GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
Research Designs & Standards Organisation (RDSO)
Stores Directorate
Manak Nagar, Lucknow
INDIA-226011

BID DOCUMENT

For Procurement of
"Design, Development, Supply, and trial of Train Collision Avoidance System with multi-vendor interoperability features"

Tender No. SP-3/041/Signal/OT/2012

Due on 15.01.2013

Bid Document consists of following

1. Bid Invitation notice
2. Bid document part-I, Section-I (It consists of instructions to tenderers)
3. Bid document part-I, Section-II & III (It consists of IRS conditions of contract and format of annexures)
4. Bid document part-I, Section-IV (It consists of General conditions of contract)
5. Bid document part-II, Section-I (It consists of technical specification & drawings etc.)
6. Bid document part-II, Section-II (It consists of Special conditions of contract (SCC) and sketches)

Cost of Bid Document:- Rs. 10,000.00

GOVERNMENT OF INDIA: MINISTRY OF RAILWAYS
RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW-226011.

Open Bid Invitation Notice No: 28/2012

1.0 Sealed tenders are invited, for and on behalf of The President of India on **Two packet system**, for "Design, Development, Supply and trial of Train Collision Avoidance System with multi-vendor interoperability features" from indigenous manufacturer who shall have carried out design and development of software embedded control systems with its field trials in the field of Train Protection or Train Collision Avoidance or indigenous manufacturer of software embedded Railway Signaling products such as Electronic Interlocking (EI), Single Section Digital Axle Counter (SSDAC), Multi Section Digital Axle Counter (MSDAC), Data loggers for logging signaling events, Solid State Block Proving Axle Counter (SSBPAC) and Universal Fail-Safe Block Interface (UFSBI) for supply of following:-

Item No.	Tender Number	Description	Qty.	Cost of Bid Document (in Rs)	Earnest Money Deposit (in Rs)	Last date of submission/ opening of tender
A	B	C	D	E	F	G
1.	SP-3/041/Signal/OT/2012	"Design, Development, Supply and trial of Train Collision Avoidance System (TCAS) with multi-vendor interoperability features" as per technical specification no. RDSO/SPN/196/2012 version 3.1.1 and Special Conditions of Contract enclosed with bid documents.	As per schedule of requirement for 3 contract packages A,B and C	10,000.00 (Rs. Ten Thousand)	20,00,000.00 (Rs. Twenty Lakh)	**15.01.2013**

2.0 **Delivery Period:** The indicative delivery schedule of various requirements of supply, installation, field trials etc. is given in tender documents.

3.0 **Consignee:**- Supervisors nominated by South Central Railway, Secunderabad for Site Equipment and Director/Signal, Signal Directorate, RDSO, Manak Nagar-Lucknow-226011, Uttar Pradesh for RDSO Equipment.
Field trials in an extensive manner are proposed to be held in Secunderabad division of South Central Railway in section Wadi (Excluding) – Vikarabad – Bidar – Lingampalli. All the stations, mid-block section interlocked Level crossings and IBS locations falling within above sections are required to be interfaced with TCAS system as specified in the special conditions of contract .

Field trials will require installation of onboard TCAS system on Diesel and Electric locomotives running in above sections and intending tenderer shall fully acquaint himself with existing conditions on locomotives, such as space availability, EMC issues, Power supply, any other required subsystem of locomotives having a bearing on the performance of the TCAS system as specified in the special conditions of contract.

4.0 Non-transferable Bid documents, containing detailed description, specifications, terms & conditions and scope of supply are available on payment of cost of tender as specified above under Para 1 column E, by a crossed Demand Draft (DD) Payable at Lucknow in favour of Executive Director/ Finance, RDSO, Lucknow, India. A request letter along with Demand draft for this should be addressed to Executive Director/Stores, RDSO, Manak Nagar, Lucknow-226011. Please indicate name and address of the bank issuing the demand draft and your account number on the request letter. No other mode of payment will be accepted for this purpose.

5.0 Tenderers are required to indicate their bank details (like name of the bank, account number and PAN/TAN number).

6.0 These bid documents are also available at RDSO website www.rdso.indianrailways.gov.in. Tenderers are advised to see RDSO website for latest updations / corrigendum.

7.0 Tenderers can download and use these documents for the purpose of submitting the bids. However, it will be responsibility of tenderer to ensure use of complete bid document available on website. These documents will be considered equally legally valid for participation in the tender process as manual documents obtained from RDSO through manual process, subject to declaration form and other details properly filled. The cost of downloaded bid documents as indicated in para1 col.- E above must be submitted along with offer in the form of a demand draft (DD) payable at Lucknow in favour of Executive Director/Finance, RDSO, Lucknow, failing which offer/bid would be summarily rejected.

8.0 In case, bid documents are required by post, the request letter along with Demand Draft as cost of tender documents must reach this office at least 15 days before the opening date of tender, so that desired tender documents can be dispatched well in time.

9.0 Please note that bid documents will not be available on cash payment under any circumstances. Bid Documents can also be obtained personally between 10.30 hr to16.00 hr on any working day till one day before tender opening date.

10.0 Bidders are required to furnish Earnest Money of amount specified in para 1 column- F above, in the form of Demand Draft/Bank Guarantee/Deposit Receipts from a nationalized bank/scheduled commercial bank valid for a period of six months plus 45 days from the date of issue, payable as mentioned under para 2 above.

11.0 Tenderers should keep their bids valid for 180 days from the date of opening of bid. In case of two-packet system, the validity for Financial offer will be taken 180 days from date of opening of technical offer. Offers with less validity are liable to be ignored.

12.0 Bids complete in all respect should be dropped before & upto 14.30 hrs of the opening date, in the nominated tender box, placed in office of Executive Director/Stores in Stores Directorate at RDSO. Tender boxes are named as per day of week, tender to be dropped in the respective box as per day of week falling on the due date tender opening. The responsibility for dropping the tender timely & in correct box lies with the firm. Tender will be opened on the same day at 15.00 hrs, in the tender opening room of Stores Directorate.

13.0 In case opening date/day falls on a gazetted holiday or subsequently declared as such a holiday, then the tenders will be opened on next working day at scheduled hour.

14.0 Bids from tenderers who have not purchased bid documents from the office of Executive Director/Stores, RDSO, Lucknow or from those who have downloaded the tender documents from RDSO website but not paid the requisite cost of tender documents, or incomplete and or late/delayed bids will be summarily rejected.

15.0 RDSO, being a Research Institution of Ministry of Railways and also registered with Department of Scientific and Industrial Research, New Delhi, is at present, eligible for exemption from payment of customs duty (in full except 5% ad- valorem plus cess etc. and additional CD @ 4%or as applicable time to time for public funded research institutes) & excise duty in full under Government Notification no. 51/96-Customs dated 23 July 1996 (as amended) and Government notification No: 10/97-Central Excise dated 1 March 1997 as amended) for the research certified items respectively. *This item is meant for research purpose hence RDSO is entitled for excise duty/custom duty exemption* .Accordingly tenderer(s) may quote their prices considering above exemption or as the case may be, duly indicating clearly each element of cost/offer, with and without concessional/ exemption, failing which inter-se ranking will be judged duly loading with maximum value applicable for the case.

16.0 AMC:-Tenderers to note that they have to mandatorily quote yearly rates for annual maintenance charges for 5 years beyond the warrantee period of 2 years after completion. These rates will not be considered for evaluating inter-se ranking of offers but they are must for fixing rates and to ensure that bidder is ready to accept Annual maintenance Contract, if entered into by user at later date. Not quoting the AMC charges will therefore render the offer as financially incomplete and will be summarily rejected.

17.0 **SUBMISSION OF BIDS UNDER 'TWO PACKET SYSTEM'**

(a) Bidders are required to submit their bids **in duplicate marked as 'original' and 'duplicate' in two separate parts**, first part being 'Technical and Commercial Portion' and second part being 'Financial Portion'. A soft copy of the bid may also be enclosed with their bids preferably; however basis of evaluation will be the hard signed copy of bid.

(b) **Rate or cost elements must not be mentioned in Technical and Commercial portion under any circumstances what so ever**, else offer will be summarily rejected. However, one blank copy of rate format to be enclosed with Technical and Commercial portion , indicating **'yes' or 'no'** for the various entries to ensure that format of Financial Portion has been filled properly and no essential part is left. Financial terms and rates shall be submitted in separate sealed cover in Financial Portion.

(c) Two separate envelops – Technical and commercial portion in one envelop and financial portion in other should be sealed and marked as under:

I. Technical and commercial Bid from M/s----------against Tender No.SP-3/041/Signal/OT/2012 Due on **15.01.2013.**

II. Financial Bid from M/s---------- against Tender No. SP-3/041/Signal/OT/2012 to be opened later.

(d) Both the above said envelopes should be placed inside a larger envelope and sealed further. Tender no., due date of opening and firm's name should be clearly mentioned on the cover.

(e) If packet is larger in size and not possible to drop in relevant tender Box, the same should be handed over to the tender clerk in confidential tender room of Stores Directorate and acknowledgment to be obtained.

(f) The date of opening of Financial bid will be advised later on to the bidders whose technical bids are found technically suitable.

18.0 **NOTE:**

1. Bid from tenderers who have not purchased bid documents or not downloaded from internet website or submitted without tender cost or bids not accompanied by bid guarantee/ earnest money deposits are liable to be summarily rejected.
2. For the tenderers guidance in submitting complete offers, a check list has been enclosed with the bid document Part-I, which must be filled in and furnished with the bid.
3. Fax and incomplete offers are liable to be summarily rejected.

For & on behalf of President of India
Acting through Executive Director/Stores/RDSO
Telefax : +91 522 2451728 / 2465701

GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

RESEARCH DESIGNS & STANDARDS ORGANISATION

BID DOCUMENTS
(Part-1)

"Design, Development, Supply and trial of Train Collision Avoidance System with multi-vendor interoperability features"

Ordinary (Domestic) Purchases
(Open tender)

MANAK NAGAR, LUCKNOW,
U.P. – 226 011.

www.rdso.indianrailways.gov.in

BID DOCUMENTS
PART-I

SECTION-I
INSTRUCTIONS TO TENDERERS
Table of contents

INSTRUCTIONS TO TENDERERS:

0100. GENERAL INSTRUCTIONS

0101. For & on behalf of the President of India, the Executive Director (Stores), Research Designs and Standards Organisation, Ministry of Railways, Lucknow-226011, India (hereinafter referred to as the Purchaser), invites bids from established and reliable manufacturers for the supply as set forth in the tender documents/ schedule of requirement.

0102. All bids in the prescribed format given in the special conditions of contract, should be submitted before the time and date fixed for the receipt of bids as set forth in the tender papers. Bids received after the stipulated time and date would be summarily rejected.

0103. All information in the bid must be in English. Information in any other language must be accompanied by its authenticated translation in English; failure to comply with this may render the bid liable to be rejected. In the event of any discrepancy between a bid in a language other than English and its English translation, the English translation will prevail.

0200. SPECIFICATIONS

Specifications other than those issued by R.D.S.O. and indicated in Bid Documents Part-II may be obtained on payment from the following:

(i) Indian Railway Standard Specification from
   (a) The Controller of Publications, Civil Lines, Delhi-110054, India.
   (b) Office of the High Commissioner for India, Publication Branch, India House, Aldwych London-WC2B 4NA

(ii) Indian Standards Specifications from
   The Director General, Indian Standards Institution, Manak Bhawan,
   9, Bahadur Shah Zafar Marg, New Delhi-110 001, India.

For Specifications pertaining to RDSO, concerned directorate may be contacted. In case further details are needed indentor / consignee as per details in Bid Document Part-II may be contacted. The responsibility to get specification lies with prospective bidder.

0300. COMPLIANCE WITH TECHNICAL SPECIFICATIONS

0301. The equipments offered should be in accordance with the stipulated drawings and specifications in tender documents. Details of variations from the drawings and specifications, if any, should be clearly indicated and in such an event a certificate from the users must be furnished to the effect that the product offered is an alternative acceptable to the users in the country of origin and in one or more other countries. The names of those foreign countries should also be indicated.

0302. The purchaser may accept internationally accepted alternative specifications, which ensure equal, or higher quality than the specifications mentioned in the 'Technical Specifications', however, the decision of the purchaser in this regard shall be final. Two copies of the alternative specifications offered should be sent along with the bid.

0303. The Tenderer shall indicate his compliance or otherwise against each clause and sub-clause of the technical specifications. The tenderer shall, for this purpose, enclose a separate statement of deviations (Annexure-7) indicating compliance or otherwise of each clause and sub-clause of specifications, which should invariably, be filled in and submitted along with the bid. Whenever the tenderer deviates from the provisions of a clause/ sub-clause, he shall furnish his detailed justification for the same in the 'Remarks' column.

0304. If the tenderer shall have any doubt as to the meaning of any portion of the conditions or of the specifications, drawings, or plans, he shall (before submitting the bid) set forth the particulars thereof and submit them to RDSO in writing, in order that any such doubt may be removed.

0400. General Guidelines

0401. The tenderers should quote their lowest possible prices.

0402. Quotations should be made only for quantity specified in the bid documents. Evaluation basis shall be with reference to quantity tendered.

0403. Tenderers submitting bids shall indicate the price FOR (Free on Rails) destination station. The FOR destination price shall include all State and Central taxes and Excise Duties leviable on the final finished supplies tendered for. In addition, a complete break-up showing the ex-factory price, packing charges, excise duty, other levies, sales tax, forwarding charges, freight and insurance charges and other charges, if any, shall also be given. Purchaser reserves the right to place contract on the basis of FOR station of despatch or FOR destination station as considered fit by him.

0404. Price to be quoted by tenderers should take in to account the credit availed under modvat / VAT schemes as per the latest directives. Element of each item should be quoted clearly and distinctly.

0405. The tenderers who intend to quote on FOR destination station basis. While quoting for such of the goods as attract excise duty on ad valorem basis will take note of Section 4(2) as updated of the Central Excise and Sale Act, 1944 as amended and indicate the element of transportation and insurance, if any, include in their FOR destination rate.

0406. Being indigenous bid, the tenderer is not entitled to any agency commission.

0407. The Purchaser will not pay separately for transit insurance and the supplier will be responsible till the entire stores contracted for arrive in good condition at destination. Where the tenderer intends to insure the goods, the insurance charges should be clearly indicated, separately in the break-up. The consignee, will advise the tenderer within 45 days of the arrival of goods at the destination, any loss/ damage, etc., of goods and it shall be the responsibility of the tenderer to lodge the necessary claim on the carrier and on insurer and pursue the same. The tenderer shall, however, at his own cost replace, rectify the goods lost/ damaged to the entire satisfaction of the consignee, within 30 days from the date of receipt of intimation from the consignee, without waiting for the settlement of the claims.

0408. The tenderers must ensure that the conditions laid down for submission of bids detailed in the in tender documents, are completely and correctly fulfilled. Bids, which are not complete in all respects as stipulated above, may be ignored.

0409. IMPORT LICENCE (if required **)** The successful tenderer will have to apply to the proper Government Authority for grant of requisite import licences/foreign exchange for such item(s) as require import, within 14 days of the advance letter of acceptance and the Purchaser will only render assistance, where necessary. However, Purchaser will have no responsibility whatsoever in this regard.

0410. Following special conditions will be applicable in case of VAT:-

(a) The Tenderer should quote the exact percentage of VAT that they will be charging extra.

(b) While quoting the rates, tenderer should pass on (by way of reduction in prices) the set off/input tax credit that would become available to them by switching over to the system of VAT from the existing system of sales tax, duly stating the quantum of such credit per unit of the item quoted for.

(c) The tenderer while quoting for tenders should give the following declaration:
"We agree to pass on such additional set off/ input tax credit as may become available in future in respect of all the inputs used in the manufacture of the final product on the date of supply under the VAT scheme by way of reduction in price and advise the purchaser accordingly".

(d) The suppliers while claiming the payment will furnish the following certificate to the paying authorities:
"We hereby declare that additional set offs/input tax credit to the tune of Rs._____has accrued and accordingly the same is being passed on to the purchaser and to that effect the payable amount may be adjusted".

0411. For tenderers guidance in submitting complete offers, a checklist has been enclosed at the end of tender documents**,** which must be filled in and furnished with the bid.

0500. QUALIFYING REQUIREMENTS OF TENDERERS

0501. The tenderer shall provide satisfactory evidence acceptable to the Purchaser to show that -

(a) he is a licensed manufacturer, who regularly manufactures the item(s) offered and has adequate technical knowledge and practical experience;

(b) he has adequate financial stability and status to meet the obligations under the contract for which he is required to submit a report from a recognised bank or a financial institution;

(c) he has adequate plant and manufacturing capacity to manufacture and supply the item(s) offered within the delivery schedule indicated by him;

(d) he has established quality control system and organization to ensure that there is adequate control at all stages of the manufacturing process.

0502. For purposes of clause-0501, the tenderers should additionally submit:

(a) a performance statement as in Annexure-2, giving a list of major supplies effected in last 3 years of the item(s) offered by him, giving details of the Purchaser's name and address, order no. and date and the quantity supplied and whether the supply was made within the delivery schedule;

(b) a statement indicating details of equipment employed and quality control measures adopted by manufacturer as in Annexure-3.

0503. In addition to the above, further information regarding his capacity/ capability, as required by bid document Part-II and any further if required by the Purchaser shall be promptly furnished by the tenderer.

0504. Tenderer not submitting the requisite information may note that his bid is liable to be ignored.

0600. TIME SCHEDULE

0601. The basic consideration and the essence of the contract shall be the strict adherence to the time schedule for the supply of item/ items offered.

0602. The time and the date specified in the contract for the delivery of the stores and equipment shall be deemed to be the essence of the contract and delivery must be completed not later than the date so specified. The attention of the tenderers is invited to clauses regarding liquidated damages and default in the General/ IRS Conditions of Contract by which the contract shall be governed.

0700. EARNEST MONEY/ BID GUARANTEE

0701. Earnest Money/ Bid Guarantee for amount of Rs. 20,00,000.00 (Rs. Twenty Lakhs Only) also as stipulated in the "Bid invitation" shall accompany each bid. The Earnest money/ bid guarantee should be kept valid for 45 days beyond the validity period of the offer i.e. 180 days + 45 days. The latest guidelines on this subject are available on RDSO website. The Earnest Money/ Bid Guarantee shall be in the form of :

a) A crossed Bank Draft in favour of the" Executive Director Finance, RDSO, **A/C "Name of firm "**Ministry of Railways ,Manak Nagar, Lucknow-226011 (UP),India , from a Nationalised Indian bank or Scheduled commercial Bank.

b) An irrevocable Bank Guarantee of any Nationalised Indian Bank or Scheduled commercial bank in favour of the Purchaser in the form attached (Annexure-10).

0702. The earnest money/ bid guarantee shall remain deposited with the Purchaser for the period of 225 days from the date of opening of tender. If the validity of the bid is extended, the earnest money/ bid guarantee duly extended shall also be furnished, failing which the bid after the expiry of the aforesaid period shall not be considered by the Purchaser.

0703. No interest will be payable by the Purchaser on the earnest money/ bid guarantee.

0704. The earnest money/ bid guarantee deposited is liable to be forfeited if the tenderer withdraws, amends, impairs or derogates from the bid in any respect within the period of validity of his bid.

0705 The earnest money/ bid guarantee of the successful tenderer will be returned after the Contract performance Guarantee required @ 10% of contract value as per relevant tender conditions and formal contract duly signed is received by the purchaser.

0706. If the successful tenderer fails to furnish a Contract Performance Guarantee, as required as per relevant tender conditions and the formal contract duly signed within fifteen days of the receipt of the formal contract, then the earnest money / bid guarantee shall be liable to be forfeited by the Purchaser.

0707. Any tender not accompanied by the earnest money/ bid guarantee in a approved form given in clause-0701 is liable to be ignored**.**

0708 The earnest money of all unsuccessful tenders will be returned by the Purchaser within 30 (Thirty) days of the finalisation of the tender. The Railway shall not be responsible for any loss or depreciation that may happen to the Security for the due performance of the stipulation to keep the offer open for the period specified in the tender documents or to the Earnest Money while in their possession nor be liable to pay interest thereon.

