

SOUTH CENTRAL RAILWAY
TENDER NOTICE No. C/SG/C/36/5/301,294,292,284, Date: 26-03-2009

For and on behalf of the President of the Union of India, The Deputy Chief Signal & Telecommunications Engineer (Projects), South Central Railway, Secunderabad invites sealed tenders (open) for the following works up to 15.00 hrs on 05-05-2009.

SI No	Tender No.	Description of work	Approximate value (Rs.)	Completion period	E.M.D (Rs.)	Cost of Tender form (Rs.)	
						In person	By Post
1	C/SG/C/36/5/301	STTC MLY Training Centre: Provision of Electronic Interlocking System (Model-Microlok II) for imparting training to ESM's and JE/Signals under comprehensive action plan for training (CAPT)	40,59,124.00	4 calendar months	81,190/-	3,000/-	3,500/-
2	C/SG/C/36/5/292	Hiring of road vehicle i.e., TOYOTA QUALIS/ TATA SUMO for the movement of officers/ Supervisors for inspection/Supervision of works as well as for carrying measurements at the site and for the office use at Headquarters/Secunderabad.	2,64,600.00	12 Calendar Months	5,300/-	1000/-	1500/-
3	C/SG/C/36/5/284	Interlocking of LC gates viz. LC Nos.135 at Gangineni Yard and LC.No.19 at Gullaguda Yard (2 LC gates) of Secunderabad Division of South Central Railway.	9,20,019.75	6 Calendar Months	18,410/-	2,000/-	2,500/-
4	C/SG/C/36/5/294	Interlocking of LC gates viz. LC Nos.36 between Wangapalli - Aler and LC. No. 25 at Pagidipalli Yard (2 LC gates) of Secunderabad Division of South Central Railway.	9,06,777.25	6 Calendar Months	18,410/-	2,000/-	2,500/-

Sl.No	Description	Time	Date
1	Last date of issue of Tender Documents in person	17-30 Hrs	04-05-2009
2	Last date of issue of Tender Documents by post	17-30 Hrs	24-04-2009
3	Closing of Tender Box	15-00 Hrs	05-05-2009
4	Opening of Tender Box	15-30 Hrs	05-05-2009

If the date of opening of tenders happens to be a declared holiday at a later date, the tenders will be opened on the next working day at the stipulated time.

For further tender conditions/ details (available in the tender documents) and for downloading of tender documents, please visit our website <http://tenders.gov.in/>

(SD/-)
Deputy Chief Signal & Telecom. Engineer,
(Projects), S.C.Railway, Secunderabad -71.
 for and on behalf of the President of the Union of India.
 Contd...2.

NOTE:

- 1(a) The above Earnest Money deposit shall be furnished in the form of Cash/FDR/DD drawn in favour of FA&CAO/C/SCR/SC valid for a period of 90 days from the date of Tender Opening. Earnest Money in the form of Bank Guarantee Bonds is not acceptable.
- (b) If the Tenderer desires to furnish in cash towards EMD, they should deposit the amount in the Divisional Cashier's office (Pay)/ South Central Railway/ Secunderabad and obtain money receipt which should be enclosed with the Tender.
- (c) The standing Earnest Money Deposit, if any with the Railway, will not be considered for the purpose of this Tender.
- (c) The Tender form, which is not accompanied with the requisite Earnest Money, will summarily be rejected. The "On Account" name of the tender should be specifically and clearly mentioned on the EMD certificate. The tender document should be dropped in the sealed box kept in the office of the undersigned or any other location as specified below. Railway is not responsible for any postal delays in transmission of the tender booklets by Regd. Post. Railways reserve the right to cancel the tender at any time without assigning any reason thereto.
2. The tender should be submitted in the prescribed form obtained from the office of the Deputy Chief Signal & Telecom. Engineer (Projects), South Central Railway, Secunderabad on submission of Cash Receipt as per the cost indicated above in person.
3. The cost of Tender documents should be remitted to the Chief Cashier/ South Central Railway/ Secunderabad; or Divisional Cashier (Pay), South Central Railway, Secunderabad, Guntakal, Vijayawada, Guntur, Nanded or any Station Master on South Central Railway and the Money Receipt so obtained should be submitted in original along with a letter of request to the Deputy Chief Signal & Telecom. Engineer (Projects), South Central Railway, Secunderabad for issue of Tender Documents. Please note that money receipt so obtained will only be accepted. Direct payment to the office of the undersigned will not be entertained. Money orders are not accepted.
4. In case the tenderer is not in a position to take the schedule in person, clear authorization letter duly attesting the specimen signature should be produced.
5. The tender documents are not transferable and cost of the tender documents is not transferable & refundable.
6. The tender documents duly completed in all respects shall be dropped in the tender box kept for the purpose at the following places:
 - (a) Tender Hall, DRM's office compound, Hyderabad Division, Secunderabad.
 - (b) Dy.CSTE/P/BZA's office in Vijayawada.
 - (c) Dy.CSTE/CN/GTL's office in Guntakal.
7. Tenders will be opened simultaneously at the above places in the presence of those tenderers who are present at that time.
8. The tender document can down loaded from **our website** <http://tenders.gov.in/> and the tenderers may participate in the bid by enclosing Cash receipt towards the cost of tender and EMD. If during the process the tender finalization, it is detected that tenderer has submitted tender documents after making any changes/ additions/ deletions in the tender documents down loaded from website, his offer will be summarily rejected and the earnest money deposited by the tenderer shall be forfeited by the Railway.

**OFFICE OF THE DEPUTY CHIEF SIGNAL &
TELECOMMUNICATION ENGINEER (PROJECTS), SOUTH
CENTRAL RAILWAY, SECUNDERABAD.**

NAME OF WORK: STTC MLY Training Centre: Provision of Electronic Interlocking System (Model- MicrolokII) for imparting training to ESM's and JE/Signals under comprehensive action plan for training (CAPT)

* * *

TENDER NO. & : C/SG/C/36/5/301
Date : 26-03-2009

DATE & TIME OF CLOSING OF : 05-05-2009
TENDER BOX AT 15-00 HOURS

DATE & TIME OF OPENING OF : 05-05-2009
TENDER BOX AT 15.30 HOURS

Estimated value : Schedule 'A' : Rs. 40, 59,124.00

Total : Rs. 40, 59,124.00

EARNEST MONEY DEPOSIT :Rs. 81,190.00

NAME & ADDRESS OF THE CONTRACTOR:

TENDER No. C/SG/C/36/5/301 Date. 26-03-2009

To

THE PRESIDENT OF INDIA
 ACTING THROUGH THE Dy. CHIEF SIGNAL
 & TELECOMMUNICATION ENGINEER (PROJECTS)
 SOUTH CENTRAL RAILWAY,
 SECUNDERABAD – 500 071

I/We have read the various conditions to tender attached hereto and hereby agree to abide by the said conditions. I/We also agree to keep this Tender open for acceptance for a period of the same and in default thereof, I/We will be liable forfeiture of my/our 'Earnest Money Deposit'.

I/We offer to do the work.....

“ at the rates quoted by me/us in respect of the Schedule attached and hereby bind myself ourselves to complete the work in period from the date of issue of letter of acceptance of the tender. I/We also hereby agree to abide by the General and Special Conditions of the Contract and to carry out the works according to the Specifications for materials and works laid down by the Railway for the present contract.

2. A sum of Rs. is herewith forwarded as Earnest Money Deposit. The full value of the Earnest Money shall stand forfeited without prejudice to any other rights or remedies if –

- (a) I/We do not execute the contract documents within seven days after receipt of the notice issued by Railways that the documents are ready and
- (b) I/We do not commence the work within fifteen days after receipt of orders to that effect.

3. Until a formal agreement is prepared and executed acceptance of this tender shall constitute a binding contract between us subject to modifications, as may be mutually agreed to between us and indicated in the letter of acceptance of my/our for this work.

Contractor's Address:

SIGNATURE OF WITNESSES

Signature of the Contractor/s.

1.

Date:

2.

Address of the contractor(s):

SECTION-II

INSTRUCTIONS TO TENDERERS (ITT) FOR THE TENDER OF INSTALLATION OF ELECTRONIC INTERLOCKING

GENERAL:

2.1.1 Tender documents:-

Tenders are invited as per Tender notice enclosed. The materials and installation required, tendering procedure and contract terms are prescribed in the tender documents. The set of tender documents issued for the purpose of tender includes following sections together with any addendum and corrigendum thereto and any minutes of pre-bid conference issued prior to the tender submission

Section	Contents
Section-I	Notice Inviting Tender
Section-II	Instructions to the tenderers
Section-III	Special Conditions of Contract
Section-IV	Additional information with reference to Technical specifications
Section-V	Schedule of Work to be quoted by Tenderer(s)
Section-VI	Annexures -Technical specification

The tenderer shall be governed by General Conditions of the Contract, Instructions to tenderers, Special Conditions of Contract, Technical specifications and Schedule of works Wherever Instructions to Tenderers and Special Conditions of Contract differ from General Conditions of Contract, the provisions of Instructions to Tenderers and Special Conditions of Contract shall prevail.

2.1.2 All offers are required to be submitted at the place and time indicated in the Tender Notice. All the information in the offer must be in English. Information in any other language shall be accompanied by its authenticated translation in English. Failure to comply with this may render the offer liable to be rejected. In the event of any discrepancy between the offer in a language other than English and its English translation, the English translation with prevail.

2.1.3. The Contractors who are working in the establishment through contract labour (Regulation and Abolition) Act, 1970 and Central Rule, 1971, shall obtain a license from the concerned Assistant Labour Commissioner and produce the same to the Railway either along with the tender or before signing the agreement failing which the contract awarded will be terminated on the ground that they have not complied with legal provisions of the said act and Earnest Money shall be forfeited.

2.1.4 The terms “Correction slip” as referred to in this tender document includes the following terms (i) Addendum slip (ii) Corrigendum slip which are issued in consecutive serials.

2.2 EARNEST MONEY:

- (a)
 - (i) The Tenderer shall be required to deposit a sum of **Rs. 81,190.00** ps with the Tender as an Earnest Money Deposit for the due performance of the stipulation to keep the offer open for **90** days. It shall be understood that the Tender documents have been sold/issued to the tenderer and the tenderer is permitted to tender in consideration of the stipulation on his part, that after submitting tender he will not resale from his offer or modify the terms and conditions thereof in a manner not acceptable to the Chief Signal & Telecom. Engineer of South Central Railway. Should a Tenderer fail to observe or comply with the said stipulations, the aforesaid amount shall be liable to be forfeited to the Railway.
 - (ii) If his tender is accepted this Earnest Money will be retained as part of security for due and faithful fulfillment of the contract in terms of Clause 16 of the General Conditions of the Contract. The earnest moneys of other tenderers shall be returned to them. The Railways shall not be responsible for any loss or depreciation that may happen thereto while in their possessions nor be liable to pay interest thereon.
- (b) The full amount of Earnest Money of **Rs. 81,190.00** shall be forfeited if the Tenderer fails to execute the agreement within 7 days from the receipt of advice of readiness of the contract agreement. This will be without prejudice to any other rights or remedies open to the Railways.

2.3 STUDY OF LOCAL CONDITIONS:-

- 2.3.1 The intending tenderer is advised to study the tender documents carefully. Any submission of an offer by the tenderer shall be deemed to have been done after a careful study and examination of these documents with full understanding of the implications thereof. It will be understood that the tenderer(s) has/have got him/himself/hemselves clarified on all points, doubts and interpretation by the proper authorities of the 'Railway Administration. These conditions and specifications shall be deemed to have been accepted unless otherwise, specifically commented upon by the Tenderer in his offer. Failure to adhere to anyone or all these instructions may render his offer liable to be ignored without any reference.
- 2.3.2 The scope of work to be executed by the contractor is specified in special conditions of the contract and schedule of works, which may be studied.

It will be imperative that each tenderer to fully acquaint himself with all the local conditions, signaling practices adopted and other factors which would have any effect on the performance of the contract and cost of the stores. No request for the change of rate, or time schedule of delivery of stores/Execution of work shall be entertained after the offer is accepted by the Railway on account of any local condition or factors.

The tenderers may undertake study/survey of signaling systems/practices used in S.C.Railway and make his own assessment of the work involved including integration of the indoor equipment with outdoor equipment. Any equipment/design/component needed to make the entire system successful/functional shall be supplied by the tenderer without any extra cost. In the event of the tenderer desiring to have a field visit before furnishing his offer, he may apply to Chief Signal & Telecommunication Engineer (Projects), South Central Railway, Secunderabad for permission in this regard. Such permission shall be granted by the Railway but the expenses in this regard shall be borne by the Tenderer completely.

2.4 CLARIFICATION REQUIRED BY THE TENDERER

2.4.1 Specifications, drawings, requisites & requirements referred to in the body of this specification form an essential part thereof. The sources from which the drawings & specifications referred to in this tender can be obtained from Dy.CSTE/Projects/SC and RDSO/LKO.

2.4.2 Should a tenderer find discrepancies in or omission from the drawing or any of the Tender documents or he has any doubt to their meaning he should at once notify the Railway, who may send a written clarification to all tenderers. Any clarification required by the Tenderer may be obtained from the Chief Signal & Telecommunication Engineer(Projects) South Central Railway, Secunderabad-500071.

Any technical clarification regarding Signal plans, policy etc should be obtained before participating in the tender.

2.5 CONTENTS OF BID:-

Technical capability:

2.5.1 Qualification criteria under this para lays down the minimum acceptable qualification in various areas to ensure that qualified bidder has the requisite experience, expertise and financial & human resources to successfully complete the work and offers a proven safe EI system.

2.5.2 The Electronic Interlocking system in the offered configuration shall have current and valid cross-approval from RDSO. The copy of the cross-approval certificate shall be submitted along with the tender offer.

2.5.3 The tender(s) shall have permanent technical organization consisting of at least two qualified Engineers, 4 Diploma holders and 8 to 10 skilled artisans/certified technicians with a minimum experience of 3 years each.

For these signaling works, a Supervisor as specified mentioned in Clause 26 of General Conditions of contract shall be an experienced person/Engineer/Ex-signal Inspector of the Railway with 5 to 6 years experience in Railway Signalling

Installation and about 2 years experience in Supervision of works of Installation of Colour Light Signalling on Railways. Details of man power employed shall be submitted with the tender. The tenderer(s) shall have adequate telecom. Facilities, computer and data network facilities, transport arrangement, construction machineries, tools and plants etc for smooth execution of the project.

2.5.4 Technical collaboration: The tenderers other than original equipment manufacturers shall submit authorization from RDSO approved EI OEM. The tenderer shall submit along with his offer full details of technical collaboration/MOU with others firms if any, for maintenance, repair servicing testing including application programming for yard specific application of the offered ELECTRONIC INTERLOCKING equipment in India acceptable to the Railway. It shall also include continuous flow of technology improvement/future Upgradation.

