATION:**
b.	"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. a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below. b) 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/solar O&M Sites.

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c) Compensation in respect of each of the victims:
(i) In the event of death or permanent disability resulting from Loss of both limbs: ₹10,00,000/- (Rupees Ten Lakhs)
(ii) In the event of other permanent disability: ₹7,00,000/- (Rupees Seven Lakhs)
d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the provision to Section 2 (I) of the Employee's Compensation Act, 1923."

17.

DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR:

1.The duties and responsibilities and obligation of the contractor including statutory responsibilities mentioned in this document are indicative and not exhaustive. Contractors are required to confirm with the concerned authorities for proper and complete compliance.

2.The contractor will abide by the provisions of Child Labor (Prohibition & Regulation) Rules 1988. He should issue appropriate Appointment Letter to his Workmen.

3.The following documents / forms under Contract Labor (Regulation & Abolition) Act 1970 and relevant rules therein shall be maintained by the contractor:

(i) A notice showing the wage period and the place and time of disbursement of wages to be displayed at the place of work and a copy sent by the contractor to the HR Department (Rule 75).
(ii) A register of workman From XIII (Rule 75)
(iii) Employment card From XIV (Rule 76)
(iv) Service Certificate From XV (Rule 77)
(v) Muster Roll, Wage Register, Deductions Register, overtime Register, leave register etc.
(vi) Half yearly return to be sent (In duplicate) by the contractor to the licensing officer. From – XXIV (Rule 82 (I) with a copy to HRM Department regularly.
(vii) All statutory registers and records shall be preserved in original for a period of Ten years and should be made available even after the contract is over for verification.

4. The contractor shall comply with the provisions of Contract Labor (R & A) Act including provisions relating to welfare and Health facilities as provided under the Contract Labor (R& A) Act 1970 and relevant rules.

5.All the registered contractors shall submit the returns required under contract Labor (Regulation & Abolition) Act 1970 and forward a copy to HR Department of BHEL-SBD.

6.SBD– Bengaluru/project/Solar O&M site is a Notified Area under the provisions for ESI Act 1948. The contractor shall comply with the provision of ESI Act, and will be responsible for any liability arising during the tenure of the work contract under the Act, The contractor should ensure ESI coverage and facilities to his workers (i.e. ESI code no. and ESI card etc.) as per ESI Scheme from ESI authorities including Medical Benefit etc, The contractor shall arrange for filing of family declaration forms in respect of their contract labors and deposit the same in ESI office for issue of Identity card by ESI authorities. The contractor may deduct required ESI contribution from the wages of their employees as per law and deposit the same (Employees share) along with his contribution to the ESI authorities.

7.Workmen insured under ESI Act only shall be deployed in contract work.

8.The contractor shall submit bi-annual return in Form 6 along with monthly Challans to the appropriate authority under the provisions of Employee's State Insurance Act 1948, and send an intimation to HR Department of BHEL-EPD.

9.Not with standing anything contrary to this, in the event of accident the contractor shall be required to submit injury report to the concerned authorities with a copy of the same to the designated BHEL Executive immediately and ensure the compliance of the ESI Act and rules made therein.

10.The contractor shall submit the following returns to the appropriate authority under the provisions of Employee's Provident Fund and Misc. Provisions Act 1952, Employees' Pension Scheme 1995 under intimation to HR Dept.

(i) Monthly return in Form 12 A along with form 5 & 10 (addition and deletion) and monthly Challan.
(ii) Annual Return in Form 6A along with Form 3A.

11.The Contractor shall maintain the following records as required under the Employees Provident Fund and Miscellaneous Provisions Act 1952, Employee's Pension Scheme 1995

- Declaration of Nomination, Form No.2 Para 33 and 61 (1).
- Pass Book.
- Cash Book.
- Attendance.
- Wage Register.

12.The contractor shall regularly pay the amount of contribution (employer's contribution as well as the employee's

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contribution) as per the Employee's Provident Fund and Miscellaneous Provisions Act 1952, Employees' Pension Scheme 1995 and Employee's State Insurance Act 1948.

(i) The contractor may recover from his workmen, the employee's contribution in accordance with the provision of the said act and the Scheme but shall not recover the employer's contribution or the other charges from his employees in any manner.

(ii) The contractor shall submit along with monthly bills to BHEL, statement showing the recoveries of contributions in respect of employees employed by or through him along with the proof of Deposit of such contribution with the Concerned Authority and shall also furnish to BHEL such information, in the capacity of principal Employer, as required to furnish under the provisions of the schemes under the Employees P.F. and Misc. Provisions Act 1952 and ESI Act, 1948 to the authorities under the said acts.

(iii) The Contractor shall arrange for his own P.F. and ESI Code No. from the PF and ESI authorities respectively. The contractor will be reimbursed by BHEL the expenditure incurred by the contractor towards payment of the Employers Contribution and PF Administrative charges.

13Any failure to comply with the statutory requirements on the part of contractor shall disqualify such contractor from all contracts awarded to him and his name shall be black listed for further tenders / contracts. In addition, the contractor's security deposit shall be forfeited apart from consequential legal action against him.

14 The contractor shall maintain Form D as per Rule 5 of the Payment of Bonus Act, 1965. The contractor is further liable to pay bonus to his employees in accordance with the payment of Bonus Act 1965 and to keep all the records in Form C as per the said Act.

15.In case the contractor employs women, he will discharge his obligation under law in respect of such women workers such as prohibition of engaging them during night hours, prohibition of employing them more than 9 hours per day, provision of crèche facility, grant of maternity leave as per rules etc.

16.The Wage period for the Workmen of Contractors shall be Calendar Month and the contractor shall be responsible for making payment of wages within 7 days of the closure of the wage month. The disbursement shall be preponed to the 6^{th} day, if the 7^{th} day happens to be a holiday. Similarly, in case of Overtime wages, the contractor shall make the OT payment to his workmen along with the salary within 7 days of the closure of the wage month The Contractor would be required to open an Account for Electronic Fund Transfer (EFT) of his Bills/Claims from BHEL as well as EFT of wages/OT/other payments of his workmen from his Account to the Accounts of his workmen so that risks associated with cash transactions can be avoided.

17.The Contractor shall be required to issue monthly Wage /OT Slips to their workmen. Further, the Contractors claims are to be accompanied by a Certificate from BHEL Official certifying that "the Wage /OT Slips for the previous month/current month have been issued by the contractor to all their workmen". Further, the contractor would be required to issue Annual PF Statement from the PF Authorities for all his workmen engaged in BHEL O&M project site/SBD Unit before submitting Claim for refund of Security Deposit for the respective years.

18.In case contractor fails to make payment of wages to his employees or remittance of contribution to the concerned authorities, the Security deposit / other dues payable under the contract can be utilized by BHEL to discharge the liability of the contractor.

19.The workmen of the contractors shall wear minimum while attending duty in BHEL campus which must be different in color from the color of uniform of regular employees. The Contractor/his authorized representative shall ensure wearing of the Uniform and Safety Shoe by his workmen in the BHEL premises.
The name of the contractor for which the worker is working should be made available on the uniform.
The cost of the uniform and Safety Shoe will be borne by contractor. ***The contractor should ensure and provide masks and gloves to the workmen engaged by him in view of the pandemic COVID-19, as per requirement. The cost of the same will be borne by contractor.***

20.The liability for compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.

21.NATIONAL & FESTIVAL HOLIDAYS (as declared by BHEL): The contractor will give paid National Holidays and Festival Holidays to the workers as per Section 5 of National and Festival Holidays Act. However, if due to the exigency of work if any of his workmen is required to work on National Holiday or Festival Holiday, the contractor has to pay wages as per Section 5, sub section 2 and 3 of the said Act.

22.Besides the three national holidays 15^{th} August, 26^{th} January and 2^{nd} October, if Govt. declares any other day as a national holiday same will be treated as paid holiday for the purpose of this contract. Accordingly, the contractor shall be required to provide paid holiday to its workers for the same. If any of the contract workmen works on such additional declared national holiday, he will be entitled to additional wage for the said day.

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23.GENERAL ELECTIONS: If the general elections are held for State Assembly / Parliament and Government declares a public holiday for exercising the franchise, the contractor shall give their workmen half day leave in "First" shift only. The contractor's workmen working in “Second” and “Night” shifts will be required to exercise their franchise during their own time.
24.The Contractor shall maintain the following Documents, Registers, Forms as required under the FACTORIES Act 1948 and Rules 1969. (I) Leave Book Form No. 15 (Rule 121) (II) Nomination Form No. 25 (Rule 127
25.The contractor will extend leave with wage to his workers who have worked for a period of 240 days or more during a calendar year. To facilitate the proper execution of the Factories Act, these leaves shall be allowed during the same calendar year, at the rate of one day for every 20 working days. A worker commencing service on a day other than the 1st day of the January shall be entitled to leave with wages at the above rate (one day for every 20 days of work) only if he has worked for 2/3 of total no. of days in the remaining year. The contractor will pay the un-availed portion of leave in cash every Six month from the start of the contract.
26.Contractor has to ensure that all his workmen are granted one day weekly off after every 48 hrs. of working. The workmen working for more than 48 hours in any week shall be paid wages twice the ordinary rate of wage in accordance with the provisions of Section 59 of the Factories Act, 1948 read with the Karnataka Factories Rules.
27.The contractor shall follow safety rules and regulations as per provisions of Factories Act 1948, and Rules at his own expense and arrange for the safety provisions as appended to these conditions or rules framed by the government from time to time.
28.Refund of Security Deposit: Security Deposit of contractor will be refunded only after the expiry of the contract period and based on the certification of successful completion of the contract by the concerned Officials and submission of an Indemnity Bond from the contractor, that in case of Claims from any of the statutory authorities, the same would be indemnified by the Contractor. In case of completion of the contract before payment of bonus to the workers, Security Deposit, as deemed appropriate, will be withheld by BHEL. The same would be released to the Contractor after submission of proof of bonus payment to his workmen.
29.The Contractor shall be required to deposit Tax as applicable, if same is applicable as per rules in force from time to time. The amount so spent can be claimed from BHEL after submitting the proof of the same. The contractor has to obtain GST registration wherever required. The Contractor must quote the Service Account Code (SAC) number at the time of raising invoice.
30.Contractor shall inform his PAN to BHEL. Income tax as applicable will be deducted at source by BHEL from the bill of contractor.
31.All the Registers and Records, forms, Notices maintained under the relevant Acts and Rules should be produced on demand before the Inspector or any other authority under the Act, failing which the contract may be terminated without any notice.
32.Contractor shall be required to submit a list of his workers to be deployed for the works contract giving details regarding Name of contract worker, Fathers Name, permanent and Present Address, Date of Birth, Qualification, Caste-SC/ST/OBC, ESI No, PF No. and the family details.
33.The contractor shall abide by all the labor legislations and other laws including the provisions of Contract Labor (Regulation & Abolition) Act, 1970, the Factories Act, 1948, the Payment of Wages Act, 1936, the Minimum Wages Act, 1948, ESI Act, Employee Provident Fund Act and other relevant Acts applicable to his workmen under this Contract.
34.BHEL shall be indemnified against all losses, Claims, prosecutions etc. under any law.
35.The contractor shall promptly furnish all information and document required by BHEL authorities for the purpose of complying with the responsibilities of Occupier of the factory and shall render all the necessary assistance for the same.
36.The contractor will maintain proper discipline of his workmen and will ensure that his workers do not cause any loss or theft or damage to any company's property. The contractor will also be responsible for the good conduct of his workmen.
37.The contractor shall ensure and maintain uninterrupted progress of the work in accordance with instructions given to him on behalf of BHEL from time to time.

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	38.In case the contractor makes default in commencing the work within the time specified by BHEL without any reasonable cause, disputes any of the terms and conditions of the contract or refuses to execute the contract or any part thereof at any stage, the contract shall, without prejudice to any other right or remedies available to BHEL, be liable to be cancelled / terminated in part or in whole. In the event of such cancellation / termination of contract, the contractor shall be liable; to compensate BHEL for all losses incurred by BHEL including the loss suffered on account of having the work executed through any other contractor or department as may be convenient to BHEL, in accordance with the exigencies of the work. In case only a part of the contract is cancelled, the remaining portion of contract may be allowed be executed by the contractor.
	39.The Contractor, shall, without fail, give up-to-date information in writing of the attendance of the workers engaged by him. The Contractor will also submit the required documents and certificates as prescribed from time to time for the clearance and the payment of the Bill.
	40.Whenever any sum of money is found to be recoverable from or payable by the contractor, the same will be deducted from any sum that may due or which at any time there after becomes due to the contractor under this contract or under any other contract or from his security deposit. In case the recoveries are not complete even after such deduction, the contractor shall pay the same or the balance thereof from the security deposit. The contractor shall immediately thereafter pay such further sums as may be required to replenish the shortage caused by such recoveries in the amount of security deposit.
	41.During the currency of contract, if the contractor is awarded any other work contract in BHEL, the contractor will have to inform the designated BHEL official before accepting the other work.
	42.In case of failure on the part of the contractor to execute the work awarded to him within the stipulated time, the sum equivalent to the EMD as per BHEL Works Policy shall be forfeited as per the Undertaking provided by tenderers, after a week's notice issued by the awarding officer and BHEL may in its discretion award the contract to any other party.
	43.In case of any extra work executed by the contractor, the contractor will be paid on pro-rata basis
	44.All the Terms and Conditions as mentioned in Work Order will also form a part of the Agreement.
	45.BHEL shall have the right to deduct any sum from the bill of the contractor for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract, Non- payment of wages or of deduction made from his or their wages which are not justified by the terms of the contract or non-observance of the said contract Labor regulations.
	46.The contractor shall be responsible for observance of local laws, employment of personnel, payment of taxes etc. As far as possible, workers shall be engaged from the local areas in which the work is being executed.
	47.The contractor shall be wholly responsible for the behavior of the workmen at the work place and outside, in the BHEL premises.
	48.The contractor shall be responsible for safe custody of BHEL's property like materials, tools etc., entrusted to him and if necessary arrange insurance at his own expense.
	49.The contractor shall be responsible to make good and rectify at his own expense any defect, which may develop or may be noticed within the period of the contract.
	50.BHEL shall be entitled to recover any payment made on behalf of the contractor under any law or otherwise.
	51.BHEL Officer In-charge shall have the right to stop the work at any stage or at any time by giving the contractor seven days' notice in writing.
18.	**LD / Penalty Clause** LD shall be applicable after 1) 03 months from zero date, for item 1 (Refer duration of contract clause 1.7 in general information) corresponding to 10 % of contract value as per sr. no. 1 of clause 48 of payment schedule (Page 69-70 of 124 of BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001) 2) 07 months from zero date for item 2 (Refer duration of contract clause 1.7 in general information) corresponding to 40 % of contract value as per sr. no. 2 & 3 of clause 48 of payment schedule (Page 69-70 of 124 of BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001) and 3) 11 months after completion of I&C for item 3 (Refer duration of contract clause 1.7 in general information) corresponding to 50 % of contract value as per sr. no. 4 to 8 of clause 48 of payment schedule (Page 69-70 of 124 of BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001)

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	If vendor is not meeting time schedule, LD/penalty shall be levied as per BHEL GCC clause 2.7.9 terms & conditions for reasons attributable to contractor. **LD applicability elaboration in line with GCC Cl. 2.7.9** a. Survey works is to be completed within 03 months form zero date - if not completed 1% per week upto the max of 10% will be deducted from anticipated value of work (Completion period (as originally stipulated) not exceeding 6 months. ……@ 1 percent per week rate of compensation in line with GCC 2.7.9) b. Site Engineering and Completion of Installation & Commissioning is to be completed within 07 months from zero date - if not completed 0.5% per week upto the max of 7.5% will be deducted from anticipated value of work (Completion period (as originally stipulated) exceeding 6 months and not exceeding 2 years……@ 0.5 percent per week in line with GCC 2.7.9) c. Field testing along with other Kavach equipment is to be completed within 11 months from I&C - if not completed 0.5% per week upto the max of 7.5 % will be deducted from anticipated value of work (Completion period (as originally stipulated) exceeding 6 months and not exceeding 2 years……@ 0.5 percent per week in line with GCC 2.7.9)
19.	**REVERSE AUCTION- Applicable as per GeM system**
20.	**CONCILIATION CLAUSE** Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the "Dispute") shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure as per BHEL Conciliation Scheme 2018. 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 for conduct of conciliation proceedings" (as available in www.bhel.com). Note: Ministry of Finance has issued OM reference No. 1/2/24 dated 03.06.2024 regarding "Guidelines for Arbitration and Mediation in Contracts of Domestic Public Procurement. In the said OM it has been recommended that Government departments/ Entities/agencies are to encourage mediation under the Mediation Act. 2023. Entities/agencies are to encourage mediation under the Mediation Act. 2023. The said Act has not yet been notified by the Government. Therefore, the clause "Settlement of Disputes" shall be modified accordingly as and when the Mediation Act 2023 gets notified.
21.	**MAKE IN INDIA CLAUSE**
	I. For this procurement, Public Procurement (Preference to MAKE IN INDIA) Order 2017 Dated 15.06.2017, 28.05.2018, 29.05.2019, 04.06.2020 and subsequent orders issued by the respective Nodal Ministry shall be applicable. Even if issued after issue of this NIT but before finalization of contract WO against this NIT. ii. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement same shall be applicable.
22.	**GOODS & SERVICE TAX (GST) REGISTRATION & COMPLIANCE**
	A. Response to tenders for indigenous supplier will be entertained only if the vendor has a valid GST registration number (GSTIN) which should be clearly mentioned in the offer. If the dealer is exempted from GST registration, a declaration with due supporting documents need to be furnished for considering the offer. Dealers under composition scheme should declare that he is a composition dealer supported by the screen shot taken from GST portal. The dealer has to submit necessary documents if there is any change in status under GST. B. Supplier shall mention their GSTIN in all their invoices (incl. Credit notes, debit notes) and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain invoice number (in case of multiple numbering system is being followed for billing like sap invoice no, commercial invoice no etc., then the invoice no. Which is linked/uploaded in GSTN network shall be clearly indicated), billed to party (with GSTIN) & shipped to party details, item description as per po, quantity, rate, value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC code, place of supply etc. C. All invoices shall bear the HSN code for each item separately (harmonized system of nomenclature)/ sac code (services accounting code). D. Invoices will be processed only upon completion of statutory requirement and further subject to following: a. Vendor declaring such invoice in form GST anx-1 b. Receipt of goods or services and tax invoice by BHEL E. As the continuous uploading of tax invoices in GSTN portal (in GST anx-1) is available for all (i.e. Both small & large) tax payers under proposed new GST return system, all invoices raised on BHEL may be uploaded immediately in GST portal on dispatch of material /rendering of services. The supplier shall ensure availability of invoice in GST portal before submission of invoice to BHEL. Invoices will be admitted by BHEL only if the invoices are available in GSTN portal (in BHEL'S GST anx-2). F. In case of discrepancy in the data uploaded by the supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note or debit note (details also to be uploaded in GSTN portal) for the shortages or rejections in the supplies or additional claims, within the calendar month informed by BHEL.

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	G. In cases where invoice details have been uploaded by the vendor but failed to remit the GST amount to GST department (form pmt-08 or form GST ret-01 to be submitted) within stipulated time, then GST paid on the invoices pertaining to the month for which GST return not fled by the vendor will be recovered from the vendor along with the applicable interest (currently 24% P.A) and all subsequent bills of the vendor will not be processed till fling of the GST return by the vendor H. In case GST credit is denied to BHEL due to non-receipt or delayed receipt of goods and/ or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount claimed in the invoice shall be disallowed to the vendor. I. Where any GST liability arising on BHEL under reverse charge (RCM), the vendor has to submit the invoices to BHEL well within the timeline prescribed in GST law, to enable BHEL to discharge the GST liability. If there is a delay in submission of invoice by the vendor resulting in delayed payment of GST by BHEL along with interest, then such interest payable or paid shall be recovered from the vendor. J. GST TDS will be deducted as per section 51 of CGST act 2017 and in line with notification 50/2018 – central tax dated 13.09.2018. GST TDS certificate which will be generated in GST portal subsequent to vendor accepting the TDS deduction in the GST portal, will be issued to the vendor.
23	**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.
24	**INTIMATION OF CHANGE OF NAME/ RE-CONSTITUTION OF THE ORGANIZATION** In the event of the organization (Proprietorship/Partnership/Company) undergoing any change of name or reconstitution, prior intimation of the same shall be given to BHEL. Upon such changes coming into effect, the same is to be intimated to BHEL immediately with supporting documents as applicable.
25	**INSURANCE:** i. BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning. ii. It is the sole responsibility of the contractor to insure his materials, equipment, workmen etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor. iii. If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities. The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL or customer. For lodging / processing of insurance claim, the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody, matter shall be reported to Police by the contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the material in his custody.
26	**LIMITATION ON LIABILITY:** "Notwithstanding anything to the contrary in this Contract or LOA or Work Order or any other mutually agreed document between the parties, the maximum liability, for damages, of the contractor, its servants or agents, shall under no circumstances exceed an amount equal to the Price of the Contract or the Work Order. Neither party shall be liable to the other for any indirect or consequential loss or damage, including but not limited to loss of use, loss of profits, or loss of contracts, or special, punitive, exemplary losses whatsoever, arising out of or in connection with this contract. This shall not be applicable on the recoveries made by Customer from BHEL on account of Contractor, any other type of recoveries for workmanship, material, T&P etc. due from the contractor."
27.	**FORMATS**
27.1	Third Party Non-Disclosure Agreement (NDA) format
27.2	EFT Format enclosed with this NIT
27.3	BHEL GCC enclosed with this NIT
27.4	Integrity Pact enclosed with this NIT

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THIRD PARTY NON-DISCLOSURE AGREEMENT
(NDA)

I, _____on behalf of the _____ (Name of Company),

acknowledge that the information received or generated, directly or indirectly, while working with BHEL on contract is confidential and that the nature of the business of the BHEL is such that the following conditions are reasonable, and therefore:

I warrant and agree as follows:

I, or any other personnel employed or engaged by our company, agree not to disclose, directly or indirectly, any information related to the BHEL. Without restricting the generality of the foregoing,
it is agreed that we will not disclose such information consisting but not necessarily limited to:

•Technical information: Methods, drawings, processes, formulae, compositions, systems, techniques, inventions, computer programs/data/configuration and research projects.

•Business information: Customer lists, project schedules, pricing data, estimates, financial or marketing data,

On conclusion of contract, I, or any other personnel employed or engaged by our company shall return to BHEL all documents and property of BHEL, including but not necessarily limited to: drawings, blueprints, reports, manuals, computer programs/data/configuration, and all other materials and all copies thereof relating in any way to BHEL's business, or in any way obtained
by me during the course of contract. I further agree that I, or any others employed or engaged by our company shall not retain copies, notes or abstracts of the foregoing.

This obligation of confidence shall continue after the conclusion of the contract also.

I acknowledge that the aforesaid restrictions are necessary and fundamental to the business of the BHEL, and are reasonable given the nature of the business carried on by the BHEL. I agree that this agreement shall be governed by and construed in accordance with the laws of country.

I enter into this agreement totally voluntarily, with full knowledge of its meaning, and without duress.

Dated at……., this……..day of ……..20 .

Name

Company

Signature

Contractors seal and Signature

JOINT VENTURE(JV)/CONSORTIUM AGREEMENT

(To be executed on Rs. 500/- Non - Judicial Stamp Paper in case JV/ CONSORTIUM AGREEMENT)

THIS AGREEMENT is made and executed on ____ day of _____ by and between (1) M/s. _____, represented by Shri_____, designated as _____, having its registered office at _____ , (The First Party, i.e, the Bidder) Company incorporated under the Company's Act 1956 having its registered office at _____ (hereinafter referred to as the "Bidder" which expression shall include its successors, administrators, executors and permitted assigns) and (2) M/s. _____, (The Second Party, i.e, the associates), a company incorporated under _____(Company act), having its registered office at _____ (hereinafter called the "Associates", which expression shall include its successors, administrators, executors and permitted assigns).

WHEREAS, the Solar Business Division, one of the Manufacturing Units of M/s. Bharat Heavy Electricals, having its office at Prof. CNR Rao Circle, Opp. Indian Institute of Science, Malleswaram, Bangalore-560 012, A Government of India Undertaking (hereinafter called the "Employer", " which expression shall include its successors, administrators, executors and permitted assigns), proposes to issue / issued a Notice Inviting Tender (hereinafter referred to as NIT), inviting bids from the individual bidders for undertaking
the work of "_____(Package name) for _____(Project name) at _____(site location) (hereinafter referred to as the "Project") being set up by M/s. _____ (hereinafter referred to as the " Owner").

AND WHEREAS, the said NIT enables submission of a bid by a Party subject to fulfilment of the stipulations pre-qualification criteria specified in the said NIT.

AND WHEREAS, the Bidder desirous of submitting bid in response to the said NIT for the said Project, and by itself is not meeting all the qualifying the Pre-qualification Criteria specified in the said NIT and in order to fully meet the qualifying requirements of NIT, the Bidder entered into this Consortium Agreement with the Associates.

AND WHEREAS the Bidder and the Associate(s) are contractors engaged in the business of carrying out various items of works. WHEREAS, the both parties have agreed to and constitute themselves into a consortium for the purpose of carrying out the said works relating to this Project, and that the consortium will be continued till the completion of the works in all respects including the performance guarantee period as may be specified in the NIT or Purchase Order/Work Order.

AND WHEREAS, with this consortium Agreement, the Bidder and Associate(s) together meets all the pre-qualification criteria as mentioned in the NIT.

WHEREAS, the parties have agreed to certain terms and conditions which forms a part of this consortium agreement, as mentioned hereinbelow :

NOW therefore, this agreement witnesseth as follows :

1. There can be a maximum of 02 (Two) parties in a JV/Consortium.
2. In the JV/Consortium, all members shall be jointly and severally liable for the execution of the entire Contract in accordance with the Contract terms. The JV/Consortium shall nominate the Lead bidder of the JV/Consortium who shall have the authority to conduct all business for and on behalf of any and all the members of the JV/Consortium during the Bidding process and during contract execution.
3. A firm that is a Bidder (either individually or as a JV/Consortium member) shall not participate as a Bidder or as JV/Consortium member in more than one Bid. Such participation shall result in the disqualification of all Bids in which the firm is involved. However, this does not limit the participation of a Bidder as subcontractor in another Bid or of a firm as a subcontractor in more than one Bid.

Contractors seal and Signature

4. The EMD & Security Deposit (In case of award) of a JV/Consortium shall be in the name of the lead bidder that submits the Bid.
5. Similarly, in case of the award, the Security Deposit, to be submitted by a lead bidder shall be in the name of the lead bidder.
6. The Bid shall be signed by the authorized representative of the Lead bidder of the JV/Consortium on behalf of the JV/ Consortium, and so as to be legally binding on all the partners as evidenced by a power of attorney signed by their legally authorized representatives.
7. The JV/Consortium agreement should indicate precisely the responsibility of all partners of JV/Consortium in respect of planning, design, manufacturing, supply, installation, commissioning and training. All members of Consortium should have active participation in execution during the currency of the Contract. The composition or the constitution of the JV/Consortium shall not be varied/modified subsequently without prior approval of the Employer/Owner.
8. The JV/Consortium members is also required to declare detailed scope of work to be executed by each partner of the Consortium
9. The Employer may assess the capacity and capability of the bidder, to ascertain that the bidder can successfully execute the scope of work covered under the package within stipulated completion period. This assessment shall inter-alia include (i) document verification, (ii) bidder's facilities visit, (iii) details of works executed, works in hand, anticipated in future & the balance capacity available for the present scope of work, (iv) details of plant and machinery, testing facilities, design capabilities, manpower and financial resources, (v) details of quality systems in place, (vi) past experience and performance, (vii) customer feedback, (viii) banker's feedback etc.
10. Employer/Owner reserves the right to waive minor deviations if they do not materially affect the capability of the Bidder to perform the contract.

IN WITNESS WHEREOF, the parties above named have signed this agreement on the day month and year first above written at _____

For and on Behalf of The Bidder

AUTHORISED SIGNATORY ::

OFFICIAL ADDRESS :

COMPANY SEAL

WITNESSES :
1.
2.

For and on Behalf of the Associates

AUTHORISED SIGNATORY ::

OFFICIAL ADDRESS :

COMPANY SEAL

WITNESSES :
1.
2.

Contractors seal and Signature

Bank Detail (For EMD/SD submission as applicable): **Bharat Heavy Electricals Limited Solar Business Division Prof. CNR Rao Circle Malleswaram Bengaluru-560012**		
1	Name of the Beneficiary:	Bharat Heavy Electricals Limited
2	Name of the Bank & Branch:	IDBI Bank Limited, Trade Finance
3	Address of the Branch:	Trade Finance IDBI House,58, 1st Floor, Mission road, Bengaluru-560027
4	Bank Telephone No:	080-2227 9576
5	NEFT IFSC code	IBKL0000377
6	Account Type:	Current
7	Account No.	008103000003605
8	RTGS IFSC code:	IBKL0000377

QR-CODE for EMD/SD Submission

Contractors seal and Signature

Electronic Funds Transfer (EFT) OR
Paylink Direct Credit Form

Please Fill up the form in **CAPITAL LETTERS** only.
TYPE OF REQUEST(Tick one): _____ CREATE _____ CHANGE

BHEL Vendor / Supplier Code:	
Company Name :	
Permanent Account Number(PAN):	
Address	

City: _____ PINCODE _____ STATE _____

Contact Person(s)	
Telephone No:	
Fax No:	
e-mail id:	

1 Bank Name:	
2 Bank Address:	
3 Bank Telephone No:	
4 Bank Account No:	
5 Account Type: Savings/Cash Credit	
6 9 Digit Code Number of Bank and branch appearing on MICR cheque issued by Bank	
7 Bank swift Code(applicable for EFT only)	
8 Bank IFSC code(applicable for RTGS)	
9 Bank IFSC code(applicable for NEFT)	

A I hereby certify that the particulars given above are true, correct and complete and that I, as a representative for the above named Company, hereby authorise BHEL, SBD, Bangalore to electronically deposit payments to the designated bank account.

B If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold BHEL / transfering Bank responsible.

C This authority remains in full force until BHEL, SBD,Bangalore receives written notification requesting a change or cancellation.

D I have read the contents of the covering letter and agree to discharge the resposibility expected of me as a participant under ECS / EFT.

Date:

Authorised Signatory:
Designation: Telephone NO. with STD Code

Company Seal

Bank Certificate

We certify that_____has an Account No_____ with us and we confirm that the bank details given above are correct as per our records.

Date: (.....)
Place: Signature

In case of any query,please call Purchase Officer/ Contract Executive concerned at BHEL-SBD

BHEL DOCUMENT NUMBER: EN-TS-05-52-501-K-001

	KAVACH PROJECT **(The Indian Railway Automatic Train Protection System)** BHEL CONTRACT ***System Integration works for Reach 8 Kavach field works***	**PAGE 1 OF 124**

DOCUMENT DESCRIPTION:

System Integration works for Reach 8 Kavach field works - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipments, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division for a period of 18 months..