0800. SUBMISSION OF BIDS/OFFERS:

0801. All bids/offers shall be either type-written or written neatly in indelible ink.

0802. Any individual (s) signing the bid 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 duly authorised by a resolution passed by the Board of Directors or in pursuance of the authority conferred by Memorandum of Association.

0803. In the case of a firm not registered under the Indian Partnership Act, all the partners or the attorney duly authorised by all of them should sign the bid and all other connected documents. The original power of attorney or other documents empowering the individual or individuals to sign should be furnished to the Purchaser for verification, if required.

0804. All prices and other information like discounts, etc., having a bearing on the price shall be written both in figures and words in the prescribed bid/offer form.

(a) If there is any variation between the rates quoted in figure and in words, rates quoted in "WORDS" shall be taken as correct. If more than one rates are tendered or if the rates tendered are considered improper for some items, the highest of the rates quoted among the offers by other tenderers for that same item shall be taken for evaluation whereas the lowest of the rates quoted among the offers by other tenderers for that same item shall be considered while placing the order.
(b) Tenders with "firm rates" only shall be considered. The offers of tenderers quoting "Rates are negotiable" or with any Price Variation Clause shall be summarily rejected.
(c) If a tenderer deliberately gives wrong information in the tender or create circumstance for acceptance of his tender, RDSO Administration reserves the right to reject such tender at any stage.

0805. Bids/offers in the form should be addressed to the President of India through the Executive Director (Stores), Stores Directorate (Purchase Section), Research Designs and Standards Organisation, Ministry of Railways, Manak Nagar, Lucknow-226011, India.

0806. In case of two packet notice, Tenderers are advised to submit their bids in sealed envelopes with one envelope containing the technical and commercial bid, and the other envelope containing the financial bid. Two sets of above marked original, duplicate and duplicate should then be placed in a cover sealed and addressed to the Executive Director (Stores), Research Designs and Standards Organisation, Ministry of Railways, Manak Nagar, Lucknow-226011,India.It should be marked as:

III. Technical and commercial Bid from M/s----------against Tender No.SP-3/041/Signal/OT/2012 Due on **15.01.2013.**

IV. Financial Bid from M/s---------- against Tender No. SP-3/041/Signal/OT/2012 to be opened later."

The above cover should then be placed in another cover and sealed. This cover should indicate the Tender number and due date of its opening and also the complete address of the tenderer, and addressed to the Executive Director (Stores), Stores Directorate (Purchase Section), Research Designs and Standards Organisation, Ministry of Railways, Manak Nagar, Lucknow-226011, India. Apart from the bid to be submitted as detailed above, no copy of the bid should be sent to other offices either at Lucknow or elsewhere.

0807. Bid shall be as per the Instructions to Tenderers, and IRS , General and Special Conditions of Contract given in the Bid Documents. However, the tenderer shall indicate his Acceptance or otherwise against each clause and sub-clause of the Instructions to Tenderers, and General and Special Conditions of Contract. For this purpose, the tenderer shall enclose a separate statement (Annexure-6) indicating only the deviations from any clause or sub-clause of the Instructions to Tenderers, and General and Special Conditions of Contract, which he proposes with full justification for such deviations. The Purchaser, however, reserves the right to accept or reject these deviations and his decision thereon shall be final.

0808. Bids are required from the indigenous manufacturers. Bids from other agents, brokers and middlemen will not be accepted.

0809. Each page of the bid 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 bid must be made at the top right hand corner of the first page.

0810. The tenderer should avoid ambiguity in his bid e.g. if his bid is to his standard sizes/lengths/dimensions, he should specifically state them in details without any ambiguity. Brief descriptions such as "standard lengths" etc. should be avoided in the bid.

0900. LOCAL CONDITIONS

It will be imperative on each tenderer to fully acquaint himself of all the local conditions and factors, which would have any effect on the performance of the contract and cost of the stores. In his own interest, the tenderer should familiarise himself with The Income Tax Act, 1961, The Companies (amendment) Acts, 2002, The Customs Act, 1962 and other related Laws in force in India and UP. The purchaser shall not entertain any request for clarifications from the tenderer regarding such local conditions. No request for the change of price, or time schedule of delivery of stores shall be entertained after the bid is accepted by the Purchaser.

1000. Higher Price for Earlier Delivery

This clause is not applicable to subject tender.

1100. Ensuring legal applicability of laws /rules

All tenderers will be responsible for the legality of the offer and ensuring the implementations of various acts/laws as prevalent in their country as well as India. Any tax/duty/levy if not specifically mentioned in offer and contract would be borne by the firm.

1200. EVAUATION OF THE BIDS

1201. For fairness and equity and to facilitate evaluation and comparison, the bids received will be evaluated by the Purchaser to ascertain the best lowest suitable & acceptable bid in the interest of the Purchaser as specified in the specifications and bid documents. Evaluation criteria not mentioned herein but if mentioned specifically in the technical specifications or special conditions of contract, if any, will be taken into consideration in the evaluation of bids.

1202. For multi items, if nothing is specified separately in the tender documents, the evaluation will be based on overall offer.

1203. Generally, the bids are required for delivery FOR destination indicating the break-up - FOR station of despatch, freight & other levies. In case, the Purchaser agrees or opts for delivery FOR station of despatch, the supplier shall agree to book the goods freight pre-paid and recover the freight element through the bill. Where, however, the supplier does not agree in his bid to book the goods freight pre-paid and claim freight element subsequently, the bid shall be loaded with the additional freight element i.e. the surcharge payable, for comparative evaluation.

1204. In pursuance of the Public Procurement Policy on MSE, it has been decided that:-

A.

(i) Tender sets shall be provided free of cost to MSEs registered with the above agencies for the item tendered.

(ii) MSEs registered with the above agencies for the item tendered will be exempted from payment of earnest money

(iii) In tenders, participating MSEs quoting a price within price band of L1+15% shall be allowed to supply a portion of the requirement by bringing down their price to L1 price in situation where L1 price is from someone other than a MSE and such MSEs can be together ordered up to 20% of the total tendered value. 20% out of this 20% (i.e., overall 4%) of procurement of goods and services will be from MSEs owned by Scheduled Castes or Scheduled Tribes (SC/ST) entrepreneurs. In the event of failure of such MSEs to participate in the tender process or meet tender requirements and L1 price, 4% sub-target of procurement earmarked from MSEs owned by SC/ST entrepreneurs shall be met from other MSEs.

B.

I. MSE who are interested in availing themselves of these benefits will enclose with their offer the proof of their being MSE registered with any of the agencies mentioned in the notification of Ministry of MSME indicated below-

(i) District Industries Centres

(ii) Khadi and Village Industries Commission

(iii) Khadi and Village Industries Board

(iv) Coir Board

(v) National Small industries Corporation

(vi) Directorate of handicraft and handloom.

(vii) Any other body specified by Ministry of MSME

II. The MSEs must also indicate the terminal validity date of their registration. Scheduled Castes or Scheduled Tribes (SC/ST) entrepreneurs must enclose attested copy of cast certificate issued by competent authority as prescribed by State Government along with their registration certificate on MSEs.

Failing (I) & (II) above, such offers will not be liable for consideration of benefits detailed in MSE notification of Government of India dated 23.03.2012

1205. The offers received should indicate clearly the rates of ED, CST/ST etc. as leviable on particular item. In case concessional duty or taxes are applicable, the tenderer should quote accordingly. However, if the tenderers state in his offer that ED, CST/ST etc. will be charged as prevailing at the time of supply, then while working out F.O.R. Destination rates for comparison, the highest rate applicable will be loaded on the offer. Similarly, if concessional rate of ED, CST/ST or any other levy is applicable due to lower turnover, the highest applicable rate will be taken for the evaluation of F.O.R

destination rates unless the tenderer confirms in the offer that any increase in the ED,CST/ST or other levy due to increase in the turnover will be absorbed by the tenderer himself.

1206 For statutory taxes/duties all the offers shall be evaluated as per tax regime as applicable on the date of tender opening.

1300. PACKING

1301. The item(s) tendered will have to undergo arduous transportation before reaching the destination and will have to be stored and handled in tropical climatic conditions (including monsoons) before they are put to actual use. It is, therefore, imperative that packing for every item is decided by taking into consideration, inter-alia, the above vital factors, so as to eliminate damage/ deterioration of item(s) in transit/ transhipment/ handling or during storage.

1302. The specifications of the packing proposed shall be indicated. The size and weight of each package shall also be indicated.

1303. The packing advice should bring out the weight, dimensions and size of each bundle/package. Where it is not possible to give weight of the bundle/package, the contractor must indicate the volume of the bundle/ package, the details of contents of each bundle/package, number of bundles/packages and total weight of the items supplied.

1400. ACCEPTANCE OF BIDS

1401. The purchaser may accept a bid for a part or whole of the quantity offered, reject any bid without assigning any reason and may not accept the lowest or any bid.

1402. Acceptance of bid will be communicated by Express Letter/FAX or formal acceptance of bid. Such acceptance of bid shall be deemed to conclude the contract.

1500. EFFECT AND VALIDITY OF BID

1501. The submission of any bid connected with these specifications and documents shall constitute an agreement that the tenderer shall have no cause of action or claim, against the Purchaser for rejection of his bid. The Purchaser shall always be at liberty to reject or accept any bid or bids at his sole discretion and any such action will not be called into question and the tenderer shall have no claim in that regard against the Purchaser.

1502. The bid shall be kept valid for acceptance for a minimum period of 180 (one hundred and eighty) calendar days from and including the date set for opening of bids. In case the offer is silent about same, it will be presumed that bids are valid for 180 days from the date of opening.

1503. Bids shall be deemed to be under consideration immediately after they are opened and until such time the official intimation of award of contract is made by the Purchaser to the tenderer. While the bids are under consideration, tenderers and or their representatives or other interested parties are advised to refrain from contacting the Purchaser by any means. If necessary, the Purchaser will obtain clarifications on the bids by requesting for such information, from any or all the tenderers, either in writing or through personal contact, as may be considered necessary. Tenderers will not be permitted to change the substance of their bids after the bids have been opened.

1600. SPARE PARTS

Where required, the tenderer should quote, apart from main equipment, separately for the mandatory spares as well as for recommended spares required for two years operation (ref. Tech. Spec. clause-9) except as otherwise required in the Special Conditions of Contract or Technical Specifications. The rates for spares should be indicated both on FOB and C&F basis in the cases of foreign bids and FOR destination in the case of indigenous bids with complete break up as per bid form. The Purchaser reserves the right to order any or all the spares as quoted in quantity considered reasonable by him at the prices quoted by the tenderer and on the terms and conditions

quoted for the main equipment. The responsibility of the tenderer under the warranty clause will not be diluted in any way on this account.

1700 Annual Maintenance Contract

(a) Tenderers are required to quote for post warranty Annual Maintenance Contract (AMC) for a period of five years after expiry of the warranty period of the M&P along with their offers. The scope of AMC will include preventive and break-down maintenance. AMC charges will include all costs of personnel, spares etc. except the cost of consumables required for day-to-day operation & daily maintenance checks.

(b) The tender documents must specify the maximum downtime and maximum response time as also penalties for failure to adhere to the same. AMC payment terms should be linked to these performance parameters.

(c) The tenderers should quote AMC rates for each of the five years. The AMC prices for each year will be firm. The AMC charges shall be separately payable in Indian Rupees only. The AMC charges would be added to the FOR destination price quoted for M&P for the purpose of comparative evaluation of offer. In order to equitably compare different AMC charges for different years, the concept of NPV (Net Present Value) will be used at a predetermined rate of discounting to bring the AMC charges at the same footing in the assessment of FOR destination price. The rate of discounting and the of NPV calculation shall be pre-disclosed in the tender document.

(d) The post-AMC maintenance of machines will be dealt with by the end users. In order to facilitate the same, tenderers are to give the current cost of spares required for maintenance of machine after AMC period and the current service charges for each items of work of repair of M&P beyond the AMC period. These charges will not be included in the price of M&P for the purpose of comparative evaluation of offers.

(e) Tenderers, who are OEM, must give undertaking for supply of spare parts for a period of expected life of the machine/equipment. Other tenderers must submit undertaking from OEM for supply of spare parts for a period of expected life of the machine/equipment.

(f) The actual Contract Agreement shall show the AMC charges as a separate schedule/annexure to distinguish it from the transaction value of M&P, to avoid undue Custom Duty/charges.

1800. LAST DATE OF RECEIPT OF BIDS

1801. The bids complete in all respects should reach the Executive Director/ Stores, Research Designs and Standards Organisation, Ministry of Railways, Manak Nagar, Lucknow-226011, UP, India, not later than time & date specified in the 'Bid Invitation Notice'.

1802. The bids received shall be opened, in the presence of such of the tenderers or their representatives who may like to be present, at 15.00 hr on the date specified in the 'Bid Invitation Notice' and where practicable, the names of tenderers and the rates tendered by them will be read out.

1900 SPECIAL LOCAL CONDITIONS:

1901 Field trials in an extensive manner are proposed to be held in Secunderabad division of South Central Railway in section Wadi (Excluding) – Vikarabad – Bidar – Lingampalli. All the stations, mid- block section interlocked Level crossings and IBS locations falling within above sections are required to be interfaced with TCAS system as specified in the special conditions of contract

1902 Field trials will require installation of onboard TCAS system on Diesel and Electric locomotives running in above sections and intending tenderer shall fully acquaint

himself with existing conditions on locomotives, such as space availability, EMC issues, Power supply, any other required subsystem of locomotives having a bearing on the performance of the TCAS system as specified in the special conditions of contract.

1903 It will be imperative on each tenderer to fully acquaint himself with all the local conditions and factors which would have any effect on the- performance of the contract and cost of the system. No request for the change of price or time schedule of delivery of system shall be entertained after the offer is accepted by the purchaser on account of any local condition or factors.

1904 The intending tenderer is advised to study the tender papers carefully. Any submission of quotation 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. These conditions and specifications shall be deemed to have been accepted unless otherwise and specifically commented upon by the tenderer in his quotation. Failure to adhere to anyone or all these instructions may render his offer liable to be ignored without any reference.

1905 Should a tenderer find discrepancies in, or omission from the specification or any of the tender papers or he has any doubt to their meaning, he should at once notify the "Director/ Store", who may send a written clarification to all tenderers.

2000 **COMPLIANCE:**

2001 The equipment offered shall be in accordance with the RDSO specifications and other requirements specified in these tender documents.

2002 The tenderer shall indicate compliance of the requirement of each clause and sub-clause of the Tender document or, in case of non-compliance, how it differs from the requirement of the tender. In the latter case, he shall furnish detailed justification for the deviations proposed and its impact on multi-vendor interoperability. Purchaser reserves the right to accept or reject these deviations and his decision there-on shall be final.

2100 DESIGN:

2101 The design of the equipment shall meet the specification of Train Collision Avoidance System (TCAS), i.e., RDSO/SPN/196/2012 version 3.1.1 (As per bid document part-II) and applicable international functional safety standards for railway signaling systems. (EN50121/50125/50126/50128/50129/50159 –or-- their IEC equivalent IEC62236/62498/62278/62279/62425/62280)

2102 Since interoperability between TCAS systems of different tenderers is a mandatory requirement, no deviation from RDSO specification and tender documents would generally be permitted except when such a requirement for deviation/ is identified as unavoidable during the actual field trials of the system so as to preserve core requirements of safety and functionality of the TCAS system.

2200 **The Technical and Commercial Offer**:-

2201 A brief outline of the system proposed along with diagrams and drawings, the equipment and materials used in the system, cross-reference with the equipment specifications.

2202 A Blank copy of Financial offer having all details quoted in Financial offer indicating ‘Y’ for ‘YES’ and ‘N’ for ‘NO’. The Technical offer must not contain indication or mention of Price. In case, Technical bid is found to contain any mention or indication of price, the complete offer shall be summarily rejected. In case of copy of this

commercial offer contains prices, it shall stand rejected. This Blank copy must contain all the conditions pertaining to commercial nature as specified by the tenderer.

2203 The schedules in commercial offer may be supplemented with explanation indicating systems and sub-systems, details of items as proposed to be covered in the offered schedule. Explanation/ reasons should also contain remarks about such of the items which have not been quoted.

2204 Following information should be furnished along with the offer:

i) Block diagram & system architecture of the system

ii) Brief write-up about different building blocks of the system

iii) Approach of the software including Logic/flowchart for critical functions like those dealing with train location assessment (RFID, Tacho, GPS/GNSS) and braking model for TCAS initiated braking(Auto brake test, manual brake test, braking algorithm) functions.

iv) Composition of the hardware including redundancy if any for safety and availability. The sub-systems should consist of Hardware Timer Clock and at least two spare Input / Output ports other than interfaces for Diagnostics, Networking etc. with provision and design flexibility for future expansion of hardware.

v) Approach on implementation of safety functions of the system

vi) Technical details of system including those subsystems having a bearing on interoperability between systems from different tenderers. These details shall include, among others,

   a. Technical/ Engineering details of RFID,
   b. Radio transmission protocol, along with the bit-wise details of fields transmitted Over-The-Air in time domain
   c. Data structure for radio and RFID based data transmission,
   d. sensitivity of RFID readers and radio receivers,
   e. Algorithm/ logic for location determination using RFID, Tacho & GPS/GNSS etc
   f. Algorithm/ logic for Braking model generation.
   g. Algorithm/ logic for signal aspect display
   h. Algorithm/ logic for treating failures of functions based on RFID location/data, radio communication, GPS/GNSS etc.

vii) Information regarding number of cards of each type proposed to be used, power supply arrangement, dimensional details of the system etc.

2205 Information regarding past experience of the Tenderer in design, development and supply of embedded electronic system for safety critical railway signalling applications and related areas should be provided, supported by verifiable documentary proof.

2206 The tenderer should give a list of relevant infrastructure available with them for design, development and fabrication of hardware, software development and testing, simulation etc.

2207 The tenderer' should indicate number of qualified Design Engineers whom they intend to entrust the job of design, development and fabrication. Experience of the Engineers in the areas of software development and validation as per functional safety standards, applicable for railway sector, also to be indicated along with verifiable documentary evidence for the same.

2208 The tenderer shall indicate separate para by para comment / compliance of the technical specifications and include the same as a part of the technical offer.

2209 Full technical specifications of the equipment and sub-system shall be included in the technical offer.

2210 A list of all the components and modules used shall be included in the technical offer.

2211 A list of Test and Measuring Instruments required for the testing, installation and maintenance of the system and a detailed write-up about the testing procedure to be adopted for the equipment to prove the adequacy of the testing and measuring instruments being offered.

2212 The requisite earnest money/bid guarantee as prescribed in the bid documents.

2213 An undertaking that the complete system is designed as per RDSO specifications and components/sub-systems used in the TCAS system are not protected by any copyright of the tenderer or any third party.

2300 **The Financial offer**

2301 The cost of materials quoted exactly according to the proforma and schedule of requirements enclosed herewith and shall be complete. Offers received for part of the schedule shall be treated as incomplete offer.

2302 An undertaking that the components/ modules and also the main system quoted in the schedule of 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.

2303 An undertaking to the effect that additional quantities up to 30% of the contract value of the system at the same unit rates shall be supplied by the tenderer in case order for the additional quantity is placed within 12 months from the date of issue of the letter of acceptance. It should be noted that this excludes additional quantities that may be required as warranty replacement due to defective design and manufacture etc.

2400 ACCEPTANCE:

2401 The purchaser may accept a tender for a part or whole of the quantity offered, reject any tender without assigning any reasons and may or may not accept the lowest or any tender.

2402 Acceptance of tender will be communicated by fax/ e-mail/ registered post/ express letter of formal acceptance of tender direct to the tenderer. In case where acceptance is indicated by FAX, e-mail the formal acceptance of the tender will be forwarded to the contractor as soon as possible, but the fax, e-mail shall be deemed to conclude the contract.

2500 **ADDRESS FOR COMMUNICATION**:

2501 Tenderer shall indicate, fully and clearly, his postal address, telephone numbers, e-mail address, telegraphic address, if any, FAX and telex numbers. Any communication sent to the tenderers at his said address, shall be deemed to have reached timely, notwithstanding the fact that the communication could not reach the tenderer at all or in time because of any inaccuracy or defect in the said address.

2600 **ERASER OR ALTERATION:** Any eraser and/or alteration in the tender paper will be disregarded or may lead to disqualification of the whole tender at the option of the purchaser until and unless the same has been signed in ink by the person signing the tender along with the stamp.