2.5.5 The tenderer shall provide satisfactory evidence acceptable to the Railway to show that:

- i. Is a licensed manufacturer, who regularly manufactures the items offered and had adequate technical knowledge and practical experience.
- ii. Has adequate financial stability and status to meet the obligation under the contract for which he is required to submit a report from a recognized bank or a financial institution.
- iii. Has adequate plant and manufacturing capacity to manufacture and supply the items offered within the delivery schedule offered by him
- iv. Has established quality control system and organization to ensure adequate control at all stages of the manufacturing process.

2.5.6 Tenderer shall set up the following facilities either through Indian partner as a Joint Venture or directly by themselves

- (a) Facilities for application program/yard specific data input changes commensurate with any changes in the station yard layout.
- (b) Maintenance, Repair Servicing and testing of defective cards/modules/sub assembly of the EI System quoted in this tender.

2.5.7 The tenderer(s) must also certify that in case of liquidation of the joint venture/collaboration, the other partner(s) shall be responsible for the remaining liabilities and also to extend full maintenance/repair support for the requisite period

2.5.8. ELIGIBILITY CRITERIA :

2.5.8.1 The tenderer(s) should have physically completed in last three financial years (i.e. current financial year and three previous financial years) at least one ***SIMILAR SINGLE WORK*** for a minimum value of 35% of advertised tender value of work.

- i) The work of Execution of any Electronic Interlocking systems – Indoor, or Electronic Interlocking System Indoor and out door - for Railway Signalling Purpose (The equipment in case the Firm is not manufacturing, they should have an authorization from the original equipment manufacturer (MICRLOCK-II)

signed before the date of tender opening shall be considered as similar nature of work.

- ii) A certificate for this purpose issued by an officer not below the rank of JA grade officer shall be submitted along with the tender.
 - iii) The value of similar nature of works completed during the qualifying period and not to the payments received within the qualifying period alone will be considered.
 - iv) In case, final bill of similar nature of work has not been passed, paid amount including statutory deductions will be considered, if final measurements have not been recorded or if final measurements have been recorded and work has been completed with negative variation. However, if final measurements have been recorded and work has been completed with positive variation, but, variation has not been sanctioned original contractual value will be considered for judging eligibility.
- 2.5.8.2 Total contract amount received during the last financial years and in the current financial year should be a minimum of 150% of advertised tender value. Tenderer(s) should submit this effect an attested certificate or an audited balance sheet duly certified by the Chartered Accountant etc from the Central Government / State Government / Public Sector Undertaking for the work done for them.
- 2.5.8.3 The tenderers having credentials in their own name only need to quote. The consortium agreements and MOUs will not be considered for eligibility.
- 2.5.4 Technical Compliance & Deviations if any

Tenderer should note that the interface equipment/device to the field signaling gears and control panels to be supplied should be complete and compatible with the signaling equipment in use for Relay Interlocking on S.C.Railway.

Typical interface circuits to be used for the control of simulated signals and points shall be submitted along with the tender offer.

Any equipment/work required to make the interface equipments match with simulated outdoor signaling equipment is the responsibility of the contractor. The signals are to be simulated with lamps fitted on board and track circuits, points and KIs are to be simulated with piano type switches on other simulation board. S.C.Railway will not bear any extra cost on account of changes/addition required for ensuring compatibility of interface devices with simulated outdoor signaling equipment.

The equipment being offered shall be in accordance with the drawings and specifications as given in Technical Specification. The tenderer(s) have to confirm that the equipment being offered conform to the RDSO's **Specn. No.RDSO/SPN/192/2005** with latest amendments up to the date of tender opening and will integrate with the outdoor signaling equipment supplied and installed on S.C.Railway by different manufacturers. **Para-wise Compliance statement of tender document and technical specifications shall be submitted.**

The Tenderer shall certify that the system being offered by him fully meets Technical Specifications. The compliance statement should be given for each

individual clause and sub-clause of Technical Specifications separately. For this purpose separate para by para comments on the Railways technical specifications shall be included as a part of the Tender document.. The compliance statement of Technical Specifications should be unambiguous.

The clauses which are being complied by the tenderer should be as “complied”. If the tenderer does not give un-qualified compliance to all the clauses or he does not provide a clear and detailed deviation (he shall furnish detailed justification for the deviations proposed) from the clauses and sub-clause of Technical Specifications, the Tender is liable to be rejected without asking further clarification from the tenderer.

The clauses where tenderer is unable to comply, deviation should be clearly brought out Remarks like ‘See Technical Literature Attached’ or other remarks of similar nature shall be avoided. Tenderer should not assume that Railway will interpret the compliance from Brochures or Technical Manuals attached by him. Details of variations from the drawings and specifications, if any, should be clearly indicated in the offer.

Notwithstanding the above, tenderer should attach adequate technical details and description of the equipment quoted so that Railway, if desired, can also independently verify the compliance of remarks given by the tenderer.

Compliance statement of Technical specifications(as mentioned in the above paras) and the deviations if any shall also be submitted on a Compact Disk (CD) on a standard MS-Offices package along with Tender.

Note: The Railway reserves the right to accept or reject these deviations and Railway’s decision thereon shall be final. The deviations quoted by the tenderer will become part of contract agreement only to the extent to which they are specifically mentioned and as accepted in the letter of acceptance.

2.6. The Tender shall be submitted (Besides the above) with the following details

- (A) Full Technical Specifications of the equipment and sub-system. A brief outline of the system being offered along with diagrams and drawings, description of the equipment and materials being used in the system along with cross reference to the equipment specifications shall be enclosed. Details of proposed Power Supply System along with load calculations shall also be included. One set of complete required documents as laid down below shall be submitted.
 - i. Design approach of the system
 - ii. Functions achieved in hardware and software
 - iii. Mode of interaction between hardware and software
 - iv. Salient features through which fail safety has been achieved eg Use of a watchdog timer, automatic shut down etc
 - v. Proof of safety in the form of process adopted for safety analysis and result there of

- vi. The following certifications from approved validation agency (independent safety auditor)
- (a) Correctness and safety of the software
 - (b) Reliability and fail safety of the interlocking system
 - (c) Expected MTBF and availability of the system.
 - (d) Expected MTBWSF.
 - (e) Expected MTTR.
 - (f) Details of modifications carried out in the system and its subsequent validation.

(B) Name of manufacturer, place of manufacture and inspection.

(C) A list of spare parts as recommended by the manufacturer shall be enclosed.

(D) A list of Test equipment and other special tools as required for data input simulation testing, installation and maintenance etc of the system and a detailed write-up about the procedure to be adopted for use of the same.

(E) The Time schedule of work including BAR/PERT Charts

Note : Offers of the tenderer(s) not submitting the requisite information/documents are liable to be ignored

2.6.4 QUOTING OF RATES

The tender document submitted shall contain:

- (a) The rates of stores & material and works quoted according to the proforma and Schedule of Work. Rates in the offer should be in the Indian currency only. Offers in foreign currency will not be accepted. The tenderers should quote rate in figures and in words. Wherever there is difference between the rates quoted in figures and in words, the rates quoted in words will be taken as correct.
- (b) All rates and other information like discounts etc having a bearing on the rate shall be written both in figures and in words in the prescribed offer form. The tenderer shall quote the complete rate for all items of works given in the Schedule of Works. Offer received for part of schedule will not be considered and shall be rejected. The following factors shall also be kept in mind while quoting the rates.

2.7 (i) Price variation & Taxes:

The prices quoted by the Tenderer and accepted by the Railway shall be firm and hold good till the completion of the works and no additional claims will be admissible on account of any price variation or fluctuation in market rates. All rates mentioned in Schedules are deemed to be inclusive of all taxes, inclusive of sales tax and excise duty, or any other authority. However, necessary D form will be issued by the Railway administration on Contractor's name only for supply of materials where Central Sales Tax is levyable. Then tenderers may take this consideration into account while quoting the rates.

ii) Long term availability of spares and system support :-

An undertaking that the components/modules as also the main equipment quoted in the schedule requirements will be supplied at the same unit rates until the end of the warranty period and subsequently also at the rates mutually agreed to.

The manufacturer shall guarantee that spare parts for the system shall be available for life cycle period. The tenderer shall give an undertaking to supply on payment all maintenance spares and tools required for the equipment during life time. In case of any plan to discontinue any equipment or components from the manufacturing process, at least one year notice shall be given to the Railways before they are discontinued or phased out. This will enable the Railways to assess the life time requirement of spares needed and order sufficient quantity prior to stoppage of the manufacture. This condition is to be observed for eight years after expiry of the warranty period (of 3 years) so that the Railway can procure spares for the components/modules from the suppliers. However, the details of the same shall be kept confidential by the Railway. The tenderer shall undertake to enter into an AMC with Railways if the Railway desires beyond warranty period under which supply of spare, repairs to defective cards and call charges for each visit as may become necessary shall be specified.

He shall also undertake to supply additional equipment required for replacement of expansion of the net work, that may become necessary due to additional traffic requirements during the currency of the agreement.

An undertaking to the effect that additional quantities up to 25% in case of major items and 100 % in case of minor items of the agreement quantity at the same unit rates shall be supplied by the tenderer in case order for the additional quantity is placed within the currency period of contract. It should be noted that this excludes, additional quantities that may be required as warranty or replacement due to defective design and manufacture etc. On this account, the responsibility of the tenderer under the warranty clause will not be diluted in any way.

2.8 SIGNING OF OFFERS:-

2.8.1 Any individual signing the tender or other documents connected therewith should specify whether he is signing

- i. As sole proprietor of the concern or as attorney of the sole proprietor
- ii. As a partner or partners of the firm
- iii. As a Director, Manager or Secretary in the case of a Limited company who is authorized by a resolution passed by the Board of Directors or in pursuance of the authority conferred by Memorandum of Association.

If the firm is not registered under the Indian partnership Act, all the partners or the attorney duly authorized by all of them should sign the tender and all other connected documents. The original power of attorney or other documents empowering the individual or individuals to sign on behalf of them should be furnished to the Railway for verification, if required.

2.8.2 Validity of offers: The tender must keep their offer open for acceptances for a minimum period of 90 days from the date of opening of tenders.

2.9 SUBMISSION OF OFFERS:

2.9.1 The offer shall be as per Instructions to Tenderers, General Conditions of Contract, Special Conditions of Contract, Technical Specifications and Schedule of Works given in this tender.

2.9.2 All offers shall be either type-written or written neatly in indelible ink in English. Each page of the offer must be numbered consecutively, should bear the tender number and should be signed by the tenderer at the bottom. A reference to the total number of pages comprising the offer must be made at the top right hand corner of the first page.

2.10 MISCELLANEOUS:-

2.10.1 The contractor shall supply to the railway free of charge all software update data and specifications which may result from developments effected by him or his collaborator in the period of currency of contract. The Railway reserves the right for such modified or improved in lieu of these originally quoted for, based on prices and other conditions mutually agreed upon.

2.10.2 This tender is not transferable. All expenses in drawing up the agreement and the cost of the stamp duty if any shall be borne by the Railway Administration.

2.10.3 Any special conditions stated by the Tenderer(s) in the covering letter submitted along with the tender shall be deemed to be a part of the contract to such extent only as have explicitly been accepted by the Railways.

2.10.4 The cancellation of validity of any document such as power of attorney partnership; deed rate etc. forthwith shall be communicated by the contractor to the Railway in writing, failing which the Railway shall have no responsibility or liability for any action on the strength of said documents.

(Sd/-)

Deputy Chief Signal & Telecommunication Engineer
(Projects) S.C.Railway/Secunderabad
for and on behalf of the President of India

SECTION-III

3.0 SPECIAL CONDITIONS OF CONTRACT

This section shall be read along with stipulations in other sections of the tender

3.1 GENERAL

3.1.1 SCC & GCC clauses:-

These regulations of tender and contracts shall be read in conjunction with general conditions of Contract which shall be subject to modifications, additions or super session by these special conditions of contract and/ or special specifications , if any, annexed to the tender form. Where there is any conflict between the special conditions and general conditions of the Contract, the former shall prevail.

3.1.2 Royalties and patent rights

The contractor shall defray the cost of all Royalties fees and other payments in respect of patents, patent rights and licenses which may be payable to patentee, licensor or other person or corporation and shall obtain all necessary licenses. In case of any breach (whether willfully or inadvertently) by the contractor on this provision, the contractor shall indemnify the Railway and their officers, servants, representatives against all claims, proceedings, damages, cost charges, expenses, loss and liability which they or any of them may sustain, incur or be put to by reason or in consequence directly or indirectly of any such breach and against payment of any royalties, damages or other moneys which the Railway may have to make to any person or holder entitled to patent rights in respect of the users of any machine, instruments, process, article, matter or thing, constructed, manufactured, supplied or delivered by the contractor or to his order under this contract.

3.1.3 Implication of MODVAT rules:

The liability of the purchaser to reimburse excise duty is limited to such sum as may be found legally due and payable in respect of contract goods after availing the full credit on all the inputs used in the manufacture of the finished products irrespective of whether the contractor has in fact availed of the said credit or not.

3.1.4 Foreign exchange and import license:

Any foreign exchange or Import License, if required, for supply of goods and services under the contract will have to be arranged by the tenderer. Railways shall make all payment under the contract in Indian Rupees only.

3.1.5 SECURITY DEPOSIT & PERFORMANCE GUARANTEE BOND:

(i) SECURITY DEPOSIT

- a) The amount of Security Deposit that is to be recovered from the Contractor will be 5% of the Contract Value.
- b) The rate of recovery shall be @ 10% of the bill amount till the full security deposit is recovered.

- c) The security deposit can be deposited in cash. Otherwise, it will be recovered only from the running bills of the contract and no other mode of collecting S.D such as Bank Guarantees; fixed deposits etc shall be accepted.
- d) Security Deposit shall be returned to the contractor after the completion of warranty period. The warranty period is 36 calendar months from the date of completion of the work.
- e) Before releasing the S.D., an unequivocal “no claims” certificate shall be submitted by the contractor.

(ii) PERFORMANCE GUARANTEE BOND

- a) The value of Performance Guarantee bond that is to be given by the Contractor in the form of irrevocable Bank Guarantee should be 5% of the Contract Value.
- b) The tenderer is requested to submit a performance guarantee in any of the following forms:
 - (i) A deposit of cash.
 - (ii) Irrevocable bank guarantee from State Bank of India or any Nationalised Bank.
 - (iii)
 - (iv) Govt. securities including State Loan bonds at 5% below the market value.
 - (v)
 - (vi) Deposit receipts, Pay orders, Demand drafts and guarantee bonds. These forms of performance guarantee could be either of the State Bank of India or of any the nationalized banks.
 - (vii) Guarantee bonds executed are deposits receipts tendered by all scheduled banks
 - (viii) A deposit in the Post office saving bank
 - (ix) A deposit in the national savings certificate
 - (x) Twelve years national defence certificate
 - (xi) Ten years defence deposits
 - (xii) National defence bonds
 - (xiii) Unit trust certificates at 5% below market value or at the face value which ever is less
 - (xiv) FDR in favour of FA&CAO/Construction/Secunderabad (free from any encumbrance)
- C). The performance Guarantee is to be submitted after receipt of letter of acceptance and before signing the Contract agreement. The time limit for submission of performance guarantee is 15 days after the date of issue of letter of acceptance.
- D) The Performance guarantee will be released only after satisfactory completion of the work and after issue of completion certificate issued by Competent Authority.