Baiyyappanahalli -Whitefield Panel Cabin (Ex) & Dodbelle - Kyatsandra (Ex) sections of South Western Railway (Reach-08)

APPLICATION		: KAVACH System
OEM/VENDOR		: Bharat Heavy Electricals Limited
END CLIENT		: Indian Railways

HIMA BINDU
Digitally signed by HIMA BINDU
DN: cn=HIMA BINDU, o=BHEL, ou=SBD, email=shbindu@bhel.in, c=IN
Date: 2025.11.11 14:14:28 +05'30'

Ritesh R
Digitally signed by Ritesh R
DN: cn=Ritesh R, o=BHEL, ou=SBD, email=RITESHR@BHEL.IN, c=IN
Date: 2025.11.11 15:12:42 +05'30'

GC / Indian Railway APPROVAL	
☐	C. Notice of No Objection
☐	B. No Objection with comments
☐	A. Objection. A complete resubmission is required

Revision:	Rev 01		
Date of Issue:	11.11.2025		
Status:	For Approval		
Author(s):		MOHAN J	
Reviewer(s):	VER 1 (Verifier): Madhushree P VER 2 (Verifier): G V Raghavendra Babu	Name of Validator /Safety Manager (VAL/SM):	G Sobha Rani
Project Manager (PM):	Ritesh R	Project Assesssor (ASR)	B Arora -GM
Additional Info			

Approval

Approved by	Name	Date	Signature
Reviewer 1 [VER]	Madhushree P		
Reviewer 2 [VER]	G V Raghavendra Babu		
Quality Manager [QM]	Rajnish Chaudhury		
Validator [VAL]	G Sobha Rani		
Project Manager [PM]	Ritesh R (DGM)		

History

Revision	Date	Description/Modification	Author/Authors
00	27.09.2025	System Integration works for Reach 8 Kavach field works	Mohan J
01	11.11.2025	System Integration works for Reach 8 Kavach field works	Hima Bindu S

Table of Contents

List of Tables

1 INTRODUCTION

KAVACH is an indigenously developed Automatic Train Protection (ATP) system meant to provide protection to the trains against Signal Passing at Danger (SPAD), excessive speed and collisions. KAVACH provides continuous update of Movement Authority (distance up to which the train is permitted to travel without danger). Hence during unsafe situations when brake application is necessitated, and the crew has either failed to do so, or is not in position to do so, automatic brake application shall take place. KAVACH has additional features to display information like speed, location, distance to signal ahead, Signal aspects etc. in Locomotive cab and generation of Auto and Manual SOS messages (Distress messages) from Locomotive as well as from the Station unit in case of emergency situation. The Communication between Stationary KAVACH and Loco KAVACH units shall be Safety Integrity Level-4(SIL4) certified as per the CENELEC standards for railways.

1.1 PURPOSE OF THIS DOCUMENT

This specification covers the technical requirements towards System Integration works for Reach 8 Kavach field works - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipments, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for Kavach system as per project schedule in SWR Bengaluru division for a period of 24 months

1.2 GENERAL INSTRUCTIONS:

The supplier shall submit the offer / bids in two parts:

Part 1: Techno-commercial bid (without pricing). Unpriced price bid to be enclosed in the technical bid.

Part 2: Price bid

1.3 SCOPE OF THE PROJECT

The scope of this project includes System Integration works for Reach 8 Kavach field works - Survey (Track survey by LiDAR, cable routing survey, survey at stations), Site engineering & Design, installation testing & commissioning of Kavach equipments, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for kavach system as per project schedule in SWR Bengaluru division for a period of 18 months per the specification. Brief Summary of Scope:

- Vendor has to visit the site premises and understand the requirement and submit the tender quote.

- System Inetrgration service along with I & C as per Annexure Scope -III

- Carrying out the subject works as indicated in specification but not limited to, vendor has to consider additional accessories required if any for successful Installation, Testing & Commissioning towards Kavach System Integration works and cost for the same shall be considered in the quote.

- Associated Survey works (like Track survey by LiDAR, cable routing survey, survey at stations etc.), Site engineering & Design, installation testing & commissioning of Kavach equipments, E-learning modules, conducting FAT (CFAT,IFAT), SAT, Support services (for training of railway personnel, documentation, liaising with RDSO/SWR for approval & RDSO final acceptance, ISA assessment and certification) for Kavach system but not limited to, vendor has to consider additional works required if any for successful Installation, Testing & Commissioning and cost for the same shall be considered in the quote.

Project Schedule:

Zero date will be provided by BHEL based on clearance from SWR.

Survey works within 03 month from Zero date.

Site Engineering, Design & Completion of Installation & Commissioning – 07 months from Zero date .

Field testing & Final Acceptance of Kavach equipment – 11 months after I &C.

Project schedule may be extended by six months over 18 months, depending upon site exigencies.

1.3.1 NORMS AND STANDARDS

Table 1: Norms and Standards

Reference	Title	Edition
IRS: S23	Electrical signalling and interlocking equipment	
RDSO/SPN/144	Safety and reliability requirement of electronic signalling equipment	
IS: 9000	Basic environmental testing procedures for electronic and electrical items	
EN 45545-2	Railway applications – Fire protection on railway vehicles	
EN 50155 standard	Specifies requirements for the design, the manufacturing, the documentation and testing of any electronic equipment installed on-board of rolling stock	–
EN 61010-1 2010 standard	specifies general safety requirements for the following types of electrical equipment and their accessories, wherever they are intended to be used	–
IEC 61373	Railway applications - Rolling stock equipment - Shock and vibration tests	–

RDSO-SRS	KAVACH-RDSO/SPN/196/2020 Version 4.0 d3 or its latest	
ELRS/SPEC/S1/0015	Reliability of electronics used in rolling stock application	
EN 50121-4	Railway Applications -Electromagnetic Compatibility (EMC)	
IEC 60571:2012	Railway applications - Electronic equipment used on rolling stock	
EN50126,EN50128,EN50129	European standards for railway safety, covering Reliability, Availability, Maintainability, and Safety (RAMS), software requirements for railway control and protection systems, safety of electronic systems in railway system	
FCC, OSHA, IEEE	RF Emission / EM radiation - Maximum Permissible Exposure Limits	

1.3.2 INPUT DOCUMENTS

Table 2: Input Documents

Title			
SRS: System Requirement Specification of KAVACH (The Indian Railway Automatic Train Protection System) - RDSO/SPN/196/2020 Version 4.0 d3 or its latest along with its associated annexures			
Functional Requirement Specifications - FRS of KAVACH RDSO-SPN-196-2020 Version 4.0			
A1	Mode Transitions, SOS & MA Handling	4.0, Amdt-6	16.07.2024
A2	Onboard KAVACH Configurable Parameters	4.0, Amdt-3	16.07.2024
A3	Stationary KAVACH Configurable Parameters	4.0, Amdt-3	16.07.2024
B	LP-OCIP (DMI) Display Requirements	4.0, Amdt-3	11.07.2024
C	Multiple Access Scheme & Radio Protocol	4.0, Amdt-10	27.06.2024
D	RFID Tag Data Format	4.0, Amdt-7	07.06.2024
E1	UHF Radio Modem Requirements	4.0	27.06.2024
F	RFID Fixing Arrangement Guidelines	4.0, Amdt-1	27.06.2024
G	Network Monitoring System Protocol	4.0, Amdt-4	16.07.2024
H	RFID Tag-TIN Layout Guidelines	4.0, Amdt-5	07.06.2024
I	KAVACH Control Table Guidelines	4.0, Amdt-6	07.06.2024
P	SKAVACH to SKAVACH Interface	4.0, Amdt-4	27.06.2024
Q	Station Master's Operation Panel	4.0, Amdt-1	16.07.2024
J	Remote Interface Units	4.0, Amdt-3	03.07.2024
Technical Guidelines for S&T Contractual works dated 01.06.2019 or latest issued by SWR Hubbali			
Factory Acceptance	FAT Format - KAVACH	SIF 0515, Ver-1.2, 27.01.2025	
Interoperability Test	Interoperability Test Format	SIF 0594, Ver-1.1, 28.01.2025	

Title		
Acceptance Test	Acceptance Test Format Hardware	RDSO/SPN/196/2020 08.11.2024
Type Test Hardware	Type Test Format Hardware	RDSO/SPN/196/2020 08.11.2024
Type Test UHF Modem	Type Test Format - UHF Modem	SIF1505, Ver 2.0, 25.09.2025
Pre-commissioning	Checklist (Onboard KAVACH)	28.04.2025
Functional Test	Functional Test Format KAVACH	SIF-0533, Ver-4.21, 06.05.2025
DMI Functional Test	Functional Test Format DMI	SIF-0522, Ver-1.4, 06.05.2025
Event Logging Format	Event Logger Test Format	SIF-00595, Ver-1.0, 06.05.2025
Vendor Approval SOP	SOP for Generic Approval	Doc. 1506, Ver 2.0, 25.09.2025
SAT (Stationary KAVACH)	Site Acceptance Test Procedure	SIF-0593, Ver 1.0, 15.03.2024

1.3.3 REFERENCED DOCUMENTS

Table 3: Referenced Documents

Title	Version
System Requirement Specification of KAVACH (The Indian Railway Automatic Train Protection System) - RDSO/SPN/196/2020 Version 4.0 d3 or its latest along with its associated annexures	4.0 Amdt -3

1.4 ABBREVIATIONS AND ACRONYMS

Table 4: Abbreviations and Acronyms

Abbreviation/ Acronym	Definition/Description
DMI	DMI Driver Machine Interface
AI	AI Analog input
AO	AO Analog output
ARP	Address resolution protocol, network protocol for assigning the network addresses to hardware addresses
COM	Communication module
CRC	Cyclic redundancy check
DI	Digital input
DO	Digital output
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharge
EI	Electronic Interlocking
ISO	International Organization for Standardization
SM-OCIP	Station Master-Operation cum Indication Panel
LP-OCIP	Loco Pilot- Operation cum Indication Panel
OEM	Original Equipment Manufacturer
TSR	Temporary speed restriction
NMS	Network Monitoring System
SIL	Safety integrity level
SC/OC	Short-circuit/Open-circuit
TCAS	Train collision avoidance system
ATP	Automatic Train Protection
RDSO	Research Designs & Standards organization
FET	Field Effect Transistor

1.5 TERMS AND DEFINITIONS

The following table describes or defines terms which are used within this document to get a better understanding or if the term is used in a specific way to avoid misunderstandings.

Table 5: Terms and Definitions

Term	Definition/Description
PM	Project manager
RQM	Requirements manager
DES	Designer
VER	Verifier
VAL	Validator
TST	Tester
INT	Integrator
IMP	Implementor

2.0 IMPERATIVE TERMS

Use of the words 'shall', 'should', 'may' and 'will' within this document observe the following rules: The word 'shall' in a text expresses a mandatory definition. The words 'should' and 'may' in a text express a non-mandatory definition. 'Should' is used, when a non-mandatory provision is recommended, otherwise 'may' is used. The word 'will' in a text expresses a definition in cases a simple futurity is required. 'Will' is also used to express a task (done by an individual or an organization), which is not controlled by this document

3.0 SCOPE OF THE WORK, TECHNICAL REQUIREMENTS AND SPECIFICATIONS

3.1 SCOPE OF THE WORK:

Installation, testing and commissioning for Onboard KAVACH equipment in locomotives /EMU/MEMUs & Trackside KAVACH equipment at station/LC/IB/ABS locations along with associated works for KAVACH. Bidder will be primarily responsible for carrying out below works as per BHEL design. BHEL will provide necessary technical and administrative support during project execution. Necessary tools and tackles required for execution of work shall be in vendor scope. Technical upgrades to Kavach as per the latest RDSO specifications, including any amendments and Technical Advisory Notes (TANs), shall not be treated as a variation.

3.1.1. Survey of the section and preparation of survey sheets for relay room wiring, Stationary KAVACH installation, power supply arrangements, OFC cabling.

3.1.2 Preparation and submission of Relay interface circuits, RFID TAG/TIN layouts, KAVACH Table of Control, Application data etc.,

3.1.3 Installation, testing and commissioning of Stationary KAVACH for installation at Stations/IB/ABS/LCs, Remote Interface Units, RFID Tags, Antennae, Radio Modems, NMS, Relays, wire coils, etc. including spares, supplied by BHEL. Any supporting materials required for above such as ferrules, lugs etc. shall be in supplier scope.

3.1.4 Installation, testing and commissioning of Onboard KAVACH along with DMI, Speed Sensors, BIUs, RFID Readers, Modems, Antenna, spares etc. including cable laying, supplied by BHEL. Any supporting materials required for above such as ferrules, lugs etc. shall be in supplier scope.

3.1.5 Carrying out FAT /SAT, dynamic loco field trials, interoperability testing and passenger trials.

Interoperability test:

a) Interoperability testing with existing Kavach OEM's.

b) Prior to supply for field trials, the BHEL KAVACH system shall be tested by RDSO for communication between BHEL Onboard KAVACH with Stationary KAVACH of existing OEM and Stationary KAVACH of BHEL with Onboard KAVACH of existing OEM.

c) The interoperability requirements for the Stationary KAVACH Unit are related to the data exchange between the Stationary KAVACH Unit and the Onboard KAVACH Unit, RFID Tag Data, Network Monitoring System, and Key Management System.

3.1.6 FIELD TRIALS:

a) Passenger field trial for 30 trips in Absolute Block Section. One trip is one up and Down direction run in the trial section.2500 hours of RIU and 5000 Kms of working in Automatic Block Section.

b) Before the start of the above field trials, the following has to be submitted to RDSO for their clearance or latest standard operating procedure for generic product approval of Kavach issued by RDSO. Bidder has to carry out below

- Design and documentation for the RFID layouts and KAVACH control table and support towards approval from Zonal Railways and RDSO.
- Design and documentation of RFID tag data and wiring diagrams support towards approval from Zonal Railways.
- Design and documentation of all executive and application software versions & checksums which are to be submitted to RDSO.
- Braking parameters for different type of allotted locos and various combinations of load for verification by COE/SC.
- Documentation & submission of Functional test documents duly tested by internal V&V of BHEL.
- Light Engine trials with all features and for submission "No issue" with finalized parameters to RDSO and Zonal Railways.
    - In the BHEL's section under approval
    - In the Kavach territory of another OEM's

3.1.7 Assistance towards Generic and Application safety case duly assessed by ISA as per CENELEC standards and final commissioning of the KAVACH system for passenger operations. The generic application case will be approved by RDSO and the Application safety case will be approved by Zonal Railway.

3.2. **DETAILED ACTIVITIES UNDER SCOPE:**

3.2.1. Within 07 days of issue of Purchase Order, bidder has to support BHEL towards collection of all sectional details from Railway and submit detailed technical planning for the work, indicating details of equipment to be installed at each location. Also submit detailed time program of work in line with the Time schedule for execution of the work,

mentioned in Scope of the work.

3.2.2. Survey of existing signaling infrastructure with suitable methodology (UAV - Drone / LIDAR) as approved by BHEL& Railway Engineer to obtain entire track profile for placement of RFID tags and mapping of absolute location for signals etc. This shall also include preparation of Cable route plans for cables to be laid, duly conducting cable route tracing for existing cables/pipelines.

3.2.3. Interfacing of existing Relay based or Electronic Interlocking at stations, LC Gates, Automatic Block Signalling (ABS) huts and Intermediate Block Signalling (IBS) huts over the allotted sections of Zonal Railway, Sections of Zonal Railway, with stationary Kavach including RIUs. This will include modification of all allied equipment including Data logger etc.

3.2.4. Programming and installation of RFID Tags on tracks as per approved layout on the entire jurisdiction of allotted section/reach.

3.2.5. Installation, testing and commissioning of Network Monitoring System (NMS) for Kavach.

3.2.6. Bidder to support for System integration ensuring that all components provided as part of the system function cohesively and are interoperable with equipment supplied by other OEM as per the guidelines of RDSO/CoE/Railway Board.

3.2.7. Installation, Testing and Commissioning of Kavach test bench and Lab model setup.

3.2.8. Preparation of necessary documentation for all the works mentioned above as per established practice and instructions of Railways Engineer. Coordination with approving agencies for approval of these documents.

3.2.9. Bidder shall coordinate on behalf of BHEL with the respective authorities for expediting the issue of Wireless Operating License (WOL) and Standing Advisory Committee on Radio Frequency (SACFA) clearances /licenses with support from railways. The railway will make the necessary payment required for obtaining and renewing WOL and SACFA clearances.

3.2.10. Support to BHEL for making all arrangements for ISA (appointed by BHEL) inspection, complying observations made during ISA and submission of compliance documents.

3.2.11. Support to BHEL for preparation of documents for PCSTE/GM/CRS inspection of Kavach works. Compliance of observations made by the sanctioning authority.

3.2.12. Coordination with other vendors/bidders carrying out signaling, Tower, OFC work or other works for successful commissioning of Kavach system. This includes amicably settling any

disputes that arise. The decision of BHEL & Railways Engineer in case of any such dispute shall be final and binding on the bidder.

3.2.13. Bidder to provide a dedicated Graduate Engineer liaising executive at Site/HQ for monitoring and reporting of daily progress of work and liaising with field officials of Railway and BHEL and other necessary coordination work.

3.2.14. After completing the survey activities, the successful bidder should visit BHEL to finalize the bill of materials (BOM) needed for site implementation, along with confirming the design calculations and completing the detailed system engineering work. This process also involves checking how BHEL's KAVACH systems will integrate with the current site setup.

3.2.15. Once inputs are received from BHEL and the integrator has gained a clear understanding of the BHEL KAVACH systems, a comprehensive report should be prepared by the system integrator. This report must include an execution plan and a detailed scope matrix to support effective implementation of the plan.

3.2.16. The bidder must obtain all necessary site inputs and coordinate with RDSO, SWR, or any other relevant Indian Railways agency to provide BHEL with the information needed for smooth document approvals. Additionally, the System Integrator is responsible for submitting the site-specific Quality Assurance Plan (QAP) to enable better planning of execution, testing, installation, commissioning, and subsequent operation and maintenance activities.

3.2.17. The bidder should also coordinate the advance movement of BHEL's supply items, working closely with both BHEL and SWR to ensure timely logistics and avoid delays in the project schedule

3.3. DETAILED SCOPE OF WORK:

3.3.1. Survey and Design

a. The track survey shall be conducted using Aerial Drone Vehicle/UAV/LIDAR survey as approved by Railway to study the complete track layout and identify curves. The complete mapping of absolute location of the entire track for Kavach territory shall be done in the aerial survey. This should help in identifying the absolute location of nominated position of RFID tags and location of signals. All the locations of Kilometer stones / Traction masts are to be mapped to the absolute locations by carrying out survey using Drone / Loco mounted camera / foot survey with odometer/ surveyor wheel and not on the basis of SIP/ESP data. After the conduct of aerial survey,

the bidder shall submit:

i. Ortho photography of entire Kavach section

ii. Videography in two copies of CD/ DVD /Pen drive/External hard disk for the entire section.

iii. Photo booklet

iv. Project booklet

v. Complete mapping of RFID tags , OHE Mast, Points, LC Gates, Station Central Locations and signals as per absolute location

However, Railways shall extend assistance for necessary permission from concerned Govt. Authority in case of Drone survey required in sensitive / Defence Area.

b. Bidder to ensure that Survey and design shall be done for the fitment and commissioning of Kavach in the Site of this Project. Survey and design of the following shall be done for Kavach fitment (bidder to provide support towards preparation & submission of necessary documents, drawings, schemes etc. for below towards obtaining approval from RDSO & Zonal Railways).

i. Absolute Location Survey including OHE mast to mast distances

ii. Radio Signal Strength Survey

iii. Cable Route Plan

iv. Kavach Deployment Plan with Details of Station Kavach / LC Kavach / Remote Interface Units

v. Kavach Time Slot and Frequency Allocation Plan

vi. Kavach Tag / TIN Allotment Plan

vii. RFID Tag / TIN Layout

viii. RFID Tag Data

ix. Kavach Table of Control (TOC)

x. Kavach Track Profile

xi. Interface Circuits

xii. Datalogger / Remote Terminal Unit (RTU) Wiring and Validation Plan

xiii. Station Working Rules (SWR)

xiv. Specific Application Safety Case by Independent Safety Assessor

xv. Power Supply Scheme

xvi. Floor Plans

xvii. Network Monitoring System (NMS) Connectivity Scheme

3.3.2. Installation, Testing, Deployment and Commissioning

The bidder shall be responsible for installation, testing & commissioning of trackside equipment (stationary Kavach) along with associated works for Kavach in the sections. Static Test plan, Dynamic Test plan and related reports shall be prepared and submitted by bidder under the guidance of BHEL for further submission to Zonal railways.

Bidder to provide support to BHEL for preparation and submission of pre-commissioning checklists for all equipment of Kavach before commissioning.

3.3.3. Manuals

Bidder to provide support for preparation & submission of Hard copies of manuals along with soft copies for the installations as follows.

S.No.	Equipment	Manual	Location
1	Station Kavach	1. Installation Manual 2. Troubleshooting Manual 3. Maintenance Manual	All locations where Station Kavach has been installed
2	Remote Interface Unit (RIU)	1. Installation Manual 2. Troubleshooting Manual 3. Maintenance Manual	All locations where RIUs have been installed
3	Onboard Kavach	1. Installation Manual 2. Trouble Shooting Manual 3. Maintenance Manual	All loco sheds whose locomotives have been fitted with

3.3.4. Submission of Drawings

Bidder to provide as built drawings based on BHEL inputs for all the installations done for the completion of project. A tentative list is given as follows.

i. Cable Route Plan

ii. Kavach Deployment Plan with Details of Station Kavach / LC Kavach / Remote Interface Units

iii. Kavach Time Slot and Frequency Allocation Plan

iv. RFID Tag / TIN Layout

v. RFID Tag Data

vi. Kavach Table of Control (TOC)

vii. Interface Circuits

viii. Kavach Track Profile

ix. Datalogger / Remote Terminal Unit (RTU) Wiring and Validation Report

x. Station Working Rules (SWR)

xi. Specific Application Safety Case by Independent Safety Assessor

xii. Floor Plans

xiii. Power Supply Scheme

The list of completion drawings given above is only indicative and any other completion drawings as deemed fit for the installations done in the completion of this Project shall be supplied at the relevant locations. The decision of B H E L & R a i l w a y Engineer shall be final in case of any dispute in this regard.

3.3.5. Maintenance Registers

Maintenance registers shall be provided by bidders for the installations as follows.

Registers	Location
Kavach SMOCIP SOS Counter Register	All stations and LC Gates provided with Station Kavach / LC Kavach
Kavach Equipment Maintenance Register	All locations provided with Station Kavach / LC Kavach / RIUs and loco sheds whose locomotives have been fitted with Kavach

The list of registers given above is only indicative and any other registers as deemed fit for the installations done in the completion of this Project shall be supplied at the relevant locations. The decision of BHEL & Railway Engineer shall be final in case of any dispute in this regard. The registers shall be supplied in the format specified by Railways for standard registers and OEM for OEM specific equipment registers.

3.3.6. STATIONARY KAVACH EQUIPMENT

The scope of work for Installation and Commissioning of Stationary Kavach and RIU includes all work required to make the system functional as per RDSO/CoE Specifications/Guidelines, local wiring practices of Zonal Railway and Good Industry practices.

Installation of Relay/Relay group base plates, fixing of Tag blocks etc. The work shall be done as per approved plan, extant practice on Zonal Railways & the instructions of Railway engineer at site.

- Fixing and wiring of Fuses including fuse blocks and fuse inserts with holders of various capacities including Indicative type as per IRS S:78-92, cartridge fuse block made of PBT as per RDSO Drg No SA-23748 Alt 4, SA- 23749 & Spec No IRS S 75/2006 with latest amendments, Round head type non deteriorating type low voltage cartridge fuse as per Specn No IRS/S/78/92 with latest amendments, Fuse terminal block with LED indication upto 2.5 sq.mm screw type one in one out including end plate for through terminal block (suitable for 400 mA, 630mA, 1A, 1.6A, 2A, 4A, 6.3A & 10A) as per RDSO/SPN/189/2004, associated fuse links, shorting links etc. The work shall be done as per extant practice on Zonal Railways & the instructions of BHEL & Railway engineer at site. (Supply Excluding BHEL Scope).
- Circuit wiring/jumpering as per circuit diagrams in the relay racks/tag blocks. This includes

preparation of Jumper sheets by wire man duly checked by firm's site supervisor & wire to wire testing as per circuit diagram. Any wrong jumper done by wireman shall be corrected. Good quality solder resin core to be supplied by bidder for soldering of Jumper wires. Soldering of jumper wires to be done after completion of testing by BHEL & Railways.

Lettering & Numbering of detail and description writing of particulars of terminations & equipment on relay rack, relays, cable termination rack, battery & power equipment, IPS, operating panel, axle counter etc constituting entire system. The work shall be done as per extant practice on Zonal Railway & instruction of BHEL & Railway engineer at site. Other painting works as per the instruction of BHEL & Railway Engineer. Signaling functions Description writing at Signaling installation shall be carried out as per RB Lr No. 2023/Sig/17-Sig Equip/Maintenance/Part dated 06.11.2023.Wiring of relay contacts and Kavach inputs to Data Logger or its Remote Terminal Unit.

- Stationary Kavach equipment as per RDSO/SPN/196/2020 ver 4.0 or latest with accessories includes installation of Kavach unit and its interface with the signaling system including SMOCIP (Station master Operation Cum Indication Panel Under BHEL Scope), interlocking of relays/ Protocol Converter to suit all types of installation such as EI of any make and PI/RRI, connectivity of radio tower and its interfaces including modems (Under BHEL Scope), connectivity of Adjacent Station Kavach, NMS Connectivity, OFC hut, LC Kavach, RIU and its interfaces including modems, and all other signaling equipment required for satisfactory performance of the complete system. This includes laying and termination of Signalling, Quad, OFC and Power cable including supply of associated material. Installation and wiring of Signal ECR, TPR, point indication NWKR/RWKR repeater relays, LC gate relays, Line clear relays, and wiring to datalogger etc. along with supply of wiring material as required, has to be done by the bidder and any other activity required for the completion of the work will have to be done by the bidder to meet the end objective of the Kavach functioning.
- Stationary Kavach unit shall be housed at stations in Relay rooms. In case of non-availability of space, the Kavach unit may be kept in Equipment room provided by Railway near by the interlocking relay room as per policy of Zonal Railway. The power required for stationary Kavach will be taken from the available mains supply with suitable conversion arrangement which will be arranged by the bidder. At stations having IPS arrangements, 110V DC will be provided. The

bidder shall arrange to convert the same to suitable voltage for Kavach operation. Necessary DC-DC converter modules, if required, will be provided by the BHEL. The station Kavach equipment shall be inspected by RDSO before supply to Railways. No input to signaling equipment/system shall be given from Kavach. Output of any signaling equipment/system shall not be directly connected to Kavach unless it is approved. A repeater signaling relay will be used to give such output & the same output shall also be logged in the data logger. The wiring has to be done in a double-cutting arrangement with parallel contacts for each signaling input wired to Kavach. Repeater relays for this purpose shall be supplied as detailed in the tender schedule. Such output from Signalling system shall be transmitted & processed to ensure its Safety Integrity Level 4. All the wiring should be done with standard practice of the Railway, providing due protection against surges.

- The bidder shall provide support to BHEL for installation and commissioning of Protocol Converter for Interfacing of Kavach with Electronic Interlocking available at Station/Relay Huts or use of relay interface.
- The bidder to carry out Site Acceptance Test (SAT) as per RDSO's guidelines.

GPS and GSM antenna are installed at the stationary Kavach unit for time synchronization and transmission of keys from Key Management System. Two separate antennas (each for GSM and GPS type) will be supplied by BHEL. The bidder shall install these antennae in diverse path for high availability. The cable for each GPS antenna installed at top of relay room/equipment room shall be laid separately using proper housing and closure to avoid entry of rodents and provide adequate protection against any cable cuts. The SIM cards required for GSM communication of stationary Kavach will be provided by Railway.

Labelling/lettering/painting of description of functions in Relay/EI/ASM room as per instruction of Engineer.

3.3.7. LC Gate/ IBS / ABS HUT Kavach

Depending on the proximity of the signals, the signals in the auto section or nearest LC gate can be clubbed with the stationary Kavach kept at station if the concerned repeater relays are available at station and the radio signal strength is adequate at the said auto signal/gate signal location. In case where such aspects are not available but radio signal strength is adequate, separate Kavach RIU unit (supplied

by BHEL) shall be installed at LC, IB and ABS Hut location to bring the aspects over OFC to the nearby station whose radio tower is to be used.

It includes installation & commission of LC/Auto Kavach Equipment consisting of Vital computer peripherals, full duplex Radio modems, UHF antenna, OFC modems, GPS and GSM antenna and interfaces (supplied by BHEL) as per RDSO/SPN/196/2020 version 4 or latest and Technical Advisory Note SIG0TCAS(TAN)/01/2021 Ver 2.0 dated 11.10.2021 or latest. This also includes making necessary earthing (Earth resistance less than 1 ohm) as per RDSO/SPN/197 Ver 1.0, wiring of Electrical/Quad/Optical cable, relay wiring, datalogger/RTU wiring supply of tool kit and interlocking of relays and wiring from suitable power supply arrangement.

Labelling/lettering/painting of description of functions in Relay/EI/ASM room as per instruction of Engineer.

3.3.8. Kavach RIU

It consists of Installation & Commissioning of station Kavach RIU (Remote Interface unit) with at least 32 Field Inputs as per RDSO/SPN/196/2020, Version 4.0 or latest and Technical Advisory Note SIG0TCAS(TAN)/01/2021 Ver 2.0 dated 11.10.2021 or latest. (supplied by BHEL). The RIU has provision of OFC Interface and should be connected to central Kavach/LC Kavach/ABS Hut Kavach in a Ring network. This includes supply (under BHEL scope) and installation of OFC termination box for 24/48 fibers, interface, Earthing, datalogger/RTU wiring & Signal functions etc. Suitable RIUs shall be provided in block section where Automatic Signalling is implemented by providing Signal Interlocking circuits in location boxes or Auto huts provided near signal posts to capture signal aspects in Automatic –Signalling section and these RIUs shall be connected to a centralized Stationary Kavach unit to ensure functioning of Kavach in Automatic Signalling territory. Suitable power supply arrangement for RIUs is to be done by the bidder for this purpose. Necessary DC-DC converter modules, if required shall be provided by BHEL. Railway will provide 110V DC power supply for Kavach equipment.

Labelling/lettering/painting of description of functions in Relay/EI/ASM room as per instruction of Engineer.

Remote Interface Units shall be connected in ring fashion and they shall be able to connect to

station Kavach in case of failure of main path. For this purpose, OFC shall be laid as decided by BHEL & Railways Engineer.

3.4 RFID

RFID includes RFID tags with enclosures and fixtures at Stations and auto sections and mid-section LC gates/IBS. This should comply RDSO/SPN/196/2020, Ver. 4.0 or Latest, and Technical advisory Note SIG0TCAS(TAN)/01/2021 Ver 2.0 dated 11.10.2021 or latest. (Supply under BHEL Scope)

The detailed guidelines for installation of RFID tags are available in RDSO's specification for Kavach. Further, the fixtures for RFID tags shall be in compliant with the RDSO issued Technical advisory Note SIG0TCAS(TAN)/01/2021 Ver 2.0 dated 11.10.2021 or latest shall also be complied.

There shall be a provision to identify the RFID tags once removed from the track for purpose of any track maintenance work. Tag type and Tag Id should be marked /printed on bottom of tag so that they can be identified easily for re-installation after removal. The marking shall be as follows:

RFID NO.: **TYPE:** **LOCATION:**

The duplicate RFID tag must be installed at a minimum distance of 3 to 5 meters between tags except for Signal foot tag for high availability. Through survey identifying the location of RFID tag installation shall be done in advance along with BHEL & Railway personnel and the RFID tag-TIN layout to be prepared accordingly. The layouts shall be approved by BHEL & Railways before commencement of RFID tag installation.

RFID tag data to be programmed in each tag type shall be submitted to Railway for approval. Once approved, the tags shall be programmed with the data. The bidder shall arrange for verification of RFID tag installation, RFID tag data at his own cost. All the cost including logistics, tools and equipment, documentation etc. will be borne by bidder.