Executive Director (Stores)
for and on behalf of President of India
Research Designs and Standards Organisation
Ministry of Railways, Manak Nagar
Lucknow-226011, UP, India
Telefax-091-522-2451728

BID DOCUMENTS
PART-I

SECTION-II

INDIAN RAILWAYS STANDARD CONDITIONS OF CONTRACT
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INDIAN RAILWAYS STANDARD CONDITIONS OF CONTRACT

0100. DEFINITIONS AND INTERPRETATION

0101. "Acceptance of Bid" means the letter or memorandum communicating to the Contractor the acceptance of his bid and includes an advance acceptance of his bid:

0102. "Consignee" means where the stores are required by the acceptance of bid to be despatched by rail, road, air or sea, the person specified in the acceptance of bid to whom they are to be delivered at the destination; where the stores are required by the acceptance of bid to be delivered to a person as an interim consignee for the purpose of despatch to another person, such other persons; and in any other case the person to whom the stores are required by the acceptance of bid to be delivered in the manner therein specified.

0103. "Interim consignee" means the servant of the Purchaser to whom the material is delivered for onward despatch to the consignee and does not include a carrier for the purpose of transmission of the stores to the consignee;

0104. "Contract" means and includes the Bid Invitation, Instructions to Tenderers, Bid, Acceptance of Bid, General Conditions of Contract, Special Conditions of Contract, Schedule of Requirements, Particulars and the other conditions specified in the acceptance of bid and includes a repeat order which has been accepted or acted upon by the contractor and a formal agreement, if executed;

0105. The "Contractor" means the person, firm or company with whom the order or contract for the supply is placed and shall be deemed to include the Contractor's successors (approved by the Purchaser), representatives, heirs, executors and administrators, as the case may be, unless excluded by the terms of the contract;

0106. The "Sub-Contractor" means any person, firm, or company from whom the contractor may obtain any material or fittings to be used in the supply or manufacture of the stores;

0107. "Drawing" means the drawing or drawings specified in or annexed to the specifications;

0108. "Government" means the Central Government or a State Government as the case may be;

0109. The 'Inspecting Officer' means the person, specified in the contract for the purpose of inspection of stores or work under the contract and includes his/their authorised representatives;

0110. "Material" means anything used in the manufacturer or fabrication of the stores;

0111. "Particulars" include-

(a) Specifications:
(b) Drawings;
(c) "Proprietary mark" or "brand" means the mark or brand of a product which is owned by an industrial firm;
(d) any other details governing the construction, manufacture or supply of stores as may be prescribed by the contract;

0112. "Proving Test" means such test or tests as are prescribed by the specification (s) to be made by the Purchaser or his nominee, after erection at site, before the plant is taken over by the Purchaser;

0113. "Purchase Officer" means the officer signing the acceptance of bid and includes any officer who has authority to execute the relevant contract on behalf of the Purchaser;

0114. The "Purchaser" means the President of India acting through the Director/ Stores, Research Designs and Standards Organisation, Ministry of Railways, Manak Nagar, Lucknow-226011, UP, India and includes his successors and assignees.

0115. "Signed" includes stamped, except in the case of an acceptance of bid or any amendment thereof;

0116. "Site" means the place specified in the contract at which any work is required to be executed by the contractor under the contract or any other place approved by the Purchaser for the purpose;

0117. "Stores" means the goods specified in the contract which the contractor has agreed to supply under the contract;

0118. "Test" means all the work prescribed by the particulars or considered necessary by the Inspecting Officer whether performed or made by the Inspecting Officer or any agency acting under the direction of the Inspecting Officer.

0119. "Work" means all the work specified or set forth and required in and by the said specifications, drawings and other documents, hereto annexed or to be implied therefrom or incidental thereto, or to be hereafter specified or required in such explanatory instructions and drawings (being in conformity with the said original specification (s), drawing (s) and other documents and also in such additional instructions and drawings not being in conformity as aforesaid, as shall from time to time during the progress of the work hereby contracted for, be supplied by the Purchaser;

0120. The delivery of the stores shall be deemed to take place on delivery of the stores in accordance with the contract to;

(a) the consignee at his premises ; or
(b) where so provided, the interim consignee at his premises: or
(c) a carrier or other person named in the contract for the purpose of transmission to the consignee; or
(d) the consignee at the destination station in case of contract stipulating for delivery of stores at destination station.

0121. "Writing" or "Written" includes matter either in whole or part, in manuscript, typewritten, lithographed, cyclostyled, photographed or printed under or over signature or seal, as the case may be.

0122. Words in the singular include the plural and vice-versa.

0123. Words importing the masculine gender shall be taken to include the feminine gender and words importing persons shall include any company or association or body of individuals, whether incorporated or not.

0124. The heading of these conditions shall not affect the interpretation or construction thereof.

0125. Terms and expression not herein defined shall have the meanings assigned to them in the Indian Sale of Goods Act, 1930 (as amended) or the Indian Contract Act,1872 (as amended) as the case may be.

0200. PARTIES

The parties to the contract are the contractor and the Purchaser as defined in clause 0105 and clause 0114.

0201 **Authority of person signing the contract on behalf of the Contractor-**

A person signing the bid or any other document in respect of the contract on behalf of the Contractor without disclosing his authority to do so shall be deemed to warrant that he has authority to bind the contract. If it is discovered at any time that the person so signing has no authority to do so the Purchaser may, without prejudice to any other right or remedy of the Purchaser, cancel the contract and make or authorise the making of a purchase of the stores at the risk and cost of such person and hold such person liable to the Purchaser for all costs ad damages arising from the cancellation of the contract including any loss which the Purchaser may sustain on account of such purchase. The provisions of clause 1000 shall apply to every such purchase as far as applicable.

0202. **Address of the Contractor and notices and communications on behalf of the Purchaser:**

(a) For all purposes of the contract, including arbitration thereunder, the address of the Contractor mentioned in the bid shall be the address to which all communications

addressed to the Contractor shall be sent, unless the Contractor has notified change by a separate letter containing no other communication and sent by registered post acknowledgement due to the Purchaser. The contractor shall be solely responsible for the consequence of an omission to notify a change of address in the manner aforesaid.

(b) Any communication or notice on behalf of the Purchaser in relation to the contract may be issued to the contractor by the Purchase Officer and all such communications and notices may be served on the contractor either by registered post or under certificate of posting or by ordinary post or by hand delivery at the option of such officer.

0300. QUOTATIONS OF RATES BY CONTRACTORS

0301. The price quoted by the contractor shall not be higher than the controlled price fixed by law for the stores or where there is no controlled price, it shall not exceed the prices or contravene the norms for fixation of prices laid down by Government or where no such prices or norms have been fixed by the Government, it shall not exceed the price appearing in any agreement relating to price regulation by any industry in consultation with the Government. In any case, save for special reasons stated in the bid , the price quoted shall not be higher than the lowest price charged by the contractor for stores of the same nature, class or description to a private Purchaser, domestic or foreign as well as Purchaser Government.

0302. If the price quoted is higher than the controlled price or where there is no controlled price, the price usually charged by the contractor from a private purchaser domestic or foreign as well as Purchaser Government for the stores of the same nature class or description, the contractor will specifically mention this fact in his bid giving reasons for quoting higher price (s). If he fails to do so or makes any mis-statement it shall be lawful for the purchaser, (i) to revise the price at any stage as to bring it in conformity with the sub-clause-0301 above or (ii) to terminate the contract and forfeit the amount of the Contract Performance Guarantee Bond.

0400. DRAWINGS/ SPECIFICATIONS

0401. When bids are called for in accordance with a drawing/ specification, the contractor's bid to supply in accordance with such drawing/specification, shall be deemed to be an admission on his part that he had fully acquainted himself with the details thereof and in no circumstances, will any claim on his part which may arise on account of his insufficient examination of the said drawing/ specification be considered.

0402. The contractor shall be responsible for and shall pay for any alterations for the works due to any discrepancies, errors or omissions in the drawings or other particulars supplied by him whether such drawings or particulars have been approved by the Purchaser or not provided that such discrepancies, errors or omissions be not due to inaccurate information or particulars furnished to the contractor on behalf of the purchaser. If any dimensions figuring upon a drawing differ from those obtained by scaling the drawing the dimensions as figured upon the drawing shall be taken as correct.

0403. Any drawings, tracings, descriptions specified or manuals shall, unless otherwise directed, be furnished by the contractor with the first consignment of the work to which they relate and no payment whatsoever will be made until such drawings, tracings, descriptions or manuals have been furnished to the satisfaction of the Purchaser.

0500. CONTRACT

0501. This contract is for the supply of the stores of the description, specifications and drawings, and in the quantities set forth in the contract on the date or dates specified therein. Unless otherwise specified, the stores shall be entirely brand new and of the best quality and workmanship to the satisfaction of the Inspecting Officer.

0502. The whole contract is to be executed in the most approved, substantial and workmanlike manner, to the entire satisfaction of the Purchaser or his nominee, who,

both personally and by his deputies, shall have full power, at every stage of progress, to inspect the stores at such times as he may deem fit and to reject any of the stores, which he may disapprove, and his decision thereon, and on any question of the true intent and meaning of the specifications shall be final and conclusive.

0503. Any variation or amendment of the contract shall not be binding on the purchaser unless and until the same is duly endorsed on the contract or incorporated in a formal instrument or in exchange of letters and signed by the parties.

0504. The Purchaser or his nominee may require such alteration to be made on the work, during its progress as he deems necessary. Should these alterations be such that either party to the contract considers an alteration in price justified, such alteration shall not be carried out until amended prices have been submitted by the contractor and accepted by the purchaser. Should the contractor proceed to manufacture such stores without obtaining the consent in writing of the purchaser to an amended price, he shall be deemed to have agreed to supply the stores at such price as may be considered reasonable by the purchaser.

0600. CONTRACT PERFORMANCE GUARANTEE BOND

0601. After an advance acceptance of bid or a contract is issued by the purchaser, the contractor shall furnish a Contract Performance Guarantee Bond in the proforma attached (Annexure-8) from a Nationalised Indian Bank within 15 days from the receipt of the advance acceptance of the tender by the contractor or within the period specified in the contract for an amount equivalent to 10% of the value of the contract. In the case of foreign contracts, the Contract Performance Guarantee Bond from a commercial Bank of the contractor's country can be accepted only if the Bond is furnished after getting it duly counter signed by the Reserve Bank of India or State Bank of India, New Delhi. The expenses to be incurred for the counter-signature shall be borne by the contractor.

0602. In case furnishing of an acceptable Performance Guarantee Bond is delayed by the contractor beyond the period provided in clause 0601, and the Bond is accepted by the purchaser, liquidated damages, as provided in clause-0002 for the period of delay in submission of the bond, shall be levied. Alternatively, the purchaser may declare the contract as at an end and enforce clause-0902.

0603. If the contractor, having been called upon by the purchaser to furnish Performance Guarantee Bond fails to furnish the same, it shall be lawful for the purchaser.

(a) To recover from contractor the amount of Performance Guarantee Bond by deducting the amount from the pending bills of the contractor under any contract with the purchaser or the Government or any person contracting through the purchaser or otherwise howsoever, or
(b) To cancel the contract or any part thereof and to purchase or authorise the purchase of the stores at the risk and cost of the contractor and in that event the provisions of clause-0902 shall apply as far as applicable.

0604. On the performance and completion of the contract in all respects the Performance Guarantee Bond will be returned to the contractor without any interest.

0605. The purchaser shall be entitled and it shall be lawful on his part to forfeit the amount of the Contract Performance Guarantee Bond in whole or in part in the event of any default, failure or neglect on the part of the contractor in the fulfillment or performance in all respects of the contract under reference or any other contract with the purchaser or any part thereof to the satisfaction of the purchaser and the purchaser shall also be entitled to deduct from the amount of the Contract Performance Guarantee Bond any loss or damage which the purchaser may suffer or be put by reason of or due to any act or other default, recoverable by the purchaser from the contractor in respect of the contract under reference or any other contract and in either of the events aforesaid to call upon the contractor to maintain the amount of the Contract Performance Guarantee Bond at its original limit by furnishing fresh Bank Guarantee of additional amount, provided further that the purchaser shall be entitled

to recover any such claim from any sum then due or which at any time thereafter may become due to the contractor under this or any other contracts with the purchaser.

0606. The Contract Performance Guarantee Bond shall remain in full force and effect during the period that would be taken for satisfactory performance and fulfilment in all respects of the contract i.e. till satisfactory commissioning of the machine(s) at consignee's works, and shall in the first instance be valid upto the period as specified in the contract after the date of last shipment delivery of the goods contracted to be purchased provided that before the expiry of the date of validity of the Contract Performance Guarantee Bond, the contractor on being called upon by the purchaser from time to time, shall obtain from the Guarantor Bank, extension of time for validity thereof for a period of six months, or as required by the Purchaser on each occasion. The extension or extensions aforesaid, executed on non judicial stamp paper of appropriate value must reach the purchaser at least thirty days before the date of expiry of the Contract Performance Guarantee Bond on each occasion.

0607. As and when an amendment is issued to the contract, the contractor shall within fifteen days of the receipt of such an amendment furnish to the purchaser an amendment to the performance Guarantee Bond rendering the same valid for the contract as amended and upto three months beyond the extended delivery period.

0608. The Contract Performance Guarantee Bond and or any amendment thereto shall be executed on a stamped paper of requisite money value in accordance with the laws of the country in which the same is executed by the party competent to do so. The Contract Performance Guarantee Bond executed in India shall be in accordance with the Indian Stamp Act, as amended from time to time, for adequacy of the Stamp Duty.

0700. DELIVERY

0701. The contractor shall as may be required by the purchaser either deliver free or FOR, FOB or CIF at the place/ places detailed in the contract, the quantities of the stores detailed therein and the stores shall be delivered or dispatched not later than the dates specified in the contract. The delivery will not be deemed to be complete until and unless the stores are inspected and accepted by the inspecting officer as provided in the contract.

0702. Notwithstanding any inspection and approval by the Inspecting Officer on the contractor's premises, property in the stores shall not pass on to the purchaser until the stores have been received, inspected and accepted by the consignee.

0703. In the case of indigenous supplies the purchaser shall not be liable to render assistance to the contractor in securing or to arrange for or provide transport to the contractor, notwithstanding that transport of the stores, is controlled by or under the orders of the Government.

0800. NOTIFICATION OF DELIVERY

Notification of delivery or dispatch in regard to each and every installment shall be made to the Consignee, purchaser, Ultimate Consignee (if applicable) immediately on dispatch or delivery. The Contractor shall further supply to the consignee, to the interim consignee, as the case may be, a packing account quoting number and date of contract and date of despatch of the stores. All packages shall be fully described in the packing account and full details of the contents of the packages and quantity of materials shall be given to enable the consignee to check the stores on arrival at destination. The copy of Railway Receipt/ Consignment Note or Bill of Lading with other dispatch documents, if any, shall be forwarded to the consignee and ultimate consignee named in the contract, as applicable, by registered post immediately on the despatch of stores. The contractor shall bear and reimburse to the purchaser, demurrage charges, if any, paid by reason of delay on the part of the contractor in forwarding the copy of the Railway Receipt, Consignment Note or other dispatch documents.

0900. TIME FOR AND DATE OF DELIVERY: THE ESSENCE OF THE CONTRACT

The time for and the date specified in the contract or as extended for the delivery of the stores shall be deemed to be the essence of the contract and delivery must be completed not later than the date (s) so specified or extended.

0901. **Progressing of deliveries**

The contractor shall allow reasonable facilities and free access to his works and records to the Inspecting Officer, Progress Officer or such other Officer as may be nominated by the purchaser for the purpose of ascertaining the progress of the deliveries under the contract.

0902. **Failure and Termination**

If the contractor fails to deliver the stores or any installment thereof within the period fixed for such delivery in the contract or as extended or at any time repudiates the contract before expiry of such period, the purchaser may without prejudice to his other rights:-

(a) recover from the contractor as agreed liquidated damages and not by way of penalty a sum equivalent to 2% of the price of any stores (including elements of taxes, duties, freight etc.) which the contractor has failed to deliver within the period fixed for delivery in the contract or as extended, for each month or part of a month, during which the delivery of such stores may be in arrears where delivery thereof is accepted after expiry of the aforesaid period, subject to maximum of ten percent of value of the delayed supplies. or

(b) cancel the contract or a portion thereof and if so desired purchase or authorise the purchase of the stores not so delivered or others of a similar description (where stores exactly complying with particulars are not, in the opinion of the purchaser, which shall be final, readily procurable) at the risk and cost of contractor. It shall, however, be in the discretion of the purchaser to obtain or not the Performance Guarantee Bond from the firm/ firms on whom the contract is placed at the risk and expense of the defaulting firm.

Where action is taken under sub-clause (b) above, the contractor shall be liable for any loss which the purchaser may sustain on that account provided the purchase, or, if there is an agreement to purchase

such agreement is made, in case of failure to deliver the stores within the period fixed for such delivery in the contract or as extended within nine months from the date of such failure and in case of repudiation of the contract before the expiry of the aforesaid period of delivery, within nine months from the date of cancellation of the contract. The contractor shall not be entitled to any gain on such purchase and the manner and method of such purchase shall be in the entire discretion of the purchaser. It shall not be necessary for the purchaser to serve a notice of such purchase on the contractor.

0903. **Extension of Time for Delivery**

If such failure as in the aforesaid clause 0902 shall have arisen from any cause which the purchaser may admit as reasonable ground for extension of time, the purchaser shall allow such additional time as he considers to be justified by the circumstances of the case, and shall forgo the whole or such part, as he may consider reasonable of his claim for such loss or damage as aforesaid. Any failure or delay on the part of Sub Contractor shall not be admitted as a reasonable ground for any extension of time or for exempting the contractor from liability for any such loss or damage as aforesaid.

0904. **Consequence of Rejection**

If on the stores being rejected by the Inspecting Officer or interim consignee or consignees at the destination, the contractor fails to make satisfactory supplies within the stipulated period of delivery, the purchaser shall be at liberty to:-

(i) require the contractor to replace the rejected stores forthwith but in any event not later than a period of 21 days from the date of rejection and the contractor shall bear all cost of such replacement including freight, if any, on such replacing and replaced stores but without being entitled to any extra payment on that or any other account: or

(ii) purchase or authorise the purchase of quantity of the stores rejected or others of a

similar description (when stores exactly complying with particulars are not in the opinion of the purchaser, which shall be final, readily available) without notice to the contractor at his risk and cost and without affecting the contractor's liability as regards the supply of any further instalments due under the contract; or

(iii) cancel the contract and purchase or authorise the purchase of the stores or others

of a similar description (when stores exactly complying with particulars are not, in the opinion of the purchaser, which shall be final, readily available) at the risk and cost of the contractor. In the event of action being taken under sub-clause (ii) above or under this sub-clause, the provision of clause 0902 above will apply as far as applicable.

(iv) Where under the contract the price payable is fixed F.O.B. port of despatch or F.O.R. despatching station, the contractor shall, if the stores are rejected at destination by the consignee, be liable, in addition to his other liabilities including refund of price recoverable in respect of the stores so rejected to reimburse to the Purchaser the freight and all other expenses incurred by the Purchaser in this regard.

0905. **Delay in Commissioning of M&P**

In the event of contractors' failure to have M&P commissioned by the time or times respectively specified in the letter of acceptance or contract, purchaser may withhold, deduct or recover from the contractor as penalty, a sum @ 2% (two percent) of the price of M&P which the contractor has failed to commission as aforesaid for each and every month (part of a month being treated as a full month) during which the M&P may not have been commissioned, subject to an upper limit of 10% (ten percent) of contract value.

1000. FORCE MAJEURE

In the event of any unforeseen event directly interfering with the supply of stores arising during the currency of the contract, such as war, revolutions, hostilities, acts of the public enemy, civil commotion, sabotage; fires; floods, explosions, epidemics, quarantine restrictions, strikes, lockouts or acts of God, the contractor shall, within a week from the commencement thereof; notify the same in writing to the Purchaser with reasonable evidence thereof. However, it should not be used by a party to escape liability for bad performance.