3.1.6 Executive authority in-charge of the work

The Deputy Chief Signal & Telecommunication Engineer(Projects), South Central Railway, Secunderabad will be the Executive-in-charge of the work. In the day to day execution of the work any clarifications or instructions given by the said Engineers shall be final and binding on the contractor.

Regarding alterations to the contents of the contract or any other matter connected with the contract, the Chief Signal & Telecommunication Engineer(Projects) South Central Railway, Secunderabad shall be the final authority and his decision shall be final and binding on the contractor.

3.1.7 Force Majeure

If at anytime, during the continuance of the agreement, the performance in whole or in part by either part of any obligation under the agreement shall be prevented or delayed by reasons of any war, hostile acts of the enemy, civil commotion, sabotage, fires, floods, explosions, epidemics, quarantine restrictions, strikes and lockouts and any statute, statutory regulations, orders or requisitions issued by any Govt. Department or a competent authority or acts of God(hereinafter referred to as unforeseen eventualities) then provided notice of the happening of any such unforeseen eventuality is given by either party to the other within fifteen days from the date of occurrence thereon, neither party shall by reason of such unforeseen eventualities be entitled to terminate this contract agreement nor shall either party have any claim for damage against the other in respect of such non-performance or delay in performance.

Performance of the contract agreement shall however, be resumed as soon as practicable after such unforeseen eventuality has come to an end or ceased to exist. Provided that, if performance in whole or part of any obligation under the contract agreement is delayed by means of any such unforeseen eventuality for a period exceeding six months, either party may, at his option, terminate the contract agreement provided further that in the event of such prevention or delays aforesaid, instead of exercising the option both parties may consult with each other with a view to minimize the effects of such prevention or delay and continue the operation of this contract agreement.

3.1.8 Compliance of Labour Laws

The contractor shall not employ labour below the age of 18 years.

The contractor shall abide by the Rules and Regulations of the contract labour(Regulation and Abolition) Act, 1970 and Central Rules, 1971 as amended up-to-date.

All the provisions of relevant labour laws shall be strictly observed by the contractor. Non observance of any such provision or denial of rights and benefits to which they are normally entitled shall be viewed seriously and action shall be taken against defaulting contractor. He shall not be allowed to undertake or execute any work through contract labour except under and in accordance with a license issued under the said act in that behalf by the authorized licensing officer.

3.2 **WORK DETAILS:-**

3.2.1 Location of works

The work involves installation of training model of Microlock-II EI system at Signal and Telcom Training School (STTC)-Molali, Secunderabad with simulated signals, track and points.

The scope of work broadly includes the following:

3.2.2 Contractor's Scope of Work

The scope includes the supply of indoor equipments, transportation of all the equipments as per schedule of work for the work from OS/Stores/Projects/SC at Secunderabad to the site of installation, their Installation, testing and commissioning of system including supply and execution of all items of supply as well as work in the relay/equipment room, power supply equipment room with all the works viz, provision of relay racks, relay fixing and wiring up to Cable Termination Rack etc. along with design of logic for a double line four road station with common loop and a siding and it will be the responsibility of the contractor to commission the complete indoor installation to work properly with simulated outdoor gears ie. Points, signals & other field signalling equipments, installation, testing and commissioning including transportation of all equipments to site of installation.

The details of Power supply scheme to be supplied is described in the Item No.9 of Schedule.

Board scope is as follows.

- a) Supply of EI equipment complete (without stand by) as per specifications mentioned in Section-V and design of application logic for a double line four road station with common loop and a siding.
- b) VDU for operator of 30" size.
- c) Complete interface equipment between EI & simulated outdoor gears and EI & VDU and EI and Control cum indication panel.
- d) Operation Cum Control panel also has to be interfaced using Non-vital input/output cards.
- e) Power Supply equipment as per schedule of works.
- f) Technician terminal with VDU, Key board, printer & mouse.
- g) Inter-connecting cables
- h) Any other equipment required for installation & commissioning of the EI system to function efficiently.
- i) Training of Railway personnel at manufacturers or Supplier's premises in India.
- j) Complete documentation as per clause 6.0 of Special Conditions of Contract.
- k) Maintenance & supervision of installation for one year after commissioning under the charge of the Railway's personnel
- l) Maintenance beyond one year is optional. If such services are rendered by the contractor, payment will be made after full satisfaction of Railway Administration and Pro-forma Invoice shall be certified by Railway Engineer
- m) Warranty period of 3 years for the equipments/systems/components supplied by the contractor.

Additional work due to change of Interlocking plan shall be carried out by the contractor expeditiously without any extra cost, upto 10% increase in number of routes. The outdoor equipment required for such alteration will be made available by Railways.

- 3.2.3. The supply of materials shall be as per Schedule of work. This includes supply of Electronic Interlocking System complete with all such systems like CPUs and all

the requisite cards of the EI system, necessary interface equipment for interfacing with simulated signaling gears, maintenance terminals with VDUs keyboards and printers, Operator panel interface etc. The complete interlocking system has to work signaling gears from VDU and control cum indication panel in accordance with table of control in a fail safe manner.

3.2.4 Work to be done by the Railways/other agencies

- i. Supply of approved signaling plan and TOC

3.2.5 Completion Period:

The completion period for the entire work is of utmost importance. The entire work is required to be fully executed within **4 months** from date of issue of Letter of acceptance(LOA) The contractor shall depute adequate no of competent Engineers/qualified staff to install, test and commission the equipment at site within the stipulated period.

NOTE-- Details of phased manufacturing programme indicating indigenous, content at each stage may be submitted along with the tender as PERT/BAR chart.

3.2.6 Extension of Completion period:

Subject to any requirement in the contract as to completion of any portion or portions of the work before completion of the whole, the contractor shall fully and finally complete the whole of the work comprised, in the contract by the date entered in the contract, provided that if any modifications have been ordered which, in the opinion of the Railway's Engineer, have materially increased the magnitude of the work, such extension of the contracted date of completion may be granted as shall appear to the Railway' Engineer to be reasonable in the circumstances provided moreover that the contractor shall be responsible for requesting such extension of the date as he may consider necessary as soon as a cause thereof shall and in any case not less than one month before the expiry of the original date fixed for completion of the work

3.2.7 Extension of time of Railway account

In the event of any failure or delay by the Railway to handover to the contractor possession of the lands necessary for the execution of the works or to provide the necessary drawings or instructions or any other delay caused by the Railway due to any other cause whatsoever, then such failure or delay shall; in no way affect or vitiate the contract or alter the character or entitle the contractor to damage or compensation thereof, but in any such case, the Railway may grant such thereof extension of the completion date as may be considered reasonable.

If the contract be delayed at any time in the progress of the work by any act of neglect of the Railway's employee or by another contractor employed by the Railway or by strike, lockouts, fire unusual delay in transportation, unavoidable

causalities or any cause beyond the contractor's control, or any delay authorized by the Railway Engineer decide to justify the time of completion of the work may be extended for such reasonable time as the Railway Engineer on behalf of the Railway Administration may decide.

3.2.8 Liquidated damages & Railway's rights

The time for completion of the work by the date or extended date fixed for completion shall be deemed to be the essence of the contract and if the contractor shall fail to complete the work within the time prescribed, the Railway shall if satisfied that the work can be completed by the contractor within reasonably short time thereafter be entitled without prejudice to any other right or remedy available on the behalf to recover by way of ascertained and liquidated damages sum equivalent to half percent of the contract value of the work for each week or part of week, the contractor is in default and allow the contractor such further extension of time as the Railway Engineer may decide. If the Railway is not satisfied that the work can be completed by the contractor to complete the work within the further extension of time allowed as aforesaid, the Railway shall be entitled without prejudice to award any other contract under Clause 62 of General Conditions of the contract whether or not actual damage is caused by such default.

By analysis of failures, if any design deficiency is pointed out by the Railway, the contractor shall rectify it at his own cost.

3.3 INSPECTION AND TEST:-

3.3.1 Prototype testing

Equipment that has been tested and approved for unconditional and unrestricted use on any passenger carrying Railway by any Railway Administration will be exempted from fresh type approval test on Indian Railway. However, for this exemption, complete details of test carried out, test results and approval certificate issued by concerned Railway Administration must be submitted to CSTE/W/ SC.Railway/Secunderabad for verification and acceptance. Railway's decision on this will be final.

3.3.2 Inspection and test shall be carried out at the place of production, or supplier and at site of installation by the Railways authorized representative (Inspecting officer) to ensure that all the requirement of tender specifications are complied during manufacture, supplying, installation and commissioning in accordance with Technical Specifications, Special Condition of Contract and General Condition of the contract. The inspecting officials shall be nominated by the CSTE/W /S.C.Railway/Secunderabad.

Notice/Intimation shall be sent in writing at least 1 month in advance by the Contractor to the Inspecting officer when the stores or material to be supplied are ready for inspection and test and no materials shall be delivered or dispatched

until the Inspecting Officer has certified in writing that such stores have been inspected and approved for dispatch.

In the event of Railways waving off the inspection, all tests provided in the test schedules approved by Railway shall be carried out by the in house quality assurance organization of the contractor and proper record of all such tests and results thereof shall be maintained and supplied to the Railway on demand. During the manufacturing process, proper record shall be maintained for the inspection and tests carried out according to the plan quality assurance control and inspection plan.

3.3.3 Inspecting agency: RDSO or the inspecting official nominated by CSTE/W/S.C.Railway

3.3.4.1 Acceptance Test Procedure

The contractor shall submit detailed Test Procedure for each equipment, sub-system and system as a whole to the Railway. The Railway shall discuss with the contractor and modify the same as may be required to ensure that the requirement of Tender Specifications are complied. The finalized Acceptance Test Procedure/Schedule shall, only, act as broad guideline and Railway shall be free to carry out any other test that may be considered essential. The Test Procedure shall give details of all equipment, test and measuring instruments required to perform the test.

3.3.5 Facilities for Test and Examination.

The contractor shall, at his own cost afford to the inspecting officer, all reasonable facilities and such accommodation as may be necessary for satisfying himself, that the materials are being and /or have been manufactured in accordance with the Specification and conditions laid down . The Inspecting officer shall have full and free access at any time during the execution of the contract to the Contractor's workshop for the purpose of aforesaid and he may require the Contractor to make arrangements for inspection of the materials or any part thereof or any material at this premises or at any other place specified by the inspecting officer and if the Contractor has been permitted to employ the services of a sub-contractor he shall in his contract with the sub-contractor, reserve to the Inspecting officer a similar right.

In case of imported equipment and materials, contractor shall provide the facilities of inspection and testing at the final stage of production, assembly and testing in the manufacturer's/ supplier's premises.

The Inspecting officer shall have the right to put all the stores of materials forming part of the same or any part thereto such tests as he may think fit and

proper. The contractor shall not be entitled to object on any ground whatsoever to the method of testing adopted by the Inspecting officer.

3.3.6. Cost of Test

The Contractor shall provide, at his cost, all materials tools labour and assistance of every kind which the Inspecting officer may demand of him for any test and examination which he shall require to be made on the Contractor's premises. If the Contractor fails to meet with the conditions aforesaid, the inspecting officer shall, in his sole judgment, be entitled to remove for test and examination all or any of the stores manufactured by the Contractor to any premises other than his(Contractor's) and in all such cases the Contractor shall bear the cost of transport and /or carrying out such test elsewhere. A certificate in writing of the Inspecting officer, that the Contractor has failed to provide the facilities and the means for test examination shall be final.

3.3.7 Delivery of Materials for Test

The Contractor shall also provide and deliver for test, at his cost at such place other than his premises as the Inspecting officer may specify such material or stores, he may require. The premises for testing other than manufacturer's premises shall be mutually decided by Railway and the Contractor.

3.3.8. Inspection Charges

The inspection charges of RDSO or the inspecting official nominated by the CSTE/W/S.C.Railway/Secunderabad, if any shall be borne by the Railways.

3.3.9. Packing and forwarding

The contractor shall pack at his own cost the stores sufficiently and properly for transit by rail/road, air and or sea as provided in the contract so as to ensure their being free from loss or damage on arrival at their destination.

All containers (including packing cases, boxes tins, drums and wrappings) in which the stores are supplied by the contractor shall be considered as non-returnable and their cost as deemed to have been included in the contractor price. Each bale or package shall contain note specifying the name and address of the Contractor, the number and date of the acceptance of tender and the designation of the Controlling officer.

Each bale or package delivered under the contract shall be marked by the Contractor at his own expense. Such marking shall be distinct (all previous irrelevant marking being carefully obliterated) and shall clearly indicate the description and quantity of the stores, the name and address of the consignee, the gross weight of the package and the name of the contractor with a distinctive number of mark sufficient for the purpose of identifications. All markings shall be carried out with such material as may be found satisfactory by the inspecting

officer as regards quickness of drying, fastness and indelibility. Materials and Equipment meant for each station shall be packed in separate boxes and marked with the name of station, consignee and railway.

The inspecting officer may reject the stores if the stores are not packed and /or marked as aforesaid and in case where the packing materials are separately prescribed, if such materials are not in accordance with the terms of the contract. Such rejection of the stores by the Inspecting Officer shall be binding on the Contractor.

3.3.10 Freight and insurance

The freight and insurance cost for the material to the site of work shall be borne by the contractor.

3.4 SUPPLY, TRANSPORTATION AND CUSTODY OF MATERIAL:

The materials required shall be supplied by the contractor at the stores of OS/Stores Projects/Secunderabad at Bhoiguda. The transportation of all material from the consignees stores to site(station) for installation and commissioning shall also be the responsibility of the contractor at his own cost.

The contractor shall be entirely responsible and shall bear all expenses towards loading transport handling and unloading for all materials, equipment, machines, tools and plants etc from the source of supply to the store of Railways at Secunderabad. The responsibility for damage to any equipment during transportation and till it is taken over by Railways shall be that of the contractor. The correct functioning of the equipment for installation shall however, be governed by the warranty clause of the contract.