During the course of execution of project, till ISA certification and final commissioning any tags removal and re-fixing required due to track maintenance work will be executed by bidder at his own cost. Cost of any damage done to tags due to negligence of bidder has to be borne by the bidder.

The bidder shall arrange for regular foot survey or aerial Videography to check the health of tags, the periodicity to be followed.

RFID fitment Drawing arrangements issued by RDSO/CoE or instruction of Engineer shall be followed.

RFID tags shall be provided at each location cover the main lines, block sections, loop lines and remaining yard portion. The provision of RFID tags in Block section shall be done to get the benefit of non-signaling-based collision prevention feature of Kavach with Kavach equipped Locomotives/Cabs.

During the course of execution of work, till ISA and final commissioning, any shifting of RFID Tags required due to minor change in signaling shall be done by the bidder at his cost.

3.5 UHF Equipment including WPC & SACFA clearance

Site-specific Radio Signal Strength (RSSI) surveys should take into account these constraints, and suitable mitigation measures (such as increasing antenna gain or optimizing azimuth and tilt) should be adopted to ensure reliable communication without violating aviation safety norms.

The antennas for the stationary communication system at stations, auto huts, and mid-section interlocked gate units shall be with a **minimum received signal strength (RSSI) of –70 dBm or better**, along with a **fade margin of at least 30 dB** at the receiver.

The bidder's scope includes installation of necessary antenna (2 transmitting and 2 receiving supplied by BHEL), radio cables along with interfaces, all radio and OFC modems (supplied by BHEL), Outdoor Cabinets (ODC), surge protection devices for radios (supplied by BHEL), EMI filters (supplied by BHEL), along with necessary power supply arrangement for, modem etc.

a. Radio modems shall be installed in a hot-standby arrangement in both stationary Kavach and Loco Kavach to ensure there is no packet loss in case of failure of one radio modem. Stationary Kavach unit shall be connected to Radio modems at the tower location using OFC cable. Two modems shall be installed in a hot standby arrangement. Each modem should be connected over a separate OFC cable and separate Power cable in diverse path to ensure high availability. (Supplies under BHEL Scope).

b. The installation at tower including RF cable, Power supply to Radio to OFC modems should be as per RDSO issued Technical advisory Note SIG0TCAS(TAN)/01/2021 Ver 2.0 dated 11.10.2021 or latest

c. During the course of trials, if there are any weak communication spots identified, the bidder is responsible for making necessary alteration in antenna installations at tower (such as change of cable type, connector, antenna type etc) to improve the radio signal strength to desirable limits as mentioned in RDSO/SPN/196/2020 version 4 or latest and Technical advisory Note SIG0TCAS(TAN)/01/2021 Ver 2.0 dated 11.10.2021 or latest. The installation of equipment's and protection system need to be submitted by bidder to Railway for approval.

d. **WPC and SACFA clearance:** The frequency of the operation for Kavach will be defined by RDSO. Railways shall process for obtaining Wireless Operating License (WOL) and Standing Advisory Committee on Radio Frequency (SACFA) clearances and their renewal. Payment of License, Royalty, SACFA fee etc., up to Final Acceptance Certificate shall be made by Bidder and reimbursed by Railway on actuals (excluding penalty for delay due to Bidder). Application shall be filed by Railway with Wireless Planning Commission, Ministry of Telecommunication.

e. Required WPC, SACFA and any other regulatory authority clearances shall be obtained by the Railway, however the necessary documentation and liaising for the same shall be the responsibility of the bidder on behalf of BHEL.

3.6 ONBOARD/LOCO Kavach

a. Loco Kavach Equipment

i. Equipment needs to be provided in the locomotives as part of Onboard KAVACH equipment. This includes Loco KAVACH Vital computer unit, Brake interface unit, Driver Machine Interface, RFID reader, BP/BC/MR/EB connections, two number of Directional type Pulse generators with high reliability shall be used for speed sensing. Each Pulse generator shall have at least two independent speed output channels with all accessories, auto-whistling circuit, GSM, GPS and radio antenna (Under BHEL Scope of Supply) with necessary cabling to name a few. Bidder to provide support towards Installation &

Commissioning for Loco Kavach system of BHEL

ii. The placement of various equipment in the engine room, operators' panel, roof of the locomotive and at the bottom of the locomotive as proposed, needs to be approved by Shed officer-in-charge.

iii. Installation, testing and maintenance of the On-Board equipment in the Diesel/Electric Locos should be done during the scheduled trip of Locos for maintenance. Railway will ensure availability of Electric/Diesel Locos to be fitted with KAVACH equipment and its components in nominated loco sheds for 5-7 days. It is expected that the fitment of whole On-board equipment shall be completed within a period of 5-7 days. Bidder shall make all efforts to reduce the time required for installation after gaining experience of installation on first few Locos. After the completion of installation and testing of loco KAVACH equipment, the configuration parameters of the loco should be got approved by RDSO and selected accordingly. The pre-commissioning checklist should be signed jointly with shed staff and submitted to officer-in-charge at loco shed.

iv. Loco equipment shall be maintained in the Diesel and Electric loco sheds nominated by Railways. The bidder has to provide I&C support for test benches supplied by BHEL for maintenance and repair of Loco KAVACH equipment at sheds and also test and troubleshoot the Loco KAVACH equipment when it is coming out of loco shed. Dedicated service engineers shall be deployed at loco shed for this purpose.

3.7 BRAKE INTERFACE UNIT

i. Conducting survey for estimation of braking characteristics required to define the braking curves of Electric/Diesel Locos plying in nominated KAVACH section of Zonal Railway. The survey shall be done by the bidder & BHEL under different passenger and freight loading conditions with emergency and service brakes of different Loco models i.e., WAP -7, WAP-4 etc.

ii. The Railway will authorize the BHEL to conduct survey on the nominated rakes/locos with different loads under the supervision of Railway representatives during the normal runs of the rakes. If required, Railway shall arrange service rake for conducting survey for the estimation of braking characteristics and trials. The Braking coefficient for different loads shall be as per uniform braking algorithm and be defined in coordination with COE/Kavach/SC. Based on the estimation of braking characteristics, finalization of braking

curves, study of Electric/Diesel Locos for placement of On-Board equipment duly approved by the Railway, the bidder will install On-Board equipment as per RDSO/COE issued technical guidelines.

iii. The proper functioning of the Loco KAVACH system shall be tested and verified using initial trial run. Necessary modifications to the braking curve/software/ hardware etc. will be carried out by the BHEL with support from Bidder. On completion of work, the application safety case by RDSO approved Independent Safety Assessor for the entire KAVACH system consisting of final configuration, software and associated parameters of loco shall be submitted to Railways for approval, bidder to provide assistance for the above.

3.8 Documentation

The bidder shall support BHEL towards supply o f all necessary documents as per Railway's requirement without any additional cost. This shall include following. All the installation drawings pertaining to a section/station/shed shall be supplied in a good quality folder for each section/ station/shed. During installation, a folder containing all the drawings, testing procedures, commissioning procedure shall be kept at the stations:

3.8.1 FOR ON-BOARD EQUIPMENT (FOR DIESEL/ELECTRIC LOCOMOTIVES):

a. Six sets each of Loco KAVACH interface wiring diagram and auto- whistling circuits. Diagrams including tracings shall be handed over to Railways. All drawings in PDF format along with AutoCAD format shall be given on six sets pen drive/External hard disk.

b. Installation details, Equipment layout & Brake interface details duly approved by OEM and Railways.

c. Manual describing details of equipment, their purpose & specification, principle of operation and details of power supply arrangement. It should also include details of various components of the equipment.

d. Manual of Installation of Loco KAVACH by OEM.

e. Manual of Maintenance of Loco KAVACH equipment.

f. Loco KAVACH maintenance schedule for various trip maintenance of loco such as

Periodic inspection, IA/IC/IB schedule, MOH, IOH etc.

g. Pre-Commissioning Checklist duly completed and jointly signed by shed staff.

h. Version control of Loco KAVACH application and execution software because of change in design configuration, loco specific changes or on any other account etc. shall be recorded and submitted to Railways during the course of execution of project and even after commissioning i.e. during warranty period.

i. Diagnostic Procedure including troubleshooting charts.

j. User manual with Do's and Don'ts.

k. Loco KAVACH Configuration Manual and user manual for Loco KAVACH configuration kit.

l. User Manual for Application Data generation software.

m. Loco Pilot Operating Manual.

n. DMI Display details (configuration details that are entered by Loco Pilots on start of equipment).

o. Any other documents required by Railways for the normal operation & maintenance.

3.8.2 FOR STATIONARY EQUIPMENT

a. Cable route plan in tracing (6 copies) indicating the cable path for all cables laid such as OFC cable, Quad cable, Power cable etc. in station area in block section.

b. Six sets each of KAVACH interface wiring diagram should be supplied in neat bound books. Diagrams including tracings shall be handed over to Railways. All documents in PDF format and drawings in AutoCAD format shall be given on six sets of External Hard Disk / Pen Drive.

c. Stationary KAVACH interface details to existing interlocking along with input pin connection details at Stationary KAVACH end. These details should enable tracing of KAVACH inputs from stationary KAVACH unit end up to relay end.

d. Six sets each of stationary KAVACH Table of Control should be supplied in neat bound books. Tracings of tables shall be handed over to Railways. All documents in PDF format and drawings in AutoCAD format shall be given on six sets of External Hard Disk / Pen Drive.

e. Complete frequency plan identifying the frequency assigned to each station.

f. Details of assignment of KAVACH ID to every stationary KAVACH.

g. TDMA/FDMA based station and loco slot distribution details for every station describing the total number of time slots used at each station, specific slot numbers, frequency assigned to each station etc.

h. KAVACH-TIN/RFID Tag Set Number, Station ID Allotment chart for the entire KAVACH section for purpose of communication and KAVACH functioning

i. Procedure for conducting FAT testing of Stationary KAVACH.

j. Installation manual and Equipment layout duly approved by OEM and Railways.

k. Manual describing details of equipment, their purpose & specification, principle of operation and details of power supply arrangement. It should also include details of various components of the equipment.

l. Stationary KAVACH and its sub-systems interconnectivity diagram.

m. User Manual for Application Data generation software.

n. User Manual for Application Data configuration

o. Version control of stationary KAVACH application and execution software because of change in station layout, yard modification / remodelling, alteration in signalling or on any other account etc. shall be recorded and submitted to Railways during the course of execution of project and even after commissioning i.e. during warranty period.

p. User manual for Station Master Operation cum Indication Panel (SMOCIP)

q. Manual of Maintenance of Stationary KAVACH and various sub-systems.

r. Pre-Commissioning Checklist

s. Diagnostic Procedure including troubleshooting charts

t. User manual with Do's and Don'ts

u. Any other documents required by Railways for the normal operation & maintenance

3.8.3 FOR TRACK SIDE EQUIPMENT

a. Six sets each of section and station RFID-TAG-TIN layouts should be supplied in neat bound/Spiral binding book. Diagrams including tracings shall be handed over to Railways. All documents in PDF format and drawings in AutoCAD format shall be given on six sets of CD/ DVD / Pen Drive

b. Six sets each of section and station RFID-TAG data should be supplied in neat bound books. Tracings of data shall be handed over to Railways. All documents in PDF format and drawings in AutoCAD/Excel format shall be given on six sets of CD/ DVD / Pen Drive/External Hard disk

c. Manual describing details of RFID tags, their purpose & specification, principle of operation.

d. RFID TAG DATA preparation manual along with associated software tools.

e. RFID TAG DATA configuration manual along with associated software tools.

f. Manual of Maintenance

g. Diagnostic Procedure including troubleshooting

h. Procedure for installation of RFID tags on tracks.

i. Any other drawings/ documents as required by Railway for the successful operation maintenance of this system.

3.8.4 FOR TEST BENCHES

a. Manual describing installation details of Stationary KAVACH test bench and its sub-systems interconnectivity diagram

b. Manual describing installation details of Loco KAVACH test bench and its sub-systems interconnectivity diagram

c. User manual for operating Stationary KAVACH test bench.

d. User manual for operating Loco KAVACH test bench.

3.8.5 FOR CENTRAL MONITORING UNIT (NETWORK MANAGEMENT SYSTEM)

a. Manual describing details of equipment, their purpose & specification, principle of operation and details of power supply arrangement along with interconnection with different sub-systems.

b. E1 network diagram

c. User manual describing different features of Network Management System and process for generating exception reports etc.

d. NMS installation and maintenance manual.

e. Any other documents required by Railways for the normal operation & maintenance.

3.8.6 KEY MANAGEMENT SYSTEM

a. Manual describing details of equipment, their purpose & specification, principle of operation and details of power supply arrangement along with interconnection with different sub-systems.

b. Any other documents required by Railways for the normal operation & maintenance.

3.8.7 LAB MODEL SETUP FOR TRAINING

a. LAB Model shall be supplied by BHEL in accordance with RDSO Letter No. STS/E/TCAS/Tender/Part VIII dated 15.12.2015 and PED/COE/SC Letter No IRISET/CoE/Kavach/Misc dated 10.09.2024. This includes supply (Under BHEL Scope), installation and commissioning of Two Stationary KAVACH units, two Loco KAVACH units along with Brake Interface unit, set of RFID tags with spares including all the components and simulator with final firmware suitable for lab demonstration as well as functioning in field with facility to test Multi-Vendor Interoperability. Bidder to provide I & C support for above

b. LAB model to be installed, project facilities, and its location shall be decided by the Railway Authority at the time of execution.

4 TEST BENCH

b. Loco equipment shall be maintained in the Diesel and Electric loco sheds nominated by Railways. BHEL is supposed to provide test benches for maintenance and repair of Loco KAVACH equipment at sheds and also test and troubleshoot the Loco KAVACH equipment when it is coming out of loco shed. Bidder to provide necessary I & C support and Dedicated service engineers shall be deployed at loco shed for this purpose.

c. BHEL shall provide stationary Kavach test bench as per extant instructions of RDSO/CoE and as per the instructions of Engineer at the location decided by Railway. Test bench shall be capable of testing stationary Kavach equipment and troubleshooting in case of failure. Bidder to provide necessary I & C.

d. Test benches to be installed at project facility location as decided by the Railway Authority at the time of execution.

5 DATA LOGGER AUGMENTATION

Data logger Augmentation wherever required is to be done by the bidder. All repeater relays of KAVACH are to be proved in Data Logger wherever KAVACH Repeater Relays are operated. If the capacity of Data Logger/RTU is not sufficient, provision of capacity enhancement by means of replacement/augmentation to be done by the bidder as per tender schedule.

6. INDEPENDENT SAFETY ASSESSOR (ISA) (THIRD PARTY)

a. Application safety case shall be prepared by BHEL. An Independent Safety Assessor (ISA) shall be engaged by the BHEL from the RDSO Panel for ISA. ISA shall be chosen from RDSO Panel with the approval of Railway. RDSO or Railway shall be responsible for giving safety clearance adopting the guidelines pertaining of Safety assessment as the case may be. This will include Application Software for implementing Safety functions, Communication Interface, Input/Output modules, Power supply and other related equipment.

b. The BHEL shall submit an Application Safety case for evaluation of KAVACH system. All documents shall be prepared in English language, checked and verified and marked appropriately indicating their version number, number of alterations etc. BHEL shall submit the Application Safety case for the entire project including all Trackside and On-board sub systems. Such safety case should be successfully tested and verified by an RDSO approved Independent Safety Assessor. The Application Safety case will be approved by RDSO/Railways as per guidelines. All necessary documents required in this regard shall be submitted by BHEL to RDSO/Railways.

c. Any document required by ISA during the course of Safety Assessment shall be submitted by the BHEL to the ISA. A copy of such documents shall also be submitted to Railways.

d. Bidder to provide support to BHEL during above safety case assessments.

7 FACILITIES PROVIDED AND WORKS TO BE DONE BY RAILWAY:

i. Space for housing Kavach and other equipment to be installed as part of the contract.

ii. Space for Towers and area for earthing arrangement and Power supply to aviation lights.

iii. OFC cable or communication channels between stations/LC Gates/ABS huts/IBS huts (excluding OFC from Relay/EI room to tower).

iv. Providing requisite drawings of existing installations and other section/station specific details available with Railways.

v. Approval of design documentation submitted by the bidder/BHEL

vi. Coordination for Approval of documentation to be submitted to Independent Safety Assessor (ISA) for Specific Application Safety Case (SASC)

vii. Process for Approval of closing comments to Technical Notes / Queries of ISA with comments of Kavach OEM

viii. Process for Approval of Closure Report of Safety Related Application Conditions (SRACs) of SASC report submitted with comments of Kavach OEM

ix. Processing of statutory sanction documentation submitted by the bidder and Kavach OEM

x. Arrangement of disconnection, if any required, and opening of relay rooms for carrying out Stationary Kavach works

xi. Arrangement of locomotives for fitment of Onboard Kavach

xii. Provision of E1 channel connectivity for NMS

xiii. Arrangement of necessary locomotives / path / crew for testing and trials of Kavach system

xiv. Obtaining Wireless Operating License (WOL) and Standing Advisory Committee on Radio Frequency (SACFA) clearances (Necessary liasoning to be done by bidder).

xv. Provision of power supply for the work, at locations where Railway supply is available (At locations where power supply is not available, bidder shall make his own arrangement at his own cost).

8 TIME SCHEDULE FOR EXECUTION OF WORK:

Time is the essence of this contract. Entire work is to be completed progressively within the completion period of 18 months. Project schedule may be extended by six months over 18 months, depending upon site exigencies. Adequate resources shall be deployed by the bidder to meet following tentative timelines (Subject to finalization of concept/design/drawings/specifications/approvals issued by RDSO/ CoE/ Railway Board):

- Expected time schedule for supply, installation and commissioning of the KAVACH system for different section / Reach shall be as follows:

'D' – Date of issue of LOA

For the timelines indicated below, bidder will be responsible for the respective works assigned from sr. no. 8 below.

S.No.	Description of Supply and Execution of Work	Time Schedule for Completion of Reach
1.	Radio Signal Strength Survey to assess signal strength in nominated KAVACH section and decision on tower height. This includes submission of initial RSSI graphs. GPS and GSM communication survey to check for signal strength.	D+1 month or earlier
2.	Placing of tower orders and submission of tower (foundation and super-structure) design drawings for 170 KMPH wind speed and Factor of Safety 2.0 along with relevant reports, proof checking by third party and submission of Tower Fabrication QAP for RITES inspections	D+2 months or earlier
3.	Carrying out Survey of tower locations, soil testing, survey for cable paths for all types of cable laying for towers and Submission of tower locations drawings	D+2 months or earlier
4.	Submission of soil test reports for tower foundations	D+3 months or earlier
5.	Completion of tower foundation work. This includes sand test, cement test, cement compressive strength test, steel test.	D+5 months or earlier
6.	Completion of tower fabrication along with RITES inspection.	D+5 months or earlier
7.	Completion of tower erection. This includes erection, painting, earthing and tower location box and submission of all test reports – verticality test, member tightness test.	D+7 months or earlier
8.	Station relay room survey and relay contact analysis. This includes submission of KAVACH relay room floor plans, interface wiring diagrams and KAVACH scheme for entire section	D+2 months or earlier

9.	Survey of cable paths for all types of cable laying for Stationary KAVACH, RIUs, SM OCIP and NMS & Submission of proposed cable path diagrams	D+2 months or earlier

S.No.	Description of Supply and Execution of Work	Time Schedule for Completion of Reach
10.	Survey of KAVACH section to estimate requirement of RFID tags, i.e. RFID tag location survey, preparation and submission of RFID TAG- TIN layout and RFID Tag Data.	D+3 months or earlier
11.	Supply of cables required for the entire section – OFC, 12 core signalling cable, PIJF cable with RDSO inspection	D+3 months or earlier
12.	Submission of KAVACH Table of Control and preparation of application data	D+4 months or earlier
13.	Completion of internal FAT by the bidder and offering of KAVACH application data FAT testing to Railways	D+5 months or earlier
14.	Supply of Stationary/LC/IB/ABS KAVACH, RIU and RFID tags including all sub-systems such as radio modems, antennae, SMOCIP. This includes supply of all cables and signalling material for total track side installations with RDSO inspection.	D+5 months or earlier
15.	Completion of required trenching, blowing, cabling including splicing and terminations	D+6 months or earlier
16.	Installation of RFID tags along with their fixtures in the nominated KAVACH section including their programming.	D+6 months or earlier
17.	Installation of complete Stationary KAVACH equipment including relay interface circuits, power wiring, bell test and correspondence test for wiring. This includes installation of radio modems, antennae, SMOCIP, connectivity for NMS, power supply equipment etc and submission of signed Pre-commissioning checklist (PCCL).	D+7 months or earlier
18.	Light Engine trials for testing of Stationary KAVACH. This includes SAT for Stationary KAVACH, RF communication performance.	D+8 months or earlier

19.	Submission of as-made documents, manuals etc. and all other documentation of Stationary KAVACH.	D+8 months or earlier
20.	Submission of final RSSI graphs	D+10 months or earlier
21.	Survey of nominated locomotives for fabrication of mechanical frames and submission of loco wiring diagram and fitment plan.	D+2 months or earlier
22.	Supply of complete Loco KAVACH equipment at nominated sheds including all sub-systems such as BIU, RFID reader, antennae, wheel sensors, LP OCIP, radio	D+4 months or earlier

S.No.	Description of Supply and Execution of Work	Time Schedule for Completion of Reach
23.	Installation and testing of Loco KAVACH equipment in all locomotives including all cables, radio modems, RFID reader and antennae, pneumatic piping and all other necessary wiring and Submission of signed Pre-commissioning checklist (PCCL)	D+7 months or earlier
24.	Light Engine trials for testing of Loco KAVACH in field.	D+8 months or earlier
25.	Submission of as-made documents, manuals etc. and all other documentation of Loco KAVACH.	D+8 months or earlier
26.	Testing and commissioning of KAVACH in entire section and locomotives as per scope of the work.	D+8 months or earlier
27.	Field trials to monitor performance of KAVACH system	D+18 months or earlier
28.	Safety Case document submission and Project completion.	D+18 months or earlier

Note: The timelines provided are tentative. The bidder is required to submit a detailed PERT chart outlining the plan to complete the entire scope of work within the stipulated contract duration for the section, as part of their proposal.

9 STUDY OF LOCAL CONDITIONS

a) The bidder may carry out a site inspection to assess the local conditions.

b) Prospective bidders are encouraged to thoroughly review the Tender Document. Any bid submitted will be considered as having been made after a comprehensive evaluation of the document, with complete awareness of its implications. It is assumed that the bidder has clarified all queries and interpretations with the appropriate authorities within the Indian Railway Administration. Unless specifically addressed in the bid, all conditions and specifications will be considered accepted. Non-compliance with any of these instructions may lead to the bid being disregarded without further communication.

c) The tender document clearly outlines the scope of work to be carried out by the bidder. It is essential that bidders familiarize themselves with local site conditions, existing signalling systems, and any other relevant factors that could influence the contract's execution and associated costs. Once the bid is accepted by BHEL, no requests for changes in pricing or timelines will be considered due to local conditions or external factors. The bidder will not be entitled to make claims related to arrangements made independently. The bidder shall be responsible for arranging approach roads or access routes and must bear all associated expenses, including road taxes, payments for right of way to third parties, and costs for construction of such approach roads.

d) The bidder may carry out a study or survey of the signalling systems and practices currently implemented in Indian Railways and make an independent assessment of the work involved. It is the bidder's responsibility to provide any equipment, design, or components necessary to ensure the complete and effective functioning of the system (excluding BHEL Scope of supply). If the bidder wishes to conduct a field visit prior to submitting their offer, they may seek permission from BHEL & Zonal Railways. While permission may be granted, all expenses related to the visit shall be borne solely by the bidder.

e) The complete KAVACH system shall be commissioned in accordance with RDSO Specification No. RDSO/SPN/196/2020 Version 4.0 or the latest version, along with Technical Advisory Note SIG0TCAS(TAN)/01/2021 Version 2.0 dated 11.10.2021 or as updated.

10 TECHNICAL SPECIFICATIONS

All systems and equipment supplied (excluding BHEL scope) under this contract must conform to **RDSO Specification No. RDSO/SPN/196/2020, Version 4.0 or the latest applicable version**. The compliance

includes adherence to the following functional and technical documents, as updated or amended by RDSO from time to time. Bidder to support BHEL for below requirements of RDSO for successful impletion of Kavach Project.

Reference	Title	Version	Effective Date
FRS	Functional Requirement Specifications	4.0	11.04.2022
SRS	System Requirement Specification of KAVACH (Indian Railway ATP System)	4.0 Amdt-3	07.06.2024
Annexure-A1	KAVACH – Mode Transitions, SOS and Movement Authority Handling	4.0 Amdt-6	16.07.2024
Annexure-A2	Onboard KAVACH Configurable Parameters	4.0 Amdt-3	16.07.2024
Annexure-A3	Stationary KAVACH Configurable Parameters	4.0 Amdt-3	16.07.2024
Annexure-B	Loco Pilot Operation-cum-Indication Panel (LP-OCIP/DMI) Display Requirements	4.0 Amdt-3	11.07.2024
Annexure-C	KAVACH Multiple Access Scheme & Radio Communication Protocol	4.0 Amdt-10	27.06.2024
Annexure-D	KAVACH RFID Tag Data Format	4.0 Amdt-7	07.06.2024
Annexure-E1	UHF Radio Modem Requirements	4.0	27.06.2024
Annexure-F	RFID Fixing Arrangement Guidelines	4.0 Amdt-1	27.06.2024
Annexure-G	KAVACH Network Monitoring System Protocol	4.0 Amdt-4	16.07.2024
Annexure-H	RFID Tag TIN Layout Guidelines	4.0 Amdt-5	07.06.2024
Annexure-I	Control Table Guidelines	4.0 Amdt-6	07.06.2024
Annexure-J	Remote Interface Units	4.0 Amdt-3	03.07.2024

Reference	Title	Version	Effective Date
Annexure-P	SKAVACH to SKAVACH Interface	4.0 Amdt-4	27.06.2024
Annexure-Q	Station Master Operation and Indication Panel (SMOCIP) Requirements	4.0 Amdt-1	16.07.2024
Factory Acceptance Test Format	SIF 0515, Ver. 1.2	27.01.2025	
Field Trial Observation Format	0524, Ver. 2.0	21.12.2021	
Interoperability Test Format for KAVACH Ver. 4.0	SIF 0594, Ver. 1.1	28.01.2025	
Hardware Acceptance Test Format	As per RDSO/SPN/196/2020 Ver. 4.0	08.11.2024	
Hardware Type Test Format	As per RDSO/SPN/196/2020 Ver. 4.0	08.11.2024	
UHF Radio Modem Test Format	SIF1505, Ver. 1.0	15.01.2025	
Pre-commissioning Checklist (Onboard KAVACH)	–	28.04.2025	
Functional Test Format – KAVACH	SIF-0533, Ver. 4.21	06.05.2025	
Functional Test Format – DMI	SIF-0522, Ver. 1.4	06.05.2025	
Functional Test Format – Event Logging	SIF-00595, Ver. 1.0	06.05.2025	
SOP for Generic Product Approval	Doc. No. 1506, Ver. 1.0	06.05.2025	

Reference	Title	Version	Effective Date
Site Acceptance Test Procedure (Stationary KAVACH)	SIF-0593, Ver. 1.0	15.03.2024	

In addition, the bidder shall comply with all applicable specifications, standards, and guidelines issued by the Railway Board, RDSO, and the Centre of Excellence (CoE) at IRISET, Secunderabad, as updated from time to time. In the event of any disagreement or dispute, the decision of the Engineer-in-Charge of Zonal Railways shall be final and binding on the bidder.

11 NETWORK MONITORING/MANAGEMENT SYSTEM FOR KAVACH

1. A Centralized Network Management System shall be implemented with connectivity to all Stationary KAVACH units and a GSM interface to enable communication with Loco KAVACH units. This system will support real-time monitoring, diagnostics, and maintenance activities.
2. The Railways will provide 2 Mbps connectivity between stations via the existing Optical Fiber Cable (OFC) network. The KAVACH bidder must supply the necessary interfacing components (Excluding BHEL scope of supply), and connecting cables—from the Stationary KAVACH equipment to the OFC hut, based on the site-specific requirements.
3. The entire KAVACH network, including stations, IBS, automatic huts, interlocked level crossing gates in mid-block sections, and locomotive KAVACH systems, must be continuously monitored from the divisional control office designated for the KAVACH section. While the network backbone will be provided by the Railways, all related interfacing and cabling (power & network) are to be arranged by the bidder.
4. For mid-section locations and level crossings, the bidder shall lay a dedicated communication cable to establish NMS connectivity to the nearest OFC hut.
5. One NMS system shall be installed per designated section. Its location will be finalized by the Railway Authority during execution. Bidder to provide the installation and commissioning support.

12 GENERAL IMPLEMENTATION GUIDELINES

i. All materials used for installation—such as wires, coils, MCBs, switches, connectors, fuses, terminals, etc.—must be approved by the Railways or RDSO. Wires used in On-board KAVACH systems must be of low smoke, fire-retardant (LSFR) type, conforming to specifications acceptable to Indian Railways.

ii. The bidder shall submit original product certificates for all items offered by him under the tender, confirming compliance with applicable standards.

iii. The Railway Administration will nominate designated officials to perform two independent levels of verification on data derived from design documents and site surveys. No design detail or data shall be used at site without prior approval from BHEL & Railways. The bidder shall provide necessary support to BHEL for training and tools to Railway personnel to facilitate these verification activities, in accordance with the work schedule.

iv. A comprehensive configuration management system for all design data and documents shall be developed by the bidder based on the inputs from BHEL and must support BHEL towards approval by the Railway.

v. The bidder must support BHEL towards submission of sufficient sets of design drawings and documents for Railway approval prior to starting field activities. These include, but are not limited to:

- Fixing/mounting of On-board equipment
- Wiring and interface arrangements
- Power supply tapping and backup
- Cable trenching and laying
- Track crossings
- Installation and mounting of Stationary KAVACH equipment, relays, power supplies
- RFID tag mounting
- Associated wiring work

vi. For installations and drawings not directly related to KAVACH**,** the bidder must follow Zonal Railways standard practices, as directed by the Engineer-in-Charge of Railways and BHEL.

13 GENERAL SIGNALING AND TELECOMMUNICATION SPECIFICATIONS (WHEREVER APPLICABLE)

A. GENERAL INSTRUCTIONS

a. All installation work must adhere to the specifications detailed herein. The field supervisor or executive engineer of Railways, BHEL will make final decisions on execution based on actual site conditions, including trenching methods and soil type, and these decisions shall be binding on the bidder.

b. Work must follow approved Railway drawings and conform to relevant standards such as the Signal Engineering Manual, RE Manual, Block Manual**,** and Schedule of Dimensions**,** which form an integral part of the contract. The bidder is solely responsible for executing all work in compliance with these standards.

c. Approved drawings can be obtained from the office of Zonal Railways in coordination with BHEL.

B CABLE LAYING

i) Scope includes trenching, duct installation, laying and termination of signalling, telecom, power cables; OFC blowing, splicing, jointing; joint/loop chamber provision, FDMS fibre termination, and cable/fibre testing. All work must comply with IR Telecom Manual**,** RDSO guidelines (RDSO/SI/G/2010 Ver 1.1 or latest)**,** and Zonal Railways technical standards. Special precautions as per RDSO shall be taken in electrified (RE) areas.

ii) Requirements such as micro-tunnelling, RCC/HDPE/GI ducting, and other protection measures shall be determined via site survey and incorporated into a Cable Route Plan to be approved by the Engineer-in-Charge of Railways and BHEL. Extra cable loops (6–8 m) shall be left at strategic points (ends, apparatus cases, signal bases, huts, bridges, culverts, etc.). Restoration of original surface conditions is mandatory after laying work.