If a Force Majeure situation arises, the supplier shall promptly notify the purchaser in writing of such conditions and the cause thereof within twenty one days of occurrence of such event with reasonable evidence thereof. Unless otherwise directed by the purchaser in writing, the supplier shall continue to perform its obligations under the contract as far as reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

If the performance in whole or in part or any obligation under this contract is prevented or delayed by any reason of Force Majeure for a period exceeding sixty days, **either party may** by giving 21 days' notice to the contractor in writing, at its option terminate the contract without any financial repercussion on either side.In case of such termination, no damage shall be claimed by either party against the other, save and except those which had occurred under any other clause of this contract prior to such termination.

Purchaser will also be entitle to take recourse under Force Majeure should such conditions arise.

1100. ACCEPTANCE OF STORES DESPATCHED AFTER THE EXPIRY OF DELIVERY PERIOD

1101. In case where only a portion of the stores ordered is tendered for inspection at the fag end of the delivery period and also in cases where inspection is not completed in respect of the portion of the stores tendered for inspection during the delivery period because of the reason that adequate notice for inspection in accordance with clause was not given by contractor, the Purchaser reserves the right to cancel the order for the balance quantity, at the risk and expense of the contractor without any further reference to him. If the stores tendered for inspection during or at the fag end of the delivery period are not found acceptable after carrying out the inspection, the Purchaser is entitled to cancel the contract in respect of the same at the risk and expense of the contractor. If, however, the stores tendered for inspection are found acceptable, the Purchaser may grant an extension of the delivery period subject to the following conditions:

(a) The Purchaser has the right to recover from the contractor the liquidated damages on the stores, which the contractor has failed to deliver within the period fixed for delivery.
(b) That no increase in price on account of any statutory increase in or fresh imposition of Excise Duty, Sales tax, Freight charges or on any account of any other tax or duty leviable in respect of the Stores specified in the contract, which takes place after the date of delivery period stipulated in the said Acceptance of Bid (contract), shall be admissible on such of the said stores as are delivered after said date.
(c) That notwithstanding any stipulation in the contract for increase in price on any other ground no such increase which takes place after the delivery date stipulated in the contract shall be admissible on such of the said stores as are delivered after the said date.
(d) But nevertheless the Purchaser shall be entitled to the benefit of any decrease in price on account of exemption of or reduction in or remission of Customs Duty, Excise Duty, Sales Tax, or on account of any other ground which takes place after the expiry of the delivery date stipulated in the contract. The contractor shall allow the said benefit in his bills or in the absence thereof shall certify that no decrease in price on account of any of these factors has taken place.

1102. The contractor shall not despatch the stores till such time an extension in terms of clause 1101 (a) to (d) above is granted by the Purchaser and accepted by the contractor. If the stores are despatched by the contractor before an extension letter as aforesaid is issued by the Purchaser and the same are accepted by the consignee, the acceptance of the stores shall be deemed to be subject to the conditions (a) to (d) mentioned in clause 1101 above.

1103. In case where the entire quantity has not been tendered for inspection within the delivery period stipulated in the contract and the Purchaser chooses to grant an extension of the delivery period, the same would be subject to conditions (a) to (d) mentioned in clause 1101 above.

1200. PROGRESS REPORTS

1201. The contractor shall, from time to time, render such reports concerning the progress of the contract and/ or supply of the stores in such form as may be required by the Purchaser.

1202. The submission, receipt and acceptance of such reports shall not prejudice the rights of the Purchaser under the contract, nor shall operate as a ground against Purchaser merely by reason of the fact that he has not taken notice of/ or subjected to test any information contained in such report.

1300. INSPECTION BY INSPECTING OFFICER

1301. When inspection during manufacture or before delivery or despatch is required, a notice in writing shall be sent by the contractor to the Inspecting Officer when the stores or material to be supplied are ready for inspection and test, and no stores shall be delivered or despatched until the Inspecting Officer has certified in writing that such stores have been inspected and approved by him. At least four week's notice must be given to the Inspecting Officer to enable him to arrange the necessary inspection. The examination of stores will be made as soon as practicable after the same have been submitted for inspection, and the result of the examination will be notified to the contractor.

1302. In cases where the Inspecting Authority specified in the contract requires on behalf

of the Purchaser that inspection of the raw materials to be used and /or stage inspection during the manufacturing process of the component/stores ,etc., is also to be done, notice in writing shall be sent by the contractor to the Inspecting Officer to visit his premises /works to test the raw materials and/or conduct necessary inspection during the manufacturing process of the component/stores, etc., as deemed essential.

1303. **Marking of Stores**

The contractor shall, if so required, at his own expense, mark all the approved stores with a recognised Government or Purchaser's mark. The stores which cannot be so marked shall, if so required by the Inspecting Officer, be packed at the contractor's expense in suitable packages or cases, each of which shall be sealed and marked with such mark.

1304. **Facilities for Test and Examination**

The contractor shall at his own expense afford to the Inspecting Officer all reasonable facilities and such accommodation, as may be necessary for satisfying himself, that the stores are being and/or have been manufactured in accordance with the Particulars. The Inspecting Officer shall have full and free access at any time during the execution of the contract to the contractor's work for the purpose aforesaid, and he may require the contractor to make arrangements for inspection of the stores or any part thereof or any material at his 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.

1305. **Cost of Test**

The contractor shall provide, without any extra charge, all materials, tools, labour and assistance of every kind which the Inspecting Officer may demand of him for any test and examination, other than special or independent test, which he shall require to be made on the contractor's premises and the contractor shall bear and pay all costs

attendant thereon. If the contractor fails to comply with the conditions aforesaid, the Inspecting Officer shall, in his sole judgement, 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 tests elsewhere. A certificate in writing of the inspecting officer, that the contractor has failed to provide the facilities and the means for test and examination, shall be final.

1306. **Delivery of Stores for Tests**

The contractor shall provide and deliver free of charge, at such place as the Inspecting Officer may nominate, such material as he may require for test by chemical analysis or independent testing machines.

1307. **Liability for Costs- Special or Independent Tests**

The cost of any special or independent tests to be carried out by the Inspecting Officer at a place other than the contractors premises, will be borne by the Purchaser unless it is stated in the specification that it is to be paid by the contractor. However, in the event of rejection of stores or any part thereof by the Inspecting Officer in the consequence of sample thereof which is removed to the laboratory or other place of test, being found on test, to be not in conformity with the contractor, or, in the event of failure of the contractor for any reason to deliver the stores passed on test within the stipulated period, the contractor shall, on demand, pay to the Purchaser all costs incurred in the inspection and /or test. Cost of test shall be assessed at the rate charged by the laboratory to private person for similar work.

1308. **Method of Testing**

The Inspecting Officer shall have the right to put all the stores or materials forming part of the same or any part thereof to 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.

1309. The contractor shall satisfy the Inspector that adequate provision has been made:-

(i) to carry out his instructions fully and with promptitude;
(ii) to ensure that parts required to be inspected before use are not used before inspection; and
(iii) to prevent rejected parts being used in error. Where, parts rejected by the inspector have been rectified or altered, such parts shall be

segregated for separate inspection and approval before being used in the work.

1310. **Powers of Inspecting Officer**

The inspecting Officer shall have the power:-

(i) before any stores or part thereof are submitted for inspection to certify that they cannot be in accordance with the contract owing to the adoption of any unsatisfactory method of manufacture;

(ii) to reject any stores submitted as not being in accordance with the particulars;

(iii) to reject the whole of the instalment tendered for inspection, if after inspection of such portion thereof as he may in his discretion think fit, he is satisfied that the same is unsatisfactory.

(iv) To mark the rejected stores with a rejection mark, so that they may be easily identified if re-submitted for inspection.

The Inspecting Officer's decision as regards the rejection shall be final and binding on the contractor.

1311. **Inspection Notes**

On the stores being found acceptable by the Inspecting Officer, he shall furnish the contractor with necessary copies of the Inspection Notes duly completed for being attached to the contractor's bill in support thereof.

1400. PACKING AND MARKING

1401. **Packing**

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. He shall decide the packing for the stores by taking into account the fact that the stores will have to undergo arduous transportation before reaching the destination and will have to be stored and handled in tropical climatic conditions (including Monsoons) before being put to actual use.

1402. Unless otherwise provided in the contract, 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 having been included in the contract price.

1403. Each package shall contain a packing note specifying the name & address of the contractor, the number and date of the contract and the designation of the Purchase Officer issuing the supply orders, the description of the stores and the quantity contained therein.

1404. **Marking**

The marking of all goods supplied shall comply with the requirement of the Indian Acts relating to merchandise marks or any amendment thereof and of the rules made thereunder. The following marking of the materials is required:-

(a) The following particulars should be stencilled with indelible paint on all the materials/packages:-

(i) Contract number.

(ii) Specification no.

(iii) Item no.

(iv) Port consignee (wherever applicable)

(v) Abbreviated consignee marks

(b) In addition to the marking as specified above, distinguishing colour marks should be given so as to distinguish the ultimate consignee in India.

1500. PAYMENT TERMS

The standard payment terms subject to recoveries if any, under the liquidated damages clause and general condition of contract will be as under: -

(a) 80% of the payment on proof of inspection certificate and certified receipt by a gazetted officer of Rail/Road Challan, to be made normally within 30 days of receipt of documents as specified.

(b) Balance 20% payment within 90 days after satisfactory installation/ commissioning and proving test of M&P subject to submission of bank guarantee for an amount of 10% of contract value, as warranty security.

1600. PAYMENT PROCEDURE

Payment for indigenous supplies will be made in Indian Rupees against bills preferred by the contractor. Any payment in the foreign exchange that the contractor may have to make for imported components forming part of the bid will be arranged by him direct.

1700. WARRANTY

1701. The Contractors shall warrant that every thing to be furnished to the purchaser under this contract shall be of the highest grade, free of all defects and faults in design, material, workmanship and manufacture, and shall be consistent with the established and generally accepted standards for goods of the type ordered and in full conformity with the contract specification, drawing or sample, if any and shall, if operable, operate properly.

1702. The Contractor also guarantees that the said goods/stores/articles would continue to conform to the description and quality as aforesaid, for a period as specified in technical specification of RDSO.

1703. If during the aforesaid period, the said goods/ stores/ articles be discovered not to conform to the description and quality aforesaid or have deteriorated otherwise than by fair wear and tear the decision of the Purchaser in that behalf being final and conclusive, then the Purchaser will be entitled to reject the said goods/stores/articles or such portions thereof as may be discovered not to conform to the said description and quality. On such rejection, the goods/ stores/ articles will be at the Seller's risk. If the Contractor/ Seller so desire the rejected goods may be taken over by him or his agents for disposals in such manner as he may deem fit, within a period of 3 months from the date of such rejection. At the expiry of the period, no claim whatsoever shall lie against the purchaser in respect of the said Goods/ Stores/ Articles, which may be disposed of by the purchaser in such manner as he thinks fit. Without prejudice to the generality of the foregoing all the provisions in the Indian Railways Standard Conditions of Contract relating to the 'Rejection of Stores' and 'Failure' and 'Termination' shall apply.

1704. The Contractor shall, if required, replace or repair the goods or such portion thereof as has been rejected by the purchaser, free of cost, at the ultimate destination, or at the option of the Purchaser, the contractor shall pay to the Purchaser, the value thereof at the contract price and such other expenditure and damages as may arise by reason of the breach of the conditions herein before specified. Nothing herein contained shall prejudice any other right of the purchaser in that behalf under this contract or otherwise.

1705. The contractor shall furnish a Warranty Performance Guarantee Bond in the proforma attached (Annexure-9) from a Nationalised Indian Bank before claiming balance payment within the period specified in the contract (refer clauses 1701.b& 1702.b) for an amount equivalent to 10% of the value of the contract. In the case of foreign contracts, the Guarantee Bond from a commercial Bank of the contractor's country can be accepted only if the Bond is furnished after getting it duly counter signed by the Reserve Bank of India or State Bank of India, New Delhi. The expenses to be incurred for the counter signatures shall be borne by the contractor.

1706. Additional Conditions of Warranty for M & P

(a) Warranty period for M&P will be 24 (twenty four) months from the date of commissioning and proving out of M&P. A maximum period of 2 (two) weeks will be allowed for attending and rectification of faults during the warranty period.

(b) Maximum down time during the warranty period will be 2% (two percent) for on line M&P and 10% (ten percent) for off line M&P calculated on quarterly basis.

(c) A penalty of 0.5% (Zero point five percent) per week of the contract value will be levied for delay in response time for attending and rectification of faults beyond specified time during the warranty period as detailed above.

(d) Maximum penalty to be levied on account of warranty failure will be 5% (Five percent) of the contract value calculated during whole of warrantee period and after that if there is any delay on the part of supplier; purchaser shall be entitled for encashment of WG Bonds.

1800. WITHHOLDING AND LIEN IN RESPECT OF SUMS CLAIMED

1801. Whenever any claim or claims for payment of a sum of money arises out of or under the contract against the contractor, the Purchaser shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the amount of Performance Guarantee Bond and any other Guarantee furnished by the contractor and for the purpose aforesaid, the Purchaser shall be entitled to encash the Performance Guarantee Bond, etc., and also have a lien over the amount of Performance Guarantee Bond, etc., pending finalisation or adjudication of any such claim. In the event of the said amount being insufficient to cover the claimed amount or amounts or if no Performance Guarantee Bond etc. has been taken from the contractor, the Purchaser shall be entitled to withhold and have lien to retain to the extent of the such claimed amount or amounts referred to supra, from any sum or

Sums found payable or which at any time thereafter may become payable to the contractor under the same contract or any other contract with the Purchaser or the Government pending finalisation or adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above, by the Purchaser will be kept withheld or retained as such by the Purchaser till the claim arising out of or under the contract is determined by the Arbitrator (if the contract is governed by the arbitration clause) or by the competent court as prescribed under clause 3003 hereinafter provided, as the case may be, and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to supra and duly notified as such to the contractor.

1802. For the purpose of clause 2001, where the contractor is a partnership firm or a limited company, the Purchaser shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/ limited company, as the case may be, whether in his individual capacity or otherwise.

1803. Lien in Respect of Claims in Other Contracts

Any sum of money due and payable by the Contractor (including the amount of Performance Guarantee Bond and any other Guarantee) under the contract may be withheld by way of lien by the Purchaser or Government against any claim of the Purchaser or Government in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Purchaser or Government.

It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Purchaser or Government will be kept withheld or retained as such by the Purchaser or Government till his claim arising out of in the same contract or any other contract is either mutually settled or determined by the Arbitrator, if the contract is governed by the arbitration clause or by the competent court under clause 3003 herein after provided as the case may be, and that the contractor shall have no claim for interest or damages whatsoever on this account or any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

1900. RESPONSIBILITY OF THE CONTRACTOR FOR EXECUTING THE CONTRACT

1901. **Risk in the stores-**

The contractor shall perform the contract in all respects in accordance with the terms and conditions thereof. The stores and every constituent part thereof, whether in the possession or control of the contractor, his agents or servants or a carrier, or in the joint possession of the contractor, his agents or servants and the Purchaser, his agents or servants, shall remain in every respect at the risk of the contractor until their actual delivery to the consignee at the stipulated place or destination or, where so provided in the acceptance of tender, until their delivery to a person specified in the contract as interim consignee for the purpose of despatch to the consignee. The contractor shall

be responsible for all loss, destruction, damage or deterioration of or to the stores from any cause whatsoever while the stores after approval by the Inspecting Officer are awaiting despatch or delivery or are in the course of transit from the contractor to the consignee or the interim consignee as the case may be. The contractor shall alone be entitled and responsible to make claims against a Railway Administration or any other carrier in respect of non-delivery, short delivery, misdelivery, loss, destruction, damage or deterioration of the goods entrusted to such carrier by the contractor for transmission to the consignee or the interim consignee, as the case may be.

1902. **Consignee's right of rejection-**

Notwithstanding any approval which the Inspecting Officer may have given in respect of the stores or any materials or other particulars or the work or the work or workmanship involved in the performance of the contract (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 stores where so provided to the interim consignee, it shall be lawful for the consignee, on behalf of the Purchaser, to reject the stores or any part, portion of consignment thereof within 45 days after actual delivery thereof to him at the place or destination specified in the contract if such stores or part, portion of 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 despatch or delivery or during transit or otherwise howsoever.

1903. Provided that where, under the terms of the contract, the stores are required to be delivered to an interim consignee for the purpose of despatch to the consignee, the stores shall be at the Purchaser's risk after their delivery to the interim consignee, but nevertheless it shall be lawful for the consignee on behalf of the Purchaser to reject the stores or any part, portion of consignment thereof upon their actual delivery to him at the destination if they are not in all respects in conformity with the terms and conditions of contract except where they have been damaged or have deteriorated in the course of transit or otherwise after their delivery to the interim consignee.

1904. The provisions contained in clause 2700 relating to the removal of stores rejected by the Inspecting Officer shall, mutatis mutandis apply to stores rejected by the consignee as herein provided.

1905. The Contractor shall refund any advance/part payment received by him in respect of the rejected stores within 21 days of the receipt of intimation from the consignee about the rejection of the stores. In default, the Purchaser may take steps against contractor for recovery of such price. This is strictly without prejudice and in addition to the rights provided in clause 0904.

1906. **Subletting and assignment-**

The Contractor shall not sublet (otherwise than that which may be customary in the trade concerned), transfer, assign or otherwise part with directly or indirectly to any person or persons, whatever is in this contract or any part thereof without the previous written permission of the Purchaser or his nominee.

In the event of the contractor's failure to obtain such permission, the Purchaser shall be entitled to cancel the contract and to Purchase the stores elsewhere on the contractor's account and risk and the contractor shall be liable for any loss or damage which the Purchaser may sustain in consequence or arising out of such purchase.

1907. **Changes in a firm-**

(a) Where the contractor is a partnership firm, a new partner shall not be introduced in the firm except with the previous consent in writing of the Purchaser which may be granted only upon execution of a written undertaking by the new partner to perform the contract and accept all liabilities incurred by the firm under the contract prior to the date of such undertaking. In the event of the contractor's failure to comply with this requirement, it shall be lawful for the Purchaser to cancel the contract and purchase or authorise the purchase of the stores at the risk
and cost of the contractor and in that event the provisions of clause 0902 as far as applicable shall apply.

(b) On the death or retirement of any partner of the contractor firm before complete performance of the contract, the Purchaser may, at his option cancel the contract and in such case the contractor shall have no claim whatsoever to compensation against the Purchaser.

(c) If the contract is not determined as provided in sub-clause (b) above notwithstanding the retirement of a partner from the firm he shall continue to be liable under the contract for acts of the firm until a copy of the public notice given by him under section 32 of the Partnership Act, has been sent by him to the purchaser by registered post acknowledgement due.

(d) The decision of the Purchaser as to any matter or thing concerning or arising out of this sub-clause or on any question whether the contractor or any partner of the contractor firm has committed a breach of any of the conditions in this sub clause shall be final and binding on the contractor.

2000. RESPONSIBILITY FOR COMPLETENESS

2001. Any fittings or accessories which may not be specifically mentioned in the specifications but which are usual or necessary are to be provided by the contractor without extra charge, and the plant must be complete in all details.

2002. The work shall be performed at the place or places specified in the contract or at such other place or place as may be approved by the Purchaser.

2003. In all cases where the contract provides for tests on site, the Purchaser, except where otherwise specified, shall provide, free of charge, such labour, materials, fuels, stores, apparatus and instruments as may be required from time to time and as may reasonably be demanded, efficiently to carry out such tests of the plants, materials or workmanship, etc., in accordance with the contract.

2004. In the case of contracts requiring electricity for the completion of the work and for test on site, such electricity, when available, shall be supplied free to the contractor at the pressure of the ordinary supply. Unless otherwise specified, the Purchaser will supply free of charge to the Contractor:-

(a) unskilled labour;

(b) Timber, stores and lifting tackles necessary for the erection of the plant and consumable stores including fuel and lubricating oils required during erection, setting to work and testing of the plant. The Contractor shall provide:-
   (i) Skilled labour.
   (ii) Tools and any other equipment which may be necessary.

2100. CHARGES FOR WORK NECESSARY FOR COMPLETION OF THE CONTRACT

The Contractor shall pay all charges for handling, stamping, painting, marking, protecting or preserving patent rights, drawings, templates, model and gauges and for all such measures as the Purchaser or the Inspecting Officer may deem necessary for the proper completion of the contract, though special provision therefore may not be made in the specification or drawings. The contractor shall also pay for all dues, rates, taxes and other fees or charges, if any, levied during transportation and other causes.