3.4.1 Consignee's right of rejection.

Notwithstanding any approval which the Inspecting officer may have given in respect of any materials or other particulars or the work or workmanship involved in the performance of the contractor (whether with or without any test carried out by the Contractor or the inspecting officer or under the direction of the Inspecting officer) and notwithstanding delivery of the materials where so provided to the interim consignee, it shall be lawful for the consignee, on behalf of the Railway, to reject the materials or any part portion or consignment thereof within a reasonable time after actual delivery thereof to them at the place or destination specified in the contract if such materials or part, portion or consignment thereof is not in all respects in conformity with the terms and conditions of the contract whether on account of any loss, deterioration or damage before dispatch or delivery or during transit or otherwise howsoever.

Note: In respect of material pre-inspected at the firm's premises the consignee will issue rejection advice within 90 days from the date of receipt.

3.5 EXECUTION AT SITE

3.5.1 Facilities to the Contractor:

The contractor will be permitted to make use of existing service roads free of cost subject to clause of the General Conditions of contract.

New service roads required by the contractor in connection with the work whether within or outside Railway land for carriage of materials or for any other purpose whatsoever will have to be constructed and maintained by the contractor at his own cost. Permission for the purpose of construction of service roads on Railway land will be given to the contractor at Railway's discretion free of any charges. If any land other than Railway's land is necessary to be acquired or to be entered upon for the purpose, then such land acquisition or permission to enter upon the land will have to be arranged for by the contractor at his own cost.

The contractor shall indemnify the Railway against claims for any damages whatsoever on this account. Railway, however, reserves the right to make use of such service roads laid by the contractor. The land that can be made available by the Railway free of charge for the use of contractor for his field offices, stacking yard, Stores depot and workshops may be ascertained by the contractor by inspecting of site.

The Railway will provide free access to the contractor/s workmen into the Railway premises during the course of the execution of the work. In case the contractor/s workmen have to stay on the Railway premises, necessary charges as ascertained from the concerned DEN of the Engineering Department of this Railway will be collected from the contractor for such stay. The decision of the Engineer of this Railway in this regard shall be final and binding on the contractor.

Electric power supply shall be supplied by the Railways free of cost. The contractor shall abide by the Indian Electricity Act and the Indian Electricity Rules as amended from time to time.

The Railway may allow the use of the Railway materials, trolleys etc in case of emergency and difficulties, on payment as per rules of the Railway in force subject to availability of the same.

3.5.2 Safety of Work, Trains & Personnel

The contractor should abide by all the Railway regulations and also ensure that the same are followed by his representatives, agents servants or workmen. He is therefore, bound under these clauses to give notice to them about the provisions of this clause and the consequent liability of the contractor under the agreement. The contractor shall conform to all the Railway Rules relating to safety of personnel and operation of signals and points. In the A.C electrified areas the special precautions as laid down in R.E. Manual shall be followed.

No petroleum spirit within the meaning of the Indian Petroleum Act shall be stored at site or adjacent land until the approval of the Railway and necessary license under the Act has been obtained by the contractor.

The contractor's employees and workers shall not for any reason operate any appliances or installations of the Railway concerning the safety of train movements, but they should whenever necessary notify to the qualified Railway staff who will then take necessary steps. The contractor shall also be responsible for any damage that he may cause due to the carelessness of his workmen and will bear the consequences in this regard.

The works must be carried out most carefully in such a way that they do not hinder the Railway operation except as agreed to by the Railway. The contractor shall do no work that may interfere with traffic until protection has been provided by the Railway and under the supervision of Railway's representative. When the work is required to be carried out on the track itself or as close to the track as may pose a hazard to rail traffic, the work shall be carried out under the supervision of an authorized Railway representative JE/SE/SSE.

Whenever trackside works are undertaken by the contractors, areas for unloading of bulk materials should be clearly demarcated and barricades provided if necessary with the consent of the JE/SE/Signal/Telecom, the in-charge of the work. Suitable steps shall also be taken to prevent transport vehicles and such other machinery gaining access so near the track as to threaten the safety to running trains. That whenever it becomes inescapable to allow transport vehicles or mobile machinery to operate in close proximity to the running lines the maximums moving dimensions for the said lines shall be adequately protected by fencing or such other suitable measures. No vehicle will normally be permitted to ply adjacent to the running lines. The contractor will be responsible for the safety of hired trucks and men etc. working at the site. He will also be responsible for any damage caused to the Railway property, staff and passengers traveling on the line on account of his truck/vehicles having been allowed to ply on the bank.

The contractor shall take all precautionary measures in order to ensure protection of his own personnel moving about or working on the Railway premises and shall have to conform to the Rules and Regulations of the Railway. If and when while the work under the contract is in progress there is likely to be any danger to the persons employed by the contractor due to running of traffic or while working on the Railway premises, the contractor shall apply in writing to the Railway to provide flagmen or lookout men for protection.

The Railway will however decide as to whether it is necessary to post such flagmen and lookout men for various types of works and also the number of such men required to protect the contractor's staff working at site. The flagmen and lookout men will be Railway Servants and no expenses on this account will be recovered from the contractor. In spite of these precautions if any unforeseen accident or injury happens, the contractor will be solely responsible for the same.

Suitable ladders for climbing the posts and slings for supporting men on the post shall be used. Ropes as required shall be used for erection of the poles. The size of the rope shall be adequate. The contractor shall take necessary precautions for working near the power lines. If at any time the Railway finds the safety arrangements are inadequate or insufficient, the contractor shall take immediate corrective actions directed by the Railway's representative at site. However, it is not obligatory on the part of the Railway to give such directions. The issue or non-issue of any direction in the matter by the Railway shall in no way absolve the contractor of his sole responsibility to adopt safe working methods. The stone-breakers, if employed, shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals. Necessary personal safety equipment as considered adequate by the Engineer-in-charge should be kept available by the contractor for the use of the persons employed on the site and maintained in a condition suitable for immediate use and the Contractor should take adequate steps to ensure proper use of equipment by these concerned. When not in use, electrical apparatus shall be switched off. No paint containing lead or lead products shall be used except in the form of paste or ready mixed paints. Suitable facemasks should be supplied by the contractor for use by the workers when paint is applied in the form of spray.

Within the station premises, and specially on passenger platforms, the contractor shall ensure sufficient free space for movement of passenger traffic.

He must cover and protect the excavations carried out in such areas with a view to avoid any accidents.

In case of an accident of any nature, the contractor will indemnify for any losses caused by him as a result of the accident.

The contractor will not be entitled to any compensation for any damage or loss sustained during execution of the work for any idle labour or transport or any loss or deterioration of the material or tools.

3.5.3 Security of Material

Security of all the materials under the custody of the contractor in the section where the work is in progress shall be the contractor's responsibility and he shall arrange to guard the same from theft/damages. In the event of any loss, the contractor shall be responsible to that effect and shall execute an indemnity bond for the materials that will remain in his custody, which has been supplied, by the Railway. The store lost/unaccounted/consumed excess or damaged shall be recovered as per GCC clause no.58.2.

3.5.4 Supervision & Labour

During the execution of the works, the contractor or his representative shall not leave the site where the works are being carried out. At the site of work the contractor shall always make available one representative who shall be approved

by the Railway Administration and who shall be invested with adequate powers by the Contractor so that orders or instructions given to the said representative by the Railway Administration in writing could be considered as duly given or conveyed to the Contractor himself. Representative of the Railway will check up the work from time to time.

Supervision and Erection of indoor work will be done by the contractors with their own labour till completion and testing of the work. The field supervisor shall receive instruction in the absence of their contractor from the Engineer-in-charge of the work or his representative at site and comply with the instructions. The contractor shall be responsible for the compliance of such instructions.

If the supervisor acting on behalf of the contractor disobeys or does not regard the instructions of the Railway's supervisor/representative and does not execute the work to the satisfaction of this Railway supervisor, it shall be binding on the contractor to replace his supervisor.

3.5.5 Inspection of Works:

The completed installation at all stages shall be subjected to checks and tests as decided by Railways and the contractor shall be liable to remedy such defects as discovered during these checks and tests and make good all deficiencies brought out. However, complete installation will be taken over finally on completion of the full system. It will be the responsibility of the contractor to rectify discrepancy noticed within a period of one month from the date the complete system is taken over. For the purpose of taking over, joint inspection will be carried out by DSTE(P) / ASTE(P)

The contractor should make himself or his representative available at the time of joint inspection. The decision of the Engineer shall be final in the matter.

The contractor will be called upon to pay all the expenses incurred by the Railway in respect of any work found to be defective or of inferior quality adulterated or otherwise unacceptable.

During the execution of the contract, samples may be taken for the purpose of test if test and /or analysis under the conditions laid down in specification, such samples to be prepared for testing and forwarded free of all cost to the Railway.

A SITE ORDER book shall be kept at the work site by the contractor. The inspecting officer of the Railway may in addition to oral instruction to the representative of the contractor at the work site, enter such instruction as he deems fit in this book. The contractor will be responsible to note necessary action and remedy the defects and ensure that the instructions either oral or written are complied with. His non noting the log book entries shall not be considered sufficient grounds for non-compliance of the instructions.

3.6 COMMISSIONING AND FINAL ACCEPTANCE TEST

3.6.1 Installation, testing and commissioning: The installation of the equipment including software loading and required data input etc. shall be done by the contractor in the Railway premises. Testing and commissioning of EI system shall be done by the contractor jointly with Railway Engineer at site. The contractor shall depute competent Engineer/Qualified staff or the same. The contractor shall submit a detailed proposed Test Schedule (before commissioning) for Railway's approval which may be modified by the Railway. Only after such approval, the contractor may carry out the testing as approved by the Railways.

3.6.2 Railway will also carry out all the tests as per the Technical Specifications and the approved Acceptance Test Schedule. Any component, modules, sub-assemblies or equipment failing during the commissioning test shall be replaced/ repaired free of cost by the tenderer. And full record of test conducted shall be maintained by the contractor and handed over to the Railway along with commissioning.

All tests and measuring instruments and other arrangements required for final Acceptance Test shall be provided by the contractor at his cost.

The completion certificate in accordance with General Conditions of Contract, Technical Specifications and Special Condition of Contract shall only be issued by the Railway Engineer after the installation is satisfactorily commissioned.

3.7 MAINTENANCE PERIOD:

After the equipment has been installed & commissioned the contractor shall be responsible for proper maintenance & supervision for a period of 1 year from the date of commissioning. For this purpose, he shall prepare a maintenance plan & make available the services of maintenance engineer who is expected to guide & supervise the work of railways maintenance staff. During this period of 1 year if any lacuna is noticed in the functioning of the installation either due to any defect in the design or equipment or component, the same shall be rectified by the contractor with his own materials at his own cost. In other words, this rectification shall be done by the contractor out of his own spares and not out of spares given to Railways.

3.8 WARRANTY:

3.8.1 After the installation is accepted & taken over by Railways the contractor shall be responsible for the warranty period of 3 years. This warranty shall start from the date of commissioning and shall expire 3 years (36 months) after commissioning. The contractor shall warranty that all the materials & equipments supplied as per the contract shall be free from defects and faults in the design, material, workmanship and manufacture and shall be of highest grade and consistent with the established and accepted standards for safety critical applications such as Railway signaling and in full conformity with the contract specifications.

During this period of warranty, the contractor shall be responsible for arranging replacements and for setting right any defective equipment (for what so ever reason) supplied by him. Railways advice in this regard to the contractor shall be final & binding on the contractor. Due to analysis of failures or other wise if any design deficiency is pointed out by the railway the contractor shall rectify at his own cost.

- 3.8.2 If it becomes necessary for the contractor to replace renew any defective module/system/component under this clause, the warranty provision shall continue for a period of six months from the date of such replacement/renewal or until the end of warranty period which ever may be later.
- 3.8.2 If any defect is not remedied with in a reasonable period, the railway may proceed to do the rectification work at contractor's risk & cost with out prejudice to any other rights which the railway may have against the contractor in respect of such defects. All inspections/replacements/ renewals carried out by the contractor during the warranty period shall be subject to the same conditions of the contract.

All replacements and repairs and design change that the railway shall call up on the contractor to deliver or perform under this warranty shall be carried out by the contractor with in one month satisfactorily.

The decision of the railway in regard to contractor's liability amount if any payable under this warranty shall be final & binding.

3.9 PAYMENT TERMS

3.9.1 Approval and measurement of work:

The contractor shall obtain written approval of the supervisor after completion of the various sub-items of each work mentioned in the schedule. The contractor should ensure that contract measurements have been made for such work which are not possible to measure subsequently and shall remain hidden e.g. Measurement of cabled trench before laying of cables and back filling. The contractor shall sign the measurement book as a token of acceptance of the measurement entered by the supervisor in charge of the work.

- 3.9.2 80% of payment will be made on receipt and accountal of material at the Railway Stores Depot at Secunderabad or at any other nominated site along with necessary documents. The balance 20% payment will be made after successful commissioning of the E.I. and certification by the Engineer-in-charge that the materials so supplied are in good working condition.

On account payments made to the contractor shall be without prejudice to the final making up of the accounts (except where measurements are specifically noted in the measurement book as 'Final measurements' and as such have been signed by the contractor) and shall in no respect be considered or used as if evidence of any particular quantity of work having been executed nor of the manner of its execution being satisfactory.

3.9.3 Deduction of income tax surcharge & others at source

In terms of new section 194-C inserted by the Finance Act, 1972, in the Income Tax 1961 the Railway shall at the time of arranging payments to the contractor for carrying out any work (Including supply of labour for carrying out any work) under the contract, be entitled to deduct income Tax and surcharge as applicable at source on Income comprised in the sum of each payments. The deductions towards Income Tax to be made at source from the payments due to non residents shall continue to be governed by Section 195 I.T. Act 1961.

All other statutory deductions AP VAT (such as labour, GST turn over tax etc at the rates as applicable at the time of payment) shall be made both from on A/C bills as well as Final bills as per rules in force.

4.0 TRAINING

The contractor shall provide adequate training to S.C.Railway personnel in planning design installation operation and maintenance of the equipment and system supplied under the contract. The contractor shall provide all facilities at every stage of testing and commissioning for adequate training of S.C. Railway personnel who may be deputed to work on the project.

The contractor shall impart training for two-man months (2 man-months each for supervisors/technicians and officers.

During the training programme, Railways shall also be given adequate inputs to carry out the alterations required for Yard re-modelling on their own.

However, the cost of all travel to and fro the place of training boarding and lodging of the trainees will be borne by the Railway. The contractor shall undertake to train Railway personnel nominated by CSTE/Works / S.C.Railway / Secunderabad in different aspects of equipment design, functioning field installation, testing, commissioning operation, maintenance and repair covering both hardware and software. The training should be comprehensive so as to impart full knowledge to Railway personnel deputed for the training to independently execute the installation, operation maintenance and repair of all equipment.