C Cable trenching should follow main and redundant paths on opposite track sides wherever feasible.

i. If laying is done on the same side, prior approval to be obtained from Zonal Railways.
ii. If laid on a single path, it will be treated as the main path.
iii. In rocky areas, GI pipes must be used and encased with 1:3:6 concrete.
iv. Minimum depth for redundant path shall be 1.0 m. If not feasible, follow SCR Drawing No. 5771/latest as per Zonal Railways instruction and maintain at least 600 mm depth.
v. Trenches must be straight and supervised by qualified engineers.
vi. Railway Board Letter No. 2021/Tele/5(2)/3-Part (1) dated 12.06.2023 must be followed.
vii. Use Drawing Nos. 15-D2 (IRSEM) for rocky terrain.

D. Crossings (track, road, platform) must follow micro-tunnelling or trenchless methods, minimum depth 1.5 m from rail level. Use 110 mm PE80 HDPE ducts (IS 4984).
Where tunnelling is not possible:

i. Use horizontal boring (SCR Drawing 5770).
ii. If not feasible, use manual crossing (SCR Drawing 5768A) with 150 mm NP2 RCC pipes, mortar-jointed (1:2 mix).
iii. Restore the surface post-laying.
iv. If none of the above apply, lay cables via FOBs inside HDPE pipes.
v. Construct cable chambers (SCR Drawing 5766) with coil loops sealed in sand and RCC slabs.

E. Cable Laying on Bridges**:**

i.On steel girder bridges: Use GI troughs or GI pipes per approved standards (e.g., IS 2629:1985).

ii. On concrete bridges with ducts: Use 110 mm HDPE pipe with end covers.

iii. Without ducts: Use GI pipes, anchored with concrete masonry and clamps every 1–2 meters.

iv. Minor bridges/culverts: Use IRSEM Drawings 15-D7 & 15-D8 with NP2 RCC pipes.

F. For entering huts (e.g., relay rooms, LC gates), lay and bunch cables over powder-coated MS ladders fixed in concrete and protected with brick masonry.

G. Cables entering location boxes/signal posts should be routed below the foundation, with sand fill and plastering inside the box.Where space is limited, install new location boxes, jumper old to new, and convert old to junction box.

H. 6Q cable jointing must follow IRS TC 77/2012 Rev 3 using proper kits.

i. Joints go in dedicated full location boxes on teak wood reapers.

ii. Use WAGO/Phoenix terminals (RDSO Spec No. 189/2004 or latest).

iii. 6Q cable pairs must be twisted before termination.

I. OFC Cable Laying:

i. Use OFC with accessories like FDMS, joint enclosures.

ii. Blow OFC through HDPE ducts (RDSO/SPN/TC/45/2013) using machines—manual pulling is not permitted.

iii. Conduct Duct Integrity Test before blowing.

iv. Terminate fibres in FDMS housed in standard 42U racks at stations/LC gates.

v. Two OFCs to be laid across the section; if one exists, lay the second in HDPE and splice near joint chambers.

vi. Install FRP loop chambers every 1 km, at crossings/bridges.

vii. Provide RFID markers (e.g., Stanley, 3M, Legrand)**,** capable of web/smartphone-based tracking**.**

J. Install cable route markers (IRSEM DRG. 15-D1) every 50 m and at joints/diversions.

i. RFID markers every 100 m and at critical locations.

ii. Submit concrete cube test reports for all batches.

K. Entire trenching and laying process must be video recorded and submitted with each stage payment certificate**.**

L. Cable distribution charts **(**station/block-wise) shall be jointly prepared with Railway and BHEL. Reserve 20% spare conductors up to outermost points**,** and 10% beyond, per S36/87.

14 LOCATION BOXES

Contractor must supply full-size GKP-type apparatus cases with 'E' type locks and keys (RDSO DRG SA 3376/M & S.3377).

- Install location boxes per cable core plan using **SCR Drawing No. 5781**.

  i. Foundations must be at rail level, stone-pitched to 40 cm around.
  ii. Foundation must be lime washed after installation.

- Painting:

  i. Surfaces must be emery-polished and primed.
  ii. Exterior: Two coats of aluminium paint
  iii. Interior: Two coats of white paint
  iv. Paint brands: Berger, Asian, British, JSW, etc**.**

- Contractor to supply and install teak wood blocks/reapers, hylam sheets (10 mm), terminals (WAGO/ARA), fuse blocks, wire coils, relays, etc.

  i. Relay frames to be installed over 10 mm hylam sheet or prepared teak wood.
  ii. Proper gland plates**,** earthing, and anti-tilt arrangements are mandatory.

- Underground cables must have punched nameplates (drum no., core count, source/destination).

i. Cable termination charts must be laser printed, laminated, and fixed inside box doors under 2 mm Perspex cover**.**

- Boxes housing relays must be fitted with powder-coated MS relay fixing frames (940 x 150 mm).

a. Cable loop pits (min. 1 m deep, 1.5 m dia) must be constructed beside each box.

i. Cables (6–8 m) to be coiled, tied, and properly layered.
ii. Topmost cable must be ≥1 m deep.

b. Stone pitching, fencing, and anti-vandalism measures shall be provided as directed.

i. Each box must have a test lamp arrangement.

c. Boxes must be painted and numbered as per Zonal Railway standards.

i. Pre-wiring at a centralized facility is encouraged.
ii. Uniform wiring/termination to be ensured across the section.

Note:

The above-mentioned general specifications are indicative in nature. The bidder shall consider all relevant factors and adhere to applicable Railway specifications to ensure the successful execution, integration, and commissioning of the KAVACH project. Compliance with the specific requirements of the respective Zonal Railways—based on site conditions and project-specific needs—shall be the bidder's responsibility.

15 REFERENCE SOURCES FOR SPECIFICATIONS AND DRAWINGS

The following documents and standards shall be referred for specifications and technical drawings:

IRS and RDSO Specifications & Drawings – Issued by Director General, RDSO, Lucknow.

TEC Standards – Published by Telecommunications Engineering Centre, New Delhi.

BSS, ISS and other Indian Standards – Available from Indian Standard Institution, New Delhi.

Railway Rules, Codes & Guidelines – From the Ministry of Railways, Government of India.

Central Government Acts and Laws – Obtainable from the Ministry of Information, New Delhi.

Installation Manuals for S&T Equipment (25KV, 50Hz).

Electrified Section Standards – Published by RDSO.

General & Subsidiary Rules – Pertaining to Indian Railways and South Western Railway.

Note: Any necessary specifications or drawings not already available can be obtained through Dy.CSTE/Projects/Zonal Railways. All work should adhere to the latest standards, guidelines, and drawings. In case of a conflict or ambiguity, the decision of the railway authorities will be final.

16 ADDITIONAL REQUIREMENTS

a) All KAVACH-related materials must be supplied only by bidder in consultation with BHEL after RDSO approval and inspection. Certification details (RDSO/ISA) must be submitted to the Railway.

b) The bidder is accountable for supporting BHEL in testing and commissioning of both locomotive and trackside KAVACH equipment. Static and dynamic testing plans along with reports must be submitted to RDSO and the Railway for approval.

d) Bidder to support BHEL for Complete system technical documentation submission to Zonal Railways/RDSO

e) All required items under bidder scope of deliverables (excluding BHEL Scope of supply), as specified in the tender, are to be supplied.

g) The bidder must factor in all installation-related costs, even for items not explicitly mentioned but essential for completing the work. All supplied materials should be of high quality.

17 PROJECT MANAGEMENT RESPONSIBILITIES

PROJECT SETUP

The bidder must support BHEL towards establishing an efficient project management system that ensures control over design, construction, verification, validation, and implementation activities for both onboard and trackside KAVACH systems, within the stipulated project timelines.

SYSTEM PERFORMANCE & MAINTENANCE

An organizational structure must be developed to ensure reliable system functioning during the warranty phases.

FAILURE RESPONSE

Rapid fault restoration is critical. The bidder shall deploy a mobile vehicle dedicated for quick site visits throughout the implementation, warranty periods.

Minimum Technical Manpower Requirements:

Designation	Qualification & Experience	No. of Persons
Site Engineer	ITI/Diploma + min. 3–5 years in signaling installation or maintenance. Age ≤ 50 (extendable to 65 in special cases).	Project Dependent

Note: Ex-Railway personnel with relevant experience are eligible even if qualifications are relaxed. Misrepresentation of qualifications or experience may lead to disqualification.

18 SCOPE OF WORK BY INDIAN RAILWAYS

The following tasks will be executed by the Railways to facilitate the implementation of the KAVACH system:

a) Railways will arrange Electric/Diesel Locomotives, EMUs, MEMUs, DEMUs, or Vande Bharat trains for the installation of onboard equipment and for conducting field trials. The bidder will be responsible for making suitable mounting arrangements as per the specific type of train provided.

b) A service rake will be provided by the Railways for conducting surveys and estimating braking characteristics through trial runs.

c) Essential technical inputs and design documents such as signalling plans, control tables, gradient data, permanent speed restrictions (PSR), caution orders, turnout speeds, OHE mast details for the KAVACH-covered section, and other necessary information will be supplied by Railways.

d) Electric power supply, subject to availability (such as 230V AC, 110V AC, or 110V DC), will be provided at installation sites for powering KAVACH equipment.

e) DC power will be made available in locomotives:

72V DC for Diesel Locos

110V DC for Electric Locos

The bidder must ensure appropriate step-down arrangements to match KAVACH system power requirements.

f) Railways will supply approved fitment diagrams for onboard KAVACH installation.

g) Testing and commissioning of installations will be supervised by the Railways after the bidder has completed all verifications and validations and offers the system for inspection. The bidder shall arrange for necessary electric tools and power for installation tasks such as drilling, soldering, etc.

h) Railways will carry out Factory Acceptance Testing (FAT) to validate the integrity of station application logic. Once the checksum is approved, no changes will be allowed without Railway consent. The bidder will support for testing.

i) SIM cards needed for KAVACH equipment and Key Management Systems (KMS) will be provided by the Railways.

j) Railways will arrange loco paths and make locomotives available for trial runs. Additionally, they will provide loaded rakes with different coach and wagon formations upon written request from the BHEL for load testing. Bidder to support the same.

k) Railways will authorize the BHEL to conduct surveys on specified rakes under supervision during regular train runs. If needed, a service rake will be arranged to assist in estimating braking characteristics. Relevant parameters will be shared by the Railways. However, BHEL may need to conduct simulations and live trials to finalize them. Bidder to support the same

19 BIDDER'S SETUP FOR DESIGN, ENGINEERING, AND APPLICATION DEVELOPMENT

The bidder is required to establish the following facilities to ensure proper implementation and support of the KAVACH system:

19.1

A facility should be set up for providing support to BHEL to modify application program data as needed, to accommodate changes in yard or section layout, speed profiles, operational frequencies, or braking characteristics.

19.2

Given that the system directly impacts train operations, uninterrupted functionality is critical. The bidder must maintain a local office within the KAVACH-covered section, equipped with fixed or mobile telephones, email, SMS, and fax services to receive service requests round-the-clock. This setup must be capable of handling both Trackside/Station-side issues and onboard equipment issues at designated loco sheds in the Zonal Railways.

At least two qualified Service Engineers must be deployed by the bidder, in addition to the necessary support staff. These personnel should be reachable via mobile phones 24x7 throughout the contract duration. Additionally, a 24x7 helpline, operational through a fixed or mobile contact number, must be provided. This helpline service shall commence immediately upon the issuance of the Final Acceptance Certificate and shall continue during the warranty period.

19.3

The bidder shall provide details of all Supervisors and Service Engineers, either currently employed or proposed to be engaged, including their names, educational qualifications, experience, and biodata relevant to the KAVACH system. If these individuals are not currently employed with the bidder, irrevocable letters of commitment from them must be submitted along with the tender documents.

19.4

Deployment of Qualified Engineers:

The bidder must submit the CVs of all Engineers and staff intended to be deployed for the project execution along with the bid. These same personnel must remain assigned to the project throughout its duration. Any proposed change in staff must be pre-approved by BHEL. The details of all proposed Engineers and staff should be presented in the following format:

S.No.	Name	Designation	Educational Qualification	Technical Qualification	Languages Known	Speak	Read	Write	Experience	Remarks

20 COMPLETION PERIOD

Timely execution is the essence of the project. The complete project must be executed and finalized within 18 months from the Zero date. The zero date shall be informed by BHEL. Project schedule may be extended by six months over 18 months, depending upon site exigencies. The bidder is required to deploy sufficient number of skilled engineers and qualified personnel to carry out surveying, designing, installation, testing, and commissioning of all systems and equipment at the designated sites.

21 CONSIGNEE

The delivery responsibilities for the KAVACH system materials shall be as follows:

21.1

All materials and accessories related to Loco KAVACH equipment (excluding BHEL Scope of supply) must be delivered to the authorized representative at the stores of the designated consignee located at the respective loco sheds of Zonal Railways.

21.2

All materials and accessories related to Stationary KAVACH equipment and associated signalling components (excluding BHEL Scope of supply) shall be delivered to the authorized representative at the designated KAVACH Stores of Zonal Railways.

21.3

Once the bidder has delivered the materials, they will be issued to the bidder against an Indemnity Bond. The bidder is responsible for ensuring proper storage of materials at secure locations that protect them from theft, fire, or water damage. Before moving any materials to the worksite, prior authorization from BHEL & the Railway is required. Additionally, the bidder must submit a monthly report detailing the delivery and issuance of materials to the site, including dates, quantities, and a consolidated summary of all transactions.

21.4

If any changes or additions to the consignee list are required, they shall be finalized mutually between the Railway, BHEL and the bidder.

22 TRAINING

The bidder shall provide support to BHEL for the following training programs:

22.1

Training for Railway officials (officers and supervisors) at the BHEL's manufacturing premises, covering manufacturing and design aspects of both hardware and software. This includes demonstrations of interoperability, operation, maintenance, data configuration, and system usage as per a mutually agreed training schedule. Zonal Railways will nominate officers from S&T, Mechanical, and Electrical departments.

22.2

Training for Railway personnel at a suitable location within Zonal Railway, a centralized training institute, or zonal training school. This includes support to BHEL for hardware and software training related to the installation and maintenance of Stationary KAVACH systems and test benches.

22.3

Training for running staff (loco pilots, inspectors, etc.) in the functioning and operational scenarios of on-board KAVACH. The bidder shall depute a representative to accompany BHEL team & loco pilots during initial trials to assist in handling the system.

22.4

Training for loco shed staff/officers/supervisors on installation, configuration, and maintenance of Loco KAVACH systems, including test bench usage.

22.5

The bidder shall coordinate between BHEL & Zonal Railways regarding the duration, location, and coordination required for training.

22.6

The bidder must prepare E-training modules using modern aids (audio/video) for all aspects of the KAVACH system: installation, maintenance, troubleshooting, testing, and commissioning based on the input provided by BHEL. These modules must include:

PowerPoint presentations

Video tutorials explaining:

System functionality

Troubleshooting

OEM software for updating station application logic and RFID tags
These materials must be delivered electronically on a 2TB external hard disk as part of the technical documentation.

22.7

Separate E-learning modules (with audio/video) must be prepared by bidder based on inputs from BHEL for:

Stationary KAVACH:

System architecture

Sub-systems (SMOCIP, RIU, towers, OFC, modems)

Power requirements

Maintenance parameters and intervals

RFID programming and layout

Any other information specified by the Railway Engineer

Loco KAVACH:

System architecture

Sub-systems (LPOCIP, Brake Interface Unit, OFC, modems)

On/Off procedures, isolation during faults

Power requirements

Maintenance at loco sheds

Procedures in various loco operational scenarios

Any other information specified by the Railway Engineer

22.8
Throughout all phases of installation, testing, and commissioning, the bidder support BHEL towards facilitating training for Railway personnel assigned to the project.

22.9
The bidder shall provide training materials in both hard and soft copies to all participating trainees based on BHEL inputs.

23 ROYALTIES AND PATENT RIGHTS

i. The bidder is prohibited from using patented designs or processes without prior written consent of the owner. If such use is specified by the purchaser, any royalty liabilities rest solely with the bidder, who must inform the purchaser of any proprietary rights

ii. The bidder must cover all royalty and license fees related to patents. In the event of unauthorized use (intentional or not), the bidder shall indemnify BHEL & the Railways against all claims, legal action, and compensation costs.

iii. If the bidder holds patents or licenses, signing of the contract authorizes the purchaser to repair the equipment using third-party services and source components from any supplier. The bidder shall be liable for any resulting patent infringements

iv. Since this is a KAVACH vendor development project, based on RDSO specifications, and involves field trials, the intellectual property (IP) for the developed technology shall be jointly owned by RDSO, BHEL and the bidder**.** A separate agreement covering these IP rights shall be signed between BHEL & bidder.

24 FOREIGN EXCHANGE AND IMPORT LICENSE

All payments under the contract will be made by BHEL in Indian Rupees only.

25 BIDDER'S OFFICE AND STORAGE FACILITY

i. Within one month of receiving the Letter of Acceptance (LOA), the bidder must establish an office and storage facility at a suitable location—approved by the BHEL & Railways Engineer-in-charge—for material storage and project execution.

ii. The bidder must provide the office address, telephone, fax, email, and key personnel contact details. Communication sent to this address will be considered duly received. Important documents shall be dispatched via Registered Post.

25.1Address Change Notification

The bidder must promptly inform BHEL & Railways in writing of any change in address. BHEL & Railways shall not be liable for any loss or inconvenience due to failure in this regard.

26 TRIAL INSTALLATION FOR ZONAL RAILWAY

26.1 Minimum Installation for Field Trials

The Railway will determine the trial section. At minimum, it shall include:

Trackside: One complete absolute block section and one station yard with full KAVACH installation including towers, LC gates (if applicable), and RFID tags.

Onboard: One fully equipped locomotive (both cabs for electric or both directional cabs for diesel locomotives).

26.2Field Trial Process

a) The bidder must support BHEL for submitting the following for both onboard and trackside systems:

Stationary KAVACH layout and interface wiring diagrams.

Technical documents including RFID layout, control table, tag data, frequency plan, timeslot allocation, TIN/Tag set numbers, station ID allocation, and any additional details requested by Railways.

Loco interface wiring diagram, auto-whistling circuit, brake interface, equipment layout, and configuration details.

b) Submitted documents will be reviewed by Railways for trial approval.

c) Routine functional and software validation tests under guidance/inputs of BHEL must be conducted on all field trial equipment.

d) Integrated system simulation and functionality tests will be jointly performed. Locomotives and coaches will be provided by Railways. DC values as per RDSO may be used.

e) Commissioning will proceed post successful trial completion. Documentation must be approved to allow further implementation in remaining sections.

f) Diagnostic data from onboard and trackside units must be stored and made available to Railways upon request.

g) A 30-day minimum trial period is required, after which data will be analysed for system performance and availability.

26.3Trial Output Requirements

Outputs from the trial phase shall form the baseline for wider system rollout and bidder must support BHEL for:

Approved onboard designs: Deceleration constants, trip parameters, DMI signal info, odometry, DMI/OBC/power placement, diagnostics.

Approved trackside designs: power, cable, baud rate, RFID/tag mounting, diagnostics.

Simulation templates for KAVACH subsystems.

Functional acceptance test cases for trial runs.

27 FUNCTIONAL AND SITE ACCEPTANCE TESTING

i. The bidder must support BHEL towards submission of RDSO-approved certificates for all software and hardware versions (both onboard and stationary KAVACH).

ii. Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) will be conducted per RDSO/SPN/196/2020 Version 4.0 (or latest). Internally, the bidder must support BHEL for performing square sheet testing before Railway engineers conduct FAT at OEM premises.

iii. Railway-nominated inspectors will verify the application software per RDSO guidelines. Commissioning will follow FAT certificate issuance. Bidder to support BHEL for the same.

iv. The bidder must support BHEL for providing detailed test procedures for each equipment/system. Railway may modify these and conduct additional tests. The finalized plan will include equipment, instruments, and methodology.

v. Bidder must arrange required testing facilities/equipment's at site.

vi. All tools, labour, and materials for tests must be arranged by the bidder. In case of non-compliance, the cost of alternate arrangements will be borne by the bidder

vii. Delivery of test materials to alternate locations shall also be at the bidder's cost.

viii. Upon successful FAT, SAT will be conducted by Railway to check features like SPAD prevention, override, etc., as per RDSO specs. Bidder to provide support towards the same.

28 SYSTEM PERFORMANCE GUARANTEE

i. The bidder shall give an unconditional guarantee that the installed and commissioned system based on the site engineered input provided by bidder will meet all objectives. If it fails to do so, additional support must be provided by the bidder without extra cost.

ii. The guarantee certificate/declaration in the prescribed format must be submitted with the offer.

iii. **Performance Requirements:**

Providing support to BHEL for preparation in Complete system reliability data for all Kavach System and sub systems.

iv. Bidder to support BHEL in Failure Analysis and Log Monitoring which will be carried out by BHEL team for:
a) Loco movement logs captured in the Network Monitoring System (NMS).
b) Software configurations & tweaking.
c) Daily logs analysed for faults like spurious braking, RFID misses, unintended operating modes.
d) Onboard data downloading via standard interface..
e) All NMS related events like monitoring of card health, modem status, power supply, and generation daily reliability reports.

29 WORK EXECUTION PROGRAM

i. Time is a critical factor, and the entire work must be completed within the tender-specified duration.

ii. The bidder must deploy sufficient managers, technicians, and equipment to ensure timely and satisfactory completion.

iii. A detailed execution plan must be prepared prior to LOA and submitted within 15 days of LOA. It must include a PERT or GANTT chart and is subject to approval by the BHEL & Railways Engineer-in-Charge.

iv. Railway may revise the approved schedule at any point. Any slippage must be justified by the bidder and may lead to penalties if unjustified.

v.The bidder is fully accountable for executing the work per the approved plan, drawings, and specifications. Non-compliance will attract contractual penalties.

vi. Execution must not disrupt train movement. No compensation will be provided for delays or precautions arising from train operations.

Vii No logistical support like roads or temporary crossings will be provided. Existing roads within Railway limits may be used.

Viii Bidder to support BHEL for preparation of detailed commissioning plan and further submission to Zonal railways, broken down into subsections (trackside) and per loco model (onboard). After installation, field trials will include below and bidder to support BHEL for:

30 passenger trips (15 up/down runs in Absolute Block Section).

2500 RIU hours and 5000 km operation in Automatic Block Section.

Prior to trials, the bidder must support BHEL for submitting the following for RDSO clearance:

RFID layout and control table approved by Zonal Railways & RDSO.

Tag data and wiring diagrams approved by Zonal Railways.

Finalized software versions and checksums.

Verified braking parameters from COE/SC.

V&V approved functional test documents.

Results of 10 Light Engine trips demonstrating key features with “no issues” in:

Bidder's territory

Other vendors' Kavach territory

Upon successful testing and checklist completion, the section shall be declared commissioned.

30 INSPECTION OF MATERIAL (WHEREVER APPLICABLE)

30.1
All equipment, components, and materials listed under RDSO-approved categories must be procured only from firms approved by RDSO and must comply with IRS/RDSO/TEC specifications. These items are to be inspected by RDSO. For items categorized under RDSO-recommended sources, procurement must be from RDSO approved/recommended firms and must also follow the relevant specifications, with RDSO inspection. For items lacking RDSO/TEC specifications, or where no RDSO-approved sources exist, or where RDSO does not conduct inspections by policy, the inspection will be done by RITES or another Railway-authorized representative, as designated by CSTE/Projects/Zonal Railways.

30.2
RDSO shall inspect all safety-critical components including wire coils, terminals, fuses, power supplies, and indoor signalling cables.

30.3
All KAVACH system materials must undergo inspection either by RDSO or by RITES / authorized Railway representatives, following RDSO's guidance.

30.4
All equipment provided by the bidder—such as Station KAVACH, LC/IB/ABS KAVACH units, Loco KAVACH equipment, Brake Interface Units, power supplies, lab models, etc (excluding BHEL scope of supply). —must carry RDSO approval.

30.5
RDSO will continue inspecting the following critical signalling items, as per Railway Board letters dated 04-03-1991 and 18-06-1991:

Signalling relays

Block instruments

Axle counters

Signal and point machines

Signal transformers and lamps

Voltage stabilizers

Signal reversers

Signal roundels and lenses

Lever locks and circuit controllers

Electric key transmitters

Fuses, PBT-type fuse/terminal blocks

Electric point and lock detectors

For other signalling items not listed, RDSO will conduct inspection only if the order value exceeds ₹5 lakhs, as per Railway Board letter dated 06-09-2017. Items below this threshold may be inspected by RITES or the consignee, provided the supplier is RDSO-approved. However, some specific items—regardless of their value—must still be inspected by RDSO as per prevailing Railway policy.

30.6 If a change in inspection authority from RDSO/RITES to the Consignee is needed, approval must be obtained from CSTE/Projects/Zonal Railway. In such cases, inspection charges equivalent to the original arrangement will be deducted by Railways and same will be passed on to bidder.

30.7
If materials are inspected by Railway's authorized representatives or the consignee, the bidder must provide manufacturer's and supplier's Guarantee Certificates for those items.

30.8
The bidder must give adequate intimation to BHEL to notify RDSO, RITES, or the Railway's representative when materials are ready for inspection or testing. All necessary facilities must be arranged to conduct these inspections.

30.9 The bidder must bear all costs related to inspections carried out by RDSO, RITES, or the Consignee as per prevailing rules. Any testing or analysis by third-party agencies (e.g., for towers) must also be borne by the bidder. Materials from firms banned by Indian Railways & BHEL must not be used under any circumstances.

30.10
Even if materials pass inspection by RDSO or Railway authorities, the consignee reserves the right to reject them upon delivery if found to be damaged or defective.

30.11
All materials and workmanship must be of high quality and expected to deliver long-lasting, trouble-free performance.

31 STORES – RECEIPT AND ACCOUNTAL (WHEREVER APPLICABLE)

i. A proper receipt and requisition process shall be maintained between the bidder, BHEL and the Railway's authorized representative.

ii. The bidder must issue a receipt when drawing materials and obtain one when returning items in coordination with BHEL. All such transactions will be with the railway's consignee.

iii.All drawn materials must be accounted for—either installed or returned to the railway's consignee.

32 LOADING / UNLOADING AND TRANSPORTATION (WHEREVER APPLICABLE)

i. The bidder must deliver materials to the consignee depot and transport them to site at their own expense, including loading/unloading.

ii. Direct site delivery may be allowed with prior approval and proper accounting. Empty drums and surplus items must be returned to the nominated depot. An Indemnity Bond must be submitted.

iii. The bond is released after work commissioning and return of surplus materials. The bidder is responsible for material security until commissioning.

iv. Transit insurance costs are to be borne by the bidder.

33. MATERIAL SECURITY (WHEREVER APPLICABLE)

Once materials are handed over, the bidder is fully responsible for their safety, even if stored on Railway premises. The bidder must safeguard them against theft or damage. Loss or damage will be recovered from the bidder, and defective material must be returned to the consignee without extra charge.

34. RETURN OF SURPLUS STORES (WHEREVER APPLICABLE)

The bidder must return all surplus materials at their own cost. A register must be maintained for all materials issued, used, or returned.

35 RETURN OF RELEASED STORES (WHEREVER APPLICABLE)

Released items must be returned in an organized manner with proper handling during removal and transport.

36. PACKING AND FORWARDING (WHEREVER APPLICABLE)

i. Packing must comply with RDSO/SPN/196/2020, Version 4.0 or latest.

ii All items must be securely packed for transit, at the bidder's cost, to prevent damage.

iii All packaging is non-returnable and deemed included in the bid cost.

iv Each package must be clearly marked with content, quantity, bidder name, station name, consignee, and Railway details.

v Improper or unmarked packages may be rejected by the inspecting officer and must be removed within 7 days by the bidder.

37 FREIGHT AND INSURANCE (WHEREVER APPLICABLE)

All costs related to transportation and insurance to the worksite shall be borne by the bidder.

38. CONSIGNEE'S RIGHT OF REJECTION (WHEREVER APPLICABLE)

i.Even after prior inspection, the consignee may reject any consignment not meeting specifications or damaged in transit.

ii. The Railway may reject any material deemed inferior, even if cleared by RDSO/RITES. Such items must be promptly replaced at the bidder's cost.

iii. Rejected materials must be removed within 7 days. If not, the Railway may dispose of them at the bidder's risk and recover applicable charges.

39. EXECUTION OF WORKS

39.1. SPECIFICATIONS AND DRAWINGS

Work must follow contractual specifications, designs, and Railway/OEM-approved standards.

The bidder is fully responsible for incorporating safety requirements into all drawings.

Reference documents include the latest:

- Signal Engineering Manual
- Telecom Manual
- Engineering Code
- Permanent Way Manual
- Works Manual
- AC Traction Manual

39.2SUPERVISION AND LABOUR

a. The bidder must deploy adequate and qualified personnel at the work site. All activities must follow current Railway practices.
b. The bidder or their representative must remain at the work site throughout the work duration. An authorized representative, approved by the Railway, must always be available at the site and have the necessary authority to receive and implement instructions from Railway officials. The Railway may inspect the work periodically. The bidder shall carry out all installation and erection activities using their own workforce until the work is completed and tested.
c. The bidder's site supervisor must follow instructions from the Engineer-in-Charge. The bidder is responsible for ensuring compliance.
d. If the site supervisor disregards instructions or fails to execute the work satisfactorily, the Railway

may stop the work or demand the supervisor's replacement, and the bidder must comply.
e. The bidder is responsible for arranging accommodation for their staff during installation, testing, and commissioning. If drinking water is available at the site, the Railway may provide it, but this is not guaranteed.

39.3 COMPLIANCE WITH LABOUR LAWS

i. The bidder shall not employ workers below 18 years of age.
ii. The bidder must comply with the Contract Labour (Regulation & Abolition) Act, 1970, and the associated Central Rules of 1975, including obtaining a valid labour license from the appropriate authority. A copy of the license must be provided to the Railway.
iii. All labour laws must be followed strictly. Any violations or denial of labour rights will result in serious action against the bidder. Contract work can only proceed with a valid labour license.
iv. The bidder must comply with the Payment of Wages Act and Minimum Wages Act, as outlined in Clauses 54 and 55 of the Indian Railways General Conditions of Contract. Labour details and wage payments must be registered on the Shramik Kalyan portal (www.shramikkalyan.indianrailways.gov.in).

The process includes:

a. One-time registration of the bidder on the portal after receiving the Letter of Acceptance (LoA).
b. Once approved, the bidder can log in using their PAN number and manage all future LoAs.
c. LoA and contract details must be uploaded to the portal within 15 days for engineer approval.
d. Labour details and monthly wage payments must be regularly updated.
e. It is mandatory for the bidder to ensure accurate and timely updates of all labour-related information.