2200. INDEMNITY

The prices stated are to include all rights (if any) or patent, registered design or trade mark and the contractor shall at all times indemnity the Purchaser against all claims which may be made in respect of the stores for infringement of any right protected by patent, registration of designs or trade mark; provided always that in the event of any claim in respect of alleged breach of a patent, registered designs or trade mark being made against the Purchaser, the Purchaser shall notify the contractor of the same and the contractor shall , at his own expense, either settle any such dispute or conduct any litigation that may arise there from.

2300. RISK OF LOSS OR DAMAGE TO GOVERNMENT OR PURCHASER'S PROPERTY

2301. All the property of the Government or Purchaser loaned, whether with or without deposit on terms and conditions to be separately agreed upon in respect of each particular contract, to the contractor in connection with contract shall remain the

property of the Government or the Purchaser, as the case may be. The contractor shall use such property for the purpose of the execution of the contract and for no other purpose whatsoever.

2302. All such property shall be deemed to be in good condition when received by the contractor unless he shall have within twenty four hours of the receipt thereof notified the Purchase Officer or the concerned authority to the contrary. If the contractor fails to notify any defect in the condition or quality of such property, he shall be deemed to have lost the right to do so at any subsequent stage.

2303. The contractor shall return all such property and shall be responsible for the full value thereof to be assessed by the Purchaser/ loaning authority whose decision shall be final and binding on the contractor. The contractor shall be liable for loss or damage to such property from whatever cause happening while such property is in the possession of or under the control of the contractor, his servants, workmen or agents.

2304. Where such property is insured by the contractor against loss or fire at the request of the Government or Purchaser such insurance shall be deemed to be effected by way of additional precaution and shall not prejudice the liability of the contractor as aforesaid.

2400. BOOK EXAMINATION CLAUSE

The Purchaser shall have the right for 'Book Examination' as follows:

2401. The Contractor shall whenever called upon and requiring to produce or cause to be produced for examination by any Govt. Officer duly authorised in that behalf, any cost or other account book of account voucher, receipt, letter, memorandum paper and writing or any copy of or extract from any such documents and also furnish information any way relating to such transaction and produce before the duly authorised Government Officer returns verified in such manner as may be required relating in any way to the execution of this contract or relevant for verifying or ascertaining the cost of execution of this contract. (the decision of such Government Officer on the question of relevancy of any document, information of return being final and binding on the parties)

The obligation imposed by this clause is without prejudice to the obligation of the contractor under any statute; rules or orders and it shall be binding on the Contractor.

2402. The Contractor shall, if the authorised Government Officer so requires (whether before or after the prices have been finally fixed), afford facilities to the Government Officer concerned to visit the Contractor's works for the purpose of examining the processes of manufacture and estimating or ascertaining the cost of production of the articles. If any portion of the work be entrusted or carried out by a sub-contractor or any of its subsidiary or allied firm or company, the authorised Government Officer shall have the power to examine all the relevant books of such sub-contractor or any subsidiary or allied firm or company which shall be open to his inspection as mentioned in clause 2601.

2403. If on such examination, it is established that the contracted price is in excess of the actual cost plus reasonable margin of profit, the Purchaser shall have the right to reduce the price and determine the amount to a reasonable level.

2404. Where a contract provides for book examination clause, the Contractor or its agency is bound to allow examination of its books within a period of 60 days from the date the notice is received by the contractor, or its agencies calling for the production of

documents as under clause 2601 above. In the event of Contractor's or his agencies failure to do so, the contract price would be reduced and determined according to the best judgement of the Purchaser which would be final and binding on the Contractor and his agencies.

2500. REMOVAL OF REJECTED STORES

2501. On rejection of any stores submitted for inspection at a place other than the premises of the contractor, such stores shall be removed by the contractor at his own cost subject to as hereinafter stipulated, within 21 days of the date of intimation of such

rejection. If the concerned communication is addressed and posted to the contractor at the address mentioned in the contract, it will be deemed to have been served on him at the time when such communication would in the course of ordinary post reach the contractor, provided that where the price or part thereof has been paid, the consignee is entitled without prejudice to his other rights to retain the rejected stores till the price paid for such stores is refunded by the contractor save that such retention shall not in any circumstances be deemed to be acceptance of the stores or waiver of rejection thereof.

2502. All rejected stores shall in any event and circumstances remain and always be at the risk of the contractor immediately on such rejection. If such stores are not removed by the contractor within the periods aforementioned, the Inspecting Officer may remove the rejected stores and either return the same to the contractor at his risk and cost by such mode of transport as the Purchaser or Inspecting Officer may decide, or dispose of such stores at the contractor's risk and on his account and retain such portion of the proceeds, if any, from such disposal as may be necessary to recover any expense incurred in connection with such disposals (or any price refundable as a consequence of such rejection). The Purchaser shall, in addition, be entitled to recover from the contractor handling and storage charges on the rejected stores after the expiry of the time-limit mentioned above.

2503. The stores that have been despatched by rail and rejected after arrival at destination may be taken back by the contractor either at the station where they were rejected or at the station from which they were sent, after refunding the price paid for such stores and other charges refundable as a consequence of such rejection. If the contract is placed for delivery F.O.R. station of despatch, the contractor shall pay the carriage charges on the rejected consignment at public tariff rates from the station of despatch to the station where they are rejected. If the contractor elects to take back the goods at the station from which they were despatched, the goods shall in addition be booked back to him freight to pay at public tariff rates and at contractor's risk. The contractor shall be liable to reimburse packing and incidental costs and charges incurred in such return of rejected stores in addition to other charges refundable as a consequence of rejection. The goods shall remain the property of the contractor unless and until accepted by the Purchaser after inspection.

2600. CORRUPT PRACTICES

2601. The contractor shall not offer or give or agree to give to any person in the employment of the Purchaser or working under the orders of the Purchaser any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or having done or forborne to do any act in relation to the obtaining or execution of the contract or any other contract with the Purchaser or Government or execution or for showing any favour for forbearing to show disfavour to any person in relation to the contract or any other contract with the Purchaser or Government. Any breach of the aforesaid condition by the contractor, or any one employed by him or acting on his behalf (whether with or without the knowledge of the contractor) or the commission of any offence by the

Contractor, or by any one employed by him or acting on his behalf, under chapter IX of the Indian Penal Code(as amended) or the Prevention of Corruption Act, 1947 or any other act enacted for the prevention of corruption by public servants shall entitle the Purchaser to cancel the contract and all or any other

contracts with the contractor and to recover from the contractor the amount of any loss arising from such cancellation in accordance with the provisions of clause 0902

2602. Any dispute or difference in respect of either the interpretation, effect or application of the above clause or of the amount recoverable thereunder by the Purchaser from the Contractor, shall be decided by the Purchaser, whose decision thereon shall be final and binding on the contractor.

2700. INSOLVENCY AND BREACH OF CONTRACT

The Purchaser may at any time, by notice in writing, summarily determine the contract without compensation to the contractor in any of the following events, that is to say:-

(a) if the contractor being an individual or if a firm, any partner thereof, shall at any time, be adjudged insolvent or shall have a receiving order or order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make and conveyance or assignment of his effects or enter into any assignment or composition with his creditors or suspend payment or if the firm be dissolved under the Partnership Act. or

(b) if the contractor being a company is wound up voluntarily or by the order of a Court or a Receiver, Liquidator, or Manager on behalf of the Debenture holders is appointed, or circumstances shall have arisen which entitle the Court or Debenture holders to appoint a Receiver, Liquidator or Manager, or

(c) If the Contractor commits any breach of the contract not herein specifically provided for.

Provided always that such determination shall not prejudice any right of action or remedy which shall have accrued or shall accrue thereafter to the Purchaser and provided also the contractor shall be liable to pay to the Purchaser any extra expenditure he is thereby put to and the contractor shall, under no circumstances, be entitled to any gain on re-purchase.

2800. LAWS GOVERNING THE CONTRACT

2801. This contract shall be governed by the Laws of India for the time being in force.

2802. Irrespective of the place of delivery and the place of payment under the contract, the contract shall be deemed to have been made at the place in India from where the acceptance of tender has been issued.

2803. Jurisdiction of Courts- The courts of the place from where the acceptance of bid has been issued shall alone have jurisdiction to decide any dispute arising out of or in respect of the contract.

2804. Compliance With Provisions of Contract Labour (Regulation and Abolition) Act-1970— For Indigenous Supplies:

(i) The Contractor shall comply with the provisions of the Contract Labour (Regulation and abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules, 1971, as modified from time-to-time, wherever applicable and shall also indemnify the Purchaser from and against any claims under the aforesaid Act and the Rules.

(ii) The contractor shall obtain a valid licence under the aforesaid Act as modified from time to time before the commencement of the contract and continue to have a valid licence until the completion of the contract. Any failure to fulfil this requirement shall attract the penal provisions of the contract arising out of the resultant non-execution of the contract.

(iii) The contractor shall pay to labour employed by him directly or through sub- contractor the wages as per provisions of the aforesaid Act and the Rules wherever applicable. The contractor, shall notwithstanding the provisions of the contract to the contrary, cause to

be paid the wages to labour indirectly engaged on the contract including any engaged by his sub-contractor in connection with the said contract, as if the labour had been immediately employed by him.

(iv) In respect of all labour directly or indirectly employed in the contract for performance of the contractor's part of the contract, the contractor shall comply with or cause to be complied with the provisions of the aforesaid Act and the Rules wherever applicable.

(v) In every case in which, by virtue of the provisions of the aforesaid Act, or the Rules, the Purchaser is obliged to pay any amount of wages to a workman employed by the contractor or his sub-contractor in execution of the contract or to incur any expenditure in providing welfare and health amenities required to be provided under the aforesaid Act and the Rules or to incur any expenditure on account of the contingent liability of the Purchaser due to the contractor's failure to fulfil his statutory obligations under the aforesaid Act of the Rules, the Purchaser will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred, and without prejudice to the rights of the Purchaser under section 20, sub-section (2) and section 21, sub-section (4) of the aforesaid Act, the Purchaser shall be at liberty to recover such amount or part thereof by deduction it from the amount of the Performance Guarantee Bond and/ or from any sum due by the Purchaser to the contractor whether under the contract or otherwise. The Purchaser shall not be bound to contest any claim made against it under sub section (1) of section 20 and sub-section (4) of section 21 of the aforesaid Act except on the written request of the contractor and upon his giving to the Purchaser full security of all costs for which the Purchaser might become liable in contesting such claim. The decision of the Purchaser regarding the amount actually recoverable from the contractor as stated, shall be final and binding on the contractor.

2900. ARBITRATION AND CONCILIATION

In case a dispute arises with regard to this contract every effort shall be made to solve the dispute / conflict in a friendly way. If the parties however, cannot achieve an agreement in the event of any question, dispute, or difference arising under these conditions or any special condition of the contract, or instructions to tenderers or in connection with this contract (except as to any matters the decision of which is specifically provided for by these conditions or instructions to the tenderers or these special conditions) the same shall be referred to arbitration under the Arbitration and Conciliation Act 1996, to the DG/ RDSO who shall appoint suitably gazetted railway officer/officers as arbitrators. The gazetted railway officer/ officers to be appointed as arbitrator however, will not be the one of those who had opportunity to deal with the matters to which the contract relates or who in the course of their duties as railway servant had expressed views on all or any of the matter under dispute or difference. The award of the arbitrator (s) shall be final and binding on the parties of this contract.

3000. SECRECY

3001. The Contractor shall take all reasonable steps necessary to ensure that all persons employed in any work in connection with the contract, have full knowledge of the Official Secrets Act and any regulations framed there under.

3002. Any information obtained in the course of the execution of the contract by the contractor, his servants or agents or any person so employed, as to any matter whatsoever which would or might be directly or indirectly, of use to any enemy of India, must be treated secret and shall not at any time be communicated to any person.

3003. Any breach of the aforesaid conditions shall entitle the Purchaser to cancel the contract and to purchase or authorise the purchase of the stores at the risk and cost of the contractor in accordance with the clause-0902 of the General conditions of contract. In the event of such cancellation, the stores or parts manufactured in the execution of the contract shall be taken by the Purchaser at such price as he considers fair and reasonable and the decision of the Purchaser as to such price shall be final and binding on the Contractor

3100. Safety Measures:

3101. The Contractor should take all precautionary measures in order to ensure the protection of his own personnel moving about or working on the railway premises, and should conform to the rules and regulations of the Railway.

3102. The Contractor should abide by all railway regulations in force from time to time and ensure that the same are followed by his representative, agents or sub-contractor or workmen.

3103. The contractor should ensure that unauthorised, careless or inadvertent operation of installed equipment which may result in accident to staff and/or damage to equipment does not occur.

3104. The Controller should indemnity and keep the Purchaser indemnified and harmless against all actions, suits, claims, demands costs charges or expenses arising in connection with any accident, death or injury; sustained by any person or persons within the railway premises and any loss or damage to railway property sustained due to the acts or omissions of the Contractor irrespective of whether such liability arises under the workman's compensation act or the fatal accidents act or any other statute in force from time to time.

3200. Special conditions

The special conditions of contract as per part II of bid document, wherever they differ from the Invitation to Tender, Instruction to Tenderers and IRS conditions of contract override the latter.

…

BID DOCUMENTS
PART-I

SECTION-III-

ANNEXURES

TABLE OF CONTENTS

ANNEXURE-1

FORM FOR INDIGENOUS BIDS

To

The President of India
Acting through the Director (Stores)
Research Designs & Standards Organisation
Ministry of Railways
Manak Nagar
Lucknow-226 011 (U.P.) INDIA.

REFERENCE :- Tender No._____Date of Opening----------

1. We _____ hereby certify that we are established firm of manufacturers/ authorized agents of M/s_____ with factories at_____ which are equipped with modern equipment and where the production methods ,quality control and testing of all materials and parts manufactured or used by us are open to inspection by the representative(s) of Indian Railways. We hereby offer to supply the following items at the prices and within the period of delivery indicated below :.

Item No	Description	Specifications	Unit	Qty	Price per unit F.O.R. Destination (In Indian Rupees)	Terms of Payment	Delivery Period	Gross weight (s) and dimensions of package (s) per unit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Total Value of the Offer

Break up of price in 'Column-6 (in Indian Rupees)

(10)									
Ex-factory price	Packing Charges	Excise duty	Other levies	Sales tax	Forwarding charges	FOR station of dispatch price (a) + (b) +(c) +(d) +(e) +(f)	Freight to destination	Insurance (if any)	FOR Destination (g+h+i)
a	b	C	d	e	f	g	h	i	j

*please delete whichever is not applicable.

2. It is hereby certified that we have understood the Instructions to Tenderers, and also the IRS, General and Special conditions of contract attached to the tender and have thoroughly examined specifications/drawings and / or pattern quoted therein and are thoroughly aware of the nature of stores required and our offer is to supply stores strictly in accordance with the requirements and according to the terms of tender. We agree to abide by the IRS , General and Special conditions of contract and other conditions of the tender in accordance with the tender documents if the contract is awarded to us.

3. We hereby offer to supply the stores detailed above or such portion thereof as you may specify in the acceptance of tender at the price quoted and agree to hold this offer open for acceptance for a period of 180 days from the date of opening of tender. We shall be bound by the communication of acceptance dispatched within the prescribed time.

4. Earnest Money/ Bid Guarantee for an amount equal to …….. is enclosed in the form specified of the 'Instructions to Tender'

Dated……..

Signature and seal of
Manufacturer/ Tenderer

Note : (i) The tenderers may prepare their own offer forms as per this proforma. However no details required as per above proforma should be lost.

(ii) The tenderers should indicate whether they possess the necessary industrial licence from Government of India for manufacturing and marketing the items offered. If, where collaboration with a foreign firm for manufacturing of the items offered is involved, the details of the same should be indicated.

(iii) No erasures or alternations in the text of the offer are permitted. Any correction made in the offer shall be initialled by the tenderer.

(iv) The foreign exchange needed for the import of the components and import licence where necessary, should be arranged by the supplier themselves.

(v) Figures in Columns 6 & those in break up of prices (a to i) should be both in figures and words and should match.

ANNEXURE-2

PROFORMA FOR PERFORMANCE STATEMENT

(For a period of last 3 years)

Tender No……Date of opening…….……..

S.N.	Order placed by (full address of purchaser)	Order no. and date	Description and quantity of stores ordered	Value of order	Date of completion of delivery		Remarks indicating reasons for late delivery, if any	Has the equipment been satisfactorily commissioned and is it giving trouble free service
					As per contract	Actual		

Signature and seal of the Manufacturer/
Tenderer

ANNEXURE-3

PROFORMA FOR EQUIPMENT AND QUALITY CONTROL

EMPLOYED BY THE MANUFACTURER

Tender No……..Date of opening……

Name of the Tenderer……..

(Note: All details should relate to the manufacturer for the items tendered)

1. Name & Full address of the Manufacturer.

2. Telephone No. Office, Factory/ Works

3. Location of the manufacturing factory.

4. Details of industrial Licence, wherever required as per statutory regulations.

5. Details of Important plant & machinery functioning in each deptt. (Monographs and description pamphlets be supplied, if available)

6. Details of the process of manufacture in the factory.

7. Details & stocks of raw materials held.

8. Production capacity of item (s) quoted for, with the existing plant & machinery.

8.1 Normal.
8.2 Maximum.

9. Details of arrangement for quality control of products such as laboratory, testing equipment etc.

10. Details of staff.

10.1 Details of technical supervisory staff-in-charge of production & quality control.
10.2 Skilled labour employed.
10.3 Unskilled labour employed.
10.4 Maximum no. of workers (skilled & unskilled) employed on any day during the 18 months preceding the date of offer.

11. Whether stores are tested to any standard specification? If so, copies of original test certificates should be submitted in duplicate.

12. Are you registered with the Directorate General of Supplies & Disposals, New Delhi, India? If so furnish full particulars of registration, period of currency etc. with a copy of the certificate of registration.

13. Are you a small scale unit, registered with the National Small Industries Corporation Limited, New Delhi, India? If so, furnish full particulars of registration, period of currency etc., with a copy of the certificate of registration.

Signature and seal of the Manufacturer

ANNEXURE -4

PROFORMA FOR AUTHORITY FROM MANUFACTURERS

No. ……..dated……..

To

THE PRESIDENT OF INDIA,

Acting through, the Director/ Stores,

Research Designs & Standards Organisation,

Ministry of Railways, Manak Nagar

Lucknow-226011 (UP) INDIA

Dear Sir,

Subject: Research Designs & Standards Organisation's Tender No.……

……...dated…….

We ……..as established and reputable manufacturers of ……

…….having factories at…….and offices at……..do hereby authorise M/s……..

……..(Name and address of Agents) to represent us, to bid, negotiate and conclude the contract on our behalf with you against Tender No.……

No company/ firm or individual other than M/s …….. are authorised to represent us in regard to this business against this specific tender.

Yours faithfully,

(NAME)

for & on behalf of M/s…….

(Name of Manufacturer)

Note: This letter of authority should be on the Letter –Head of the Manufacturing Concern and should be signed by a person competent and having the power of attorney to bind the manufacturer.

ANNEXURE-5

Certificate of undertaking
to be given by tenderers
who have downloaded and used bid documents from RDSO website

Bidder will give a certificate as under:

(a) Cost of bid documents has been paid as required in tender documents

(b) "I/We certify that I/we have checked this downloaded bid documents with the bid documents available online at www.rdso.indianrailways.gov.in. and there is no discrepancy/ variation/ printing mistake and it is further certified that no alteration/ modification has been made in the bid documents. I/We accept that the entire responsibility of ensuring that these documents are as per original available on website is mine/ours. I/We also agree that if anything contrary is found the decision of RDSO will be final and binding on me/us."

Signature & Seal of the

Manufacturer / Tenderer

Full address with contact numbers & names with e-mail address

ANNEXURE-6

PROFORMA FOR STATEMENT OF DEVIATIONS

FROM TENDER CONDITIONS

The following are the particulars of deviations from the requirements of the Instructions to Tenderers, General and Special Conditions of Contract:

CLAUSE	**DEVIATION**	**REMARKS** (Including justification)

Signature and seal of

The Manufacturer/ Tenderer

NOTE: Where there is no deviation, the statement should be returned duly signed with an endorsement indicating “No Deviations”.