The training course should apart from formal class room training, include hands on practical experience on a working installation in the field or lab. The contractor shall make all necessary arrangement for the same. The place of training shall normally be at the manufacturer's premises or as decided mutually between then Railway and the Contractor.

5.0 RETURN OF RELEASED STORES/ SURPLUS STORES

The contractor shall return any cut pieces of wires cables that may be left back and also may surplus materials from the work and empty cable drums and other

packing materials delivered to him. They shall be handed over to the Railway at Railway's nominated stores depot through SSE/SE/JE in-charge of the work.

Empty cement bags need not be returned to Railways (where ever cement is issued) for which an amount of Rs.150 per every 100 empty cement bags will be recovered from the bills payable to the Contractor

The stores found to be surplus for the work shall be returned to OS(Projects)/Stores/Bhoiguda/ Secunderabad depot by the contractor with his own staff. Released material should be handed over to the respective Stores in a systematic manner. Proper care should be taken while releasing and transporting the stores. The contractor shall arrange to transport the same with his own labour and transport.

The contractor shall be liable to render full accountable for all the materials issued by the Railway. If any quantity of Railway materials is consumed in excess or wasted or damaged or lost or otherwise not satisfactorily accounted for, recovery shall be made from the contractor at twice the issued rate prevailing at the time of last issue of the materials consumed in excess or wasted or damaged or lost or not satisfactorily accounted for.

6.0 DOCUMENTATION

Only Signalling Plan and Table of Control as per S.C.Railway practice will be issued by Railway, as prevalent in the Railway practice. All indoor work details shall be prepared by contractor and submitted to Railways for approval. After execution of the work, the Contractor has to supply six sets of documents as mentioned in the table below as per schedule no.3 of schedule of works, along with system details, site installation details/drawings, maintenance manual, operation procedure etc in a bound book as per the practice of S.C.Railway.

S..No.	Document
1	Wiring Diagrams
2	Application Program Listing
3	Relay/cable Termination particulars
4	Input/output assignment details
5	Relay layout and contact analysis chart
6	Equipment disposition layout
7	Details of power supply arrangement
8	Any other drawing as required by the Railway as per its practice
9	All documentation as per clause No.10 of technical specification.

The original tracings are to be prepared by the contractor on reproduction film and required prints are to be taken. Diagrams including tracings will be handed over to Railways. One set Drawings in soft copy of Auto Cad format shall also be given on a compact Disc.

7.0 Variations of Scheduled Quantities :

- 7.1 (i) The variation of quantity upto 25% shall in no degree affect the validity of the contract and it shall be performed by the contractor as provided therein and be subject to the same conditions, stipulations and obligations originally included and approved for in specification and drawing and the amounts to be paid therefore, shall be calculated in accordance with the accepted rates of the schedule.
- (ii) In the event of any reduction in the quantity to be supplied/work to be executed for any reason whatsoever the contractor shall not be entitled to any compensation but shall be paid only for the actual amount of work done or quantity of supply made in the accordance with accepted rates of schedule.
- (iii) The contractor is bound to notify the Engineer at least 7 days before the necessity arises for the execution of any item in excess of 25% of the quantity provided in the Agreement. If necessity demands, it is mandatory on part of the contractor to execute the work up to 25% excess of agreement quantities as detailed below:
- (a) In case of increase in quantity of an individual item by more than 25% of the agreement quantity is considered un avoidable, negotiations may be held with the existing contractor for arriving at reasonable rates for additional quantities in excess of 125% of agreement quantity.
- (b) The limit for varying quantities for minor value items shall be 100% (as against 25% prescribed for other items). A minor value item for this purpose is defined as an item whose original agreement value is less than 1% of the total agreement value.
- 7.2.1 Any additional item if required to be operated during the course of execution, shall be executed by holding negotiations are to be held with the existing contractor for arriving at reasonable rates..
- 7.2.2 In case the contractor fails to attend the meeting after being notified to do, so or in the event of no agreement being arrived at the Railway shall be entitled to execute the extra work/supply by other means and the contractor shall have no claim for loss or damage that may result from such procedure.

8. **VITIATION:**

If vitiatio occurs on account of variation in quantities, the amount payable to the contractor will be restricted to the overall lowest value among the first three acceptable offers, calculated for quantities of various schedules as actually executed.

(Sd/-)

Deputy Chief Signal & Telecom . Engineer/Projects
S.C.Railway, Secunderabad

Section - IV

ADDITIONAL INFORMATION WITH REFERENCE TO TECHNICAL SPECIFICATIONS:-

Para of Tech. Spec.	Clarification
3.4	The system shall be capable of operating on control-cum-indication panel as well as on VDU .
3.10.	The tenderer shall supply user-friendly graphic based design tool to generate station specific application software to carryout future yard modifications.
3.13.1	The proof of compliance of SIL-4 of CENELEC standards or equivalent international standards for hardware and software shall be submitted by the tenderer.
3.13.2	The third party validation certificate of software of EI system and warm/hot standby change over software for the offered configuration shall be submitted.
5.1.2	The cycle time and response time of the system shall be clearly indicated.
5.1.4	VDU control terminals and the control cum indication panel are required.
5.1.5	Event logging for 1,00,00,000 events and facility for automatic serial transfer to central monitor through data logger shall be available in the system.
7.1	The standby arrangement is not required. However, the system shall be upgradable to hot standby for CPUs & input and output cards by inserting I/O cards in the empty slots provided in the system. Necessary software shall be supplied free of cost to provide hot-standby for I/O cards and CPUs at a later date by the contractor.
8.2	The software engineering standards followed for developing software shall be made available to RDSO.
8.3	The verification and validation procedures carried out in house or by independent agency shall be made available to RDSO.
8.5.2	The system shall switch the output to safe state when the vital output relay of the system for control of field equipment is energized due to false feed created either intentionally or unintentionally.
9.1	The EI shall work on 110V/60V/24V/12V DC.
15(d)	110V AC will be used for signal lamp lighting.

GENERAL:

The term Track Circuit may be read as Track circuit/Axle counter wherever it appears in the Technical Specifications.

The functional requirements of Data logger included along with supply of EI in Schedule will be generally in conformity with the RDSO's Specification No. IRS/S-99/2006 with Latest Amendment.

* * *

GUARANTEE BOND FOR PERFORMANCE GUARANTEE

Proforma of Performance Guarantee to be submitted by contractors as per new clause added in the General Conditions of Contract by Railway Board vide letter No. 2003/CE-I/CT/4/PT.1 dated 12/16-5-06.

In consideration of the President of India (hereinafter called "the Government") having agreed to exempt _____ (hereinafter called "the said Contractor/s") from the demand, under the terms and conditions of Tender No. _____ opened on _____ for the work of _____

_____ vide acceptance letter No. _____ dtd. _____ herein after called the said Contract, of performance guarantee for due fulfillment by the said contractors of the terms and conditions contained in the said contract, on production of irrecoverable bank guarantee amounting to Rs. _____/- (Rupees _____ only).

We _____ (indicate the name of the bank) "hereinafter referred to as: the Bank "at the request _____ (Contractor(s) do hereby undertake to pay to the government an amount not exceeding Rs. _____ (in words Rs. _____) against any loss or damage caused to or suffered or would be caused or suffered by the government by reasons of any breach by the said contractors of any of the terms or conditions contained in the said contract.

We undertake to keep this performance guarantee in force till the satisfactory completion of the work and maintenance period is over.

We, _____ (name of the bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the government stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Government by reasons for breach by the said contractor(s) of any of the terms and conditions contained in the said contract or by reason of the contractor(s) failure to perform the said contract. 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 government any amount so demanded notwithstanding any dispute or disputes raised by the contractor(s) / supplier(s) in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the contractor(s) / supplier(s) shall have no claim against us for making such payment.

We, _____ (name of the Bank) 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 is shall continue to be enforceable till all the dues of the government under or by virtue of the said contract have been fully paid and its claims satisfied or discharged or till _____ (office/department). Ministry of _____ certifies that the terms and conditions of the said contract have been fully and properly carried out the said contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____ (date), we shall be discharged from our liability under this guarantee thereafter.

We, _____ (name of the Bank) further agree with the government that the government shall have the fullest liability 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 contractors(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the government 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 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 government or any indulgence by the government to the said contractor(s) or any such matter or things whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

This guarantee will not be discharged due to the change in the constitution of the bank or the contractor(s) / suppliers(s).

We, _____ (name of the Bank), lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Government in writing.

Dated: the _____ day of _____ 2006.

For _____ (Bank)

Witness :

1. _____

2. _____

ANNEXURE - I

NAME OF WORK: STTC MLY Training Centre: Provision of Electronic Interlocking System (Model- Microlok II) for imparting training to ESM's and JE/Signals under comprehensive action plan for training (CAPT)

Tender Notice No. C/SG/C/36/5/301 Dated **26-03-2009**

S.NO.	SCHEDULE	ESTIMATED AMOUNT	TENDERER'S OFFER ON PAR OR ABOVE OR BELOW (IN PERCENTAGE) (+) OR (-)	
		RUPEES IN FIGURES RS.	IN FIGURES	IN WORDS
1	Schedule :	40,59,124.00		
	TOTAL	40,59,124.00		

TENDERERS TO NOTE:

1. Tenderer is requested to quote only percentage of their rates in comparison with the estimated rates.
2. Tenderer should not quote individual item wise rates.
3. Tenderer should quote their rates separately for each schedule individually.
4. Percentages quoted for individual items or groups not in accordance with the Schedule will be summarily rejected.

SIGNATURE OF TENDERER

EXAMPLE:

1. If the tenderer intends to quote their rates on par with estimated rates, they have to write '**RATES AT PAR**'.
2. If the tenderer is intended to quote his rate 'ABOVE' percentage of the estimated rates, he has to write (+) **Plus** %.
3. If the tenderer is intended to quote his rates 'BELOW' percentage of the estimated rates, he has to write (-) **Minus** %.

(SD/-)

**Dy.Chief Signal & Telecom.Engineer (Projects),
South Central Railway, Secunderabad – 71.**

SECTION-V
(SCHEDULE OF WORK)

Name of the work: STTC MLY Training Centre: Provision of Electronic Interlocking System (Model- Microlok II) JE/Signals under comprehensive action plan for training (CAPT)

SCHEDULE						
NS	Description of the Item	UNIT	QTY	RATE in Rs.	Amount in Rs.	Inspection
1	Supply , installation, testing and commissioning of Electronic Interlocking system (Microllok-II without stand by arrangement) for a double line four road station with common loop and siding facility with the following hard ware. This includes: (1) Design, testing and commissioning of application logic for the system to suit Interlocking Plan of a double line 4 road station with common loop, and a siding .(signaling plan of the typical station to be designed can be collected from the office of the DY.CSTE/P/SC. (2) Erection and wiring testing and commissioning of relay racks, relays, other associated equipment including Power supply arrangement and earthing arrangement. (3) Maintenance and Supervision of SSI for first Year . (4) Painting of all the particulars related to work. (5) Customer training of 2 man months. (6) Preparation and supply of Six sets of As made documents in Rexine bounds Material like wire coils ND fuses and other material available in the schedule will be issued by Railways. Remaining miscellaneous material/Consumables are to be arranged by the contractor.					
	(1) Microlok II card file	No.	2	86158	172316	RDSO
	(2) Microlok II CPU PCB	No.	2	150320	300640	RDSO
	(3) Microlok II PS PCB	No.	2	78829	157658	RDSO
	(4) Microlok II Vital input PCB	No.	10	55915	559150	RDSO

	(5) Microlok II Vital Output PCB	No.	8	53163	425304	RDSO
	(6) Non Vital Input Output Cards	No.	10	66546	665460	RDSO
	(7) VCOR Relay	No.	2	78829	157658	RDSO
	(8) VCOR Relay Base	No.	2	6050	12100	RDSO
	(9) Address Select PCBs-48 Pin	No.	9	4583	41247	Consignee
	(10) Address Select PCBs-96 Pin	No.	8	6050	48400	Consignee
	(11) CPU EEPROM PCB	No.	2	5319	10638	Consignee
	(12) 1" - Wide Blank Front Panel Assy	No.	17	2110	35870	Consignee
	(13) 48-Pin connector Housing Assy	No.	18	1145	20610	Consignee
	(14) 48-Pin connector Guide Assy	No.	18	548	9864	Consignee
	(15) 96-Pin Connector Housing Assy	No.	16	1100	17600	Consignee
	(16) 96-Pin Connector Guide pair	No.	16	548	8768	Consignee
	(17) 48-Pin Female connector	No.	25	274	6850	Consignee
	(18) 48-Pin Female Crimp Contact	No.	500	28	14000	Consignee
	(19) 96-Pin Female Connector	No.	10	458	4580	Consignee
	(20) 96-Pin Female Crimp Contact	No.	500	19	9500	Consignee
	(22) VDU 30 inch, Console for Panel operation	No.	2	93184	186368	Consignee
	(23) Maintenance Terminal with VDU	No.	2	55000	110000	Consignee
	(24) Printer HP laser jet	No.	1	15300	15300	Consignee
	(25) Supply of Consumables such as cable trays, connecting cables, power cables, cooling fans inside the rack, cable trays and cable assembly accessories etc.,	LS	1	26800	26800	Consignee
	(26) Microlok Rack with accessories	No.	1	66000	66000	Consignee

2	Supply of Encapsulated type Class B (as per VDE0675 or Class 1 as per IEC 61643) Lightning Current Arresters & Class C (as per VDE 0675 or Class 2 as per IEC 61643) Surge Arresters with in built thermal isolating device suitable for Single Phase TT network as per VDE 100-534. The devices complies IEC 61024 and IEC 61312 and tested as per VDE 0675 and IEC 61643 standards, housed in a suitable thermo plastic (Polystyrene / Polycarbonate) Spelsberg box confirming to protection class DIN VDE 0470-1: IP 55/65.Class B/Class 1 consisting of:a) One module to be connected between Phase and Neutral. b) One module to be connected between Neutral and Earth. The detailed technical specification mentioned in Annexure-A. Class C/Class 2 consisting of :a) One module to be connected between Phase and Neutral .b) One module of remote signaling unit as per the detailed technical specification.	No.	4	16523	66092	Consignee
3	Supply of DC Relay miniature plug-in type neutral line relay, tractive armature 24V DC (QN1) with 8F/8B contacts metal to carbon with plug board, retaining clips and connectors as per SPCN No.BRS-930, IRS-S-23 & S-34 as applicable interlocking code ABCDE.	No.	40	2184	87360	RDSO
4	Supply of Relay plug-in type, style 'AC-LED' All aspects, AC lamp proving relay unit with in-built current transformer type, slow release neutral line relay, 4F/4B contacts, front and back contacts metal to carbon, shall be suitable for working in series with 110V AC, LED signal lamp rated at 15W confirming to RDSO Spec. STS/E/Relays/AC lit LED signal/09-2002 or latest, BRS:941A, IRS:S 34 & IRS:S 23 (as applicable) or latest. The interlocking code for this unit shall	No.	30	4142	124260	RDSO
5	Supply of HP laser jet 3055 ,All in one - same as HP laser jet 3052 all in one plus 33.6 faxing(V.34,Super G3) with two 2 RJ11 ports .	No.	1	21000	21000	Consignee