39.4 SAFETY OF WORK, TRAINS, AND PERSONNEL

a. The bidder must follow all Railway safety rules and ensure that their staff also comply.
b. No flammable materials may be stored at or near the site without prior Railway approval and necessary licenses.
c. Bidder's staff must not operate Railway equipment related to train safety. Any issues must be reported to Railway personnel. The bidder is responsible for damages caused by negligence.
d. Work must not obstruct train operations unless approved by the Railway. Any work near or on the track must be supervised by authorized Railway personnel. Protective measures like barricading or fencing must be implemented as required.
e. The bidder is responsible for the safety of all their vehicles and staff. Any damage to Railway property or personnel due to their work will be their liability.
f. Adequate safety measures must be taken for workers on Railway premises.
g. Appropriate ladders, ropes, and slings must be used for elevated work. Extra caution is required when working near power lines.
h. If the Railway finds safety arrangements inadequate, the bidder must rectify the issue immediately. The Railway is not obligated to provide such instructions, and the bidder retains full responsibility for site safety.
i. The bidder must supply and maintain personal protective equipment (PPE) for all workers. Lead-based paints are prohibited unless in paste or ready-mixed form. Respiratory protection must be provided when spraying paint.

j. In passenger areas, especially platforms, free space must be maintained, and all excavations covered for safety.
k. The bidder is liable for any accidents and must indemnify the Railway for losses.
l. No compensation will be provided to the bidder for losses due to accidents, idle labour, or damaged materials.
m. Signal aspects and point settings during testing must only be changed under authorized supervision. No interference with traffic is allowed without Railway approval.
n. The bidder is accountable for any damages resulting from their workers' negligence.

39.5 EMERGENCY WORKS

In case of emergencies or failures requiring immediate action, the Railway may deploy its own resources if the bidder cannot act swiftly. Costs incurred will be recovered from the bidder.

39.6 NIGHT WORK

If necessary to meet deadlines, the Engineer may instruct the bidder to work at night. No extra payment will be made for night work. The bidder must provide adequate lighting and ensure safety during such operations.

39.7 MAINS POWER SUPPLY

Testing will be done using Railway-supplied power. For installation activities requiring long durations of power use, the Railway may provide 230V supply if available, at a standard charge. If not available, the bidder must arrange alternative power at their own cost.

39.8 COMPLIANCE WITH ENGINEER'S INSTRUCTIONS

The bidder must ensure timely implementation of all instructions from the BHEL & Railways Engineer. Parts needing inspection before use must be kept separate and not used until approved. Rejected or altered parts must be re-inspected before use.

40 INSPECTION OF WORKS

i. The Railway's Engineer can inspect the work at any stage. If any work or material is found defective or substandard, it must be rectified by the bidder at no extra cost.

ii. The bidder must provide all tools and assistance for inspections at no additional cost. Requests for inspection must be made in writing a day in advance.

iii. Completed installations will undergo checks. The bidder must address any defects found. The system will be finally accepted after joint inspection.

iv. Costs for rectifying substandard or rejected work will be borne by the bidder.

v. Samples for testing may be collected during execution at the bidder's cost.

vi. Cable trench inspection (depth, brickwork, filling) must be jointly conducted and recorded before laying cables.

vii. A Site Order Book shall be maintained, where BHEL & Railway instructions are recorded. The bidder is responsible for noting and acting on these.

viii. Daily progress and material release records must be jointly signed and produced during inspections.

ix. The bidder must arrange for an installation quality audit by the OEM or its authorized representative, who must certify adherence to OEM standards.

41. PROGRESS REPORTING

3.27.1. The bidder must submit periodic progress reports, including manpower, equipment, and work status. Format and frequency will be mutually agreed upon post-award.
3.27.2. Monthly progress meetings will be held between the Railway, BHEL and the bidder. Issues and corrective actions must be documented and signed by both parties.

42 MODIFICATIONS

3.28.1. The bidder must correct any errors, omissions, or discrepancies in the supplied drawings at their own expense, even if such drawings were approved earlier.
3.28.2. Modifications due to changes in project scope (like new lines, LC gate interlocking, etc.) must be implemented by the bidder throughout the warranty period.

43 PROVISIONAL ACCEPTANCE CERTIFICATE (PAC)

A On-board Equipment

a. The bidder shall install On-board KAVACH equipment in Railway loco sheds during the locomotive's scheduled maintenance. The bidder must adhere to installation time. The expected installation duration is 5–7 days per loco.
b. ***Testing & Commissioning:***
i. Joint testing will be carried out as per the final acceptance schedule approved by the Railway. Defective parts must be repaired or replaced free of charge by the bidder. All testing tools will be provided by the bidder.
ii. After successful testing and completion of the pre-commissioning checklist, the KAVACH system will be commissioned. A PAC will be issued after a one-month observation period per locomotive.

B Trackside Equipment & Accessories

a. Upon completing each sub-section, the bidder must certify completion, testing (V&V by OEM/BHEL), and provide support to BHEL to submit test results to the Railway.
b. The bidder shall provide necessary staff to support final inspection and commissioning.
c. Joint testing will be conducted based on a mutually approved schedule. Defective components must be replaced or repaired free of cost. (Supply will be under BHEL scope)
d. If initial inspection fails, the bidder has one month to correct issues. If defects persist, the Railway/BHEL may complete the work at the bidder's cost.

44 PLACING IN SERVICE AND MAINTENANCE SUPERVISION

Once the equipment is installed, tested, and the Provisional Acceptance Certificate (PAC) is issued by the Railway Engineer, the bidder must provide maintenance supervision for at least six months.

For On-board equipment, maintenance must be carried out at designated loco sheds.

For trackside equipment, maintenance must be done at Stationary KAVACH and RFID tag locations.

The bidder shall submit a maintenance plan and provide services of a qualified Maintenance Engineer, stationed as approved by the Railway, to guide and supervise Railway staff.

The bidder's engineer must regularly visit loco sheds and signal supervisors at base stations to ensure preventive maintenance and quickly address any system faults.

During the supervision period, if any issues arise due to design, manufacturing, or workmanship defects, the bidder must correct them at no extra cost to the Railway.

45 FINAL ACCEPTANCE CERTIFICATE

A. The Final Acceptance Certificate (FAC) will be issued by the Railway Engineer only after:

i. The system has been operational for at least 6 months post-PAC, Smooth and stable performance is ensured during this period, and A joint verification and successful commissioning is confirmed by the site supervisor, BHEL and Engineer-in-Charge.
ii. This includes submission and Railway approval of the Application Safety Case, verified by an RDSO-approved Independent Safety Assessor (ISA).
iii. FAC marks the official completion of the work.

B. After the FAC is issued, no claims by the bidder will be entertained unless submitted in writing prior to FAC issuance. Even after the FAC is issued, both the Railway/BHEL and the bidder remain responsible for any contractual obligations that remain unfulfilled or pending.

C During the warranty period, if any problem arises due to design, equipment, components, or workmanship, the bidder support BHEL to fix it.

46 CLEARANCE OF SITE

a. The bidder shall, at their own expense, clean the site, set out all work, and provide necessary manpower and materials to enable inspection by the Railway. Any errors found must be corrected at the bidder's cost.
b. Upon completion of work in any section, the bidder must remove all debris and obstructions as directed by the Railway.

c. Special attention must be given to avoid loose earth or ballast accumulation on platforms, drains, tracks, or nearby paths.

d. If the site is not cleaned within 15 days of completion, the Railway will do so at the bidder's cost. Written notice will be given before taking such action.

47.0 MAINTENANCE OF WORKS

Throughout the execution and until the end of the maintenance period (as defined in the tender), the bidder is responsible for ensuring the works remain in good, safe, and functional condition.

Any damage or defect not caused by Railway documents, natural events, or civil unrest must be repaired by the bidder at their own cost.

The bidder is also liable to compensate the Railway or any third party for losses or damages due to their negligence.

The bidder shall conduct preventive maintenance as per the maintenance schedule outlined in the KAVACH maintenance manual on behalf of BHEL, which must be approved by RDSO or the Railway.

48 PAYMENT SCHEDULE

S. No.	Activity	Payment Schedule
1	Carrying out Survey using by LiDAR & Drone for RFID Tag TIN layout, Survey of Track side & loco side for Kavach Installation & completion of same followed by successful approval of Indian Railways	10%
2	Completion of design RFID TAG TIN Layout, TOC, Track profile, NMS database preparation and approval of the same by Indian Railways	20%
3	Completion of Internal testing of Kavach systems (Stationary, Onboard, RIU, RFID Tags, BIU, Test Benches, NMS, Kavach Interfacing Repeater rely wiring, test/lab setup) & Installation of the system at the field	20%
4	Demonstration of multivendor interoperability & acceptance by Indian Railways.	10%
5	Successful field trials completion	20%

6	Compliance of equipment to specification excluding ISA certification and submission of all required documents in soft & hardcopy, e-learning modules + training to railways officials, liaison support to BHEL for RDSO approvals	10%
7	Generic ISA certification and acceptance by RDSO	5%
8	Specific ISA certification and acceptance by Zonal railways	5%

49 PRE-QUALIFICATION CRITERIA:

SL	BHEL Qualification requirement	Documents to be submitted for evaluation
a	Bidder should have sufficient expertise & experience of successfully executing site/field engineering works, testing & commissioning of Kavach/TCAS or RRI/PI/EI or Centralized train control system/Train Management System or Automatic Train protection system or Automatic block Signalling or Intermediate Block Signaling. And Bidder must have sufficient expertise & experience of successfully completing Site System Integrator/Field Engineering works for KAVACH for Indian Railways/Kavach approved OEM's in past 5 years.	Bidder to submit following documents as proof: 1. LIDAR/Track Survey completion reports certified by Indian Railways. 2. Documents such as empanelment letter from RDSO or Railways/Work completion certificates against the PO executed for Indian railways or Kavach OEM/PO for work under execution from Indian Railways or Kavach OEM If bidder on its own is not qualifying for this requirement then it may quote in consortium with a partner who can qualify for this requirement. If consortium bidding is resorted then lead bidder must submit agreement/MOU copies between lead bidder & its partner which is valid till end of contract period. .
b	The bidder should have an office in Bengaluru for carrying the support & design works for Kavach	Relevant supporting documents such as valid Rental agreement copies/other valid documents/license issued by Govt agencies to be furnished.
c	Lead bidders who wish to participate should have executed Indian Railways works as per S.No (a) above, during last five years as per below, as on the date of opening of Technical Bid. 1. **One** work of value not less than **Rs 221.47** Lakhs of estimated value incl of GST **(OR)** 2. **Two** works of value not less than **Rs 138.42** lakhs each of estimated value incl of GST **(OR)** 3. **Three** works of value not less than **Rs 110.74** lakhs each of estimated value incl of GST	Lead bidder to submit following documents as proof of completion/execution of work: 1.P.O/W.O from Zonal railways/RDSO/Kavach OEM/other PSU 2. Work Completion certificates/Invoice from Zonal railways/RDSO/Kavach OEM/other PSU. Note: 1. Valid work experience certificates issued by a Government department/organization shall be accepted. 2. Certificates issued by a public listed company will also be acceptable if the company has an average annual turnover of ₹500 crore or more during the last three financial years (excluding the current one), is listed on NSE/BSE, and has been registered for at least 5 years before the date of submission of proposal. The certificate must be issued by an authorized official of the company. If a certificate from a public listed company is

		submitted, the Contractor must also provide a copy of the work order, bill of quantities, bill-wise payment details (certified by a Chartered Accountant), TDS certificates for payments received, and a copy of the final/last bill to support the certificate
d	The proposed subcontractor should not be banned by Indian Railways. Quotation from bidders banned by Indian railways will not be considered for evaluation.	Declaration from bidder regarding that they are not banned by Indian railways is required. BHEL will cross verify the same with Indian Railways for their acceptance/approval

50 Technical guidelines for detailed Scope of Works (SOW)

Note: The below are indicative guidelines and are not exhaustive limited to bidder must consider the additional requirements if any or based of Indian railways input for successful implementation of the Kavach in Reach 8 of SWR Bengaluru Division

50.1 Survey Using UAV/Drone and LiDAR

All Surveys need to be carried out by bidder except RSSI survey for successful integration of system.

Conducting a survey using WPC-approved UAV/drone and LiDAR for the absolute identification of railway assets for precise placement of RFID tags. The survey has to be carried out to ensure accurate documentation and georeferencing of bridges, culverts, ROBs, RUBs, level crossings (LCs), signal locations, points, OHE masts, kilometer stones, intermediate block (IB) locations, and other vital railway infrastructure.

50.1.1 Scope of Survey:

Capture high-resolution, georeferenced aerial imagery and terrain data along the railway corridor using drone-mounted LiDAR and photogrammetry equipment with WPC approval.

Identify and mark the absolute geographic coordinates of all relevant railway asset locations:

- Bridges (major and minor)
- Culverts
- Road Over Bridges (ROB), Road Under Bridges (RUB)
- Level Crossings (LCs)
- Signal posts/locations
- Points and switches
- Overhead Equipment (OHE) masts
- Kilometer stones and intermediate block (IB) locations.

Generate digital ortho-rectified imagery, digital elevation models (DEM), and 3D models for precise mapping and documentation.

Establish permanent benchmarks using DGPS/Total Station, ensuring all location data is aligned to project coordinate systems and referenced for future works.

Extract and classify features from LiDAR point cloud and UAV imagery for asset tagging, using railway drawing templates and GIS/CAD platforms.

Utilize the survey deliverables for the planned and accurate placement of RFID tags, ensuring traceability and reliability for systems like KAVACH.

50.1.2 Deliverables

Asset-wise listing and geo-coordinates (latitude/longitude) for each infrastructure item covered.

2D and 3D digital mapping in required CAD/GIS formats, fit for RFID tag deployment planning.

Survey reports, ortho-imagery, point cloud datasets, and feature extraction files verifying all target locations.

50.2 Kavach Relay Wiring Diagram Designs

KAVACH relay wiring diagram designs conform to established Indian Railways signaling practices—using double-cut relay interfaces and redundant fail-safe logic. The relay wiring integrates KAVACH with conventional relay interlocking, electronic interlocking (EI), and field signaling equipment. Key design elements and typical connections are summarized below.

50.2.1. Key Elements in KAVACH Relay Wiring

Signal lamp proving relays (e.g., RECR, HECR), point indication relays (NWKR, RWKR), track circuit relays (TPR), and block instrument relays—all provide wired interface points to KAVACH.

KAVACH receives inputs from these relays via double cutting (series redundant wiring) to ensure that only true relay statuses are interpreted—minimizing risk of false positives from wiring or contact faults.

The relay contacts are typically non-AC immune, plug-in type (e.g., QN1, QNA1), 24V coil voltage, with multiple front (N/O) and back (N/C) contacts for reliable signal transfer.

Repeater relays are used where direct contacts are unavailable; KAVACH input is fetched from their front contacts in parallel with interlocking.

For remote locations (e.g., cabin, LC gate, IB section), the Remote Interface Unit (RIU) multiplexes relay contacts and exchanges data with KAVACH via optical fiber or quad cables.

50.2.2 Typical Relay Wiring Architecture

Each monitored signaling object (signal aspect, point position, block status) has a designated relay contact wired to a specific KAVACH input card terminal.

The schematic diagram for double cut wiring uses two series contacts for disconnecting both signal wires when inactive.

All wiring terminates at a relay rack next to the KAVACH unit; additional relay racks are installed if existing space is insufficient.

Diagrams must be updated and kept in the relay room as part of the S&T (Signaling & Telecom) station documentation.

50.2.3. Schematic Diagram References

Each field device—signal, point, track—is mapped to specific input cards in the KAVACH hardware, with terminals labelled per the S&T circuit standard.

Block diagram shows interlocking relays, double-cut contacts, repeater relays, and the KAVACH interface rack.

KAVACH output relays (where provided) drive auxiliary circuits for status indication and safety interlocks.

All critical circuits are powered from the station 24V internal supply for reliability.

For exact station wiring, Zonal Railways issue project-specific S&T circuit diagrams which must be referred to during implementation. The wiring must strictly conform to Indian Railways' interlocking and safety standards.

KAVACH relay wiring diagrams are designed to enable safe, double-cut interfacing of the KAVACH (TCAS) system with relay-based and electronic interlocking equipment. This ensures all critical field information—such as

signal aspects, point positions, track circuit conditions, and block instrument status—is securely and redundantly wired into the Stationary KAVACH Unit for processing and train protection functions.

50.2.4 Key Design Features

All vital inputs (signal lamp proving relays like RECR, HECR, DECR, point indication relays NWKR & RWKR, track circuit TPRs, and block instrument relays) connect to KAVACH via double cutting (series contacts) to mitigate false signals and ensure failsafe operation.

Relay contacts used are generally non-AC immune, plug-in types (QN1, QNA1, 24V, 12F/4B), fully compliant with Indian Railway Standards (BRS 930/931A, IRS S34, IRS S23, IRS S60), providing front (N/O) and back (N/C) points for input.

Where spare contacts are unavailable on existing relays, repeater relays are added, and wiring is brought in parallel for redundancy and maintainability.

All relay inputs terminate at dedicated field input cards or interface racks inside the station relay/KAVACH room.

50.2.5 Schematic Wiring Architecture

Two wires from each relevant relay contact (front series, double cutting) go to the assigned input terminals on the KAVACH field interface or relay rack.

Remote Interface Units (RIU) fetch relay inputs from remote cabins/Gates/Sections and multiplex data over optical fiber or quad cables back to the Stationary KAVACH.

The wiring schematic shows all relay contacts, identification labels, and terminal numbers, matching with field equipment and ensuring traceability.

The finalized relay wiring and configuration details are documented and maintained with Station S&T circuit diagrams for legal and operational compliance.

This circuit approach is vital for the safe, modular upgrade and maintenance of the KAVACH installation and must follow Indian Railways' project-specific S&T circuit diagrams at all stages

50.3 RFID TIN/TAG Layout Diagram Designs

RFID TIN/TAG layout diagram design for KAVACH follows strict Indian Railways and RDSO guidelines, ensuring safe, reliable, and redundant absolute location referencing for Automatic Train Protection. Tag layouts are prepared for each station, yard, and block section, closely aligned with the Signal Interlocking Plan (SIP) and well-defined numbering protocols.

50.3.1 Key RFID Tag Types and Placement

Normal Tags: Installed at intervals in station and block sections, used for regular location referencing.

Signal Foot Tags: Placed at the base of signals and at End-of-Authority locations, serve as fixed reference markers.

Signal Approach Tags: Installed 150–250 m before every signal foot for odometry correction.

TIN Discrimination/Turnout Tags: Mark the start or end of a Track Identification Number (TIN) section, especially at turnouts or yard entries.

Gate Tags: Provided at level crossings.

Border Tags: At station boundaries for train handover/handover.

Exit Tags: At the end of kavach territory.

Adjustment/Junction Tags: Used in non-signaling sections or to reset accumulated distance discrepancies.

50.3.2 Station and Section Layout Principles

Each tag location is determined by referencing the SIP; site surveys and on-ground realities are factored before finalizing placement.

Every tag is duplicated for redundancy, with main and duplicate tags set 3–5 meters apart. Minimum distance between tag sets is 10 meters (except special cases).

Tags should not be placed in switch portions of turnouts, areas prone to waterlogging, or places with frequent ballast accumulation.

Each tag has a unique ID; even TIN numbers are used in UP direction, odd for DN direction. Block section TINs are reused only after a minimum of 50 km.

Adjustments are incorporated for multiple lines, junctions, sand humps, and virtual blocks for future extensibility.

50.3.3 Typical Layout Diagram Elements

A top view schematic, showing:

All signals, points, crossings, track circuits, loops, dead ends, and borders.

Color-coded main and duplicate RFID tags, numbered according to TIN and tag ID protocols.

Notations for each tag type (N – Normal, S – Signal Foot, T – TIN/Turnout, G – Gate, X – Exit, L – Adjacent Line tag).

Direction arrows, station centre lines, transitions between station and block sections.

Tags at defined distances from key objects—e.g., approach tags 150–250 meters before a signal foot, tags after advance starters, and tags at both ends of block sections.

50.3.4 Data Format and Numbering

TIN values range (1–127; up to 255 per software version). Each station and block has unique allocations, recorded centrally for uniqueness.

Station ID is a 5-digit number—first two digits for Zonal Railway, last three for station.

Layout diagrams may not be to scale but are always referenced to the SIP and the controlling station plan.

50.3.5 Design Compliance and Documentation

All layouts are cross-verified with field conditions and SIP before finalization.

RFID Tag-TIN layout diagrams are submitted as PDF/DWG, included in the project “control table” documents for approval and future reference.

No tag ID is repeated within 25 km, and border tags are used at block section handover points for seamless coverage.

This systematic approach is essential for correct functioning of KAVACH and is strictly audited during installation and field validation by Indian Railways.

50.4 RFID Tag Data Designs (TAG-DATA)

KAVACH RFID Tag Data (TAG-DATA) design follows a standardized binary encoding as specified by RDSO, ensuring that each tag can provide the KAVACH onboard unit with unambiguous, absolute location and track context information. The tag data structure is field-based, with each field carrying critical bits for tag type, unique ID, absolute location, TIN information, section type, and more.

50.4.1 Key RFID TAG-DATA Fields and Encoding

Field	Bit Position	Length (bits)	Description
Type of Tag	X3–X0	4	Tag identity (Normal, Signal Foot, LC, etc.)
Version	X5–X4	2	TCAS Spec version used (e.g., 3.2 or 4.0)
Unique ID	X15–X6	10	Tag-set unique identifier (1–1023)
Absolute Location	X38–X16	23	Location in meters (from SIP/reference); can be 0–83,88,607
TIN (Nominal)	X46–X39	8	Track Identification Number for direction of increasing location
TIN (Reverse)	X54–X47	8	TIN for direction of decreasing location (reverse runs)

Field	Bit Position	Length (bits)	Description
Station ID (Nominal)	Y6-Y0 &X63-X55	16	Station ID corresponding to Tag placement, Note: 0 to be programmed if Tag is not mapped to any station
Station ID (Reverse)	Y22-Y7	16	Same encoding as above
Section Type (Nominal)	Y24-Y23	2	00: Station, 01: Absolute block, 10: Automatic section, 11: Virtual
Section Type (Reverse)	Y26-Y25	2	Same encoding as above
Tag Placement	Y30-Y27	4	Placement details (G-tag, N-tag, etc.), used e.g. for gate approach identification
Tag Duplication	Y31	1	0- Main Tag 1- Duplicate Tag
Communication in Nominal	Y32	1	0- Required 1-Not required
Communication in Reverse	Y33	1	0- Required 1-Not required

Field	Bit Position	Length (bits)	Description
CRC-30	Y63-Y34	30	CRC checksum for data integrity

Junction tags, adjustment tags, exit tags, and other specialized tags follow extended formats accommodating additional location points or direction corrections.

All numeric fields are encoded in binary; reserved values are used for undefined or future expansion.

CRC-30 polynomial (x^30 + x^29 + x^21 + x^20 + ...) ensures error detection for the transmitted data block.

50.4.2 Application and Functionality

When an onboard KAVACH RFID reader passes over a tag, the reader receives the encoded TAG-DATA and decodes the fields for: current location, correct TIN, direction, and section type; the tag can also trigger specific KAVACH actions depending on its type (e.g., trip on red signal foot tag crossing without authority).

Tag data is programmed during installation as per the finalized RFID Tag-TIN layout for the station or section.

Data is interoperable between different vendors and fully compliant with SRS RDSO/SPN/196/2020 Ver 4.0 and later.

Example: Normal Tag (Ver 4.0) Field Map

Type: 0001 (Normal)

Version: 01 (Spec 4.0)

Unique ID: 231 (binary 00011100111)

Absolute Location: 250000 (binary 0011 1101 0010 0000 0000)

TIN(Nom): 22 (binary 0001 0110)

TIN(Rev): 23 (binary 0001 0111)

Section Type (Nom, Rev): 00/01 (Station/Block)

CRC: Calculated per full bitstream

Refer to the full system requirement specification (SRS) and its Annexure-D for in-field programming and verification details. This structure guarantees robust interlocking, safe train separation, and precise odometry correction within the KAVACH ATP system. KAVACH RFID TAG-DATA design uses a standardized field-based binary structure as per RDSO/SPN/196/2020 Ver 4.0 and its amendments, ensuring location, track, and operational context are securely and unambiguously encoded in each tag for the KAVACH ATP system.

50.4.3 Coding and Interpretation

Numeric fields use binary encoding with designated ranges and reserved values for expansion.

CRC-30 checksum is strictly applied for integrity; failure triggers KAVACH warnings/failsafe.

Each RFID tag is uniquely programmed at deployment per RDSO-approved tag data forms, aligned with the railway's SIP, layout, and TIN tables.

Table formats are maintained centrally for reference and field audit.

50.4.4 Application in KAVACH

The onboard unit decodes all TAG-DATA fields as the train passes the tag, using the data for odometry reset, location determination, authority checks, TIN confirmation, and section type logic.

Compliance with these field structures ensures interoperable, safe ATP operation across equipment vendors and zonal boundaries.

For field mapping or detailed field values, always refer to the approved Annexure-D of the RDSO KAVACH SRS and associated project documentation.

50.5 RFID Database Preparation

RFID Database Preparation for the KAVACH system involves the systematic creation, validation, and management of all RFID tag-related data corresponding to track locations and infrastructure. This database essentially forms the "control table" from which the KAVACH onboard and stationary units retrieve key train position information to ensure safe train movement.

50.5.1 Key Steps in RFID Database Preparation

Collect Survey and Layout Data: Use site survey data, approved RFID Tag-TIN layout diagrams, and Signal Interlocking Plans (SIP) to finalize absolute tag locations and numbering.

Create RFID Tag Data Records: For each RFID tag, encode the binary tag data (TAG-DATA) as per RDSO/SRS standards including tag type, unique ID, absolute location, TIN, and section type.

Populate Control Table: The database or control table stores tag records indexed by location and TIN, organized station-wise and section-wise. It supports queries by the onboard KAVACH unit during train runs for accurate position tracking.

Validate Data Integrity: Perform CRC checks and cross-verify database entries against physical tag installation details and track location coordinates to ensure correctness.

Software Tools Usage: Specialized KAVACH RFID Programming Tools are used for data entry, simulation, and generating programming files for RFID tags. These tools help maintain consistency and error-free data.

Integration with Signaling Data: The RFID database is integrated with signaling and interlocking system databases to streamline movement authorizations and safety logic on the KAVACH system.

Periodic Updates and Audits: The database is regularly updated to reflect field changes (repairs, infrastructure modifications) and is audited periodically to maintain synchronization with track reality.

50.5.2 Typical Database Features

Tag ID and Type

Geographical Location (chainage/meter mark)

Track Identification Number (TIN)

Section Types and Boundaries

Installation Date and Status Flags

Linkage to relay and signaling interface data for movement authority calculations

Compatibility with train onboard units and stationary control systems.

50.5.3 Role in KAVACH Operation

The onboard KAVACH system references this database dynamically to verify train position from RFID reads.

Movement authorities, brake enforcement, and safety logic depend critically on accurate and up-to-date RFID tag data.

Stationary KAVACH units also use this data to manage trackside information and communicate safely with moving trains.

50.6 Kavach Table of Control Designs (TOC)

The Kavach Table of Control (TOC) is a critical design document that maps the signaling layout, RFID tag locations, TINs (Track Identification Numbers), and movement authority logics for the Stationary KAVACH unit. It enables the system to calculate movement authority and monitor train progress safely. TOC preparation follows detailed guidelines issued by RDSO and is aligned with the Signal Interlocking Plan (SIP) and RFID Tag-TIN Layouts.

50.6.1 Purpose and Role

The TOC provides a comprehensive database of signal IDs, entry-exit signal combinations, TINs, block sections, and associated movement authorities.

It is used by the Stationary KAVACH unit to verify route locking status, signal aspects, point positions, and track circuit statuses before communicating movement authorities to the train.

The TOC ensures safe train operations by allowing KAVACH to calculate distances, speeds, and braking curves referenced to absolute location and interlocking logic.

TOC Content and Design Elements

Entry-exit Signal combinations along with Route IDs and route distances for various signaling sections within a station territory.

Signal aspect sequences and permitted speeds for each section.

Representation of normal and diverted routes, including diverging points and crossovers.

Block section details including boundaries defined by RFID tags, TINs, and control points.

Directional information for trains, including gradient profiles and reversal zones.

Integration of Level Crossing (LC) control data and alarms where applicable.

Shunting limits and yard boundaries may be referenced but shunt signals themselves are excluded from the TOC.

50.6.2 Design Guidelines

TOC entries are consistent with the SIP and are cross-checked for accuracy with the RFID Tag-TIN layouts prepared during site surveys.

Movement authorities are expressed in terms of absolute distances and signal aspects, rather than just section counts.

Special cases such as diverging routes with different movement authority lengths are carefully articulated.

TOC format must be clear enough to be used in Factory Acceptance Tests (FAT) and field commissioning, facilitating simulation and verification of KAVACH functions.

Preparation and Documentation

TOC is compiled by project design engineers in conjunction with signaling and S&T departments.

Each sheet includes references to relevant documents such as SIP numbers, RFID Tag/TIN layout codes, and control authority approvals.

TOC is maintained as part of the stationary KAVACH application data, updated periodically with infrastructure or signaling changes.

TOC forms are submitted in standardized templates as per RDSO guidelines and approved by the competent authority.

50.6.3 Use in KAVACH System

Upon train movement, the Stationary KAVACH unit consults the TOC to determine permitted routes, allowed speeds, and communicate movement authority to the onboard KAVACH.

The TOC enables real-time monitoring and automated intervention to prevent Signal Passing at Danger (SPAD) and collisions.

The KAVACH system's safety integrity depends heavily on the accuracy and currency of the TOC data.

Overall, the KAVACH Table of Control is a foundational control database design, mapping the signaling infrastructure, RFID tag positions, and safe train movement parameters, enabling the Railway Automatic Train Protection system to function reliably and safely across station and block sections

50.7 Kavach Track Profile Table Designs

The Kavach Track Profile Table (TPT) is an essential design document that contains detailed track alignment and gradient information for train movement authority calculations within the KAVACH Automatic Train Protection (ATP) system. It provides the vertical and horizontal profile data alongside speed restrictions and track characteristics to enable safe and precise train control.

50.7.1 Purpose and Role

The TPT enables the KAVACH onboard and stationary units to compute braking curves and enforce safe speeds based on track gradient, curvature, and speed restrictions.

It ensures that train speed limits, permanent speed restrictions (PSR), and sectional gradients are accurately reflected in the movement authority decisions.

TPT works in conjunction with the Table of Control (TOC) and RFID tag data to provide a full picture of track geometry for safe operations.

50.7.2 Content of Track Profile Table

Track Chainage: Absolute distance in meters from a defined zero point for the section/station.

Gradient Data: Gradient values at chainages including up and down slopes with signed percentage or ratio (e.g., 1 in 100).

Curve Information: Radius of curve and degree of curve at different points to inform speed restrictions.

Speed Restrictions: Permanent speed restriction (PSR) data for curves, turnouts, loops, and other areas requiring speed control.

Turnout Speeds: Designated permissible speeds for single and multiple turnouts on the route.

Location of Tags: Corresponding RFID tag chainages linked for synchronization between location and track profile.

Shunting Limits and Special Zones: Information about limits on shunting movements and zones of special operational consideration.

Directionality: Profiles may indicate direction-specific data for UP and DN directions and for complex junctions or reversals.

50.7.3 Design Guidelines

TPT entries must comply with Indian Railway Signal Engineering standards and project-specific requirements.

Gradients and speed restrictions are sourced from official Signal Interlocking Plans and verified during field surveys.

Data is organized by station and section, with references to the Source Interlocking Plan (SIP) and RFID Tag/TIN layout numbers.

Track profiles are continuously updated to reflect infrastructure changes and maintenance work.

50.7.4 Format and Documentation

The table is usually provided in tabular PDF or CAD formats as part of the project design documentation.

It accompanies TOC and RFID layout documents to form the control backbone for KAVACH system commissioning.

Each entry includes metadata such as station code, division, section name, and document versions for traceability and quality review.

Validation checks are performed at design and factory acceptance test stages to ensure data accuracy and compliance.

50.7.5 Use in KAVACH Operations

Train onboard KAVACH units refer to TPT data along with RFID tag reads to dynamically compute allowed maximum speeds.