ANNEXURE-7

PROFORMA FOR STATEMENT OF DEVIATIONS FROM

TECHNICAL SPECIFICATIONS

The following are the particulars of deviations from the requirements of the Technical Specifications:

CLAUSE	**DEVIATION**	**REMARKS** (Including justification)

Signature and seal of

The Manufacturer/ Tenderer

NOTE: Where there is no deviation, the statement should be returned duly signed with an endorsement indicating “No Deviations”.

ANNEXURE-8

PROFORMA OF BANK GUARANTEE FOR CONTRACT

PERFORMANCE GUARANTEE BOND

Ref……. Date……..

Bank Guarantee No……

To

THE PRESIDENT OF INDIA,

Acting through, the Executive Director (Finance),

Research Designs & Standards Organisation,

Ministry of Railways, Manak Nagar

Lucknow-226011 (UP) INDIA

1. Against contract (or vide Advance Acceptance of the Tender) No……..……dated……..covering supply of…… ……(hereinafter called the said 'contract') entered into between the President of India and……(hereinafter called the 'Contractor'), this is to certify that at the request of the Contractor we,…….

…….Bank Ltd., are holding in trust in favour of the President of India, the amount of …….(write the sum here in words) to indemnify and keep indemnified the President of India (Govt. of India) against any loss or damage that may be caused to or suffered by the President of India (Govt. of India) by reason of any breach by the Contractor of any of the terms and conditions of the said contract and/ or the performance thereof. We agree that the decision of the President of India (Govt. of India), whether any breach of any of the terms and conditions of the said contract and/ or in the performance thereof has been committed by the Contractor and the amount of loss or damage that has been caused or suffered by the President of India (Govt. of India) shall be final and binding on us and the amount of the said loss or damage shall be paid by us forthwith on demand and without demur to the President of India (Govt. of India.).

2.We…….Bank Ltd., further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for satisfactory performance and fulfilment in all respects of the said contract by the Contractor i.e. till…… hereinafter called the said date and that if any claim accrues or arises against us……..Bank Ltd., by virtue of this guarantee before the said date, the same shall be enforceable against us……Bank Ltd., notwithstanding the fact that the same is enforced within six months after the said date, provided that notice of any such claim has been given to us…….Bank Ltd., by the President of India (Govt. of India) before the said date. Payment under this letter of guarantee shall be made promptly upon our receipt of notice to that effect from the President of India (Govt. of India).

3.It is fully understood that this guarantee is effective from the date of the said contract and that we ……Bank Ltd., undertake not to revoke this guarantee during its currency without the consent in writing of the President of India (Govt. of India).

4.We ……Bank Ltd., further agree that the President of India (Govt. of India) shall have the fullest liberty 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 contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by the President of India (Govt. of India) against the said Contractor and to forbear or enforce any of the terms and conditions relating to the said

contract and we……Bank Ltd. shall not be released from our liability under this guarantee by reasons of any such variation or extension being granted to the said

Contractor or for any forbearance and/ or omission on the part of the President of India or any indulgence by the President of India to the said Contractor or by any other matter or thing what-so-ever which, under the law relating to sureties, would but for this provision have the effect of so releasing us from our liability under this guarantee.

5.We…….Bank Ltd., further agree that the guarantee herein contained shall not be affected by any change in the constitution of the said Contractor.

Date…….. Signature……

Place…… Printed Name……..

Witness…… ……

(Designation)

…….

(Bank's Common Seal)

ANNEXURE-9

PROFORMA OF BANK GUARANTEE FOR 10% CONTRACT VALUE TOWARDS WARRANTY GUARANTEE

To

THE PRESIDENT OF INDIA,

Acting through, the Executive Director (Finance),

Research Designs & Standards Organisation,

Ministry of Railways, Manak Nagar

Lucknow-226011 (UP) INDIA

Subject: Guarantee No……..for…….(Amount) covering

Machine (s) Serial No……..Supplied

to Consignee(s)……

Reference: Contract No…….dated……placed on M/s……....

……..
…

Whereas M/s ……..one of our constituents, (hereinafter called the "Sellers") have agreed to sell to you (hereinafter referred to as the "Government"), ……..Nos.of……(give description) as per contract No…….dated……..(hereinafter called "the said contract").

And whereas according to the terms of said contract, it has been stipulated that payment of 10% of the value of the stores would be made, provided that the Sellers furnish to the Purchaser a bank guarantee from a recognised Bank ,acceptable to the Purchaser for 10% of the value of the said contract, valid for a period covering in full the Guarantee Period as per the warranty clause of the said conditions of the contract, being the conditions attached to and forming part of the said contract.

And whereas the Sellers have approached us to give the said Bank Guarantee on their behalf in your favour for an amount representing 10% of the value of the said contract which you have agreed to accept.

That in consideration of the promises and at the request of the said Sellers, we hereby irrevocably undertake and guarantee to pay to the Government of India or at such other place as may be determined by you forthwith on demand and without any demur, any sum upto a maximum amount of ……(Rs…….) representing 10% of the value of the stores despatched under the said contract in case the Sellers make default in paying the said sum or make any default in the performance observance or discharge of the guarantee contained in the said contract.

We agree that the decision of the government, whether any default has occurred or has been committed by the Sellers in the performance observance or discharge of the guarantee aforesaid shall be conclusive and binding on us.

Government shall be at liberty, from time to time, to grant or allow extension of time or give other indulgence to the said Sellers or to modify the terms and conditions of the contract with the said Sellers without affecting or impairing this guarantee or our liability hereunder.

We undertake to pay to the Government any money so demanded notwithstanding any dispute or disputes raised by the Sellers 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 a valid discharge to our liability for payment thereunder and the Sellers shall have no claim against us for making such payment.

This Bank Guarantee comes into force when the balance ten per cent of the value of the stores, shipped per Vessel……..vide Bill of Lading No…… dated…… or R/R No……... dated……(in the case of indigenous contracts) under the said contract, has been paid and will remain in full force and effect upto……i.e. for……months counted from the date of placing the stores in services, and shall continue to be enforceable for further six months i.e. upto ……(date), hereinafter called the said the date.

This Guarantee will not be discharged due to the change in the constitution of the Bank or the Sellers.

That no claim under this guarantee shall be entertained by us unless the same has been preferred by the Government within the said date.

Date…… Signature…….

Place…… Printed Name……..

Witness…… ……

(Designation)

……..

(Bank's Common Seal)

ANNEXURE-10

PROFORMA BANK GUARANTEE FOR BID GUARANTEE /EMD
(ON BANK'S LETTERHEAD WITH ADHESIVE STAMP)

Ref.....
Date.....

Bank Guarantee No. .....

To,
The PRESIDENT OF INDIA
acting through the Executive Director/ Finance,
R.D.S.O., Ministry of Railways,
Manak Nagar,
Lucknow-226011

Dear Sir,
In accordance with your invitation to tender No.....for Supply
of.....*M/s*.....
.....
hereinafter called the tenderer with the following Directors on their Board of Directors/Partners of the firms:

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

wish to participate in the said tender for the supply of .....
……
…….....
As a Bank Guarantee against Bid Guarantee for sum of …… of.....
……
……..
..... (in words & figures) valid for(180+45) two hundred twenty five days from.....
.....
required to be submitted by the tenderer as a condition for the participation, this Bank hereby guarantees and undertakes during the above said period of (180) one hundred and eighty days to immediately pay, on demand by the Executive Director Finance R.D.S.O., Ministry of Railways, Manak Nagar, Lucknow-226011, INDIA, in writing the amount of.....……..……
.....(in words & figures) to the said
Executive Director, Finance R.D.S.O., Ministry of Railways, Manak Nagar, Lucknow-226011 INDIA, and without any reservation and recourse, if:—

(i) the tenderer after submitting his tender, modifies the rates or any of the terms and conditions thereof, except with the previous written consent of the Purchaser; or

(ii) the tenderer withdraws the said bid within !50 days after opening of bid; or

(iii) the tenderer having not withdrawn the bid, fails to execute the contractual documents within the period provided in the contract; or

(iv) having executed the contract fails to give the bonds so aforesaid within the period provided in the contract.

This guarantee shall be irrevocable and shall remain valid up to 4.00 P.M. on ..... if further extension to this guarantee is required, the same shall be extended to such required periods on receiving instructions from M/s..... on whose behalf this guarantee is issued.

Date…… Signature……

Place…… Printed Name……..

Witness…… ……

(Designation)

…….

(Bank's Common Seal)

Annexure -11

CHECK LIST

1.	Have you Used purchased or downloaded the Bid Documents?	Yes/No
2.	Have you paid / enclosed the cost of Bid documents?	Yes/No
3.	Have you submitted proper Bid Guarantee (DD/BG)?	Yes/No
4.	Have you furnished the Performance Statement?	Yes/No
5.	Have you furnished the Statement of Equipment and Quality Control?	Yes/No
6.	Have you furnished the Statements of Deviations?	Yes/No
7.	Have you quoted in the prescribed Proforma?	Yes/No
8.	Have you kept your offer valid for 180 days	Yes/No
9.	Whether you have quoted AMC charges.	Yes/No
10.	Have you filled in the self-assessment sheet of technical capability.	Yes/No
11.	Have you submitted documents in support of qualifying requirements of tender as per special condition .	Yes/No
12.	Have you attached Bill/list of Spares	Yes/No
13.	Have you submitted signed bid documents	Yes/No

Signature & Seal of the

Manufacturer / Tenderer

Full address with contact numbers & names with e-mail address

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

BID DOCUMENTS
PART-I

(SECTION-IV)

General Condition of Contract

Research Designs and Standards Organization
Manak Nagar, Lucknow
INDIA – 226011

G1.00 Law governing the contract:- The contract shall be governed by the law for the time being in force in the Republic of India.

G2.00 Compliance to regulations and bye-laws:-The Contractor shall conform to the provision of any statute relating to the works and regulations and bye-laws of any local authority and of any water and lighting companies or undertakings, with whose system the work is proposed to be connected and shall before making any variation from the drawings or the specifications that may be necessitated by so confirming give to the consignee and purchaser notice specifying the variation proposed to be made and the reason for making the variation and shall not carry out such variation until he has received instructions from the purchaser in respect thereof. The Contractor shall be bound to give all notices required by statute, regulations or bye-laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.

G3.00 Communications to be in writing:- All notices, communications, reference and complaints made by the Railway or the Purchaser or the Purchaser's Representative or the Contractor interse concerning the works shall be in writing and no notice, communication, reference or complaint not in writing shall be recognized.

G4.00. Service of Notices on Contractors:- All communications to Contractor shall be made at the address given in Contract and all complaints, notices, communications and references shall be deemed to have been duly given to the Contractor if delivered to the Contractor or his authorised agent or left at or posted to the address so given and shall be deemed to have been so given in the case of posting on day on which they would have reached such address in the ordinary course of post or on the day on which they were so delivered or left. In the case of contract by partners, any change in the constitution of the firm shall be forthwith notified by the Contractor to the Purchaser.

G5.00. Occupation and use of land:- No land belonging to or in the possession of the Railway shall be occupied by the Contractor without the permission of the Railway. The Contractor shall not use or railway bodies/persons are permitted to use railway premises with competent authority's approval, conservancy charges as applicable from time to time may be levied.

G6.00 Railway Passes:- No free Railway passes shall be issued by the Rly. to the Contractor or any of his employee/worker.

G7.00 Carriage of materials:- No forwarding orders shall be issued by the Railway for the conveyance of Contractor's materials, tools and plant by Rail which may be required for use in the works and the contractor shall pay full freight charges at public tariff rates there for.

G8.00 Representation on Works:-The Contractor shall, when he is not personally present on the site of the works place and keep a responsible agent at the works during working hours who shall on receiving reasonable notice, present himself to the Consignee and orders given by him shall be deemed to have the same force as if they had been given to the Contractor by purchaser for the purpose of executing work against this contract subject to the condition that work so done is within ambit of specifications of this contract. Any work done beyond the scope of this contract by contractor, without written amendment to contract will not entitle for any payment rather any risk and cost will be born by contractor.

G9.00 Relics and Treasures:-All gold, silver, oil and other minerals of any description and all precious stones, coins, treasures relics antiquities and other similar things which shall be found in or upon the site shall be the property of the Railway and the Contractor shall duly preserve the same to the satisfaction of the Railway and shall from time to time deliver the same to such person or persons as the Railway may appoint to receive the same and inform to the purchaser.

G10.00 Excavated material:-The Contractor shall not sell or otherwise dispose of or remove except for the purpose of this contract, the sand, stone, clay ballast, earth, rock or other substances or materials which may be obtained from any excavation made for the purpose of the works or any building or produced upon the site at the time of delivery of the possession thereof but all the substances, materials, buildings and produce shall be the property of the Railway provided that the Contractor may, with the permission of Railway owner of such property, use

the same for the purpose of the works either free of cost or pay the cost of the same at such rates as may be determined by the owner.

G11.00 Indemnity by Contractors - The Contractor shall indemnify and save harmless the Railway from and against all actions, suit proceedings losses, costs, damages, charges, claims and demands of every nature and description brought or recovered against the Railways by reason of any act or omission of the Contractor, his agents or employees, in the execution of the works or in his guarding of the same. All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

LABOUR

G12. Wages to Labour: - The Contractor shall be responsible to ensure compliance with the provision of the Minimum Wages Act, 1948 (hereinafter referred to as the "said Act" and the Rules made there under in respect of any employees directly or through petty contractors or subcontractors employed by him on road construction or in building operations or in stone breaking or stone crushing for the purpose of carrying out this contract. If, in compliance with the terms of the contract, the Contractor supplied any labour to be used wholly or partly under the direct orders and control of the Railways whether in connection with any work being executed by the Contractor or otherwise for the purpose of the Railway such labour shall, for the purpose of this clause, still be deemed to be persons employed by the Contractor.

If any moneys shall, as a result of any claim or application made under the said Act be directed to be paid by the Railway, such money shall be deemed to be moneys payable to the Railway by the Contractor and on failure by the Contractor to repay the Railway any moneys paid by it as aforesaid within seven days after the same shall have been demanded, the Railways shall be entitled to recover the same form any moneys due or accruing to the contractor under this or any other Contract with the Railways.

G13.00 Apprentices Act: - The Contractor shall be responsible to ensure compliance with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time in respect of apprentices directly or through petty contractors or sub-contractors employed by him for the purpose of carrying out the Contract. If the contractor directly or through petty contractors or sub-contractors fails to do so, his failure will be a breach of the contract and the Railway may, in its discretion, rescind the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation of the provisions of the Act.
Note: The contractors are required to engage apprentices when the works undertaken by them last for a period of one year or more and/the cost of works in rupees one lakh or more.

G14.00 Provisions of payments of Wages Act: - The Contractor shall comply with the provisions of the Payment of Wages Act, 1936 and the rules made there under in respect of all employees directly or through petty contractors or sub-contractors employed by him in the works. If in compliance with the terms of the contract, the Contractor directly or through petty contractors or sub-contractors shall supply any labour to be used wholly or partly under the direct orders and control of the Purchaser whether in connection with the works to be executed hereunder or otherwise for the purpose of the Purchaser such labour shall never the less be deemed to comprise persons employed by the contractor and any moneys which may be ordered to be paid by the Purchaser shall be deemed to be moneys payable by the Purchaser on behalf of the Contractor and the Purchaser may on failure of the Contractor to repay such money to the Railways deduct the same from any moneys due to the Contractor in terms of the contract. The Railway shall be entitled to deduct from any moneys due to the contractor (whether under this contract or any other contract) all moneys paid or payable by the Railway by way of compensation of aforesaid or for costs of expenses in connection with any claim thereto and the decision of the Purchaser upon any question arising out of the effect or force of this clause shall be final and binding upon the Contractor.

G15.00 Provisions of Contract labour (Regulation and Abolition) Act, 1970 –

(1) The Contractor shall comply with the provision of the contract labour (Regulation and Abolition) Act, 1970 and the Contract labour (Regulation and Abolition) Central Rules 1971 as modified from time to time, wherever applicable and shall also indemnify the Railway from and against any claims under the aforesaid Act and the Rules.

(2) The Contractor shall obtain a valid licence under the aforesaid Act as modified from time to time before the commencement of the work and continue to have a valid licence until the completion of the work. Any failure to fulfill the requirement shall attract the penal provision of the Contract arising out of the resultant non-execution of the work.

(3) The Contractor shall pay to the labour employed by him directly or through subcontractors the wages as per provision of the aforesaid Act and the Rules wherever applicable. The Contractor shall notwithstanding the provisions of the contract to the contrary, cause to be paid the wages to labour indirectly engaged on the works including any engaged by subcontractors in connection with the said work, as if the labour had been immediately employed by him.

(4) In respect of all labour directly or indirectly employed in the work for performance of the contractor's part of, the contract, the Contractor shall comply with or cause to be complied with the provisions of the aforesaid Act and Rules wherever applicable.

(5) In every case in which, by virtue of the provisions of the aforesaid Act or the Rules, the Railway is obliged to pay any amount of wages to a workman employed by the Contractor or his sub contractor in execution of the work or to incur any expenditure on account of the Contingent, liability of the Railway due to the contractor's failure to fulfill his statutory obligations under the aforesaid Act or the rules the Railway will recover from the Contractor, the amount of wages so paid or the amount of expenditure so incurred, and without prejudice to the rights of the Railway under the section 20, sub-section (2) and section 2, sub-section (4) of the aforesaid Act, the Railway shall be at liberty to recover such amount or part thereof by deducting it from the security deposit and/or fromany sum due by the Railway to the contractor whether under the contract or otherwise. The Railway shall not be bound to contest any claim made against it under sub-section (1) of section 20 and subsection (4) of section 21 of the aforesaid Act except on the written request of the Contractor and upon his giving to the Railway full security for all costs for which the Railway might become liable in contesting such claim. The decision of the Railway regarding the amount actually recoverable from the contractor as stated above, shall be final and binding on the Contractor.

G16.00 Reporting of Accidents to Labour:-The Contractor shall be responsible for the safety of all employees directly or through petty contractors or sub-contractor employed by him on the works and shall report serious accidents to any of them however and wherever accident occurring on the works to the Railways Representative, the contractor shall make every arrangements to render all possible assistance,

G17.0057. Provision of Workmens Compensation Act:-In every case in which by virtue of the provisions of Section 12 Sub-section (1) of the Workmen's Compensation Act 1923, Railway is obliged to pay compensation to a workman directly or through petty contractor or subcontractor employed by the Contractor in executing the work, Railway will recover from the Contractor the amount of the compensation so paid, and, without prejudice to the rights of Railway under Section 12 Sub-section (2) of the said Act, Railway shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by Railway to the Contractor whether under these conditions or otherwise, Railway shall not be bound to contest any claim made against it under Section 12 Sub-section (1) of the said Act except on the written request of the Contractor and upon his giving to Railway full security for all costs for which Railway might become liable in consequence of contesting such claim.

G18.00. Provision of Mines Act:-The Contractor shall observe and perform all the provisions of the Mines Act, 1952 or any statutory modifications or re-enactment thereof for the time being in force and any rules and regulations made there under in respect of all the persons directly or through the petty contractors or sub-contractors employed by him under this contract and shall indemnify the Railway from and against any claims under the Mines Act, or the rules and regulations framed there under, by or on behalf of any persons employed by him or otherwise.

G19. Railway not to provide quarters for Contractors: - No quarters shall normally be provided by the Railway for the accommodation of the Contractor or any of his staff employed on the work. In exceptional cases where accommodation is provided to the Contractor at the Railway's discretion, recoveries shall be made at such rates as may be fixed by the Railway for the full rent of the buildings and equipments therein as well as charges for electric current, water supply and conservancy.

G20.00 . (1)abour Camps: The Contractor shall at his own expense make adequate arrangements for the housing, supply of drinking water and provision of latrines and urinals for his staff and workmen, directly or through the petty contractors or sub-contractors and for temporary creche (Bal-mandir) where 50 or more women are employed at a time. Suitable sites on Railway land, if available, may be allotted to the Contractor for the erection of labour camps, either free of charge or on such terms and conditions that may be prescribed by the Railway. All camp sites shall be maintained in clean and sanitary conditions by the Contractor at his own cost.