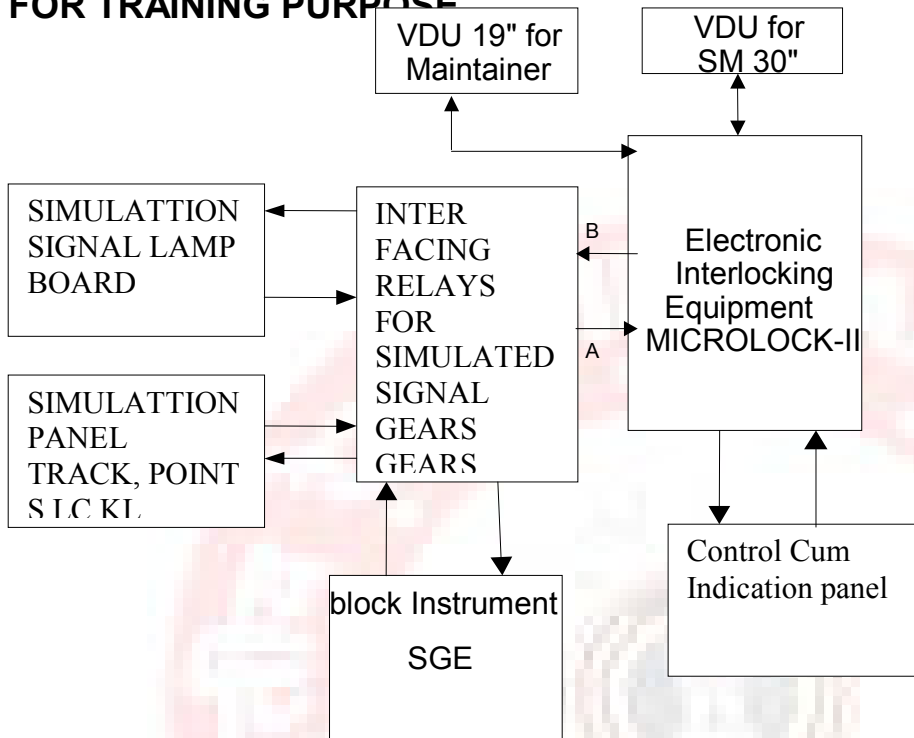
6	Supply , wiring, testing commissioning of Simulation Panel - powder coated with front and Back Panel doors, with toggle switches depicting the yard diagram of a double line four road station with common loop and a siding- The signals shall be provided on a separate board with bulbs of (100 V AC 25) Watt and holders of required quality.	No.	1	87000	87000	Consignee
7	Supply ,wiring, testing and commissioning of Operating cum Indication Panel for double line four road with common loop and a siding this shall have slit indications and bush button knobs other that are required for a Domino type panel	No.	1	87000	87000	Consignee
8	Supply of Stationary low maintenance secondary lead acid cells 2V 120AH capacity as per RDSO specification IRS-S-88/93 or latest. This includes supply of inter cell connectors, bolts, nuts, acid level indicating floats and vent plugs.	No.	60	1060	63600	RDSO
9	Supply and installation of SMPS based DC Distribution system of suitable for 4 road station in Non-RE area. The configuration of DC-DC Converter shall be as per the instructions of officer in charge (To be procured from RDSO approved firms).	Set	1	128240	128240	Consignee
	24-32V/5A DC-DC converters - 15 Nos.					
	12-28V/5A DC-DC converters - 6 Nos.					
	60-110V/1A DC-DC converters - 4 Nos.					
	3-6 V/0.1A DC-DC converters - 4 Nos.					
	2-12V / 5A DC-DC converters - 2 Nos.					
	Rack to house the above DC-DC converters					
	ASM Panel for the above.					
	20A fuse base - 1 No.					
10	Supply of Basic Earth kit - 1 set, consisting of the following :	No.	2	16353	32706	RITES

	(a) Earth Electrodes of Copper clad Nickel Steel alloy of 6 feet long , 3/4 inch dia and copper clad thickness shall be minimum 10 mil-3 Nos.					
	(b) Thread less compressed type coupler of Copper clad Nickel Steel alloy with copper clad thickness of minimum 10 mil--2 Nos.					
	(c) RDSO approved Earth enhancing compound in 10 Kg pack --2 Nos.					
	(d) Copper tape of 25mmX6mmX150mm -- 1 No.					
	(d) Copper tape of 25mmX6mmX300mm -- 2 Nos.					
	(e) cadmium Bronze cable of 50 Sq mm to RDSO spec. RDSO/SPN/178/2003 to connect equipment bus bar and Earth electrode.--15 meters length					
11	Installation of unit earth as per enclosed drawing consisting of :	No.	2	6230	12460	
	a) Digging the earth to the required depth					
	b) Insertion of 3 Nos. electrodes in each pit - (electrodes will be supplied by Railways.)					
	c) Joining electrodes using coupler (couplers will be supplied by Railways.)					
	d) Filling of Earth Enhancing compound 3 bags of 10 kg in each pit .(Earth enhancing compound will be supplied by Railways.)					
	e) Provision of Exothermic weld connection on copper tape of 25mm x 6mm x 150mm to the earth electrode (weld material, tools & fixtures required for the weld to be arranged by the contractor) - 1 Nos.					
	f) Provision of Exothermic weld connections, one to connect the Cadmium Bronze cable to the copper tape welded to the earth electrode and another to the copper tape to be fixed inside the equipment / relay rack / apparatus room (fixtures for mounting the Copper tape inside the relay room, weld materials and tool & fixtures for the weld shall be arranged by the contractor)- for the total ring requirement.					
	Note : This work includes construction of concrete sink of suitable size.					

12	Supply of Relay rack 1 way universal type as per drg. no.S&T/MFT/291 with scaffolding, powder coating with stainless steel nuts and bolts for fixing the racks. Supporting angles, frame mounting triangle base with 'J' bolts and insulation of required numbers complete suit QN1 / K-50 prewired tag blocks.	Nos.	3	2720	8160	Consignee
13	Supply of the following resistors/condensers/diodes. A) Electrolytic condensers 50V 470 mfd.- 10 nos. (B) Electrolytic condensers 63V 2200 mfd - 30 nos.(C) Wire wound resistances 100 ohms 10 Watts - 20 nos. (D) Diodes - BY 127 - 20 Nos. & (E) PVC Insulation tapes of 25 mtrs-25 Nos.	LS	2	2830	5660	Consignee
14	Supply of Hylam sheet 6mm thick and size 2400mmX600mm of color approved by the site in charge. (IS: 2036)	Nos.	2	2000	4000	Consignee
15	Supply of PVC insulated wire copper conductor 16/02mm to ATC IS:694 to RDSO specification no.IRS.S76/89. Each coil of 100 meters. length. To be procured from RDSO approved firms	Coil	200	670	134000	RDSO
16	Supply of PVC insulated wire multi-strand copper conductor 10 Sq.mm flexible Specn.IRS.S76/89.Amendment No.2 or latest. Each coil of 100 meters length. To be procured from RDSO approved firms (size 140/0.3mm)	Coil	4	7951	31804	RDSO
17	Supply of PVC wire coils of size 03/0.75 multi strand (flexible). Each coil of 100 meters length. To be procured from RDSO approved firms.	Coil	15	1421	21315	RDSO
18	Tag blocks un wired 200 way to specification IRS:S-77/2006(Rev.1) to drawing no.SA-24751 to be procured from RDSO approved firms	Nos.	4	1032	4128	Consignee
19	Supply of Solid State Buzzers with different frequencies working on 12V-24V-60 Volts.	Nos.	6	183	1098	Consignee

20	Supply of Non-deteriorating type of fuse holders and fuse links of following rating to RDSO specification No.IRS.S.78/92 or latest.					
	a) Fuse holders 20 Amps capacity for knife edge type fuse links	No.	200	130	26000	RDSO
	b) Fuse links 2 amps. knife edge	No.	100	17	1700	RDSO
	c) Fuse links 10 amps. knife edge	No.	100	17	1700	RDSO
	d) Fuse links 1 amp. knife edge	No.	100	17	1700	RDSO
21	Supply of crank handle box made of teak wood with glass fronted door as per drawing 03/91 with decolum sheet on all exposed surfaces and fix with RKT inside the box with a micro-push switch with 2NO+2NC contacts and veeder counter non-reset type and wire them as per the approved circuit diagram, clamp and terminate the cable in the cable termination box in ASM office and in the relay room and bunching and lacing with lacing threaded (twine) and interlock the RKT key with crank-handle by Nickel coated dog chain. The box should have hinges and pad locking arrangement with one no. 40mm Nav-tal lock with duplicate keys and key chain with label (All materials except RKT are to be supplied by the contractor).	No.	2	3500	7000	
22	Fabrication, supply, painting and erection of Battery/ Equipment Stands with MS Angle size 50x50x5 mm as per Detailed Spcn. All the materials required for fabrication are to be supplied by the contractor, including hard wood.	RMT	20	173.00	3460	
23	Initial charging of Secondary cells by the authorized representative of battery manufacturer :					
	ii) 2V 120 AH	No.	60	250	15000	
	TOTAL VALUE OF THE WORK			Rs.	4059124	

SCHEME OF ELECTRONIC INTERLOCKING INSTALLATION FOR TRAINING PURPOSE



- A** Output relays from EI equipment to control points, signals, LC gates and siding points.
- B** Input relays to EI equipment from points, signals, LC gates, siding points and track circuits

TENTATIVE INPUTS & OUT PUTS**VITAL INPUTS**

1	1D2 HECR	32	18NWKR	63	30D1 DECR
2	1D2 HHECR	33	18RWKR	64	1A TPR
3	1D2 DECR	34	19NWKR	65	1 TPR
4	1D1 HECR	35	19RWKR	66	11A TPR
5	1D1 HHECR	36	20NWKR	67	11B TPR
6	1D1 DECR	37	20RWKR	68	12A TPR
7	1 RECR	38	21 OFF ECR	69	12B TPR
8	1HECR	39	21 ON ECR	70	13A TPR
9	1DECR	40	21 PILOT ECR	71	13B TPR
10	1 UECR	41	23 OFF ECR	72	25 TPR
11	1 COHECR	42	23 ON ECR	73	26-28 TPR
12	3 RECR	43	23 PILOT ECR	74	UM TPR
13	3HECR	44	25 RECR	75	UL TPR
14	3DECR	45	25 DERCR	76	DM TPR
15	4 RECR	46	26 RECR	77	CL TPR
16	4HECR	47	26 HECR	78	18A TPR
17	6RECR	48	27 RECR	79	18B TPR
18	6DECR	49	27 HECR	80	19 TPR
19	9LXCR	50	28 RECR	81	20A TPR
20	10 OFF ECR	51	28 HECR	82	20B TPR
21	10 ON ECR	52	28 DECR	83	3-4 TPR
22	10 PILOT ECR	53	30 RECR	84	6 TPR
23	11NWKR	54	30HECR	85	30 TPR
24	11RWKR	55	30DECR	86	30A TPR
25	12NWKR	56	30 UECR		
26	12RWKR	57	30 COHECR		
27	13NWKR	58	30D2 HECR		
28	13RWKR	59	30D2 HHECR		
29	14KLCR	60	30D2 DECR		
30	16KLCR	61	30D1 HECR		
31	16NWKR	62	30D1 HHECR		

VITAL OUT PUTS

1	1D2 DR	32	27 HR
	1D1		
2	HHR	33	28 HR
3	1D1 DR	34	28 DR
4	1 HR	35	30 HR
5	1 DR	36	30 DR
6	1 UGR	37	30 UGR
			30 CO
7	1 CO HR	38	HR
			30D2
8	3 HR	39	DR
			30D1
9	3 DR	40	HHR
			30D1
10	4 HR	41	DR
11	6 DR		
12	9 LXYS		
13	10 HR		
14	11 NWR		
15	11 RWR		
16	12 NWR		
17	12 RWR		
18	13 NWR		
19	13 RWR		
20	14 KLYR		
21	16 KLYR		
22	18 NWR		
23	18 RWR		
24	19 NWR		
25	19 RWR		
26	20 NWR		
27	20 RWR		
28	21 HR		
29	23 HR		
30	25 DR		
31	26 HR		

SECTION-VI

ELECTRONIC INTERLOCKING
(FORMELY KNOWN AS SOLID STATE INTERLOCKING)

SPECIFICATION NO. RDSO/SPN/192/2005

(DRAFT)

NUMBER OF PAGES 20

**SIGNAL DIRECTORATE
RESEARCH DESIGNS & STANDARDS
ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR**

LUCKNOW – 226 011

DOCUMENT DATA SHEET			
Designation RDSO/SPN/192/2005			Version 0.0
Title of Document Specification for Electronic Interlocking.			
Authors: See Document Control Sheet Signed by: Name: Anurag Goyal Designation: Jt. Director/ Signal/RDSO			
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Abstract This document defines Electronic Interlocking.			

DOCUMENT CONTROL SHEET

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AMENDMENTS

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TABLE OF CONTENTS:

S.NO.	Item		Clause No.	<i>Page Nos.</i>
1	Foreword	----	0	6
2	Abbreviation	----	0.3	7
3	Scope	----	1.0	8
4	Terminology	----	2	8
5	General requirements	----	3	8
6	Requirement of Electronic Interlocking	----	3.13	9
7	Interlocking Requirements	----	4	9
8	System composition	----	5	9
9	Hardware & fail-safety	----	6	11
10	System Architecture	----	7	12
11	Maintenance and diagnostic aids	----	7.2	13
12	Software Requirement	----	8.0	13
13	Power supply requirements	----	9	14
14	Information to be furnished by the manufacturer/ supplier	----	10	15
15	Test and requirements	----	11	16
16	Type test	----	11.3	17
17	Acceptance Tests	----	11.4	17
18	Routine tests	----	11.5	17
19	Test Procedure	----	12	18
20	Quality Assurance	----	13	20
21	Packing	----	14	20
22	Information to be furnished by the Purchaser	----	15	20

Government of India
Ministry of Railways
(Railway Board)
INDIAN RAILWAY
STANDARD SPECIFICATION
FOR
ELECTRONIC INTERLOCKING
(DRAFT)

SERIAL NO. RDSO/ SPN/192/2005

0. FOREWORD :

- 0.1 This specification is issued under the fixed serial No. RDSO/ SPN/192/2005 followed by the year of original adoption as standard or in case of revision, the year of latest revision.
- 0.2 This specification requires reference to the latest version of following specifications: –

1	IRS: S 36	Relay interlocking systems
2	IRS: S23*	Electrical signalling and interlocking equipment
3	RDSO/SPN/144	Safety and reliability requirement of electronic signalling equipment.
4	IS: 9000*	Basic environmental testing procedures for electronic and electrical items.
5	IS 2147-62*	Degrees of protection provided by enclosure for low voltage switchgear and control gear.
6	ISO 9001	Quality Systems- model for quality assurance in design, development, production, installation and serving.
7	EN50126	Railway applications- specification and demonstration of reliability, availability, maintainability and safety.
8	EN50128	Railway applications- signaling and communication- Software for Railway control and protection system.
9	EN50129	Railway applications- Safety related electronic systems for signaling.
10	EN50159-1 & 2	Railway applications- Signaling and Communication Safety related communication in closed and open transmission system.
11	IEC 529/ EN 60529	Specification for degree of protection provided by enclosures (IP code).
12	EN 61000.4.2	Electromagnetic compatibility (EMC)- testing and measurement techniques- electrostatic discharge immunity test and basic EMC.
13	EN 61000.4.4	Electromagnetic compatibility - testing and

		measurement techniques- electrostatic fast transient/ burst immunity test and basic EMC publication.
14	EN 61000.4.5	Electromagnetic compatibility - testing and measurement techniques- surge and immunity test.
15	IRS: S-99	Data Logger System.
16	RDSO/SPN/186	Domino Type Control Panel for Railway Signalling

* Or equivalent Recognized International standard. The supplier shall submit a copy of the same for verification.