The TPT contributes to automated intervention like speed reduction or braking in unsafe situations based on track geometry.

It complements signaling data to ensure simultaneous compliance with both route authority and track safety limits.

50.8 Station Kavach Configuration Files Generation

Station Kavach Configuration Files generation is a crucial process within the KAVACH Automatic Train Protection system, enabling the Stationary KAVACH unit to function with up-to-date signaling, track profile, and safety data. These configuration files consolidate various inputs—like the Table of Control, Track Profile Table, RFID tag locations, signaling aspects, and route data—into a machine-readable format to control real-time train movement authority determination.

50.8.1 Key Aspects of Configuration File Generation

Data Sources: Configuration files are generated using approved design documents such as Signal Interlocking Plans (SIP), RFID Tag-TIN layouts, Table of Control (TOC), Track Profile Tables (TPT), and other project-specific data.

Tools: Specialized KAVACH configuration tools and software applications convert human-readable design data into structured binary or XML/JSON configuration files. These tools simulate interlocking logic and route locking to verify correctness before deployment.

Content: The configuration files include details on:

Signal IDs and aspects monitored by the station KAVACH

Movement Authority parameters for entry-exit routes

Track gradient and speed restrictions from TPT

Locations and encodings of RFID tags

Point and track circuit status mappings

Safety parameters, timers, and communication configurations.

Validation: Generated files undergo rigorous factory acceptance tests (FAT) and field trials to ensure reliability and correct logic implementation.

Deployment: The configuration files are uploaded onto Stationary KAVACH hardware via secure interfaces using software tools that support version control and rollback, ensuring configuration integrity.

50.8.2 Workflow Summary

Preparation of Signaling, RFID, and Track Profile design inputs.

Input to the KAVACH configuration software.

Automated generation of binary/configuration files representing station topology and safety rules.

Offline simulation and verification against approved layouts.

Upload configuration to Stationary KAVACH units.

Continuous update and version control management based on infrastructure changes or enhancements.

50.8.3 Importance

Facilitates real-time dynamic calculation of Movement Authorities and train status monitoring.

Ensures synchronization between physical trackside equipment and KAVACH logic.

Supports secure, fault-tolerant, and compliant operation of the safety-critical KAVACH system.

50.9 NMS Data Preparation

Network Monitoring System (NMS) Data Preparation for the KAVACH Automatic Train Protection system involves organizing and processing the operational, diagnostic, and event data generated by both Stationary and Onboard KAVACH units to facilitate real-time monitoring, fault detection, and reporting across the railway network.

50.9.1 Key Components of NMS Data Preparation

Data Collection: Real-time collection of health status, event logs, signaling relay monitoring, RFID tag reads, GPS data, and radio communication status from Stationary and Loco KAVACH units via Ethernet, OFC (Optical Fiber Cable), and GSM-R links.

Data Formatting: Standardization of data into consistent formats for system-wide interoperability. This includes timestamping, coding of error or event types, location-tag associations, and structured messaging conforming to RDSO/KAVACH protocols.

Database Population: Feeding prepared data into centralized NMS databases that maintain logs, exception reports, speed and track profile histories, and system health trends. This facilitates querying by train ID, station, event type, and time periods.

Alert Configuration: Defining criteria for SMS/email alerts, exception reports, and operator prompts based on fault conditions such as missed RFID tags, relay interface errors, communication failures, or spurious brake applications.

User Interface Integration: Preparing data for visualization dashboards and control room software that enable railway operators and maintenance staff to monitor subsystem health and respond promptly.

Data Validation and Auditing: Continuous cross-checking of logged information against physical trackside conditions and telemetry to maintain accuracy and improve system availability.

50.9.2 Process Summary

Collect raw data streams from various KAVACH subsystems (stationary, locomotive, relay interfaces).

Convert raw data to structured formats suitable for central database ingestion.

Organize data chronologically and by subsystem for efficient retrieval and analysis.

Implement data integrity measures including error-checking and redundancy.

Configure alert parameters and escalation mechanisms for maintenance and safety teams.

Provide data access to authorized personnel via secure NMS portals and applications.

50.9.3 Importance in KAVACH System

Enables proactive fault detection and maintenance scheduling, minimizing operational disruptions.

Supports operational staff with real-time decision-making tools to ensure train safety.

Provides a comprehensive record for post-incident investigations and performance analysis.

Contributes to achieving reliability, availability, maintainability, and safety (RAMS) targets for Indian Railways' KAVACH deployment.

Preparing NMS data for KAVACH requires thorough collection, formatting, and organization of multi-source system data to build a robust monitoring and diagnostic infrastructure essential for safe and efficient railway operations. Network Monitoring System (NMS) Data Preparation for the KAVACH Automatic Train Protection system involves organizing and processing the operational, diagnostic, and event data generated by both Stationary and Onboard KAVACH units to facilitate real-time monitoring, fault detection, and reporting across the railway network.

50.10 Internal Factory Acceptance Test (IFAT)

Internal Factory Acceptance Test (IFAT) for the KAVACH system is a comprehensive quality and functional verification process conducted within the manufacturing facility before equipment shipment to ensure compliance with Indian Railways' specifications and safety standards. It is an integral part of validating the Stationary and Onboard KAVACH application logic, hardware interfaces, and overall system behavior under controlled conditions.

50.10.1 Purpose of IFAT

Confirm that all components of the KAVACH system meet technical specifications and functional requirements.

Verify that signaling interlocking logic, RFID tag interfaces, relay contacts, communication protocols, and safety logic operate correctly.

Detect and resolve defects early to prevent issues post-installation in the field.

Serve as a formal milestone for technical acceptance by Indian Railways before Site Acceptance Testing (SAT).

50.10.2 IFAT Scope and Activities

Test Setup: Includes Onboard KAVACH simulators, Stationary KAVACH units, RFID simulators, Relay Interface Simulators, RTS generators, Field Simulator Panels (FSP), and operator interface consoles to mimic real-world railway signaling scenarios.

Functional Verification: Tests cover correct processing of signal aspects, entry-exit route locking, block section monitoring, RFID tag read processing, and relay outputs.

Communication Checks: Validate optical fiber, quad-cable, and Ethernet communication links for correctness and robustness.

Safety Logic Testing: Confirm fail-safe operation on faults, correct application of movement authority, and alarm triggering.

Performance Testing: Assess timing characteristics, response delays, and throughput to ensure operational readiness under simulated traffic loads.

Documentation Review: Check that all drawings, software versions, configuration files, and test reports conform to contract requirements.

50.10.3 IFAT Deliverables

Formal Test Reports documenting all test case executions, results, and deviations.

Factory Acceptance Test (FAT) Certificate issued by authorized quality and project officials.

Updated and approved configuration data and software build information.

Evidence of traceability to RDSO specifications and Indian Railway standards.

50.10.4 Process Flow

Preparation: Define IFAT scope, test plan, and environmental setup.

Execution: Perform tests systematically as per approved procedure document.

Logging: Record test results and anomalies in real-time.

Analysis: Review logs and perform root cause analysis for failures.

Certification: Issue acceptance report after successful completion.

Handover: Release hardware and software for installation and SAT.

50.10.5 Importance

IFAT reduces project risks by identifying integration issues early within a controlled factory environment.

It ensures compliance with Safety Integrity Level (SIL-4) certification requirements.

Supports Indian Railways' goals of safe, reliable, and timely KAVACH system deployment across the network.

50.11 RFID TAG Installation

Execution works for RFID Tag installation in KAVACH system on Indian Railways consist of several key activities focused on precise placement, securing, and verification of RFID tags along the track to enable accurate train location detection and safe operations.

50.11.1 Key RFID Tag Installation Execution Steps:

Site Survey and Layout Confirmation: Conduct detailed site survey and finalize tag locations based on the approved RFID Tag-TIN Layout, considering factors like signal locations, points, block sections, gates, and other critical assets.

Preparation of Track Sections: Clear the track section around tag installation points, ensuring sleeper condition and track stability to properly fit the tags between rails, typically on sleepers.

Tag Mounting: Affix RFID tags onto the sleepers between the rails at exact chainages with appropriate fixtures and fasteners ensuring secure fit, protection from vibration, weather, and ballast movement.

Duplicate tags are installed 3 to 5 meters apart for redundancy except for Turnout/TIN discrimination tags which are installed at the same location.

Tags are generally avoided in switch portion zones and areas susceptible to waterlogging to prevent damage and false readings.

Electrical Testing and Verification: Conduct initial testing for tag readability and integrity using RFID reader devices. Ensure tags return expected data and proper identification codes without interference.

Coordination with Track Personnel: Work closely with track maintenance and signaling staff to ensure installation does not disrupt normal operations, and tagging sequences comply with operational safety.

Documentation and Reporting: Maintain detailed installation records including tag serial numbers, exact GPS chainage, photographs, and testing results, which form part of as-built documentation.

Commissioning Tests: After physical installation, tests under real train traffic or simulator environment validate tag functionality and integration with the KAVACH system for accurate train location tracking and authority computation.

Maintenance and Troubleshooting: Establish regular inspection and diagnostic routines for tag cleanliness, damage, and functionality as part of the system lifecycle to sustain reliability.

50.11.2 Additional Considerations:

Tags must withstand harsh environmental conditions (temperature variation, vibration, humidity, ballast impact).

Installation requires approval from concerned railway authorities based on site-specific constraints.

Use of specialized tools and jigs for repeatable installation accuracy is recommended.

50.12 Kavach Relay Rack installation and Wiring

Kavach Relay Rack Installation and Wiring is a critical task conducted in the station KAVACH room (usually the relay room) to interface the Stationary KAVACH system with the existing signaling infrastructure. The relay rack collects vital signaling relay inputs, point indications, track circuit statuses, and block signaling information necessary for KAVACH's train protection logic.

50.12.1 Relay Rack Installation

The relay rack is typically installed in close proximity to the Stationary KAVACH hardware in a dedicated KAVACH room or relay room.

The rack houses multiple plug-in relay modules (commonly QN1, QNA1 types) designed to pick up the front contacts of interlocking relays (signal lamps, points, track circuits, block instruments).

Space planning is essential to accommodate existing relay racks and any additional relay interfaces required for KAVACH inputs.

If existing relay racks lack space, new relay racks are installed to accommodate the necessary repeaters and input modules for KAVACH.

The relay rack is grounded and housed in an environment-controlled room to prevent electrical noise interference and ensure reliability.

50.12.2 Wiring Details

Inputs to the relay rack come from the signaling interlocking system via repeater relays, ensuring double cutting (redundant series contacts) to guarantee failsafe relay input detection.

Relay coil connections correspond to contacts in the signaling interlocking system, pulling status indications such as signal aspect (RECR, HECR), point positions (NWKR, RWKR), track circuit status (TPR), and block instrument line clear/close conditions.

Wiring uses industrial-grade, shielded multicore cables with adequate labeling and segregation to avoid crosstalk and ensure maintainability.

Wiring diagrams for the relay rack form a part of the station S&T circuit drawings and must be updated with any signaling alterations for operational integrity.

Remote Interface Units (RIU) may feed relay inputs from remote locations (LC gates, intermediate block cabin, automatic signaling sections) to the relay rack via optical fiber or quad cable, providing data multiplexing and fault tolerance.

50.12.2 Testing and Commissioning

After installation and wiring completion, rigorous testing is conducted to verify correct relay contact sensing, double cutting operation, and signal integrity.

Manual and automated test jigs simulate signaling inputs to the relay rack to validate KAVACH input processing.

Test results and as-built wiring documents form part of the official station S&T files for audit and future maintenance.

Summary

Aspect	Details
Location	Relay room, near Stationary KAVACH
Relay Types	Plug-in, non-AC immune relays (e.g., QN1, QNA1), conforming to IRS and BRS standards
Inputs	Signal aspect relays (RECR, HECR), point relays (NWKR, RWKR), track circuit relays (TPR)
Wiring	Shielded multicore cables, double cutting for redundancy, organized and labeled
Remote Inputs	Via RIUs over optical fiber or quad cable
Documentation	Part of station S&T circuit diagrams, updated with each signaling field change
Testing	Functionality, integrity, and redundancy verification using test jigs and simulation tools

This installation and wiring approach ensures safe, reliable interfacing of KAVACH with conventional relay and electronic interlocking systems, supporting Indian Railways' SIL-4 safety integrity requirements

50.12.3 Key Testing Protocols for Relay Rack Wiring:

Visual Inspection: Check proper labeling, wire termination, neatness, and secure fastening of cables at relay terminals and cable trays.

Continuity Testing: Use a megger or continuity tester to verify no open circuits or shorts between wires connected to relay contacts and KAVACH input terminals.

Insulation Resistance Test: Measure insulation resistance between wires and earth to ensure no leakage or faults.

Double Cutting Verification: Check that relay contacts are wired in series (double cutting), so the circuit is physically broken on both poles when de-energized; verify correct wiring of both contacts.

Functional Simulation: Use relay simulators or test jigs to energize/de-energize each relay coil, confirming that the corresponding contacts on the relay rack operate correctly and signals reach the KAVACH input module.

Signal Integrity Testing: Validate no attenuation or signal degradation across wires, ensuring clear signals without noise.

Loop and Cross-talk Testing: Check for unwanted signal paths or interference between conductors by measuring isolation.

End-to-End Testing: From relay rack input terminals back to the signaling interlocking relay contacts to confirm wiring correctness.

Redundancy and Fault Tolerance: Introduce intentional faults or disconnect one contact in double cutting circuits; ensure the KAVACH system detects and alarms the fault condition.

Documentation Review: Validate wiring diagrams and test results against project specifications and approved drawings.

Integration Testing: After wiring tests, run integrated tests with the Stationary KAVACH unit to verify relay inputs are correctly processed during mock signaling scenarios.

50.13 Station Kavach Installation

Station KAVACH Installation Testing and Commissioning involves a structured sequence of activities to validate the functionality, safety, and integration of the Stationary KAVACH system within the railway signaling environment before being operationalized.

Installation of the Stationary KAVACH system involves a series of coordinated steps to ensure proper setup, integration, and functioning within the railway signaling environment. Below are the general installation steps typically followed:

50.13.1 Installation Steps of Stationary KAVACH System

Site Preparation

Inspect and prepare the relay/KAVACH room for equipment installation.

Confirm availability of stable power supply (usually 24V DC), grounding, ventilation, and environmental controls.

Verify cable tray routes and conduit availability for interconnecting cables.

Mounting of Equipment

Install Stationary KAVACH main control units, relay racks, Remote Interface Units (RIUs), RFID readers, and associated equipment racks securely in designated locations.

Ensure proper mechanical fixation, ease of access, and adherence to layout drawings.

Cabling and Wiring

Route and terminate cables for power, signaling inputs (relay contacts, interlocking outputs), communication links (fiber optic, twisted pair, Ethernet).

Connect RFID readers to the main unit per approved wiring schemes.

Ensure double cutting of relay contacts in wiring according to safety standards.

Label all cables and wiring ends for easy identification and future maintenance.

Relay Rack Wiring

Mount and wire relay racks interfacing signaling relays with KAVACH inputs.

Verify double cutting series connections, check for correct relay contact assignments.

Connect Remote Interface Units (if any) via optic fiber or quad cables.

Power-Up and Initial Checks

Apply power to the system and verify power supply voltages, indicator LEDs, and absence of faults.

Perform continuity and insulation resistance tests on wiring.

Software and Configuration Loading

Upload station-specific configuration files including Table of Control (TOC), Track Profile Table (TPT), and RFID data.

Verify correct loading and system startup.

Functional Testing

Conduct comprehensive tests simulating signal changes, RFID tag reads, movement authority calculations.

Validate correct relay input processing and output commands.

Test communication channels with other KAVACH units.

Integration with Signaling System

Interface with relay interlocking or electronic interlocking to verify synchronized operations.

Test alarms, fault detection, and fail-safe features.

Final Commissioning and Documentation

Complete factory acceptance testing (FAT) and site acceptance testing (SAT).

Document installation, testing results, and handover to operating personnel.

Provide training on system operation and maintenance.

Following these steps ensures a reliable, compliant, and safety-assured installation of the Stationary KAVACH system according to Indian Railways standards.

50.13.2 Key Testing and Commissioning Activities

Pre-Installation Checks: Verification of site readiness including power supply, equipment racks, cable trays, relay racks, and environmental conditions complying with KAVACH standards.

Hardware Installation Verification: Physical inspection of Stationary KAVACH units, relay racks, cabling, and RFID reader units ensuring secure and correct installation as per design documents.

Wiring Continuity and Integrity Tests: Conduct mechanical and electrical continuity tests on all wiring to detect open circuits, shorts, insulation faults, and verify double cutting in relay contacts.

Functional Testing (Factory Acceptance Test at Site): Running detailed test cases simulating signaling relay inputs, RFID tag detections, and route locking scenarios to verify the correct response of Stationary KAVACH logic.

Communication Checks: Testing optical fiber, quad-cable, and Ethernet communication links between Stationary KAVACH, Remote Interface Units, and control centers for data integrity and latency.

Integration with Signaling Interlocking: Validation of signal aspect, point position, block circuit feedback and ensuring seamless interface between Stationary KAVACH and existing interlocking logic.

System Calibration: Calibration of RFID tag readers, signal interface relays, and timing parameters to match site-specific operational characteristics.

Performance Testing Under Simulated Traffic: Use of simulators or controlled train movements to validate system response, movement authority calculations, and braking intervention logic.

Safety and Fail-Safe Validation: Testing fault detection mechanisms, alarm generation, and fail-safe braking commands under abnormal conditions.

Documentation and Reporting: Compilation of installation records, test results, deviation reports, and operator manuals for formal acceptance.

Training and Handover: Providing operational training to station staff and final handover after successful Site Acceptance Testing (SAT).

Summary

Stage	**Activities**
Pre-installation	Site readiness checks

Stage	Activities
Installation	Equipment mounting, cabling, relay rack setup
Wiring Testing	Mechanical and electrical continuity
Functional Testing	Simulated signaling and RFID tests
Communication Testing	Data link integrity and latency verification
Integration	Signaling system interface validation
Calibration	RFID and relay calibration
Performance Testing	Simulated train movement and safety checks
Safety Validation	Fault and fail-safe mechanism verification
Documentation	Reports and manuals preparation
Training & Handover	Staff training and system handover

These processes ensure that Stationary KAVACH installations meet Indian Railway safety, performance, and reliability standards before being commissioned for regular operational use

50.14 LC/IB/Auto Hut/RIU Installation

Installation and commissioning of LC (Level Crossing), IB (Intermediate Block Cabin), Auto Hut (Automatic Signaling Hut), and RIU (Remote Interface Unit) in the KAVACH system follow specific procedures to ensure integration with the Stationary KAVACH unit and overall railway signaling safety.

50.14.1 Installation Steps

Site Preparation: Survey and prepare locations ensuring space, power, and environmental controls (ventilation, dust protection). Confirm cable routes for communication and signaling connections.

Mounting Units: Fix LC/IB/Auto Hut cabinets and associated RIUs securely on foundations or poles, ensuring protection from weather and unauthorized access.

Cabling and Wiring: Terminate signaling relay contacts, power cables, and communication lines (fiber optic, quad cables) to/from the RIU and hut equipment per approved drawings. Maintain labeling and segregation.

Relay and Interface Installation: Install relay racks or electronic interlocking modules within huts. Connect to local signaling equipment for block control, crossing gates, or automatic signals.

Power Supply Check: Verify stable and conditioned power supply for all installed units.

50.14.2 Commissioning Steps

Preliminary Tests: Conduct wiring continuity, insulation resistance, and mechanical fixation tests to ensure installation integrity.

Functional Testing: Simulate signaling relay inputs (e.g., signal aspects, block occupancy) and RFID tag detections via RIU to verify correct data transmission to Stationary KAVACH.

Communication Tests: Validate fiber optic and quad cable data links between RIUs and Stationary KAVACH for latency, packet loss, and redundancy.

Safety and Fail-Safe Checks: Test fault detection, alarms, and fail-safe operations for signal failures, communication loss, or equipment malfunction.

Integration Testing: Perform end-to-end integration with Stationary KAVACH system, confirming proper recognition of signals, block sections, level crossings, and RFIDs.

Documentation and Handover: Compile test records, as-built wiring diagrams, and configuration files. Train operational and maintenance staff and formally hand over the installation.

Summary

Activity	**Description**
Site preparation	Surveys, space, power, environmental setup
Physical installation	Mounting cabinets and relay racks
Wiring and cabling	Power, signaling relays, communication cables
Testing	Wiring checks, functional relay & RFID simulation
Communication	Fiber/quad cable link validation
Integration	System-level verification with Stationary KAVACH
Documentation	Records, training, and formal handover

These steps ensure that remote units like LC, IB, Auto Hut, and RIU operate reliably as part of the KAVACH safety network, maintaining train separation and signalling integrity on Indian Railways

50.15 Station Kavach - Customer Factory Acceptance Test (S- CFAT)

The Station KAVACH Customer Factory Acceptance Test (S-CFAT) is a critical validation phase conducted at the manufacturer's facility before the Stationary KAVACH unit is dispatched for field installation. This test involves

both the manufacturer and customer (Indian Railways representatives) to jointly verify that the system complies with functional, safety, and technical specifications as per project requirements.

50.15.1 Purpose of S-CFAT

To demonstrate end-to-end functioning of the Stationary KAVACH system under controlled, factory-simulated conditions.

To validate signal processing, RFID reading, relay interfacing, movement authority computation, and communication links.

To identify and resolve any defects or deviations early to avoid field issues.

To provide documented evidence and formal acceptance by Indian Railways for shipment and site installation.

50.15.2 Key Scope and Activities

Setup: Complete Stationary KAVACH unit configured with production software and customer-specific configuration files (TOC, TPT, RFID data).

Functional Tests: Simulation of signaling scenarios including signal aspect changes, route setting, block section occupancy, and relay contact changes to verify system response.

RFID Tag Simulation: Emulating RFID tag scans using test panels or simulators to test train location detection and movement authority calculations.

Communication Checks: Testing communication reliability between KAVACH hardware components and remote units (RIUs) over optical fiber or Ethernet.

Safety and Fault Simulation: Injecting faults to verify fail-safe mechanisms, alarm generation, and system resilience.

Performance Monitoring: Measuring system response times, accuracy, and adherence to safety integrity levels (SIL-4).

Documentation Review: Verification that all relevant manuals, configuration files, test results, and certifications are complete and compliant.

50.15.3 Deliverables

Comprehensive S-CFAT Test Report with signed acceptance from customer representatives.

List of identified defects/issues and resolutions, if any.

Updated configuration and software baseline for site loading.

Formal clearance for shipment and subsequent Site Acceptance Testing (SAT).

50.15.4 Importance

S-CFAT is the first major certification step ensuring that the Station KAVACH system meets Indian Railways' operational and safety requirements.

It reduces risks of installation delays or failures by resolving issues ahead of site delivery.

Provides confidence to the rail operators about the system's reliability and compliance.

Overall, the Station Kavach Customer Factory Acceptance Test (S-CFAT) is an in-depth, joint manufacturer-customer validation exercise, essential to the successful deployment of the KAVACH Automatic Train Protection system on Indian Railways

50.16 Station Kavach Site Acceptance tests

Station KAVACH Site Acceptance Test (S-SAT) is the final and crucial verification activity conducted at the installation site after completion of hardware installation, wiring, and configuration loading. It ensures that the Stationary KAVACH system operates correctly and integrates seamlessly with the existing signaling infrastructure in the live railway environment before commissioning for regular operations.

50.16.1 Purpose of S-SAT

Validate the Stationary KAVACH system's real-world performance under actual site conditions.

Confirm correct interfacing with signaling relays, block instruments, RFID tags, and communication links.

Verify functional accuracy of movement authority computations, relay contacts, and safety interlocks.

Detect and rectify any installation, wiring, or configuration issues missed during factory tests.

Provide formal acceptance and handover to railway operational teams.

50.16.2 Key Scope and Activities

Physical Inspection: Verify installation completeness, cable terminations, grounding, and environment conditions.

Wiring Verification: Perform wiring continuity, insulation resistance, and double-cutting tests at site.

Functional Testing: Simulate signal aspects, block section occupancy, RFID tag reads in real time using test tools or controlled train movements.

Communication Tests: Check optical fiber, Ethernet, and quad cable communication robustness between Stationary KAVACH and remote units (RIUs, LC cabins).

Integration Checks: Confirm synchronization with signaling interlocking and relay logic for signal aspects, point positions, and track circuits.

Safety Validation: Test fail-safe responses, alarm logic, and emergency braking commands during fault injection.

Performance Evaluation: Monitor system latency, event logging, and reliability metrics under live conditions.

Training and Documentation: Deliver final operation manuals and train station personnel on KAVACH usage and troubleshooting.

50.16.3 Deliverables

Detailed Site Acceptance Test Report with test results, deviations, and resolutions.

Signed acceptance certificate by railway authorities.

Final as-built wiring, configuration, and commissioning documentation.

Approval for commissioning and operational use.

50.16.4 Importance

S-SAT ensures that the Stationary KAVACH system is fully compliant with Indian Railway safety, functionality, and reliability standards.

It provides confidence for seamless and safe train operations with KAVACH protection.

Acts as the formal gateway for transition from installation to operational deployment.

50.17 Loco Kavach Installation

Loco KAVACH Installation and Testing Support involves the deployment, configuration, and rigorous validation of the onboard KAVACH Automatic Train Protection unit fitted on locomotives to ensure safe train operations.

50.17.1 Installation Support for Loco KAVACH

Physical Mounting: Securely fixing the Loco KAVACH Control Unit, RFID reader antennas, signaling interface panels, and communication modules inside the locomotive cab or equipment bays while considering vibration, temperature, and accessibility factors.

Power and Connectivity: Connecting the Loco KAVACH to the locomotive's stable power supply system, ground references, and interfaces to onboard signaling and braking systems.

RFID Reader Installation: Placing RFID antennas at designated locations on the locomotive chassis to optimize tag detection accuracy and range.

Cable Routing and Wiring: Properly routing shielded cables for power, data, communication, and control signals, ensuring secure and interference-free connections.

Integration with Onboard Systems: Establishing reliable connections to the engineer's console, train control systems, and communication networks like GSM-R or Wi-Fi for data exchange.

50.17.2 Testing Support for Loco KAVACH

Initial Power-Up and Hardware Check: Validate power supply voltages, hardware health status LEDs, and fault indications.

Software and Configuration Loading: Download locomotive-specific configuration data, RFID tag databases, and route maps into the onboard processor.

Functional Testing: Simulate RFID tag passes, signal inputs, and relay outputs using diagnostic tools to verify correct processing of location, movement authority, and braking commands.

Communication Testing: Verify data link integrity between Loco KAVACH and Stationary KAVACH units through GSM-R or other communication media.

Integration Tests: Check seamless operation with braking system commands, signal acknowledgement from locomotive controls, and emergency brake actuation.

Performance Testing: Assess response times, error handling, and safety logic compliance in simulated or controlled field trials.

Training Support: Assist loco crew and maintenance teams with operational training and troubleshooting guides.

Summary

Category	Installation Support	Testing Support
Hardware Mounting	Fix control units, antennas, panels securely	Initial hardware health checks
Power & Wiring	Connect to loco power, signal, and communication lines	Functional RFID and input/output signal simulation tests
Software Config	Load loco-specific config and tag data	Communication link testing with Stationary KAVACH
Integration	Interface with locomotive controls and braking system	Integration and emergency brake tests
Training	Training for crew and maintenance personnel	Troubleshooting and operational guidance

These steps ensure that Loco KAVACH units provide robust, accurate train protection functionality aligned with the Indian Railways safety and operational standards

50.18 Loco Kavach Trial Support (L-CFAT)

Loco Kavach Trial Support, often referred to as Loco Customer Factory Acceptance Test (L-CFAT), is a critical testing and validation phase conducted before the official commissioning of the KAVACH Automatic Train Protection system onboard locomotives. This phase ensures that the Loco KAVACH unit meets all specified functional, safety, and interoperability requirements.

50.18.1 Purpose of L-CFAT

To jointly verify by manufacturer and Indian Railways representatives that the onboard KAVACH system functions correctly under simulated operational conditions.

To validate RFID tag interactions, signaling inputs, movement authority calculations, and fault detection.

To certify that the system meets Safety Integrity Level (SIL-4) requirements and Indian Railways safety standards before field trials.

50.18.2 Key Activities in L-CFAT

Hardware and Software Verification: Check hardware condition, power supply, indicator LEDs, and ensure the correct software version is loaded.

Configuration Loading: Upload locomotive-specific configuration files including RFID databases, track profiles, and control tables.

Functional Testing: Simulate various scenarios such as tag passage, signal aspects, speed restrictions, and emergency braking to verify response accuracy.

Communication Validation: Test communication links between the Loco KAVACH and Stationary KAVACH units, including GSM-R or other dedicated railway communication channels.

Fault Injection and Fail-Safe Checks: Assess the system's reaction to fault conditions, alarms, and emergency interventions.

Performance Testing: Measure response times and accuracy under simulated operating scenarios.

50.18.3 Deliverables

Detailed L-CFAT test reports documenting all test observations.

Customer acceptance certificate for the Loco KAVACH unit's readiness.

Preparedness for subsequent on-track field trials and operational deployments.

50.18.4 Importance

L-CFAT reduces risks by verifying system readiness before costly and time-consuming field trials.

Ensures compliance with Indian Railways' safety and performance standards.

Builds confidence among railway operators and maintenance teams in the Loco KAVACH system's reliability.

50.19 Kavach Commissioning Support for the entire section

Kavach Commissioning Support for the entire section involves comprehensive activities to bring the KAVACH Automatic Train Protection system into full operational status across a designated railway section, ensuring system-wide safety and functionality.

50.19.1 Key Components of Section Commissioning Support

Pre-Commissioning Validation:

Verify completeness of Stationary and Loco KAVACH installations, including all relay racks, RFID tag installations, Remote Interface Units (RIUs), and communication infrastructure.

Confirm that all configuration files (TOC, TPT, RFID database) are correctly loaded and version-controlled.

Ensure power supplies, environmental conditions, and network connectivity meet operational requirements.

System Integration Testing:

Conduct end-to-end functional testing covering signal interlocking, RFID tag reading, movement authority computations, and train communication over the whole section.

Perform fail-safe and fault injection tests to confirm alarm and emergency braking protocols.

Validate communication stability over fiber optics, GSM-R, or Ethernet links between Stationary and Loco units across the section.

Trial Runs and Monitoring:

Support initial train movements under controlled conditions to observe KAVACH system response and adjust parameters as necessary.

Monitor system logs, event histories, and operational data using NMS and control center tools.

Diagnose and resolve any issues or faults identified during trial runs.

Training and Documentation:

Provide comprehensive training to loco pilots, maintenance crews, and operation staff on system functions, troubleshooting, and safety protocols.

Deliver detailed as-built documentation, commissioning certificates, and operational handover packets.

Final Acceptance:

Facilitate formal acceptance by Indian Railways authorities following successful Site Acceptance Tests (S-SAT).

Handover to railway operations for regular use under continuous monitoring and support.

Summary Table

Phase	Activity Highlights
Pre-Commissioning	Install & config verification, power & network readiness
Integration Testing	End-to-end functionality and fail-safe validation
Trial Runs	Controlled train movements, parameter tuning, fault diagnostics
Training & Handover	Staff training, documentation, official acceptance
Continuous Support	Monitoring, maintenance, periodic system evaluation

This commissioning support ensures that the entire section equipped with KAVACH functions cohesively, providing automated train protection and enhancing railway safety across the network

50.20 Kavach Communication and Integrity Testing for the entire section

Kavach Communication and Integrity Testing for the entire section is a vital activity to ensure that all communication channels and data exchanges within the KAVACH Automatic Train Protection system operate reliably, securely, and with data integrity across the railway section.