(2) Compliance to rules for employment of labour: - The Contractor(s) shall conform to all laws, bye-laws rules and regulations for the time being in force pertaining to the employment of local or imported labour and shall take all necessary precautions to ensure and preserve the health and safety of all staff employed directly or through petty Contractors or Sub-Contractors on the works.

(3) Preservation of peace: - The Contractor shall take requisite precautions and use his best endeavours to prevent any riotous or unlawful behaviour by or amongst his workmen and other employed directly or through the petty contractors or sub-contractors on the works and for the preservation of peace and protection of the inhabitants and security of property in the neighbourhood of the works. In the event of the Railway requiring the maintenance of a special Police Force at or in the vicinity of the site during the tenure of works, the expenses thereof shall be borne by the Contractor and if paid by the Railway shall be recoverable from the Contractor.

(4) Sanitary arrangements: - The Contractor shall obey all sanitary rules and carry out all sanitary measures that may from time to time be prescribed by the Railway medical Authority and permit inspection of all sanitary arrangements at all times by the Purchaser, the Purchaser's Representative or the Medical Staff of the Railway. Should the Contractor fail to make the adequate sanitary arrangements, these will be provided by the Railway and the cost therefore recovered from the Contractor.

(5) Outbreak of infectious disease: - The Contractor shall remove from his camp such labour and their families as refuse protective inoculation and vaccination when called upon to do so by the Purchaser or the Purchaser's Representative on the advice of the Railway, Medical Authority. Should Cholera, plague, or other infectious disease break out, the Contractor shall burn the huts, beddings, clothes and other belongings of or used by the infected parties and promptly erect new huts on healthy sites as required by the Purchaser, failing which within the time specified in the Purchaser's requisition, the work may be done by the Railway and the cost therefore recovered from the Contractor.

(6) Treatment of Contractor's staff in Railway Hospitals: - The Contractor and his staff, other than labourers and their families requiring medical aid from the Railway Hospital and dispensaries will be treated as private patients and charged accordingly. The Contractors' labourers and their Families will be granted free treatment in Railway Hospitals and dispensaries where no other Hospitals or dispensaries are available provided the Contractor pays the cost of medicines, dressing and diet money according to the normal scale and additional charges for special examinations such as pathological and bacteriological examination, X-Ray, etc., and for surgical operation.

(7) Medical facilities at site: - The Contractor shall provide medical facilities at the site as may be prescribed by the Purchaser on the advice of the Railway Medical Authority in relation to the strength of the Contractor's resident staff and workmen.

(8) Use of intoxicants: - The sale of ardent spirits or other intoxicating beverages upon the work or in any of the buildings, encampments or tenements owned, occupied by or within the control

of the Contractor or any of his employees shall be forbidden and the Contractor shall exercise his influence and authority to the utmost extent to secure strict compliance with this condition.

(9) Non-employment of female labour: - The Contractor shall see that the employment of female labour on in Cantonment areas, particularly in the neighborhood of soldier's barracks, should be avoided as far as possible.

(10) Restrictions on the employment of retired Purchasers of Railway services within two years of their retirement:- The Contractor shall not, if he is a retired Government servant of Gazetted rank, himself engage in or employ or associate a retired Government Servant of Gazetted rank, who has not completed two years from the date of retirement, in connection with this contract in any manner whatsoever without obtaining prior permission of the President and if the Contractor is found to have contravened this provision it will constitute a breach of contract and administration will be entitled to terminate the contract at the risk and cost of the contractor and forfeit his security deposit.

G20.00 (1) Non-employment of labourers below the age of 15 or as amended:- The Contractor shall not employ children below the age of 15 or as prescibed by law as labourers directly or through petty contractors or subcontractors for the execution of work.

(2) Medical Certificate of fitness for labour:-It is agreed that the contractor shall not employ a person above 15 and below 19 years of age for the purpose of execution of work under the contract unless a medical certificate of fitness in the prescribed form (Proforma at Annexure II) granted to him by a certifying surgeon certifying that he is fit to work as an adults is obtained and kept in the custody of the contractor or a person nominated by him in this behalf and the person carries with him, while at work; a token giving a reference to such certificate. It is further agreed that the responsibility for having the adolescent examined medically at the time of appointment or periodically till he attains the age of 19 years shall devolve entirely on the contractor and all the expenses to be incurred on this account shall be borne by him and no fee shall be charged from the adolescent or his parent for such medical examination.

(3) Period of validity of medical fitness certificate: - A certificate of fitness granted or renewed for the above said purposes shall be valid only for a period of one year at a time. The certifying surgeon shall revoke a certificate granted or renewed if in his opinion the holder of it is, no longer fit for work in the capacity stated therein. Where a certifying surgeon refuses to grant orrenew a certificate or revoke a certificate, he shall, if so required by the person concerned, state his reasons in writing for doing so.

(4) Medical re-examination of labourer:-Where any official appointed in this behalf by the Ministry of labour is of the opinion that any person employed in connection with the execution of any work under this contract in the age group 15 to 19 years is without a certificate of fitness or is having a certificate of fitness but no longer fit to work in the capacity stated in the certificate, he may serve on the Contractor, or on the person nominated by him in this regard, a notice requiring that such persons shall be examined by a certifying surgeon and such person shall not if the concerned official so directs, be employed or permitted to do any work under this contract unless he has been medically examined and certified that he has been granted a certificate of fitness or a fresh certificate of fitness, as the case may be.

EXPLANATIONS:

(1) Only qualified medical practitioners can be appointed as "Certifying Surgeons" and the term "Qualified Medical Practitioners" means a person holding a qualification granted by an authority specified in the Schedule to the Indian Medical Degrees Act, 1916 (VII to 1916) or in the Schedule to the Indian Medical Council Act, 1933 (XXVII) of 1933.

(2) The Certifying surgeon may be a medical officer in the service of State or Municipal Corporation.

Bid document Part-II
(SECTION-I)

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

TECHNICAL SPECIFICATION

Research Designs and Standards Organization
Manak Nagar, Lucknow
INDIA – 226011

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

SPECIFICATION
OF
TRAIN COLLISION AVOIDANCE SYSTEM (TCAS)

SPECIFICATION No. RDSO/SPN/196/2012

Version 3.1.1

Number of Pages (including all Annexures) - 56

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RDSO/SPN/196/2008		Version 1.0	25 .11.2008
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RDSO/SPN/196/2011	Guard & LC Gate TCAS eliminated	Version 2.1	Draft
RDSO/SPN/196/2011	Guard & LC Gate TCAS made optional	Version 2.2	Draft
RDSO/SPN/196/2011	• Version 2.2 Discarded. • Following Clauses changed from version 2.1: 2.1.4, 3.1, 3.2, 3.8, 3.13, 3.14, 3.15, 3.20, 3.24, 3.25, 3.30 to 3.34, 4.10, 4.12, 7.7, item 8 in table in 10.1, 11.0, • New Clauses introduced at 2.1.1 ii, 2.1.2, 3.35, 3.41, 3.42, 9.2, 11.2 & 11.3. The numbers of clauses subsequent to new clauses changed in sequence.	Version 2.3	Draft
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RDSO/SPN/196/2012	Complete Revision	Version 3.0	Draft
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1. Introduction

1.1 This document sets forth general, operational, system, technical, functional, and performance requirements for Train Collision Avoidance System (TCAS).

1.2 TCAS is a vital system. Aim of this system is to prevent train collisions in block sections and on running lines at stations and also prevent Signal Passing at Danger (SPAD).

2. Applicable Documents

2.1 This specification requires reference to the following documents –

1	EN 50126	Railway Applications- Specifications and demonstration of Reliability, Availability, Maintainability & Safety.
2	EN 50128	Railway Applications-Communications, Signalling and processing systems-Software for Railway Control and Protection Systems.
3	EN 50129	Railway Applications-Communications, Signalling and processing systems- Safety Related Electronics Systems for Signalling.
4	EN50159-1	Railway Applications-Communications, Signalling and processing systems - Safety related communication in closed transmission systems.
5	EN50159-2	Railway Applications-Communications, Signalling and processing systems - Safety related communication in open transmission systems.
6	EN 50121	Railway Applications - Electromagnetic compatibility (EMC)
7	EN50238	Railway applications – Compatibility between rolling stock and train detection systems
9	IEC 60571	Electronic Equipment Used on Rail Vehicles
10	IEC 61373	Railway Applications – Rolling stock equipment – Shock and vibration tests
11	ELRS/SPEC/SI/0015	Reliability of electronics used in rolling stock application
12	RDSO/SPN/144	Safety and reliability requirement of electronic signalling equipment.
13	IRS: S 36	Relay Interlocking systems.
14	IRS: S 23	Electrical Signalling and Interlocking Equipment
15	RDSO/SPN/192	Electronic Interlocking
16	CTC/TS--50459	Railway Applications - Communication, Signalling and Processing Systems - European Rail Traffic Management System - Driver-Machine Interface – Part 1:Ergonomic principles for the presentation of ERTMS/ETCS/GSM-R Information Part 1:Ergonomic arrangements of ERTMS/ETCS Information

2.2 Wherever in this specification, any of the above mentioned specifications are referred, the latest version/ issue of the same is implied.

3. Terminology& Definitions

3.1 List of abbreviations:

Abbreviation	Full Form/ Description
ABT	Automatic Brake Test
AC	Alternating current
ART	Accident Relief Train
BIU	Brake Interface Unit
BBU	Battery Back-up Unit
CENELEC	European Committee for Electrotechnical Standardization
CTS	Clear To Send
DC	Direct Current
DEMU	Diesel-Electric Multiple Unit
DOX	Data Activated Transmit
DPWCS	Distributed Power Wireless Control System
ECR	Lamp Checking Relay
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
EMU	Electrical Multiple Unit
EPROM	Electrically Programmable Read Only Memory
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
FCC	Federal Communications Commission
FMEA	Failure Mode Effect Analysis
FRS	Functional Requirement Specification
FSK	Frequency-shift keying
FSS	First Stop Signal
G&SR	General & Subsidiary Rules
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IBS	Intermediate Block Signal
IEC	International Electrotechnical Commission
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
Kmph	Kilometers Per Hour
LC	Level Crossing
LSS	Last Stop Signal
MEMU	Mainline Electrical Multiple Unit
MIE	Microprocessor/ Micro-controller based Intelligent Equipment
MTBF	Mean Time Between Failures

MTBWSF	Mean Time Between Wrong Side Failures
OCIP	Operation Cum Indication Panel
OFC	Optical Fiber Communication
RAM	Random Access Memory
RAMS	Reliability, Availability, Maintainability & Safety
RDSO	Research Designs & Standards Organisation
RE	Railway Electrification
RF	Radio Frequency
RFID	Radio Frequency Identification
ROM	Read Only Memory
RS485	Recommended Standard 485
RTS	Ready To Send
SIL	Safety Integrity Level
SOS	Save Our Souls – A distress message
SPAD	Signal Passing at Danger
SRS	System Requirements Specification
TCAS	Train Collision Avoidance System
TIN	Track Identification Number
UNISIG	European Signalling Industries

3.2 **Definitions**:

3.2.1 **Acceptance Tests:**Tests carried out on the equipment/ system for the purpose of acceptance of the equipment/ system.

3.2.2 **Banking/ Coupled mode:** When, in addition to main leading loco, one or more locomotives are there in the train, other locomotives are said to be in Banking/ Coupled mode.

3.2.3 **Berthing Track:** This is the designated section of the track in station section on which trains normally stop e.g. Platform lines etc.

3.2.4 **Block Section:** The portion of the running line between two block stations onto which no running train may enter until Line Clear has been received from the block station at the other end of the block section.

3.2.5 **Cross Approval:** A process of approval of foreign firms for their proven products/ systems through their Indian counter parts or supplier.

3.2.6 **Driving Cab**: The cab where controls etc. are provided for the Driver to run the locomotive/ train.

3.2.7 **Driving Position**: The position in the locomotive from where driver runs the locomotive/ train. Electric locomotives, some diesel locomotives, EMU, MEMU, DEMU etc. have separate driving cabs for either direction driving and therefore have one driving position in each cab. However, most diesel locomotives have only one cab having two driving positions i.e. one for each direction driving.

3.2.8 **Dynamic speed profile**: The speed-distance curve which a train may follow without violating the static train speed profile and the end of movement authority**.** This curve depends on the braking characteristics of the train and the train length.

3.2.9 **End of Authority (EOA)**: Location to which the train is permitted to proceed and where target speed is zero.

3.2.10 **First Stop Signal (FSS) -** It is the first stop signal on approach to a station/ IBS/ interlocked LC gate.

3.2.11 **Functional Acceptance Tests:** Tests carried out by installing some equipments in the field to prove that the system performs in accordance with this specification & the local configuration data is acceptable.

3.2.12 **Interlocked LC Gate:** An LC Gate interlocked with Signals. Such gates are protected though signals provided on trackside.

3.2.13 **Last Stop Signal:** It is the last stop signal of a station/ IBS/ interlocked LC gate while leaving the station/ IBS/ interlocked LC gate.

3.2.14 **Level Crossing (LC):**The intersection of road with railway track at the same level.

3.2.15 **Light Engine (LE):** When the locomotive alone or consist of MU coupled locomotives runs as a train, the train is called as Light Engine.

3.2.16 **Locomotive**: The word 'locomotive' wherever used in this specification shall also mean the driving cab of EMU, MEMU, DEMU or any other self-propelled vehicle running on Indian Railways.

3.2.17 **Mid-Section**: A location on track anywhere in the block section.

3.2.18 **Movement Authority:** The distance upto which the train is permitted to travel without danger.

3.2.19 **'Off' aspect of a Signal:** Any aspect other than 'On' aspect of a signal.

3.2.20 **'On' aspect of a Signal:** It is the most restrictive aspect of the signal. In case of stop signal, Red (or Danger) aspect is the 'On' aspect.

3.2.21 **Overlap Distance**: The length of track in advance of a stop signal, which must be kept clear, either for clearing the stop signal next in rear or for the purpose of granting permission to approach. The overlap distance may be different for different types of signals & signalling.

3.2.22 **Point:**A railroad switch, turnout or points is a mechanical installation enabling railway trains to be guided from one track to another. The position of the point is said to be 'Normal' if it is set to straight track & 'Reverse' if it is set to diversion.

3.2.23 **Routine Tests:**Tests carried out on the equipment/ system by the manufacturer before offering for inspection.

3.2.24 **Schedule of Dimensions (SOD)**: Indian Railways Schedule of Dimensions. SOD can be purchased from IR.

3.2.25 **Static speed profile**: The Static Speed Profile (SSP) is a description of the fixed speed restrictions for a part of track sent from track to train.

3.2.26 **Station Section:** It is that portion of station limits which can be used for shunting even after granting Line clear to station in Rear.

3.2.27 **Stop Signal:** A railway signal whose ON aspect is 'Danger'.

3.2.28 **Traffic Direction**: This is the direction of the train according to the traffic movement as decided by the railway for a particular section e.g. Up or Dn (down). This direction is used to determine head-on collision, Rear end collision, approaching or moving away from a train or station etc.

3.2.29 **Train Direction**: This is the direction of the train as per Loco cab control e.g. Forward or Reverse or Neutral. This direction is used for determining roll back/ forward, reverse movement etc.

3.2.30 **Type Tests:** Tests carried out to prove conformity with the specification. These are intended to prove the general qualities and design of the equipment/ system.

4. General Requirements

4.1 TCAS shall consist of On-board, station, trackside &on-track equipments.

4.2 Loco TCAS unit shall consist of at least:

i. UHF full-duplex radio communication unit with hot stand-by with separate cable &antenna for each radio, to communicate with other TCAS units

ii. An RFID reader with antenna at the bottom of the locomotive to read RFID tags fitted on track, connected to MIE on RS485 port.

iii. Microprocessor/ micro controller based Intelligent Equipment (MIE) for processing the information ensuring fail-safety

iv. Loco Pilot's Operation-cum-indication panel (LP-OCIP) consisting of suitable display arrangement & buttons/ switches for operation

v. Electromechanical non-resettable 6 digit counters for recording operation of Loco unit to Isolation Mode, Staff Responsible Mode, SPAD prevention & Collision prevention by TCAS.

vi. Interface to existing speed sensor for distance & speed measurement.Loco unit shall apply the Odometry Recalibration Factor also when it is found stable within $\pm$1% in all last 20 recalibrations. In case of input from Speed Sensor is not available, the input from GPS shall be used as fallback arrangement for calculation of speed &distance.GPS receiver shall also be used to determine traffic direction.

vii. Interface with Loco Cab controls for detecting train direction.

viii. Two GSM interfaces for connectivity with Centralized Management System. Wherever existing GSM Antenna is available in the Loco for other purposes(s), the same shall be used by providing suitable interface.

ix. Interfaces for connecting GSM-R module & Balise Transmission Module (BTM) as per UNISIG specifications for ERTMS/ETCS. This shall not be part of current phase.

x. Re-chargeable battery with internal charger

xi. Data logger to log the events for minimum 90 days with date & time stamp

xii. Brake Interface Unit (BIU)

xiii. Location determining Unit

xiv. Real Time Clock having synchronization facility with GPS clock

xv. USB 2.0 interface for downloading of log & other data for diagnostic purposes.

xvi. Interconnecting cables

4.3 Loco Shed TCAS unit for checking the working of Loco unit while in Loco shed.

4.4 Station/ IBS/ Interlocked Gate TCAS unit shall consist of atleast:

i. UHF full-duplex radio communication unit with hot stand-by with separate cable &antenna for each radio, to communicate with Loco units

ii. Microprocessor/ micro controller based Intelligent Equipment (MIE) for processing the information ensuring fail-safety

iii. Station Manager's Operation-cum-indication panel (SM-OCIP) consisting of suitable display arrangement & buttons/ switches for operation

iv. Re-chargeable battery with external charger

v. Electromechanical non-resettable 6 digit counter for recording reset operation.

vi. Data logger to log the events for minimum 30 days with date & time stamp.

vii. Real Time Clock having synchronization facility with GPS clock

viii. A fail-safe interface unit to interface with the signalling inputs

ix. Two GSM interfaces for connectivity with Centralized Management System

x. RS485 ports (minimum two & upgradable to six) for interfacing with OFC/ Quad cable for connectivity with other Station unit. RS485 ports shall be internally wired through built-in modem for interfacing with Quad Cable Network.
xi. An Ethernet port for connecting it to Centralized Management System.
xii. USB 2.0 interface for downloading of log & other data for diagnostic purposes.
xiii. Interface for connecting 21" LCD panel in a room at the station.
xiv. Interconnecting cables

4.5 RFID tags shallbe fitted on point zones, near Signals & track in block section for giving Track Identification Number (TIN) information to loco unit, location correction, identifying signal by Loco unit& for direction determination in tunnels. Each RFID tag shall communicate the distance to next RFID tag.

4.6 RFID tags at all the places shall be duplicated with identical information.

4.7 TCAS shall be universally suitable for various types of sections of Indian Railways e.g. Stations equipped with Relay interlocking, Electronic interlocking, Multi-aspect Colour Light Signalling, Electromechanical Signalling with Multiple Aspect Colour Light Signalling, Automatic Signalling (Not in the current Phase), Suburban (excluding underground railway sections), Multiple Line, Intermediate Block Signalling Sections; turnouts of all types having different speed potentials.

4.8 TCAS shall be suitable for all types of electric and diesel locomotives, including all types of microprocessor based locomotives, Distributed Power Wireless Control System (DPWCS) locomotives running on Indian Railways. In case of Microprocessor based locomotives, the braking system of TCAS will be suitably interfaced with the computer controlled braking system of the locomotive. However, the loco unit in 'Coupled/ Banking' mode shall not apply any brake.

4.9 TCAS shall be suitable for Air/Vacuum /Dual/Electro-pneumatic Brake system/CCB/EP70 of Diesel and Electric Locomotives, EMUs/ DMUs/ MEMUs as well as any other self-propelled vehicles treated as train.

4.10 TCAS units shall be capable of working in all electrified as well as non-electrified territories. It shall be suitable for use on AC/DC EMUs/DMUs/MEMUs/single or multi-headed electric/diesel locomotives/ banking locomotives.

4.11 TCAS Network shall be suitable for train speeds atleast up to 160 km/h.

4.12 The Loco unit & Station unit shall work on the DC power supply & shall have battery backup.

4.13 The Loco unit, Station unit & Track side equipments shall not in any way infringe the schedule of dimensions being followed by the Indian Railways.