Whenever, reference to any specification appears in this document, it shall be taken as a reference to the latest version of that specification.

ABBREVIATIONS :

SNO.	ABBREVIATION	EXPANDED FORM
1.	ABS	AUTOMATIC BLOCK SIGNALLING
2.	ATP	AUTOMATIC TRAIN PROTECTION
3.	CA	CROSS ACCEPTANCE
4.	CCIP	CONTROL CUM INDICATION PANEL
5.	CD	COMPACT DISC
6.	CENELEC	EUROPEAN COMMITTEE FOR ELECTRO TECHNICAL STANDARDIZATION
7.	CIU	CENTRAL INTERLOCKING UNIT
8.	CMU	CENTRAL MONITORING UNIT
9.	CTC	CENTRALISED TRAIN CONTROL
10.	EI	ELECTRONIC INTERLOCKING
11.	EMU	ELECTRICAL MULTIPLE UNIT
12.	EPROM	ERASABLE PROGRAMMABLE READ ONLY MEMORY
13.	IBS	INTERMEDIATE BLOCK SIGNALLING
14.	I/O	INPUT/OUTPUT
15.	ISA	INDEPENDENT SAFETY AUDITOR
16.	MTBF	MEAN TIME BETWEEN FAILURE
17.	MTBWSF	MEAN TIME BETWEEN WRONG SIDE FAILURE
18.	MTTR	MEAN TIME TO REPAIR
19.	MT	MAINTENANCE TERMINAL
20.	OC	OBJECT CONTROLLER
21.	OFC	OPTICAL FIBRE CABLE
22.	PC	PERSONAL COMPUTER
23.	PCB	PRINTED CIRCUIT BOARD
24.	QA	QUALITY ASSURANCE
25.	QAP	QUALITY ASSURANCE PROGRAM
26.	SEM	SIGNAL ENGINEERING MANUAL
27.	SIL	SAFETY INTEGRITY LEVEL
28.	STR	SCHEDULE OF TECHNICAL REQUIREMENTS
29.	TOT	TRANSFER OF TECHNOLOGY
30.	UV	ULTRA VIOLET
31.	VDU	VISUAL DISPLAY UNIT

32.	VGA	VIDEO GRAPHIC ARRAY
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1.0 **SCOPE :**

- 1.1 This specification covers the technical requirements of Electronic Interlocking.
- 1.2 The EI covered in this specification shall be a microprocessor based equipment used for the operation of points, signals, level crossing gates, block working with adjacent station, releasing of crank handle for manual operation of points and other controls like slots etc. through a control cum indication panel or VDU based control panel. It shall be capable of future interfacing with ATP & CTC systems.
- 1.3 In case of End Cabin/ Multi Cabin working, it shall be possible to interface more than one CCIP or VDU control terminal or both with the EI.

2. **TERMINOLOGY:**

- 2.1 For the purpose of this specification, the terminology given in latest version of IRS: S 23 and RDSO/SPN/144 shall apply.

3. **GENERAL REQUIREMENTS:**

- 3.1 The system shall provide all the interlocking, control and indication functions as per approved interlocking plan, selection table and panel diagram of the station.
- 3.2 The system shall have facility of monitoring of internal variables as well as status of I/O.
- 3.3 The system shall be suitable for working on sections having 25 kV AC traction and where passenger/freight trains hauled by single phase thyristor controlled or three phase induction motor controlled AC locomotives or chopper controlled EMU stock are operated.
- 3.4 The system shall be capable of working in conjunction with the control cum indication panel or a VDU or both as per clause 5.3 as required by Railways.
- 3.5 The system should have capability to interface with Block Working. It should also be capable of interfacing with IBS, ABS including interfacing with outlying yards and sidings. Supplier shall submit interface details.
- 3.6 The system shall be capable for working in non air-conditioned environment and ambient temperature range between -10° C to 70 ° C and Relative Humidity upto 95% at 40° C.
- 3.7 The system shall be provided in a dust protected cabinet. If forced cooling is required, the cooling fans shall operate on system power supply with over current protection arrangement. The failure of any one of the fans shall give an alarm to the operator.
- 3.8 The equipment shall be so constructed as to prevent unauthorized access to the system.

- 3.9 Necessary provision shall be made in the hardware and software for modular expansion of the system. For large stations, which cannot be covered by one EI, it shall be possible to connect more than one EI preferably through a serial channel. The communication channel provided between various EI shall comply with the requirements for transmission of vital safety information as laid down in relevant clause of latest version of RDSO/SPN/144/2004.
- 3.10 EI shall have user-friendly graphic based design tool to generate station specific application software to carry out future yard modifications.
- 3.11 For all vital inputs/ outputs, double cutting arrangement shall be provided.
- 3.12 Either OFC or twisted pair cable shall be used for all vital connections.

3.13 REQUIREMENT OF ELECTRONIC INTERLOCKING:

- 3.13.1 Both hardware & software of EI must meet SIL-4 as defined in CENELEC Standards. If the system is developed using any equivalent International standard other than CENELEC, a copy of standards followed shall be submitted with application. The certificate of validator certifying that the system is equivalent to SIL-4 compliant shall also be submitted.
- 3.13.2 The EI system software as well as warm/hot standby changeover software should have been independently verified and validated including its offered configuration by third party. User Railway shall verify application software pertaining to yard data.
- 3.13.3 The firm manufacturing EI, when applying for type approval or cross – acceptance approval shall submit documentary proof of independent validation as per CENELEC Standards or equivalent standard along with complete safety case.
- 3.13.4 The firm shall give details of all modifications carried out in the system after initial validation/ approval. Date of each modification with brief reasons for undertaking modifications shall be given. All modifications must have got approval of original validating agency/ approving agency.
- 3.13.5 The next level Signal control circuits like Cascading of Signal aspects, Red lamp protection etc. shall be achievable through Software only.
- 3.13.6 The audio-visual alarm shall be available for Approach locking, Button sticking etc. in EI.
- 3.13.7 CIU shall have log of all counters provided at Panel like Emergency Route cancellation, Calling on signal, Emergency Point operation, Overlap release operation etc. so that in case, operation commands are given through VDU in place of CCIP, then proper working of counters shall be possible and readings of all counters can be read as and when required.

4. INTERLOCKING REQUIREMENTS:

- 4.1 The system shall meet the interlocking requirements as specified in Cl.4.0 of IRS: S 36.

5. SYSTEM COMPOSITION:

- 5.1 The EI system shall consist of the following:

- 5.1.1 Microprocessor based interlocking equipment to read the yard and panel inputs, process them in a fail-safe manner as per the selection table and generate required outputs.

- 5.1.2 Cycle time and response time to read and process the input shall be fast enough to ensure safety and avoid any apparent delay. Cycle time and response time of the system shall be clearly indicated.

- 5.1.3 Requirement of spare parts of each type for the first line maintenance shall be indicated to meet system availability with Mean time to repair (MTTR) being not more than 6 hours.

- 5.1.4 Domino type Control Cum Indication Panel (CCIP) with panel processor having standby processor or VDU control terminal as required by purchaser.

- 5.1.5 Maintenance terminal (MT) with display, keyboard, printer and event logging facility for minimum 10,00,000 events. The system shall have facility for automatic serial data transfer to a central monitoring unit through data logger. The protocol for this communication shall be as per Data Logger specification No. IRS: S-99.

- 5.1.6 Relay rack along with required number of approved type of relays or OCs.

5.1.7 OBJECT CONTROLLER:

- 5.1.7.1 OC shall be a Processor based system having similar architecture as of CIU. It shall work as slave unit of CIU through duplicated serial communication and placed within 15 Km. radius from CIU. The OC shall drive the field gears (Points, Signals & Relays) and take feedback (Inputs) from various field gears without any modification/ change in the design of outdoor Signalling equipment.

- 5.1.7.2 OC shall be normally placed in field locations.

- 5.1.7.3 The medium of communication between CIU and OCs shall be OFC provided on a ring basis. In case of communication failure between CIU & OC, all the outputs shall be brought to safe state whenever two consecutive telegrams are not received in stipulated time period.

- 5.1.7.4 All the inputs and outputs of OCs shall be isolated.

- 5.1.7.5 OC shall carry out the supervisory function to check the proper level of system voltages at critical points to ensure proper working of the system and shall also check the health of the complete system.

- 5.1.7.6 Occurrence of any error in any OC or hardware fault leading to unsafe condition shall immediately withdraw all output commands and remove the source supply to

outputs. Functionally, each OC should be independent from other OC. Error in one OC should not affect the working of other OCs.

5.1.7.7 If the system is developed using OCs, then it shall be developed in following two phases:

- (i) In first phase, the object controller shall have only Relay driver cards duly validated and meeting all safety requirements to drive Points, Signals and other field gears. The approval shall be given to provide system with this arrangement over the stations of Indian Railways.
- (ii) In second phase, after successful testing & working of above mentioned system for specified time as decided by RDSO, Solid State Point and Signal lamp modules shall be developed to the satisfaction of validators and RDSO.

5.1.7.8 In case of Cross Acceptance, EI with OCs may be directly accepted provided these have performed satisfactorily for the quantity and period as specified in Cross Acceptance procedure of RDSO.

5.2 CCIP shall conform to relevant clauses of IRS: S 36 and RDSO/SPN/186. It shall be provided with push buttons/ control switches for individual operation of points, clearing of signals, releasing of crank handle/ground lever frame/ gate controls, cancellation of routes and other functions as covered by IRS: S 36 including block signalling, auto signal, IB signal, adjacent yard layout, to facilitate indication or operation cum indication as per requirement.

5.3 CONTROL TERMINAL WITH VDU DISPLAY:

5.3.1 If required by the purchaser, a control terminal with VDU display in lieu of or in addition to conventional CCIP shall be supplied. This will consist of:

- i) A latest PC, colour VDU monitor with minimum size of 17"(43 cm.) as specified by purchaser.
- ii) A Key Board & mouse and
- iii) Suitable interface to continuously display the current position/status of various field equipment and track circuits.

A flashing indication shall be provided on the VDU to indicate healthy condition of the main system, communication channel and panel processor.

Three dot markers in Red, Blue & Green colours respectively shall also be displayed prominently at conspicuous location on the VDU terminal to indicate that the colour monitor is healthy and all the three colours (Red, Blue & Green) are present in right proportion.

5.3.2 The control terminal shall work with 230V $\pm$ 10%, 50Hz AC power supply, for which an UPS of adequate capacity shall be supplied along with the system.

5.3.3 A colour monitor (minimum VGA or better) shall be used for the VDU of the control terminal. It shall be possible to display the complete yard layout including the section on the monitor. It shall also have facility for displaying a portion of the yard or section in an enlarged mode, if required.

- 5.3.4 The current position/ status of various field equipments and track circuits shall be displayed on the VDU using different colours/ symbols, as desired by the purchaser.
- 5.3.5 The system shall have suitable interface to receive and process the information for displaying the status of field equipment on the control terminal. This interface shall be of standard type like RS 232 or any other approved type.
- 5.3.6 Availability of communication channel shall be indicated by a constantly flashing indication. Whenever the serial channel goes faulty, a suitable error message shall be displayed on the terminal.

6. **HARDWARE AND FAIL-SAFETY :**

- 6.1 Requirements of SEM as laid down in relevant clause of latest version of RDSO/SPN/144 shall be complied.

6.2 **COMPONENTS :**

Components used shall comply with relevant clause of latest version of RDSO/SPN/144 and should be commercially available.

6.3 **PROTECTION AGAINST ELECTROMAGNETIC AND ELECTROSTATIC INTERFERENCE :**

The requirements laid down in relevant clause of latest version of RDSO/SPN/144 shall be complied. The equipment chassis shall be connected to suitable earth.

6.4 **PRINTED CIRCUIT BOARD :**

- 6.4.1 The requirements laid down in relevant clause of latest version of RDSO/SPN/144 shall be complied.
- 6.4.2 Each card shall be marked with running serial number for identification of individual cards.

6.5 **FAIL-SAFETY :**

- 6.5.1 The requirements laid down in relevant clause of latest version of RDSO/SPN/144 shall be complied.
- 6.5.2 Either or both of hardware and software redundancy shall be provided to ensure that any single fault does not lead to unsafe failure.
- 6.5.3 MTBWSF should be minimum 10^9 hours.
- 6.6 The system shall have provision for accommodating additional 25% of I/O cards.

7.0 SYSTEM ARCHITECHTURE:

7.1 One of the following architectures shall be employed in the system.

- (a) Single Hardware architecture with diverse software. In addition, hot/ Warm standby processor(s) /system shall be provided with facility of automatic changeover.

In case of Warm standby system, the standby system should start functioning with a time delay of approximately 120 secs. of failure of main system. Preferably, the train operation shall not be affected or otherwise, there shall be no unsafe occurrence due to switching over from main system to standby system.

In case of hot standby system, train operation shall not be affected. It should also be ensured that the fault, which affected the main processor/ system, does not affect the hot standby processor/ system.

- (b) Two out of two hardware architecture with identical hardware and identical or diverse software. In addition, warm standby/ hot standby processor(s) / system using similar 2 out of 2 hardware and software architecture shall be provided with facility of automatic changeover.

In case of Warm standby system, the standby system should start functioning with a time delay of approximately 120 secs. of failure of the main system. Preferably, the train operation shall not be affected or otherwise, there shall be no unsafe occurrence due to switching over from main system to standby system.