50.20.1 Key Components of Communication and Integrity Testing

Communication Link Testing:

Verify all optical fiber cables, quad cables, Ethernet links, and GSM-R communication channels used between Stationary KAVACH units, Remote Interface Units (RIUs), and Loco KAVACH units.

Test link availability, signal strength, latency, packet loss, and error rates under simulated and live conditions.

Ensure redundancy links and failover systems operate as specified to maintain continuous communication.

Data Integrity Validation:

Confirm that all critical safety-related data—such as RFID tag reads, relay contact statuses, movement authority commands—are transmitted without corruption.

Perform cyclic redundancy check (CRC) validations and end-to-end verification for data packets.

Simulate data faults and communication interruptions to verify that the system detects anomalies and triggers appropriate alarms or failsafe actions.

Network Performance Testing:

Measure throughput, jitter, and latency parameters to ensure timely delivery of commands and feedback within safety-critical time windows.

Validate synchronization of data across distributed KAVACH components to prevent inconsistencies.

Test communication encryption and secure protocol implementation to comply with railway cybersecurity standards.

Integration and Functional Testing:

Test integration of communication systems with relay racks, signaling interlocking, and onboard KAVACH modules.

Simulate real-time train passages and signaling changes to observe communication responsiveness and accuracy.

Documentation and Reporting:

Compile detailed test logs, communication link status reports, and integrity verification outcomes.

Document any defects, corrective actions, and retest results for audit and compliance purposes.

50.20.2 Importance in KAVACH Section Safety

Ensures uninterrupted, accurate, and secure data flow necessary for safe train movement authority calculations.

Detects and mitigates communication faults that could lead to unsafe conditions or system failures.

Supports compliance with Safety Integrity Level (SIL-4) requirements mandated for railway train protection systems.

50.21 Design Documentation & supply to RDSO/Indian Railways

The described scope relates to the comprehensive design and supply of cable route plans and various technical design documents for the KAVACH Automatic Train Protection system, tailored to meet Indian Railways' operational and safety standards.

50.21.1 Scope of Design & Supply of Cable Route Plan and Design Documents

Cable Route Plan Design:

Prepare detailed plans showing the physical routing of cables (power, communication, signaling, fiber optic, quad cables) within station premises and adjoining block sections.

Include cable tray layouts, conduit placements, segregation of power and signal cables, entry/exit points, and cable termination locations.

Optimize pathways for future scalability and maintenance access.

Design Documents Preparation & Submission:

Submit 6 sets of bound, approved documents based on official drawings adhering to Railway's technical specifications.

50.21.2 Documents to be Included

Interface Circuit Diagrams: Both original and altered (as-made) interlocking and control circuit sheets showing KAVACH integration points.

Contact Analysis: Detailed listing and mapping of relay contacts used for interface with KAVACH to demonstrate completeness and double-cutting verification.

RFID Tag Data: Encoding tables and layouts specifying RFID tag IDs, types, absolute locations, and Track Identification Numbers (TIN).

Stationary KAVACH Connectivity Diagram: Overall schematic showing interconnections between KAVACH units, relay racks, Remote Interface Units (RIUs), power supplies, and communication links.

Roll Diagram (Continuous Map): A long track schematic showing tag locations, signal positions, station boundaries, and block sections in continuity for the entire commissioned section.

RFID Tag-TIN Layouts: Precisely engineered placements of tags aligned with Track Identification Numbers in the station and adjoining block section.

Table of Control (TOC): Comprehensive route authority mapping, signal aspects, interlocking logic, and movement authority details for the whole section.

Stationary and Loco KAVACH Interface Diagrams: Wiring and communication interfaces illustrating how onboard and stationary units interact.

Power Supply Diagram: Schematics of power sources, distribution, grounding, and redundancy to support uninterrupted KAVACH operations.

Frequency Plan and TDMA Based Time Slot Allotment Chart: Detailed radio frequency usage and time division multiple access scheduling charts ensuring non-interfering communication channels for KAVACH components.

Other Manuals and Technical Documents: Complete set of installation manuals, operational guides, maintenance instructions, safety certifications, and configuration details.

50.21.3 Coverage

The documentation package covers **one station and its adjoining block section** considered as a single commissioning unit.

50.21.4 Purpose

These integrated documents ensure that the Railway authorities have full visibility on design, interfaces, safety compliance, and operational parameters.

Provide a verified basis for procurement, installation, testing, maintenance, and future upgrades.

Comply with strict Indian Railways standards, supporting Safety Integrity Level (SIL-4) assurance and seamless project handover.

Overall, the design and supply of this comprehensive documentation package is fundamental to the successful deployment, safe operation, and certified acceptance of the KAVACH system within Indian Railways infrastructure.

50.22 Support Services.

Support for providing product manuals, installation and maintenance guides, liaising with RDSO SWR for approvals, e-learning module development, and training to railway officials is a comprehensive service package essential for the successful deployment and sustained operation of the KAVACH system.

50.22.1 Key Support Services

Product Manuals and Installation/Maintenance Guides:

Preparation of detailed product manuals covering specifications, features, and operational descriptions.

Development of step-by-step installation guides specifying mounting, wiring, configuration, and commissioning procedures.

Creation of maintenance manuals including preventive maintenance schedules, troubleshooting procedures, fault diagnosis, and repair instructions.

Manuals adhere to Indian Railway standards and are user-friendly for field engineers and technicians.

Liaison with RDSO SWR for Approvals:

Coordinating with Research Designs and Standards Organisation (RDSO) and Signal Wiring Section (SWR) to obtain necessary technical approvals and clearances.

Submitting design documents, test reports, and compliance certificates to RDSO SWR.

Addressing observations and incorporating recommendations to ensure certification.

Ensuring all documentation and project deliverables are aligned with RDSO's evolving standards.

E-learning Module Development:

Developing interactive digital training content for KAVACH systems including theory, practical installations, testing protocols, and troubleshooting.

Modules designed for ease of understanding and accessibility via online platforms.

Incorporate videos, animations, quizzes, and assessment tools for effective skill transfer.

Training to Railway Officials:

Organizing classroom training sessions, hands-on workshops, and on-site demonstrations.

Target groups include signaling engineers, technicians, traffic staff, and maintenance crews.

Training covers system operation, safety practices, diagnostic techniques, and emergency response measures.

Continuous support for question resolution and refresher training sessions to ensure up-to-date competency.

ANNEXURE -I

BHEL supply scope table with estimated quantities for major KAVACH system items and associated components.

Final quantities may vary as per specific site requirements and system engineering.

Item Description	Estimated Quantity	Remarks
Stationary KAVACH unit	5	At major station
RIU KAVACH unit	4	For station interlocking zones
Onboard KAVACH unit	10	For locomotives/rolling stock
NMS (Network Monitoring System)	01	Centralized control rooms
DMI (Driver Machine Interface)	20	Two per onboard unit
Pulse Generator	20	Two per onboard unit
RFID Tag	2000	Trackside installation (tentative)
RFID Reader	20	Two per onboard unit
Modems	30 (UHF) +20 LTE	Data communication linking

Item Description	Estimated Quantity	Remarks
Antenna	40 (UHF) +20 LTE+30 GPS & GSM	For radio towers and on-train use
Radio Tower	05	Major signalling locations
OFC (Optical Fiber Cable)	5 km	Station to Radio Tower communication
Interfacing connectors/cables	100 sets	For system interconnection
Test Benches, Test Setup	1 set	For training purpose
Minor ancillary supply items	As required	For installation & commissioning

All execution activities and miscellaneous supply required for project completion will be arranged by the System Integrator

ANNEXURE -II

Installation & Commissioning (I&C) responsibilities matrix between BHEL and System Integrator (SI):

Activity/Responsibility	BHEL	System Integrator (SI)
Finalize BOM and Design Calculations	Provide design details, review	Freeze BOM, provide detailed design & system engineering
Site Survey and Input Collection	Support SI with site inputs	Conduct detailed surveys, gather site data
Integration of KAVACH Systems with existing site	Provide technical integration support	Verify and coordinate integration at site
Submission and Approval of Documentation	Review and approve	Prepare and submit documents to BHEL and railway agencies
Site Quality Assurance Plan (QAP)	Review QAP	Prepare and submit site-specific QAP
Logistics & Movement of Materials	Coordinate logistics	Plan and coordinate material movement with BHEL and SWR
Installation of Major Systems and Sub-systems	Supervise installation	Execute installation works

Activity/Responsibility	BHEL	System Integrator (SI)
Testing and Commissioning	Witness and assist testing	Perform testing and commissioning
Operation & Maintenance Planning	Provide O&M guidelines	Prepare and assist O&M activities post commissioning
Coordination with RDSO, SWR, and other agencies	Facilitate coordination	Coordinate with agencies to ensure approvals and clearances

This matrix is indicative and can be further finalized& discussed as per project requirements and contractual terms with the successful bidder.

ANNEXURE -III (BOQ).

S No.	Description of Item (Survey works)	Unit	Qty
1	Carrying out Survey using WPC approved UAV drone/LIDAR for identification of absolute location of bridges, culverts, ROB, RUB, LCs, Signal location, point locations, OHE Mast, Km Stone, IB Locations etc. for placement of RFID Tags	RMT	36000.00
2	Location survey for cable route and preparation of tentative cable route plan as per the instructions of Engineer in-Charge.	Route Kilo Meter (RKM)	2.00
3	Site survey for study of braking characteristic of electric /diesel loco, submission of drawings for installations of train borne and track equipment's, design and installation of proto track equipment's, design and installation of proto type for approval and obtaining approval of the same.	Kilometre	36.00

S No.	Description of Item (Testing (FAT & SAT), Design documentation & Training to Railway staff)	Unit	Qty
1	Testing, commissioning of KAVACH system in the entire system. It includes Carrying out FAT / SAT testing, Loco dynamic trials, pre-commissioning activities as per RDSO approved Pre- Commissioning Check List, commissioning of KAVACH system in the entire section. Includes support for BHEL till Final acceptance & ISA certification along with 03 years maintenance support for entire contract period.	Route Kilo Meter (RKM)	36.00
2	Design & supply of cable route plan & Design documents, as per technical specification and submission of 6 sets of documents in proper binding from approved drawings shall be taken and submitted to Railways. This includes (but not limited to) as made documents of Interface circuit diagrams and interlocking circuit diagrams (altered sheets), contact analysis, RFID tag data, Stationary KAVACH connectivity diagram, roll diagram (continuous map), RFID Tag-TIN layouts, Table of Control for entire section, Stationary and Loco KAVACH interface diagrams, power supply diagram, frequency plan, TDMA based time slot allotment chart etc. and other manuals and technical documents (1 station and adjoining block section is considered 1 set). This includes liaison support with RDSO/SWR for approval and supply of elearning modules too.	Set	5.00

3	Training to Railway staff on trackside KAVACH and Wayside KAVACH which includes class room, onsite, Loco shed & firm visits.	Man-Days	100.00
S No.	**Description of Item (Relay rack Wiring and Testing)**	**Unit**	**Qty**
1	"Fixing of the following on Pre-erected Relay Racks (e) Fixing relay bases on the relay frames erected in Relay Room, Wiring of all types of relays by drawing various sizes of wires/multi core cable, fixing fuses, condensers, resistances, LEDs etc and wiring duly soldering the same as per approved circuit diagram, testing point to point before soldering and after soldering, bunching and lacing as per detailed technical specification. Numbered ferrules shall be provided for each wire. Different colour codes and sizes of wire to be used as per standard practice. This also includes, provision of all PVC sleeves required to be provided. Copper lugs to suit to 16/02 wire and neat bunching, lacing with Modi Nylon / Twine thread and using PVC dotted tape with buttons. This also includes soldering all the wires in the relay room with Rosin core of IS Spec. 1921 @ 40<37@ Tin and 40% Led). Soldering should be done as per standard practice. This also includes inserting the clips, point to point testing as per the circuit diagram and plugging relays to Relay bases (except Inter-cables, relays other materials such as Rosin core, flux, nylon thread. PVC dotted tape should be supplied by the contractor). Point to point testing should be done in the presence of Engineer-in-charge as instructed in two stages, one before soldering and the other after soldering." For 05 Stations	Numbers	720.00
33	Fixing relay bases, wiring in location boxes, bunching, fixing of relays as per circuit diagram. This includes fixing of condensers, resistance, 6 way I 1 way terminals WAGO, ND type fuses, LED indicators for fuses as per type fuses. For 05 Stations	Per Relay	80.00
D	**Item which are BHEL Supply scope - I & C support in Civil Contractor which include cable laying, termination, feruling, lugs other consumables necessary for installation**		
S.No	**Description of Item**	**Unit**	**Qty**
1	Support towards Installation and commissioning of Test Bench for Loco equipment (Diesel/Electric) as per RDSO letter No. STS/E/TCAS/ Tender/ Part -IX dated 03.02.2016 or latest" (Inspection by RDSO)	Numbers	1.00
2	Support towards Installation, Testing and commissioning of Test Bench for Station TCAS equipment. This should	Numbers	1.00

	comply with RDSO/SPN/196/ 2020 Version 4.0 or latest. (Inspection : RDSO)		
3	Support towards Installation, Testing and commissioning of Lab Models of station equipment (2 set), loco equipment (2 set), trackside components (2 set) and simulator (2 sets) at Headquarters(For training of staff). (Inspection : RDSO)	Numbers	1.00
4	Support towards Installation, Testing & Commissioning of station TCAS RIU(Remote Interface Unit) with at least 32 Field I/P's as per RDSO/SPN/196/2020 Version 4.0 or latest. The RIU should have provision of OFC I/F and should be connected to central TCAS in a Ring network .This includes modems, I/F, Earthing, Wiring & Signal functions etc. [Detailed Specification in Technical Document enclosed] (Inspection : RDSO)	Set	4.00
5	Support towards Installation & Commissioning of Locomotive (on board) KAVACH Equipment consisting of Vital computer & peripherals such as Driver Machine interface, 2 RFID Readers, 2 full duplex Radio modems, 4 UHF antenna, 2 GPS and GSM antenna, two number of Pulse generator/Wheel Sensor with direction sensing, and associated cabling and power supply arrangement, excluding Brake interface unit. This should comply with RDSO/SPN/196/2020 Version 4.0 or latest. (Inspection by RDSO).	Set	10.00
6	Support towards Installation, Testing & Commissioning of Station TCAS Equipment with suitable Rack consisting of Vital computer peripherals, 2 full duplex Radio modems, OFC modems, UHF antennas, GPS and GSM antenna and interfaces and their installation, wiring (including supply of Coaxial, OFC,CAT-6, power cable as per requirement) and testing as per RDSO/SPN/196/2020 Version 4.0 or latest. This also includes earthing (Earth resistance less than 1 ohm) as per RDSO RDSO/SPN/197 Ver 1.0, wiring of Electrical/Optical, relay wiring, connecting of SMOCIP from station TCAS, supply of tool kit and interlocking of relays/ Protocol Converter to suit all types of installation such as EI of any make and PI/RRI, DC-DC converter and suitable power supply arrangement for STCAS and tower equipment. (Supply of earthing material and supply of relays is covered separately). [Detailed Specification in Technical Document enclosed] (Inspection : RDSO)	Set	5.00
7	Support towards installation and commissioning of Brake Interface unit suitable for different locomotives as	Numbers	10.00

	per RDSO/SPN/196/2020 Version 4.0 or latest. (Inspection by RDSO)		
8	Support towards transportation, Installation, Programming, Verification and Commissioning of RFID tags with enclosures and fixures at Stations and block sections(absolute/Automatic Block section). This should comply to RDSO/SPN/196/2020 Version 4.0 or latest. Inspection by RDSO	Numbers	1250.00
9	Support towards Re-programming, Re-fixing and verification of existing RFID Tags	Numbers	250.00
10	Support towards Re-programming of existing RFID Tags without shifting.	Numbers	230.00
11	Support towards Installation, Programming, Verification and Commissioning of RFID tags with enclosures and fixtures at Stations and block sections consisting of LCs, IBS & Auto signals. 1 Station & adjoining block section will be counted as one set. This should comply with RDSO/SPN/196/ 2020 Version 4.0 or latest . [Detailed Specification in Technical Document enclosed] (Inspection : RDSO)	Set	5.00
12	Support towards installation of rack mounted 24 fibre Distribution Management System (FDMS) of size 1U, of Reputed/Branded company make as per specification RDSO/SPN/TC/37/2020 Revision 4.0 with latest amendments. The FDMS shall include 24 SC-PC/Required adaptors having insertion loss less than or equal to 0.1dB and 24 numbers 900 micron 1.5m SC-PC/Required pigtails."	Numbers	18.00
13	Support towards installation and commissioning of Network Management System for Centralized monitoring of KAVACH station and Loco equipment as per RDSO/SPN/196/ 2020 Version 4.0 or latest.(Inspection by RDSO)	Set	1.00

Note:

If additional quantities need to be installed by the bidder based on requirements finalized by RDSO, SWR, or any other Indian Railways authority, the bidder will be reimbursed at agreed unit rates for these additional quantities during the purchase order stage. The bidder must execute these additional works without any objection or delay.

GENERAL CONDITIONS

OF

CONTRACT

SOLAR BUSINESS DIVISION
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)
PROF. CNR RAO CIRCLE, IISc POST
MALLESHWARAM
BENGALURU - 560012

CONTENTS

2. Chapter-2

CHAPTER -1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

i) The General Conditions of Contract form part of the Tender specifications. All pages of the tender documents shall be duly signed, stamped and submitted along with the offer in token of complete acceptance thereof. The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages

ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any aspects, the scope of work etc., he shall contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The tender specifications and terms and conditions shall be deemed to have been accepted by the tenderer in the offer. Pre requirements and conditions shall be liable for rejection.

iii) Integrity pact (IP): If NIT calls for Integrity Pact, the same shall be duly signed & stamped by the authorised signatory & submitted along with tender document.

1.2. SUBMISSION OF TENDERS

1.2.1 The tenderers must submit their tenders as per instructions in the NIT

1.2.2 BHEL takes no responsibility for delay, loss or non-receipt of tenders sent by post/courier. The tenders received after the specified time of their submission are treated as 'Late Tenders' and shall not be considered under any circumstances. Offers received by Fax/Email/Internet shall be considered as per terms of NIT.

1.2.3 Tenders shall be opened by authorised Officer of BHEL at his office at the time and date as specified in the NIT, in the presence of such of those tenderers or their authorised representatives who may be present

1.2.4 Tenderers whose bids are found techno commercially qualified shall be informed the date and time of opening of the Price Bids and such Tenderers may depute their representatives to witness the opening of the price bids. BHEL's decision in this regard shall be final and binding.

1.2.5 Before submission of Offer, the tenderers are advised to inspect the site of work and the environments and be well acquainted with the actual working and other prevalent conditions, facilities available, position of material and labour, means of transport and access to Site, accommodation, etc. No claim will be entertained later on the grounds of lack of knowledge of any of these conditions.

1.3. ***LANGUAGE***

1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. For the purpose of the tenders, the metric system of units shall be used.

1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and overwriting is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4 ***PRICE DISCREPANCY:***

1.4.1 Conventional (Manual) Price Bid opening:

i) If, in the price structure quoted for the required goods/services/works, there is discrepancy between the unit price and the total price (which is obtained by multiplying the unit price by the quantity), the unit price shall prevail and the total price corrected accordingly, unless in the opinion of BHEL there is obvious misplacement of decimal point in the unit price, in which case the total price as quoted shall govern and the unit price corrected accordingly

ii) If there is an error in a total corresponding to the addition or subtraction of subtotals, the subtotals shall prevail and the total shall be corrected;

iii) If there is a discrepancy between words and figures, the amount in words shall prevail, unless the amount expressed in words is related to an arithmetic error, in which case the amount in figures shall prevail subject of (i) and (ii) above.

iv) If there is such discrepancy in an offer, the same shall be conveyed to the bidder with target date up to which the bidder has to send his acceptance on the above lines and if the bidder does not agree to the decision of BHEL, the bid is liable to be ignored.

v) In case of lump sum price, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

vi) In case of omission in quoting any rate for one or more items, the evaluation shall be done considering the highest quoted rate obtained against the respective items by other tenderers for the subject tender. If the tenderer becomes L-1, the notional rates for the omission items shall be the lowest rates quoted for the respective items by the other tenderers against the respective omission items for the subject job and the 'Total quoted price (loaded for omissions)' shall be arrived at. However, the overall price remaining the same as quoted originally, the rates for all the items in the 'Total quoted price (loaded for omissions)' shall be reduced item wise in proportion to the ratio of 'Original' total price and the 'Total quoted price (loaded for omissions)''.

1.4.2 Reverse Auction: In case of Reverse Auction, the successful bidder shall undertake to execute the work as per overall price offered by him during the Reverse Auction process. In case of omission of rates, the procedure shall be as per 'Guidelines for Reverse Auction' enclosed.
i) Offers from tenderers who are under suspension (banned) by any Unit/Region/Division of BHEL shall not be considered. ii) Offers from tenderers who do not comply with the latest guidelines of Ministry/ Commissions of Govt of India shall not be considered.

*1.5. **EVALUATION OF BIDS***

i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre-Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer, BHEL reserves the right to ask for proofs/documents, clarification in relation to Technical/commercial data during tender evaluation

ii) Price Bids of shortlisted bidders shall only be opened either through the conventional price bid opening or through electronic Reverse Auction, at the discretion of BHEL

iii) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated to the vendor before the opening of Price bid.

*1.6. **DATA TO BE ENCLOSED***

The following information in full shall be furnished by the tenderer. Non-submission of this information may lead to rejection of the offer.

i) INCOME TAX PERMANENT ACCOUNT NUMBER, GSTIN, SAC, HSN Certified copies of PAN, GSTIN shall be furnished along with tender. The names, addresses and contact information of the Directors/Partners shall be furnished along with the offer.

ii) An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor.

iii) IN CASE OF INDIVIDUAL TENDERER:

His / her full name, address, PAN, GSTIN and place & nature of business to be furnished. iv)

IN CASE OF PARTNERSHIP FIRM

The names of all the partners and their addresses, a copy of the partnership deed/instrument of partnership shall be enclosed.

v) IN CASE OF COMPANIES:

Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished). Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

*1.7. **AUTHORISATION AND ATTESTATION***

Tenders shall be signed by a person duly authorised/empowered to do so. An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor shall be submitted along with the tenders

*1.8. **EARNEST MONEY DEPOSIT***

1.8.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

The EMD may be accepted only in the following forms:

(i) Electronic Fund Transfer credited in BHEL account (before tender opening)

(ii) Banker's cheque/ Pay order/ Demand draft, in favour of BHEL (along with offer) In case total EMD amount is more than Rs.20 Lakh, the amount in excess of Rs.20 lakh maybe accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at-least six months.

(iii) Through SBI collect/RTGS (before tender opening)

(iv) No other form of EMD remittance shall be acceptable to BHEL

1.8.2 EMD by the bidder will be forfeited as per Tender Documents if

i) After opening the tender and within the offer validity period, the tenderer revokes his/her 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.

iii) EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged in derailing the tender process by unlawful means.

1.8.3 EMD shall not carry any interest.

1.8.4 In the case of unsuccessful bidders, the Earnest Money will be refunded to them within a reasonable time after acceptance of award by successful tenderer.

1.8.5 EMD of successful tenderer will be converted as part of Security Deposit

*1.9. **SECURITY DEPOSIT***

"Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SB/ rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms defined in NIT I contract, from the bills along with due interest "

The total amount of Security Deposit will be 5% of the contract value (including all applicable taxes) EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.

1.9.1 Modes of Security deposit:

The balance amount to make up the required Security Deposit of 5% of the contract value may be accepted in 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 should have the approval of BHEL iv) Fixed Deposit Receipt 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)

v) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL) (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) vi) 50% of the required Security Deposit, including the EMD, should be paid before start of the work. Balance of the Security Deposit can be collected by deducting10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected. If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor. Security Deposit shall be released to the Contractor upon fulfilment of contractual obligations as per terms of the contract.

1.9.2 The Security Deposit shall not carry any interest.

1.9.3 The validity of Bank Guarantees towards Security Deposit shall be initially up to the completion period as stipulated in the Letter of Intent/Award (plus maintenance period if applicable), and 03 months claim period. The same shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL

1.9.4 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 fulfil 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. ***REFUND OF SECURITY DEPOSIT***

50% of the security deposit may be refunded on completion of the work after payment of the final bill and the balance 50% of the security deposit is refunded only after the expiry of the maintenance period from date of completion of work as stipulated in the contract concerned.

1.10.1 *DEFECTS LIABILITY PERIOD:*

The contractor shall be responsible to make good and remedy at his own expenses within such period as may be stipulated by the Engineer-in-charge, any defect which may develop or may be noticed before the expiry of the maintenance period of six months or as stipulated in NIT hereto from the certified date of completion and intimation of which has been sent to the contractor within seven days of the expiry of the said period by a letter sent by hand delivery or by registered post or Email. If contractor fails to attend to the above, defect will be rectified at contractor's risk & cost and same will be deducted from the security deposit/payable amounts available with BHEL.

1.11. ***BANK GUARANTEES***

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. ii) The Bank Guarantees shall be as per prescribed BHEL formats.

iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period (subject to a minimum period of six months), as per the advice of BHEL. BHEL shall not be liable for issue of any reminders regarding expiry of the Bank Guarantees.

iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by BHEL

v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.

vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.

vii) The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due).

*1.12. **VALIDITY OF OFFER***

The rates in the Tender shall be kept open for acceptance for a minimum period of Ninety (90) DAYS from latest due date of offer submission (including extension, if any). In case BHEL calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

*1.13 **EXECUTION OF CONTRACT AGREEMENT***

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Intent by BHEL. The Tenderer shall submit an unqualified acceptance to the Letter of Intent/Award within the period stipulated therein.

The successful tenderer shall be required to execute an agreement in the prescribed form, with BHEL, within fifteen days (15 days) after the acceptance of the Letter of Intent/Award, and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by Tenderer.

*1.14. **REJECTION OF TENDER AND OTHER CONDITIONS***

1.14.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender or any tender and reserves to itself full rights for the following without assigning any reasons whatsoever: -

a. To reject any or all of the tenders.

b. To split up the work amongst two or more tenderers as per NIT

c. To award the work in part if specified in NIT

d. In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.14.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc., are liable to be rejected.

1.14.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL, or tenderer under suspension (hold/banning /delisted) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India. BHEL reserves the right to reject a bidder in case it is observed that they are overloaded and may not be in a position to execute this job. The decision of BHEL will be final in this regard.

1.14.4 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character.

1.14.5 BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. They may, however, recognize such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

1.14.6 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money/Security Deposit/any other money due.

1.14.7 Canvassing in any form in connection with the tenders submitted by the Tenderer shall make his offer liable to rejection.

1.14.8 In case the Proprietor, Partner or Director of the Company/Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting the Tender shall be informed, along with the Offer. Failing to do so, BHEL may, at its sole discretion, reject the tender or cancel the contract and forfeit the Earnest Money/Security Deposit.

1.14.9 The successful tenderer should not sub-contract part or complete work detailed in the tender specification undertaken by him without written permission of BHEL's Construction Manager/Site Incharge. The tenderer is solely responsible to BHEL for the work awarded to him.

1.14.10 The Tender submitted by a techno commercially qualified tenderer shall become the property of BHEL who shall be under no obligation to return the same to the bidder. However unopened price bids and late tenders shall be returned to the bidders after finalization of contract.

1.14.11 Unsolicited discount received after the due date and time of Bid Submission shall not be considered for evaluation. However, if the party who has submitted the unsolicited

discount/rebate becomes the L-I party, then the awarded price i.e contract value shall be worked out after considering the discount so offered.

1.14.12 BHEL shall not be liable for any expenses incurred by the bidder in the preparation of the tender irrespective of whether the tender is accepted or not.

1.15 ***BHEL Fraud Prevention Policy:***

The bidder along with its associate/ collaborators/sub-contractors/ Sub-Vendors/ Consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website http://www.bhel.com and shall immediately bring to the notice of BHEL Management about any fraud or suspected fraud as soon as it comes to their notice. Fraud prevention policy and list of Nodal officers shall be hosted on BHEL website, vendor portals of Units/Regions Internet.

CHAPTER-2

2.1 DEFINITION: The following terms shall have the meaning hereby assigned to them except where the context otherwise requires

i) BHEL shall mean Bharat Heavy Electricals Limited, a company registered under Companies Act 1956, with its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, or its Authorised Officers or its Site Engineers or other employees authorised to deal with any matters with which these persons are concerned on its behalf.

ii) "EXECUTIVE DIRECTOR" or 'GROUP GENERAL MANAGER' or "GENERAL MANAGER (Incharge)" or "GENERAL MANAGER" shall mean the Officer in SOLAR BUSINESS DIVISION, Prof. CNR Rao Circle, IISc Post, Malleshwaram, BENGALURU - 560012

iii) "COMPETENT AUTHORITY" shall mean Executive Director or Group General Manager or General Manager (In-charge) or General Manager or BHEL Officers who are empowered to act on behalf of the Executive Director or General Manager (In-charge) or General Manager of BHEL.

iv) "ENGINEER" or "ENGINEER IN CHARGE" shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as "Engineer" on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes 'CONSTRUCTION MANAGER' or 'SITE

INCHARGE' as well as Officers

v) *"SITE" shall mean the places or place at which the plants/equipment are to be erected and services are to be performed as per the specification of this Tender.*

vi) *"CLIENT OF BHEL" or "CUSTOMER" shall mean the project authorities with whom BHEL has entered into a contract for supply of equipment or provision of services.*

vii) *"CONTRACTOR" shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor's successors, heirs, executors, administrators and permitted assigns.*

viii) *"CONTRACT" or "CONTRACT DOCUMENT" shall mean and include the Work Order, Contract Agreement, the accepted appendices of Rates, Schedules, Quantities if any, General Conditions of Contract, Special Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments mutually agreed upon and the Letter of Intent/Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement.*

ix) *"GENERAL CONDITIONS OF CONTRACT" shall mean the 'Instructions to Tenderers' and 'General Conditions of Contract' pertaining to the work for which above tenders have been called for.*

x) *"TENDER SPECIFICATION" or "TENDER" or "TENDER DOCUMENTS" shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical Specifications, Appendices, Annexures, Corrigendum's, Amendments, Forms, procedures, Site information, etc and drawings/documents pertaining to the work for which the tenderers are required to submit their offers. Individual specification number will be assigned to each Tender Specification.*

xi) *"LETTER OF INTENT" shall mean the intimation by a Post/Fax/email to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.*

xii) *"COMPLETION TIME" shall mean the period by 'date/month' specified in the 'Letter of Intent/Award' or date mutually agreed upon for handing over of the intended scope of work, the erected equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.*

xiii) *"PLANT" shall mean and connote the entire assembly of the plant and equipment's covered by the contract.*

xiv) "EQUIPMENT" shall mean equipment, machineries, materials, structural, electrical and other components of the plant covered by the contract.

xv) "TESTS" shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL, in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.

xvi) "APPROVED", "DIRECTED" or "INSTRUCTED" shall mean approved, directed or instructed by BHEL.

xvii) "WORK or CONTRACT WORK" shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipment's to the entire satisfaction of BHEL.

xviii) "SINGULAR AND PLURALS ETC" words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.

xix) "HEADING" – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.

xx) "MONTH" shall mean calendar month unless otherwise specified in the Tender.

xxi) Day' or 'Days' unless herein otherwise expressly defined shall mean calendar day or days of twenty-four (24) hours each. A week shall mean continuous period of seven (7) days.

xxii) "COMMISSIONING" shall mean the synchronization testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.

xxiii) "WRITING" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.

xxiv) "TEMPORARY WORK" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.

xxv) 'CONTRACT PRICE' or 'CONTRACT VALUE' shall mean the sum including applicable taxes mentioned in the LOI/LOA/Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained

xxvi) "COMMENCEMENT DATE" or "START DATE" shall mean the commencement/start of work at Site as per terms defined in the Tender

xxvii) "SHORT CLOSING" or "FORE CLOSING" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor

xxviii) "TERMINATION" of Contract shall mean the pre mature closing of contract due to reasons as mentioned in the contract

*2.2 **LAW GOVERNING THE CONTRACT AND COURT JURISDICTION***

The contract shall be governed by the Law for the time being in force in the Republic of India. The Civil Court having original Civil Jurisdiction at Bengaluru, shall alone have exclusive jurisdiction in regard to all claims in respect of the Contract. No other Civil Court shall have jurisdiction in case of any dispute, under this contract

*2.3 **ISSUE OF NOTICE***

2.3.1 Service of notice on contractor: Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same by Registered Post / Speed Post/ FAX / Email to or leaving the same at the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such posting or leaving of the notice shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

2.3.2 Service of notice on BHEL Any notice to be given to BHEL in-charge under the terms of the Contract shall be served by sending the same by post or Email or leaving the same at BHEL address or changed address as notified in writing by BHEL to the Contractor.

2.4 USE OF LAND

No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.

2.4.1 STORES AND MATERIALS:

The contractor shall, at his own expense, supply all stores and materials required for the contract, other than those which may be provided by BHEL at the rates detailed therein subject to their availability at the place of issue indicated therein. All stores and materials to be supplied by the Contractor shall be of the best kind as described in the Specifications and the Contractor shall, if required by the Engineer –in- charge furnish him with proof to his satisfaction that the store and materials so comply with the specifications.

The contractor shall, at his own expense and without delay, supply samples of stores and materials proposed to be used in the execution of the work for the approval of the Engineer-in charge, who may reject all stores and materials not corresponding either in quality or character to the approved samples.

In the case of stores provided by BHEL, the Contractor shall bear the cost of loading, transporting to site, unloading, storing under cover as required, assembling & jointing the several parts together as necessary and incorporating & fixing these stores & materials in the work, including all preparatory work of whatever description that may be required, and closing, preparing, loading and returning empty cases or containers to the place of issue without any extra charges.
Contractor is responsible for safe & secure storage of above material.

2.4.2 PATENT RIGHTS:

The contractor shall fully indemnify BHEL, or the agent, servant, or employee of BHEL, against any action, claim or proceeding relating to infringement or the use of any patent or design or any alleged patent or design rights, and shall pay any royalties which may be payable in respect of any article/ or part thereof included in the contract.

In the event of any claims being made or action brought against BHEL, or any agent, or servant or employee of BHEL., in respect of any of the matters aforesaid, the contractor shall not apply when such increment has taken place in complying with the specific directions issued by the BHEL but the contractor shall pay any royalties payable in respect of any such use.

2.4.3 WATER:

The contractor shall allow in his tender and provide at his cost all water required for the work or his employees on the work, together with all pipes and fittings or other means that may be necessary or required to ensure a proper and ample supply of water for all purpose connected with the work.

In the event of a provision existing in the Tender documents for supply of water on payment by BHEL, water will be supplied from the BHEL supply System, or other sources at any points fixed by the Site Engineer/ Engineer-in-charge on the site of work. The contractor shall make necessary arrangement for lifting, pumping, carrying or conveying the water as required at his own cost. The levy of water charges to be borne by the Contractor in such case shall be specifically mentioned in the Tender documents.

2.4.4 TEMPORARY WORKSHOPS, STORES ETC:

The Contractor shall, during the progress of the work provide, erect and maintain at his own expense all necessary temporary workshops, store, offices, toilets etc., required for the proper and efficient execution of the work. The planning, siting and erection of these building shall have the approval of the Engineer-in-charge and the Contractor shall at all times keep them in a clean and sanitized condition to the entire satisfaction of the Engineer-in-charge.

On completion of the work all such temporary buildings shall be cleared and the site restored to its original state in a clean and tidy condition to the entire satisfaction of the Engineer-incharge.

2.5 COMMENCEMENT OF WORK

2.5.1 Time is essence of contract and is specified in the tender document or in each individual work order.

2.5.2 The contractor shall commence the work within seven (07) days from LOI/work order or as intimated by BHEL and shall proceed with the same with due expedition without delay.

2.5.3 If the contractor fails to start the work within stipulated time as per LOI or as intimated by BHEL, then BHEL at its sole discretion will have the right to cancel the contract. The Earnest Money and/or Security Deposit with BHEL will stand forfeited without any further reference to him without prejudice to any and all of BHEL's other rights and remedies in this regard.

2.5.4 All the work shall be carried out under the direction and to the satisfaction of BHEL.

2.6 MEASUREMENT OF WORK AND MODE OF PAYMENT:

2.6.1 All payments due to the contractors shall be made by electronic mode only, unless otherwise found operationally difficult.

2.6.2 For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

2.6.3 These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer.

The abstract of quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.

2.6.4 Based on the above quantities, contractor shall prepare the bills in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.

2.6.5 All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.

2.6.6 Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

2.6.7 The measurement shall be taken jointly by persons duly authorized on the part of BHEL and by the Contractor.

2.6.8 The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.

2.6.9 If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.

2.6.10 Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

2.6.11 Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. Contractor shall give unqualified "No Claim" Certificate. All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

2.7 ***RIGHTS OF BHEL***

BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.

2.7.1 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 To terminate the contract or get any part of the work done through other agency or deploy BHEL's own/hired/otherwise arranged resources, at the risk and cost of the contractor after due notice of a period of two weeks by BHEL, in the event of: -

i) Contractor's continued poor progress

ii) Withdrawal from or abandonment of the work before completion of the work iii)

Contractor's inability to progress the work for completion as stipulated in the contract

iv) Poor quality of work

v) Corrupt act of Contractor

vi) Insolvency of the Contractor

vii) Persistent disregard to the instructions of BHEL

viii) Assignment, transfer, sub-letting of contract without BHEL's written permission

ix) Non fulfilment of any contractual obligations / non-compliance of statutory requirements

x) In the opinion of BHEL, the contractor is overloaded and is not in a position to execute

the job as per required schedule

2.7.3 To meet the expenses including BHEL overheads of 35% & Liquidated damage/penalties arising out of "Risk & Cost" as explained above under Sl.No. 2.7.2. BHEL shall recover the amount from any money due from Contractor, from any money due to the Contractor including Security Deposit or by forfeiting any T&P or material of the contractor under this contract or any other contract of BHEL or by any other means or any combination thereof

2.7.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, as per mutual agreement.

2.7.5 To effect recovery from any amounts due to the contractor under this or any other contract or in any other form, the moneys BHEL is statutorily forced to pay to anybody, due to contractor's failure to fulfil any of his obligations. BHEL shall levy overheads of 35% on all such payments.

2.7.6 While every endeavour will be made by BHEL to this end, they cannot guarantee uninterrupted work due to conditions beyond their control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.

2.7.7 In case the execution of works comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than two months, due to reasons not attributable to the contractor and other than Force Majeure conditions, BHEL may consider permitting the contractor to de mobilize forthwith and re mobilize at an agreed future date. Cost of such demobilization/remobilization shall be mutually agreed. ORC (Over run Charges) in such cases shall not be applicable for the period between the period of demobilization and re mobilisation. The duration of contract/time extension shall accordingly get modified suitably. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

2.7.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts, etc, due to which inordinate discontinuity of work is anticipated, BHEL at its discretion may consider contractor's request to short close the contract, provided that the balance works are minor vis a vis the scope of work envisaged as per the contract. At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work as mutually agreed, shall however be reduced from the final contract value.

2.7.9 ***LIQUIDATED DAMAGES/PENALTY***

COMPENSATION FOR DELAY:

If the contractor fails to maintain the required progress in terms of condition 2.10 or to complete the work and clear the site on or before the contracted or extended the period of completion, he shall, without prejudice to any other right or remedy of the BHEL on account of such breach, pay as agreed compensation an amount calculated as stipulated below

For unfinished anticipated value of work where finished portion is fit for use

Rate of compensation as follows:

- *Completion period (as originally stipulated) not exceeding 6 months. ……@ 1 percent per week*
- *Completion period (as originally stipulated) Exceeding 6 months and not exceeding 2 years…@ 0.5 percent per week*
- *Completion period (as originally stipulated) exceeding 2 years…….. @ 0.25 percent per week*

Provided always that the total amount of compensation for delay to be paid under condition shall not exceed the under noted percentage of the anticipated contract value

- *Completion period (as originally stipulated) not exceeding 6 months. ……..@ 10 percent of anticipated value of work*
- *Completion period (as originally stipulated) Exceeding 6 months and not exceeding 2 years…@ 7.5 percent of anticipated value of work*
- *Completion period (as originally stipulated) Exceeding 2 years……..@ 5 percent of anticipated value of work*

The amount of compensation may be adjusted or set off against any sum payable to the Contractor under this or any other contract with the BHEL.

2.7.10 ***POST TECHNICAL AUDIT OF WORK AND BILLS****: BHEL reserve the right to carry out a post-payment audit and technical examination of the work and final bill including all supporting vouchers, abstract etc., and to enforce recovery of any sums becoming due as a result thereof in the manner provided in the proceeding sub-paragraph's provided however that no such recovery shall be enforced after three years of passing the final bill*

2.8 ***RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC****.*

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

2.8.1 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.

2.8.2 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Maternity act, Regulations etc. such as contract labour(R&A) Act 1970, Minimum wage Act 19748, Payment of wages Act 1936,ESI Act 1948, EPF Act 1952, Employees' compensation Act 1923, Provision of Companies Act 1948 & rules thereof, The interstate Migrant Workmen 1979, The Karnataka Factories Rules 1969, Payment of Bonus Act 1965, Payment of Gratuity Act 1972. Child labour Prohibition act 1986, Karnataka Minimum Wage Act , Prevention of sexual harassment at work place Act 2013, Guidelines/notification related to Safai Karamchari Act , Equal Remuneration Act 1976, The company's instructions as

issued from time to time in regard to working hours, wages, leaves, holidays etc. for labour as may be enacted by the Government during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also give to the local Governing Body, Police and other relevant Authorities all such notices as may be required by the Law.

The contractor shall produce the following registers and forms:

- *Form XIII- Register of work men employed by contractor(Rule 75)*
- *Form XIV- Employment Card issued by contractor(Rule 76)*
- *Form XVI- Muster Roll (Rule 78(1) (a)(i))*
- *Form XVII- Register of Wages (Rule 78(1) (a)(i))*
- *Form XVIII- Register of wages cum Muster Roll(in case of weekly payment)*
- *Form XIX- Wage slip (Rule 78(b))*
- *Form XX- Register of deduction for damages Or Loss Rule 78(1) (a)(ii))*
- *Form XXI- Register of files Rule 78(1) (a)(ii))*
- *Form XXII- Register of Advance Rule 78(1) (a)(ii))* x *Form XXIII- Register of Overtime Rule 78(1) (a)(iii))*
- *Form XXIV- Return to be sent by the contractor to the Licensing officer (Rule 82(1))*

2.8.3 The contractor shall obtain independent License under the Contract Labour (Regulations and Abolition Act) as required from the concerned Authorities based on the certificate (Form-
V) issued by the Principal Employer/Customer

2.8.4 The contractor shall pay all taxes, fees, license charges, deposits, duties, tolls, royalties, commission or other charges which may be levied on account of his operations in executing the contract.

2.8.5 While BHEL would pay the inspection fees and Registration fees of Boiler & explosive/Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.

2.8.6 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

2.8.7 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.

2.8.8 The contractor shall be responsible for the proper behavior and observance of all regulations by the staff employed by him.

2.8.9 The contractor shall ensure that no damage is caused to any person/property of other parties working at site. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.

2.8.10 All the properties/equipment/components of BHEL/their Client loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client.

2.8.11 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be deemed to be in good condition when received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc, the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor

2.8.12 Any delay in completion of works/or non-achievement of periodical targets due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.

2.8.13 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

2.8.14 All safety rules and codes applied by the Client/BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract. The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices. Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer. All tools, plant and equipment brought to the site shall become the property of BHEL and shall not be removed from the site without the prior written approval from BHEL. When the work is finally completed or the Contractor is determined for reasons other than the defaults of the contract, he shall forthwith remove from the site all tools, plants, equipment etc., (other than those as may have been provided by BHEL) and upon such removal, the same shall revert in, and become the property of the contractor.

2.8.15 The contractor will be directly responsible for payment of wages to his workmen on specified date of respective month declared as per applicable Labour Act. A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for record purpose.

2.8.16 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

2.8.17 Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour and Tools & Plants being rendered idle due to any reason at any time.

2.8.18 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Client whichever is earlier.

2.8.19 The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly

2.8.20 The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices, etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor. If the work is executed in Factory premises, no hutment will be allowed.

2.8.21 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.

2.8.22 The Contractor to note that some of BHEL's T&Ps/MMDs may not be insured. The Contractor will take necessary precautions and due care to protect the same while in his custody from any damage/ loss till the same is handed over back to BHEL. In case the damage / loss is due to carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/ replaced immediately and in case of his failure to do so within a reasonable time, BHEL will reserve the right to recover the loss from the contractor.

2.8.23 The contractor shall provide all watchmen necessary, for the protection of the site, the work, the materials, the tools, plant, equipment and anything else lying on the site during the progress of the work. He shall solely be responsible for and shall take all reasonable and proper steps for protecting, securing, lighting and watching all places on or about the work and the site which may be dangerous to any person whom so ever.

2.8.24 SITE DRAINAGE: All water that may accumulate on the site during the process of the work, or in trenches and excavations shall be removed to the entire satisfaction of the Engineering-charge and at Contractors expense.

2.8.25 INSPECTION OF THE WORK: BHEL Officers concerned with the Contract shall have power at any time to inspect and examine any part of the work and the contractor shall give such facilities as may be required to given for such inspection and examination.

2.8.26 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract

i. *For any item of wok required to be carried out after the contract has been awarded and which is not covered by Contractors Schedule but is covered by C.P.W.D. schedule of rates the rate payable for such a fresh item will be derived from updated C.P.W.D. schedule of rates by the method of proportion as follows:*

ii. *Rate as per estimated updated C.P.W.D DSR and loading tender excess (plus or minus) on pro–rata basis for nearest analogous items. For other items rate as per estimated C.P.W.D DSR and loading tender excess(plus or minus) iii.If rates are not available in C.P.W.D. DSR, deviated item rates will be derived from market rate with 15% profit and overheads.*

2.9 ***PROGRESS MONITORING, MONTHLY/ WEEKLY REVIEW AND PERFORMANCE EVALUATION***

2.9.1 A detailed plan/programme for completion of the contractual scope of work as per the time schedule given in the contract shall be jointly agreed between BHEL and Contractor, before commencement of work. The above programme shall be supported by month/ week wise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis a vis this jointly agreed programme. The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc as desired by BHEL.

2.9.2 Monthly/ weekly progress review between BHEL and Contractor shall be based on the agreed programme as above, availability of inputs/fronts etc, and constraints if any, as per prescribed formats. Manpower, T&P and consumable reports as per prescribed formats shall

be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.

2.9.3 The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii) BHEL

2.10 ***TIME OF COMPLETION***

2.10.1 Time is essence of the contract. The time schedule shall be as prescribed in the Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified by BHEL Engineers

2.10.2 The entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11

2.11 ***EXTENSION OF TIME FOR COMPLETION***

2.11.1 If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract.

2.11.2 Based on the monthly reviews jointly signed, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.

2.11.3 However if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take at the risk and cost of contractor.

2.11.4 A joint programme shall be drawn for the balance amount of work to be completed during the period of 'Time Extension', along with matching resources (with weightages) to be deployed by the contractor as per specified format. Review of the programme and record of shortfall shall be done every month of the 'Time extension' period in the same manner as is done for the regular contract period.

2.11.5 During the period of 'Time extension', contractor shall maintain their resources as per mutually agreed program

2.11.6 At the end of total work completion as certified by BHEL Engineer, and upon analysis of the total delay, the portion of time extensions attributable to (i) Contractor, (ii) Force majeure conditions, and (iii) BHEL, shall be worked out and shall be considered to be exhausted in the same order. The total period of time extensions shall be the sum of (i), (ii) and (iii) above and shall be equal to period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/levied for the portion of time extensions attributable to contractor and recoverable from the dues payable to the contractor.

*2.12 **OVERRUN COMPENSATION (THIS CLAUSE IS NOT APPLICABLE IN BHEL FACTORY & TOWNSHIP PREMISES)***

2.12.1 Over Run Compensation (ORC) is payable by way of rate revisions for periods beyond original, contract period subject to the following terms and conditions.

2.12.2 Rates shall be increased by 10% for the first twelve months of one or more extensions beyond original contract period. For the next twelve months of further extensions if any, rates shall be increased as above by 10% over the previous twelve months, and similarly for each subsequent twelve months extension.

2.12.3 Should there be any 'Time extension' for reasons attributable only to the contractor, then the work shall be executed by the contractor at the rates applicable for the period the work was planned

2.12.4 Payment of ORC shall be regulated as follows:

i) Contractor is entitled to Over Run Compensation (ORC) only for the portion of backlog attributable to BHEL.

ii) 50% of the compensation is allocated for deployment of resources agreed as per the joint programme drawn vide 2.11.4. Payment shall however be based on the actual deployment of resources for the month as certified by BHEL, as per weightages assigned therein

iii) 50% of the compensation, is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. Payment shall be on pro rata basis for actual achieved quantities

iv) Total Over Run Compensation shall be limited to 10% of the executed contract value as certified in Final Bill. For this purpose, executed contract value excludes PVC, ORC, Supplementary/Additional Items and Extra Works done on Man-day rate basis

2.12.5 Contractor shall not be entitled for any Over Run Compensation (ORC) for the portion of backlog attributable to the contractor. Such works shall be executed at the rates applicable for the period the work was planned

2.13 ***QUANTITY VARIATION***

2.13.1 The quoted rates shall remain firm irrespective of any variations in the individual quantities*.*

2.14 ***EXTRA WORKS***

2.14.1 All rectifications/modifications, revamping, and reworks required for any reasons not attributable to the contractor, or needed due to any change in deviation from drawings and design of equipment, operation/maintenance requirements, mismatching, or due to damages in transit, storage and erection/commissioning, and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

2.14.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

2.14.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.

2.14.4 BHEL retains the right to award or not to award any of the major repair/ rework/modification/rectification/fabrication works to the contractor, at their discretion without assigning any reason for the same

2.14.5 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 manhour 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 as per applicable minimum wage act

2.14.6 The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc will not be applicable due to extra works.

2.14.7 Extra Works for Civil Packages shall be regulated as follows

i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re-erecting etc due to no fault of Contractor, shall be in the order of the following:

a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.

b) As per applicable updated CPWD-DSR (or latest edition) with applicable escalation derived, Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed,

c) Item rates are to be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor, plus 15% towards Contractor's overheads and profit.

ii) PVC and ORC will not applicable be for (i) above.

2.15 ***SUPPLEMENTARY ITEMS***

2.15.1 For NON Civil Works

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

i) Based on percentage breakup/rates indicated for similar/nearby items

ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work

2.15.2 For Civil Works

i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:

a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities

b) Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.14

ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.13

iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor. iv) PVC and ORC will not be applicable for (i) above.

2.16 ***STRIKES & LOCKOUT***

2.16.1 The contractor will be fully responsible for all disputes and other issues connected with his labour/employee. In the event of the contractor's labour/employee resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of 15 days, BHEL shall have the right to get the work executed through any other agencies and the cost so incurred by BHEL along with Overhead charges of 35% shall be deducted from the Contractor's bills along with overhead of 35%

2.16.2 For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL

2.17 FORCE MAJEURE

The following shall amount to Force Majeure: -

2.17.1 Acts of God, act of any Government, War, Sabotage, Riots, Strike, Civil commotion, Police action, Revolution, Flood, Fire, Cyclones, Earth quake and Epidemic and other similar causes over which the contractor has no control.

2.17.2 If the contractor suffers delay in the due execution of the contractual obligation due to delays caused by force majeure as defined above, the agreed time of completion of the job covered by this contract or the obligations of the contractor shall be extended by a period of time equal to period of delay, provided that on the occurrence of any such contingency, the contractor immediately reports to BHEL in writing the causes of delay and the contractor shall not be eligible for any compensation.

2.18 ***ARBITRATION & RECONCILIATION***

2.18.1 In case amicable settlement is not reached in the event of any dispute or difference arising out of the execution of the Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision by the Contractor in any manner touching upon the Contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the sole arbitration of the arbitrator appointed by BHEL/In charge.

The award of the Arbitrator shall be binding upon the parties to the dispute Subject as aforesaid, the provisions of Arbitration and Reconciliation Act 1996 (India) or statutory

modifications or reenactments thereof and the rules made there under and for the time being in force shall apply to the arbitration proceedings under this clause. The venue of the arbitration shall be the place from which the contract is issued or such other place as the Arbitrator at his discretion may determine

2.18.2 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 the Contract, such dispute or difference shall be referred to by either party to the arbitration of one of the arbitrators in the department of public enterprises. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the parties hereto finally and conclusively.

2.18.3 The cost of arbitration shall be borne equally by the parties.

2.18.4 Work under the contract shall be continued during the arbitration proceedings

2.19 ***PAYMENTS***

Payments to Contractors are made in any one of the following forms

2.19.1 Running Account Bills (RA Bills)

i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).

ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents along with relevant statutory documents applicable for the work.

iii) Recoveries on account of electricity, water, statutory deductions, etc are made as per terms of contract

iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to re do the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for

the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor.

v) In order to facilitate part payment, BHEL Site Engineer at his discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work

2.19.2 Final Bill

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope and upon material reconciliation, along with the following.

i) 'No Claim Certificate' by contractor

ii) Clearance certificates where ever applicable viz Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department, etc

iii) Indemnity bond as per prescribed format BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL

2.20 ***PERFORMANCE GUARANTEE FOR WORKMANSHIP***

2.20.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of as mentioned in the contract/NIT from the date of commencement of guarantee period as defined in Technical Conditions of Contract, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the balance security deposit.

2.20.2 BHEL shall release the balance security deposit subject to the following

i) Contractor has submitted 'Final Bill'

ii) Guarantee period as per contract has expired

iii) Contractor has furnished 'No Claim Certificate' in specified format

iv) BHEL Site Engineer/Construction Manager has furnished the 'No Demand Certificate'

in specified format

v) Contractor has carried out the works required to be carried out by him during the period of Guarantee and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Guarantee money refundable.

*2.21 **CLOSING OF CONTRACTS***

The Contract shall be considered completed and closed upon completion of all contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a completion certificate as per standard format, based on specific request of Contractor.

*2.22 **REVERSE AUCTION/PRICE BID OPENING:***

- *BHEL reserves the right to go for reverse auction at any point of time before opening of Price Bid.*
- *Bids with non-acceptance of reverse auction will be liable for rejection.*
- *Opening of Price Bid at discretion of BHEL.*
- *BHEL shall be at liberty to cancel the tender at any time, before ordering, without assigning any reason.*

*2.23 **SUSPENSION OF BUSINESS DEALINGS***

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.

2.24 OTHER ISSUES

2.24.1 Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 200/- unless otherwise required under relevant statutes.

2.24.2 In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.

2.24.3 Unless otherwise specified in NIT, offers from consortium/JVs shall not be considered.

2.24.4 BHEL may not insist for signing of Contract Agreements in respect of low value and short time period contracts

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract(s) for _____

_____
_____ (hereinafter referred to as "Contract"). The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint panel of Independent External Monitor(s) (IEMs), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles: -

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions.

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. The Bidder(s)/ Contractor(s) commits himself to observe the following principles during participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and shall await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process, terminate the contract, if already awarded, exclude from future business dealings and/ or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - **Compensation for Damages**

4.1 If the Principal has disqualified the Bidder (s) from the tender process before award / order acceptance according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.

4.2 If the Principal is entitled to terminate the Contract according to Section 3, or terminates the Contract in application of Section 3 above , the Bidder(s)/ Contractor (s) transgression through a violation of Section 2 above shall be construed breach of contract and the Principal shall be-entitled to demand and recover from the Contractor an amount equal to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee , whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years (to be reckoned from date of bid submission) with any other company in any country conforming to the anti-corruption approach in India that could justify his exclusion from the tender process. The date of such transgression, for the purpose of disclosure by the bidders in this regard, would be the date on which cognizance of the said transgression was taken by the competent authority. The transgression(s), for which cognizance was taken even before the said period of three years, but are pending conclusion, shall also be reported by the bidders.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Suspension of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 - Equal treatment of all Bidder (s)/ Contractor (s) / Sub-contractor (s)

6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.

6.2 In case of a joint venture, all the partners of the joint venture should sign the Integrity Pact. In case of Sub-contracting, the Principal Contractor shall be solely responsible for the adherence to the provisions of IP by the sub-contractor(s).

6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 -Independent External Monitor(s)

8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact on receipt of any complaint by them from the bidder(s).

8.2 The IEMs are not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as /Top Secret are not to be disclosed.

8.4 The Principal will provide to the IEMs sufficient information about all meetings among the parties related to the Contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEMs the option to participate in such meetings.

8.5 The role of IEM is advisory and the advice of IEM is non- binding on the Organization. However, as IEMs are invariably persons with rich experience who have retired as senior functionaries of the government, their advice would help in proper implementation of the IP.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of the tendering process, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an examination, and submit their joint recommendations to the Management. In case the full panel is not available due to some unavoidable reasons, the available IEM(s) will conduct examination of the complaints. Consent of the IEM(s), who may not be available, shall be taken on record.

8.7 The IEMs shall examine all the representations/grievances/ complaints received by them from the bidders or their authorized representative related to any discrimination on account of lack of fair play in modes of procurement and bidding systems, tendering method, eligibility conditions, bid evaluation criteria, commercial terms & conditions, choice of technology/ specifications etc.

8.8 The CMD, BHEL shall decide the compensation to be paid to the IEMs and its terms and conditions.

8.9 IEMs should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the Principal should be looked into by the CVO of the Principal.

8.10 If the IEMs have reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code / Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the IEMs may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs.

8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.

8.13 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings.

9.2 If any claim is made/ lodged during currency of this Integrity Pact, the same shall be binding and continue to be valid despite the lapse of this Pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.

10.2 Changes and supplements as well as termination notices need to be made in writing.

10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members.

10.4 Should one or several provisions of this Integrity Pact turn out to be invalid, the remainder of this Integrity Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this Integrity Pact with the Principal would be competent to participate in the bidding. In other words, entering into this Integrity Pact would be a preliminary qualification.

10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. If required, the Principal may adopt any mediation rules for this purpose. However, not more than five meetings shall be held for a particular dispute resolution. The fees/expenses on dispute resolution shall be equally shared by both the parties. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as per the terms & conditions of the Contract.

For & On behalf of the Principal
(Office Seal)

AJEET KUMAR JAISWAL Manager Works Contract Cell BHEL-SBD, Bengaluru - 560012

For & On behalf of the Bidder/ Contractor
(Office Seal)

Place BHEL SBD Bangalore
Date NIT issued date

Witness: TG Pragadeesh
(Name & Address) BHEL SBD Bangalore

Witness:_____
(Name & Address) _____
_____

ಪ್ರಗದೀಶ್ ಜಿ, ಹಿರಿಯ ವ್ಯವಸ್ಥಾಪಕರು/ವರ್ಕ್ಸ್ ಕಾಂಟ್ರಾಕ್ಟ್ ಸೆಲ್
प्रगदीशटी जी, वरिष्ठ प्रबंधक /वर्क्स कॉन्ट्रैक्ट सेल
PRAGADEESH T G, Senior Manager/ WCC
BHEL- SBD, Bengaluru-560012

Annexure-2

Clause on IP in the tender

Integrity Pact (IP)

(a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

Sl	IEM	Email
1.	Dr. Sarat Kumar Acharya, Ex-CMD, NLC	iem1@bhel.in
2.	Shri R. Mukundan, IRPS (Retd.)	iem2@bhel.in
3.	Shri Madan Lal Meena, IAS (Retd.)	iem3@bhel.in

(b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-I, in case of two/ three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note:

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person(s):

(1)
Name: Ajeet Kr. Jaiswal
Deptt: WCC
Address: BHEL SBD
Phone: (Landline/ Mobile)
080-2218-2246
Email: ajaiswal@bhel.in
Fax: _____

(2)
Name: T.G. PRAGADEESH
Deptt: WCC
Address: BHEL SBD
Phone: (Landline/ Mobile)
080-2218-2232
Email: pragadeeshtg@bhel.in
Fax: _____

ANNEXURE A

PROFORMA OF BANK GUARANTEE FOR EARNEST MONEY

(On non-Judicial paper of appropriate value)

Bank Guarantee No……..

Date……..

To

(Employer's Name and Address)

……..

Dear Sirs,

In accordance with the terms and conditions of Invitation for Bids/Notice Inviting Tender No……1(Tender Conditions), M/s. …….. having its registered office at ……2 (hereinafter referred to as the 'Tenderer'), is submitting its bid for the work of**……..3** invited by ……4.(name of the Employer) through its Unit at ……(

The Tender Conditions provide that the Tenderer shall pay a sum of Rs …… as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of .....5 ..... is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,

we, the .....[Name & address of the Bank] ..... having our Registered Office at ……..(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs. 5 .....(in words Rupees.....) without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Vendor/Contractor/Vendors in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We …….. Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tenderer or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including……..6 and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ……. [7] we shall be discharged from all liabilities under this Guarantee.

We, …… Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed……..5…..
b) This Guarantee shall be valid up to ……6
c) Unless the Bank is served a written claim or demand on or before _____7 all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of

(Name of the Bank)

Date……

Place of Issue……

ANNEXURE B

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, New Delhi-110049[1] through its Unit at **BHEL, Solar Business Division, Bangalore** having agreed to exempt_____ (Name of the Vendor / Contractor / Vendors) with its registered office at_____ [2] (hereinafter called the said "Contractor" which term includes vendors), from demand under the terms and conditions of the Contract reference No._____ dated _____ [3] valued at Rs……[4] (Rupees ----------)[4] (hereinafter called the said Contract), of Security Deposit for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs._____[5] (Rupees _____ only),

we ____(indicate the name and address of the Bank) having its Head Office at _____(address of the head Office) (hereinafter referred to as the Bank), , at the request of _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, , an amount not exceeding Rs._____ without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs._____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal or Arbitrator or any other authority, our liability under this present being absolute and unequivocal.
The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force upto and including _____6 and shall be extended from time to time for such period as may be desired by the Employer. Unless a demand or claim under this guarantee

is made on us in writing on or before the _____[7], we shall be discharged from all the liability under this guarantee thereafter.

We, ____(indicate the name of the Bank)____further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We,……. BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [5]

b) This Guarantee shall be valid up to ……[6]

c) Unless the Bank is served a written claim or demand on or before _____[7] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Date _____ Day of _____

for____(indicate the name of the Bank)__

(Signature of Authorized signatory)

[1] ADDRESS OF THE EMPLOYER. I.e Bharat Heavy Electricals Limited
[2] ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.
[3] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE
[4] CONTRACT VALUE
[5] BG AMOUNT IN FIGURES AND WORDS
[6] VALIDITY DATE ((At least 3 months more than completion period)
[7] DATE OF EXPIRY OF CLAIM PERIOD (At least 3 months more than the present date of validity of BG)

Notes:

1. The expiry of claim period shall be at least 3 months more than the validity date. It may be ensured that the same is in line with the agreement/ contract entered with the Vendor.
2. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.