In case of hot standby system, train operation shall not be affected. It should also be ensured that the fault, which affected the main processor/ system, does not affect the hot standby processor/ system.

- (c) Two out of three hardware architecture with identical hardware and identical or diverse software.

7.2 MAINTENANCE AND DIAGNOSTIC AIDS:

7.2.1 MT consisting of a standard PC with printer from a reputed manufacturer shall be provided for following Operations: -

- i) Display of the current status of points, signals, controls etc. of the yard.
- ii) Storage of minimum one month data or 10,00,000 events.
- iii) Display of recorded events and
- iv) Data transfer to floppy, CD, flash memory or any other storage media.
- v) Transfer of recorded events to external data logger.

7.2.2 Result of the failure of any card/module in the system should be clearly indicated. The supplier should also indicate process of replacing such defective cards / modules.

- 7.2.3 Control operation of yard functions shall not be possible from the maintenance terminal.
- 7.2.4 In case of any module/ card becoming faulty, this fact should be displayed on MT with diagnostic facility to identify faulty module/ card.

8.0 SOFTWARE REQUIREMENTS:

- 8.1 The software of system should have two layers:

- (a) Executive Software or System Software

This Executive Software shall define what the system can do and how the various parts of the system operate together. It shall include all start up and operational safety tests (including checking the Executive Software itself) that are the parts of the processor for continual assurance of safety operation.

- (b) Application Software

It shall be containing the logic that defines how the inputs and outputs for a particular station are related. This shall be station specific.

The Executive Software and Application Software shall be programmed into Read Only Memories (ROM) by the manufacturer. Both the ROMs shall be separated & isolated from each other. It shall not be possible to modify Executive Software. However, Application engineers should have the facility to modify application software as and when required.

- 8.2 Software used in EI should have been developed in conformity with a software engineering standard issued by recognized standards body such as CENELEC with special relevance to safety critical applications. Particular software engineering standards used shall be specified and one complete set of such standards shall be made available to RDSO.
- 8.3 The selected EI Software should have been independently verified and validated. As specified in the software Engineering Standards, full documentation on Quality Assurance Program specially the Verification and Validation (V&V) procedures carried out in-house or by any independent agency, should be made available to RDSO to check their conformity to the standards. If the procedure and documentation for V & V is considered inadequate, RDSO reserves the right to get the verification and validation of software and hardware done by an independent agency at the cost of the supplier.
- 8.4 The system shall conform to software requirements and self-check procedures as laid down in relevant clause of latest version of RDSO/SPN/144.

8.5 SELF CHECK PROCEDURES:

- 8.5.1 Self-check of the associated functional hardware as required by the hardware design should be performed periodically as laid down in relevant clause of latest version of RDSO/SPN/144.

Sufficient self-check should be built into the system to detect possible hardware faults.

- 8.5.2 Integrity of the final vital output of the system for control of the field equipment should be continuously checked by reading both front & back contacts of relays to guard against inadvertent operation of the equipment.

9. POWER SUPPLY REQUIREMENTS:

- 9.1 The EI shall work on 110V/ 60V/ 24V/12V DC power supply.
- 9.2 Two different voltages shall be used, one to drive EI equipment and the other for receiving the inputs from the field gears.
- 9.3 The short circuit protection shall be provided.
- 9.4 The required protection shall be provided to protect from any malfunctioning due to false/ spurious feed.
- 9.5 Suitable surge protection and proper earthing arrangement shall be provided in the power supply system to protect against transient voltages, lightning & spikes etc.
- 9.6 If CCIP and CIU are in separate building, then lightning and surge protection has to be provided for each core of copper cable connecting CCIP and CIU or else OFC cable shall be used to connect CCIP & CIU.
- 9.7 A detailed Power supply arrangement diagram/ circuit shall be provided.
- 9.8 Power supply arrangement for individual processor should be such that, in case of fault in power supply of one processor, all processors should not cease to function simultaneously. It should be possible to switch off and take out faulty processor for repairing/replacement without affecting working of the balance system.

10. INFORMATION TO BE FURNISHED BY THE MANUFACTURER / SUPPLIER:

The manufacturer shall supply the following information.

- a) Design approach for the system.
- b) Functions achieved in hardware & software.
- c) Mode of interaction between hardware & software.
- d) Salient feature through which fail safety has been achieved e.g. use of a watchdog timer, automatic shut down etc.
- e) Proof of safety in the form of process adopted for safety analysis and result thereof.

- f) Full documentation of Software Engineering followed during development.
- g) Full documentation of verification and validation procedure, Quality Assurance Program along with report and certificate from in-house Quality Assurance (QA) Group or an Independent Safety Auditor (ISA).
- h) If the Railways consider software validation necessary, the manufacturer/supplier will supply all the documents etc. to the Validator nominated by the Railways.
- i) Complete application software with facility for EPROM programming for entering yard data.
- j) In case of Cross-Acceptance, the firm should submit the performance feedback as given below :
- Name of System/Equipment :
 - Make :
 - Model/Version No. :
 - User Railway & Section :
 - Maximum Sectional Speed :
 - Average number of Trains per day :
 - Application of System/Equipment :
 - Problems faced and solutions evolved :
 - Failure data may be submitted as per format given below :-

Location	No. of System/ Eqpt.	Date of commissioning	Total hours in use	No. of safe side failures	No. of unsafe failures	MTBF	MTBWSF	MTTR
Total								

Proven ness criteria of Equipment Usage of same Type/Make & Model/Version shall be as under: -

S.No.	Category of Equipment/System	Minimum no. of Equipment	Equipment Hours in use
1.	Solid State Interlocking	25	2,16,000

- (i) At least 20% of the equipment/system, with a minimum of 10, should be in continuous operation for a minimum period of 720 days.
- (ii) If the offered equipment has undergone minor hardware/software up-gradation to improve functionality/safety of the equipment in recent past, then the equipment utilisation of the earlier version (prior to minor modifications) can be considered for the proveness. However, in such cases, a minimum of 10 (Ten) equipments should be in continuous operation for a minimum period of 180 days.

10.1 The manufacturer shall supply the following documentation/ manuals:

- i) Installation & Maintenance Manual with pre-commissioning check list.

- ii) Diagnostic aids including troubleshooting charts: A trouble-shooting chart shall also be provided to indicate the step-by-step actions to be taken in case of failure of the equipment. It shall be possible to rectify the fault by replacement of defective PCB card by the maintainer at site.
 - iii) Details of Hardware e.g. schematic diagrams of the system circuits/components, details for each type of assembled PCB.
 - iv) Details of software algorithm flow chart along with test/validation procedure used and the results thereof.
 - v) Version No. of Signalling equipment shall be as per RDSO/SPN/ 144. In case of Cross-acceptance, Version No. as per manufacturer's practice may be accepted.
 - vi) Software checksum of EPROM(s) shall be provided as per RDSO/SPN/ 144.
- 10.2 The manufacturer shall provide the following certifications from approved validation agency:
- i) Correctness and safety of the software.
 - ii) Reliability and fail-safety of the interlocking system.
 - iii) Details of modifications carried out in the system and its subsequent validation.
 - iv) Expected MTBF.
 - v) Expected MTBWSF.
 - vi) Expected MTTR.

11. TESTS AND REQUIREMENTS:

11.1 Conditions of Tests

Unless otherwise specified all tests shall be carried out at ambient atmospheric conditions.

11.2 For inspection of material, relevant clauses of IRS: S 23 and RDSO/SPN/144 shall apply.

11.2.1 TEST EQUIPMENT:

The firm should have all essential Testing Equipments as per latest STR.

11.3 TYPE TESTS:

11.3.1 Standard RDSO layout shall be used for conducting type tests.

The following tests shall constitute type tests:

- a) Visual inspection as per Clause 12.1
- b) Insulation Resistance tests as per Clause 12.2
- c) Card-level functional tests on all the cards and fail-safety tests on one card of each type.
- d) System level functional and fail-safety tests.
- e) Computerised testing for minimum two hundred thousand permutations and combinations as per Clause 12.3.

- f) Environmental/ climatic tests as per Clause No. 9.0 of RDSO/SPN/144, Revision 1 (Indoor Equipment).
- g) System Diagnostics test as per Clause 12.4.
- h) System Software tests as per Clause 12.5.

11.3.2 Any other tests shall be carried out as considered necessary by RDSO.

11.3.3 Only one EI shall be tested for this purpose. The equipment shall successfully pass all the type tests for proving conformity with this specification. If the equipment fails in any of the type tests, the purchaser or his nominee at his discretion, may call for another equipment/card(s) of the same type and subject it to all tests or to the test(s) in which failure occurred. No failure shall be permitted in the repeat test(s).

11.4 **ACCEPTANCE TEST:**

11.4.1 The following shall comprise acceptance tests:

- a) Visual inspection (Clause 12.1)
- b) Insulation Resistance tests (Clause 12.2)
- c) Card level functional test on all the cards.
- d) System level functional tests.
- e) System Diagnostics test (Clause 12.4)
- f) Verification of application software vis-a-vis selection table (This shall be done by user Railway).

11.4.2 Any other tests shall be carried out as considered necessary by the purchaser.

11.5 **ROUTINE TEST:**

11.5.1 The following shall comprise the routine tests and shall be conducted by manufacturer on every EI and the test results will be submitted to the inspection authority before inspection. The application software in proper format shall also be submitted to the inspection authority in advance.

- a) Visual inspection (Clause 12.1)
- b) Insulation Resistance tests (Clause 12.2)
- c) Card level functional test on all the cards.
- d) System level functional test.
- e) Computerised testing for 1,00,000 permutations and combinations (Clause 12.3)
- f) System diagnostics test as per Cl. 12.4.

11.5.2 Any other tests shall be carried out as considered necessary by the purchaser.

12 **TEST PROCEDURE:**

The test procedure shall be based on the system design. The methodologies to be adopted for various tests shall be decided taking into account the system design/ configuration and shall be approved by the purchaser.

12.1 VISUAL INSPECTION:

The equipment shall be visually inspected to ensure compliance with the requirement of Clauses 3 to 7 of this specification. The visual inspection will broadly include –

i) System level checking:

Constructional details
Dimensional check
General workmanship
Configuration

ii) Card level checking

PCB laminate thickness
General track layout

Quality of soldering and component mounting

Conformal coating
Legend printing
Green masking

iii) Module level checking

Mechanical polarisation
General shielding arrangement of individual cards
Indications and displays
Mounting and clamping of connectors.
Proper housing of cards

12.2 INSULATION RESISTANCE TEST:

This test shall be conducted between the equipment power supply line terminals and the earth. If there is a possibility of the meggering voltage reaching the cards, these will be taken out before starting the IR test.

This test shall also be carried out after the climatic tests. The measurement shall be made at a potential of not less than 500 V DC.

The IR value shall not be less than 10 Mega ohms. After the climatic tests, this value shall not be less than 10 mega ohms.

12.3 COMPUTERIZED TESTING:

The manufacturer shall provide a computer-based test set up with the required software for automatic testing.

The following tests shall be conducted with the help of this set up.

12.3.1 FUNCTIONAL TESTING:

The system shall be tested functionally for all the signals with all routes, point operation, emergency point operation, route cancellation, emergency route cancellation, operation of G/F control points, level crossings and crank handle as per the selection table of the yard provided by the purchaser.

12.3.2 OPERATIONAL FAIL SAFETY TEST:

These tests are conducted as per procedure given below:

- i) After setting of points in main route & desired overlap, signal is cleared. Back locking of the route and overlap should be verified. It should also be checked that other yard functions are free.

The track circuit of the route should be dropped one by one and it should be verified that it is not possible to clear the signal. All the routes are checked one by one.

- ii) Conditions required for route setting should be disturbed in various permutations and combinations and it should be verified that it is not possible to set the route with the disturbed conditions. Similarly, conditions required only for signal clearance (such as track circuits) should also be disturbed and it should be verified that the route is set but the signal is not cleared.

12.4 SYSTEM DIAGNOSTICS TEST:

These tests shall be conducted by automatic test procedure through a PC. The diagnostic tests on the system shall be performed to test the integrity of the system software by verifying the checksum. It shall be possible to verify the application program vis-a-vis the selection table by the user, preferably through regeneration of the locking table from yard data.

The PC at the end of the test shall print out summary of the tests conducted.

12.5 SYSTEM SOFTWARE TEST:

Checksum of system software and format of the application software shall be verified. In case of any change in the system software/ format of application software, the same shall be validated.

- 12.6 Type test, Acceptance test and Routine test as given in para 11.3, 11.4 and 11.5 shall not be required in case of Cross- acceptance, The firm has to submit following documents to ensure that the system meets all requirements as mentioned in para 11:

- i) Certificates of Type tests done as required by RDSO specifications.
- ii) List of Routine tests done and sample copy of results to be submitted.
- iii) Acceptance tests to be done at the time of inspection of equipment to be supplied.
- iv) Performance feed back reports from user Railways.

For the verification of same, a team of RDSO officials may visit the manufacturing facility of manufacturer in its respective Country(s). Sample tests shall be carried out, if found necessary. However, at least one set of equipment shall have to be installed in Indian Railways, to prove its performance in Indian conditions. Details of cross acceptance procedure may be referred to in concerned document of RDSO.

13. QUALITY ASSURANCE:

- 13.1 All materials & workmanship shall be of good quality.
- 13.2 Since the quality of the equipment bears a direct relationship to the manufacturing process and the environment under which it is manufactured, the manufacturer shall ensure QAP of adequate standard.
- 13.3 Validation and system of monitoring of QA procedure shall form a part of type approval. The necessary Plant, Machinery and Test instruments as given below shall be available with the manufacturer.

13.3.1 PLANT AND MACHINERY:

The firm should have all essential Plant & Machinery as per latest STR.

In case of CA, the above Plant and Machinery shall not be necessary to be available with Indian Partner if no TOT is taking place. In case of TOT, The same shall be required with Indian Partner of foreign firm.

In case of CA, when TOT is not taking place, the Plant & Machinery may be verified by the team of RDSO officials visiting the Firm premises.

- 13.3.2 All test instruments as given in Cl. 11.2.1 shall be available with the manufacturer.
- 13.4 Along with the prototype sample for type test, the manufacturer shall submit the Quality Assurance Manual.

14. PACKING:

As per relevant clause of latest version of RDSO/SPN/144.

15. INFORMATION TO BE FURNISHED BY THE PURCHASER:

- a) Approved interlocking plan, selection table and panel diagram of the station (Cl. 3.1).
- b) Whether CCIP (domino type) or VDU control terminal or both required (Cl. 5.1.4).
- c) System output required to drive field gears – relay interface or object controllers.
- d) 110V AC or DC usage for signal lamp lighting.
- e) Size of VDU monitor screen, if ordered.