4.14 TCAS shall be capable of giving following three levels of brake commands for train braking

i Normal Brake command
ii Full Service brake command
iii Emergency brake command

& the Brake Interface Unit (BIU) shall apply normal, service & emergency brakes of locomotives respectively based on the type of brake command through existing brake system of locomotives. Also, equipment shall have facility to give additional command in conjunction with Normal Brake / Full Service Brake / Emergency Brake which shall be used to develop higher brake cylinder pressure corresponding to loco independent brake, if train is a light engine.

4.15 The fixing of the equipment, including antenna should be rugged enough so

that it does not get detached during the run of the train.

4.16 All units shall store events essential for performance monitoring and diagnostic purpose, for a period of 90 days in Loco unit& 30 days in other units, and logging of last five collision type situations will be stored in central server. It shall not be possible to interfere with this data by any person. It shall also be possible to generate print reports based on such stored data using a portable PC. Event storage equipments shall be of rugged design to escape damage during physical collision. The data logger, as individual, shall have SIL-2 level of safety as per CENELEC or equivalent standards.

4.17 The system shall be compatible & interoperable with the existing TCAS system on Indian Railways.

4.18 Modes:

The Loco unit shall be able to provide protection to the train in various modes of operation depending upon the information available to it from station, lineside & trackside equipments. These are:

4.18.1 **Normal Mode** – When Loco unit receives all the data, which is required for performing full functionality, it shall switch to Normal mode.

4.18.2 **Controlled Mode** – Loco unit shall switch to this mode when it is unable to deduce the correct Track Identification Number. The working in this mode is defined in Clause 5.17. As soon as TIN is acquired by the Loco unit, it shall exit from this mode & shall enter into other mode depending upon other conditions.

4.18.3 **Restricted Mode** – This mode is entered into by the Loco Pilot or automatically & it allows the Loco Pilot to move the train under his own responsibility in a TCAS equipped area under certain situations. However, it shall monitor the speed of the train to a maximum limit of 15 KMPH (configurable in steps of from 0 to 30 KMPH in steps of 5 KMPH).

4.18.4 **Staff Responsible Mode** – This mode is entered into by the Loco Pilot it allows the Loco Pilot to move the train under his own responsibility

4.18.5 **Coupled/ Banking operation** – This mode shall be entered & exit manually. This mode shall be entered if the locomotive is not the leading locomotive. The loco equipment in 'Coupled/ Banking' mode shall not apply any brake. The brake in banking loco shall be applied through its normal brake system. However, the locomotive in this mode shall carryout all the functions related with track identification.

4.18.6 **Isolation Mode** – The Loco unit automatically transitions to this mode when in standstill condition of the locomotive, Isolation switch is operated by the Loco Pilot to isolate the Brake Interface Unit (BIU) physically from the brakes. If Isolation switch is operated in running condition of the locomotive, Loco unit shall command the emergency brake till the train stops & shall then switchover to 'Isolation Mode'. In this mode, Loco unit has no role/ responsibility for its functionality. However, under this mode Loco unit shall not affect the normal working of locomotive including its brake system.

4.18.7 **Failure Mode** – The Loco unit equipment shall switch to this mode, in case of a fault, which affects safety and shall permanently command the Emergency Brake.

4.18.8 **Unfitted Mode** – Loco unit shall automatically switch to this mode after exiting out of TCAS territory. In this mode, the Loco unit has no other role/ responsibility for its functionality but shall carry out the functions defined in Clauses 5.10, 5.11, 5.15&5.16.

4.18.9 **Reverse Mode** – This mode is entered into by the Loco Pilot & permits movement of the train in reverse train direction. The speed of the train shall be supervised against a defined value (programmable, 0 to 30 KMPH in steps of 5 KMPH).

4.18.10 **Stop Mode** – This mode is entered into automatically if the train is stopped by TCAS.

4.18.11 The various functions to be performed in various modes of Loco unit have been defined tentatively in Annexure-IX. These shall be finalized after development & trial of the system.

4.19 Any transition of mode of Loco unit while the train is moving shall be automatic in principle.

4.20 Transitions of mode which occur while the train is stationary, shall be initiated automatically or manually as appropriate.

4.21 If, as a result of an automatic transition, the responsibility for the Loco Pilot increases, the Loco unit shall seek an acknowledgement from the driver, whether the train is stationary or not.

4.22 In case the transition has to be acknowledged and the Loco Pilot fails to acknowledge as required, the Loco unit shall initiate a service brake application unless otherwise other factors warrant application of Emergency Brakes.

4.23 During the transition period between two modes the supervision provided shall at least ensure the same protection provided by the least restrictive mode.

4.24 The current mode shall be displayed on Loco Pilot's OCIP.

4.25 Transition from TCAS to Non-TCAS territory & vice versa:

i. The trains equipped with Loco TCAS shall be able to run in non TCAS territory.

ii. The transition of Loco TCAS from TCAS to Non-TCAS territory shall seek acknowledgement by the Loco Pilot. If the Loco Pilot does not acknowledge after the transition for 200m (configurable) the brake shall be applied. If the Loco Pilot acknowledges afterwards, the brake can be released.

iii. The transition of Loco TCAS from Non-TCAS to TCAS territory shall also seek acknowledgement by the Loco Pilot. However, in case of failure of Loco Pilot to acknowledge, there shall be no brake application.

4.26 The TCAS shall conform to the Safety Integrity Level (SIL) 4 as per CENELEC standards or equivalent.

5. Functional Requirements

5.1 Loco unit shall be checked while leaving the loco shed, using Automatic testing equipment to ensure the functional capability of complete TCAS, including the health of complete hardware & software, satisfactory working of brake interface unit and communication capability.

5.2 The TCAS equipment shall perform an automatic self-test when the equipment is switched ON. This self-test shall not require any action on the part of the Loco Pilot/ operator. This self-test must test all vital elements. The result of self-tests shall be indicated on OCIP.

5.3 On startup or restart, the Loco unit shall go to Controlled mode if restarted within stipulated time (2 minutes nominal) and the last stored mode was not in 'Unfitted Mode' or 'Banking/ Coupled Mode' or 'Isolation Mode'. Otherwise or on startup, the Loco TCAS unit shall go to 'Staff Responsible Mode' after getting Acknowledgement from the Loco Pilot in stipulated time. In all other cases, It shall go to 'Controlled Mode'.

5.4 **Direction**

There shall be two types of direction of movements, one for train such as forward or reverse and other for traffic such as Up or Dn.

5.4.1 On startup or restart, the Loco unit shall not assume any traffic direction by default. The traffic direction shall be set only when loco has moved certain distance in a particular direction. However, if the collision like situation is perceived before the traffic direction is set, the length of the train shall be

considered by the Loco unit of other trains approaching either from front or rear side of the said train.

5.4.2 The traffic direction shall normally be determined through RFID, It shall be determined through GPS receiver on startup or restart or as fallback arrangement of RFID.

5.4.3 The traffic direction shall be used for determining whether two trains are approaching, one following the other or going away from each other.

5.4.4 The train direction shall be determined based on position of cab control. This direction shall be used for detecting Roll back/ forward & Reverse movement.

5.5 **New Train Formation**

A train shall be considered as a new formed train by loco TCAS under one or more of the following situations:

(i) When loco unit has been switched on or restarted;
(ii) When loco unit has come out of Banking/ Coupled mode ;
(iii) When direction of movement of loco has changed in station section;
(iv) When length of the train has changed by more than 10 meters.

5.6 **Train Length Assignment**

5.6.1 Loco unit shall assume a default train length under one or more of the following situations:

(i) When Loco unit has been switched on or restarted;
(ii) When Loco unit has come out of Banking/ Multiple mode;
(iii) When direction of loco movement has changed in station section;

5.6.2 The default train length shall be 700m which shall be configurable at the installation stage.

5.6.3 Every station unit shall monitor the status of track circuits identified for measurement of train length either for the stopping train or for the train with default train length. Station unit shall communicate the location of boundary of Track Circuit, time of occupied & clear status of these track to each Loco unit which is not in Multiple or Coupled mode. Loco unit, based on its location at the timings so received, shall calculate its train length.

5.6.4 The train length so calculated by Loco unit shall be stored by it replacing the previously stored train length with time stamp under one or more of the following conditions:

(i) If the previous train length was default train length;
(ii) After stopping at a station, if the train length calculated by Loco unit differs the previously stored train length by more than 10m. This difference in train length shall be user programmable.

5.6.5 The accuracy of the train length measurement by Station unit shall be within ± 5 meters.

5.6.6 Based on the train length calculated by Loco unit, it shall also correctly detect whether the train is a Light Engine or not. In case the train is detected as Light Engine, Loco unit in association with BIU shall also apply with higher BC pressure corresponding to loco independent brake in addition to NB/SB/EB.

5.6.7 Station unit shall have provision of programming time correction value which shall be used by it for correcting the time of clear status of track circuit referred in5.6.3.

5.6.8 Station unit shall also have provision for programming a maximum period of track circuits referred in Clause 5.6.3, remaining occupied to differentiate occupation of these track circuits by train or due to failure. If occupation period of these track circuits is beyond the defined period of time, Station unit shall not transmit the timings for calculation of train length.

5.6.9 On not receiving the timing information from Station unit even upto 1 minute of its entry into block section, Loco unit shall seek acknowledgement from the Loco Pilot in token of assurance that the train composition & hence the train length has not changed nor new train has been formed at this station. In case

of no acknowledgement from Loco Pilot within 5 seconds, Loco unit shall assume default train length as in Clause 5.6.2 and treat the train as new train.

5.7 **Types of Brake commands & Brake Interface Unit (BIU)**

5.7.1 TCAS shall be capable of giving following three levels of brake commands for train braking:

(i) Normal Brake (NB) command
(ii) Full Service Brake (FSB) command
(iii) Emergency Brake (EB) command

5.7.2 In addition, TCAS shall also give additional command i.e. Loco Brake command in conjunction with Normal Brake / Full Service Brake / Emergency Brake, to develop BC pressure upto maximum value corresponding to loco independent brake if the train is identified as a Light Engine.The Brake Interface Unit (BIU) of Loco unit shall have following features:

5.7.2.1 It shall apply normal, service & emergency brakes of locomotives respectively based on the type of brake command. In addition to these brakes, it shall also apply Loco brake, if Loco Brake command is received.

5.7.2.2 It shall not reduce the braking level initiated by the Loco Pilot. However, TCAS can increase the level of braking over driver initiated braking as and when need arises.

5.7.2.3 It shall not modify the existing braking characteristics of the locomotive (single/MU/Banking) as well as other self-propelled vehicles treated as train.

5.7.2.4 It shall automatically cut off traction/ regression shall take place at the instance of Loco unit initiated braking & traction shall be restored after withdrawal of Loco unit brake commands.

5.7.2.5 It shall be possible to increase the extent of brake level (initiated by Loco unit) by the loco pilot, if he desires so.

5.7.2.6 Whenever braking command is withdrawn by TCAS, the TCAS initiated brake shall release and loco pilot shall be able to restore traction.

5.7.3 If RDSO developed and approved BIU is available, the same shall be used in place of the one described in 5.7.2. The interfacing to BIU shall be either through potential free contacts or through DC voltage.

5.8 **Automatic Brake Test (ABT) & Brake characteristics**

5.8.1 On formation a new train, loco unit shall assume default brake characteristics of the train. The default brake characteristics shall be such that in the event of perceived danger, the loco unit is able to stop train short of safe distance or control the speed to desired value before target, as the case may be.

5.8.2 Whenever a train with default brake characteristics enters in block section, loco unit shall carryout Automatic Brake Test (ABT) to assess the correct brake characteristics of the train on a level track indicated through RFID tag. The ABT shall automatically take care of any Loco Pilot initiated braking including loco's dynamic/ Rheostatic/ Regenerative brake during the course of ABT, such that, it does not have impact on TCAS generated braking characteristics and TCAS meets its prime requirement of prevention of collision.

5.8.3 The outcome of the ABT shall be displayed on Loco Pilot's OCIP in the form of message 'AUTO BRAKE TEST OK' with audio alarm in case the ABT is considered successful by the loco unit.

5.8.4 In case of failure of ABT to take place due to any reason, Loco unit shall perform ABT again in the next block section.

5.8.5 In case ABT is considered unsuccessful by Loco unit, 'AUTO BRAKE TEST NOT OK' shall be displayed on Loco Pilot's OCIP alongwith audio alarm to alert Loco Pilot. However in such case, Loco unit shall retain the default brake characteristics & shall be able to stop short of safe distance limit or to control

the speed by application of the Full Service Brake and/ or emergency brakes in collision like situations or as the case may be.

5.8.6 It shall be possible to test the working of all brake valves of Brake Interface Unit (BIU) in stationary condition of the train by pressing Manual Brake Test (MBT) button by the Loco Pilot. The MBT shall be possible to be initiated through a soft key on the OCIP.

5.8.7 The braking logic of the Loco unit shall be so intelligent that based on the default or assessed brake characteristics of the train and depending upon the speed of the train, gradient of the location & the target, Loco unit shall decide which type(s) of brake & when to be applied to stop the train short of safe distance or control the speed to desired value before target without frequent repeated braking. In case the distance available between the two trains at the instance of perceived danger is not adequate, Loco unit shall apply maximum brake to reduce the speed of the trains as much as possible under the circumstances so that impact is minimized.

5.8.8 Design of the Loco unit equipment shall be such that its braking interface unit can be isolated by the Loco Pilot when so warranted. The isolation of braking interface shall be communicated to the Centralized Management System. To deter its incorrect use, the isolation mechanism must be protected and isolation of braking interface must be recorded. Also, the message about such isolation shall be displayed on Loco Pilot's OCIP to inform Loco Pilot about isolation of TCAS. Isolation of TCAS/BIU shall not affect existing brake characteristics of the loco/other self-propelled vehicles. Traction cut off feature through TCAS shall also be isolated under such events.

5.8.9 In order to control the train speed to a particular ceiling limit with reference to a location or to stop the train with reference to a location or prevent collision, Loco unit shall intelligently take decision about type & location of brake application based on the speed of the train, distance from the target, brake characteristics of the train (assessed or default) etc. so that train speed is controlled or train is stopped, as the case may be, within a safe distance of 200m from the target. In case of Stop Signals at ON, it shall stop close to the signal with safe front end of the train within 50m on approach to the signal.

5.9 Track Identification Number (TIN)

5.9.1 Each track shall have designated Track Identification Number (TIN).

5.9.2 Each straight track shall have single unique designated TIN end to end i.e. from block section to station section then to block section. Each line in the station section having berthing portion shall have different TINs.

5.9.3 The TINs used for loop lines at a station can be reused on other stations.

5.9.4 Prior to start of TCAS territory, arrangements shall be provided to allocate TIN of that track to Loco unit before it enters the TCAS territory.

5.9.5 Further, inside the TCAS territory, Loco unit shall be able to self-deduce the change in its TIN whenever it changes the track after negotiating the point zones. For this purpose duplicated RFID tags shall be provided at each entry/ exit of each point, at entry/ exit of each station section and at not more than 1000m interval in block section.

5.9.6 There shall be no case of assignment or deduction of wrong TIN by Loco unit.

5.9.7 In exceptional cases of incorrect track identification number by a Loco unit, it shall go to 'Controlled Mode'.

5.9.8 After the train leaves TCAS territory, Loco unit shall enter into Unfitted mode automatically. The driver shall be asked to acknowledge the transition. If the driver does not acknowledge within 5 seconds, a service brake command shall be initiated. The driver shall then acknowledge the level transition in order to release the service brake command.

5.10 Prevention of Side Collision in Block Section

5.10.1 In case of unusual stopping of train in the block section, TCAS shall be capable of automatically generating & transmitting 'Side Collision' message to all trains in the radius of 3000m, after a delay of 5 seconds (programmable in steps of 5 seconds) of stoppage of the train unless cancelled by the Loco Pilot.

5.10.2 There shall be a provision to cancel the generation/ transmission of this message by Loco Pilot by pressing a button on the OCIP either before the generation or even after transmission has started.

5.10.3 The Loco unit coming towards the 'Side Collision' message source (on adjoining lines only in case of multiple line sections), on getting 'Side Collision' message shall display it on the OCIP & will automatically reduce speed to 15 kmph before reaching to the location of generation of message.

5.11 Protection of Roll Back / Forward &Reverse Movement

5.11.1 Loco unit shall be capable of detecting Roll Back/ Forward &Reverse movement of train through Loco cab interface. It shall apply emergency brakes & give audio/ visual warning if train has moved 5 meter (configurable) Roll Back/ Forward &Reverse movement.

5.11.2 It shall be possible for the Loco Pilot to reverse the train, if situation so warrants, by changing the mode of Loco unit to 'Reverse Mode'.

5.11.3 The forward or reverse directions mentioned in sub-clauses of Clause 5.11 are with reference to Train direction.

5.12 Station Approaching

5.12.1 While approaching a station, Loco unit shall be able to alert the Loco Pilot by giving an audio-visual warning from 2000 meters in rear of the first stop signal. Audio alarms of TCAS shall be 'single' distinct from all other on-board alarms and stop either after 5 Seconds or when acknowledged.

5.12.2 At this location, Loco unit shall be able to detect with the help of Station unit, whether the train is being received on main line or not. In case the train is not being received on main line, it shall apply brakes, if required, to control the speed of the train to maximum permissible speed for loop line before arriving at first point. In case it is received on line, which is already occupied, Loco unit shall apply brakes so as to stop the train short of the safe distance from locomotive/train/stabled load.

5.12.3 If Loco unit is unable to communicate with Station unit from a distance of 2000m from the FSS, the Loco unit shall enter to Restricted Mode and apply the brakes so as to stop the train short of FSS assuming the signal to be at ON. The application of brake shall be released by Loco unit either as soon as communication with Station unit is established and the fresh Movement Authority is available or on invocation of Isolation or Staff Responsible Mode.

5.13 Prevention of Signal Passing at Danger (SPAD)

5.13.1 Loco unit shall receive from Station unit, aspect of the next signal on route from a distance of minimum 600m. The aspect of signals shall be chain linked i.e., distance & its identification number of the next signal on the route shall also be communicated by Station unit alongwith aspect of the signal.

5.13.2 Loco unit shall receive movement authority also (the distance for which the train is authorized to travel) from station unit.

5.13.3 Station unit shall calculate the movement authority based on the signal aspect, point position, whether train is being received on main line or not & the status of the berthing track circuit.

5.13.4 In case of any conflict between signal aspect, point position & berthing track circuit, the station unit shall transmit most restrictive aspect of that signal & shall make movement authority to zero for that signal.

5.13.5 Loco unit while entering into block section & after clearing the block section (including the train length) shall inform so alongwith their TIN to concerned Station/ IBS unit.

5.13.6 Both the station /IBS unit of a block section together shall ensure that there is only one train with same TIN in the same block section. The off aspect & movement authority to Loco unit for LSS shall be transmitted by Station/ IBS unit only when LSS is off & concerned block section is clear of any train(s) of the same TIN.

5.13.7 Arrangements shall be made in Station/ IBS unit for resetting the occupancy of block section to clear status in case Loco unit of a train fails in the block section & it is unable to communicate its clearance from block section at the receiving Station/ IBS unit. The resetting arrangement shall have an electro-mechanical 6 digit non resettable counter to record such resetting and shall be permitted only when the concerned block instruments are in Line Closed condition. .

5.14 Prevention of Head on & Rear End Collisions

5.14.1 Loco units either directly or through Station unit, shall be capable of detecting head on collisions, rear end collisions of trains/locos on single line, multiple lines in all possible scenarios based on the track identification, speed of the trains, location, traffic direction etc.

5.14.2 In case of head on collision situation, Loco units of both the trains shall automatically apply brakes to bring the trains/locomotives to a stop short of safe distance from each other.

5.14.3 In case of rear end collision situation, Loco unit of only rear train shall automatically apply brakes to bring it to a stop short of safe distance from the train ahead. There shall be no brake application in train ahead on account of rear end collision situation.

5.14.4 As soon as the head-on collision or rear end collision, as the case may be, situation is over, the application of brakes by Loco unit shall be withdrawn.

5.15 Detection of Parting/Jumbling

5.15.1 Loco unit through a potential free contact to be made available by the railways, shall detect parting/ jumbling of the train and shall transmit 'Train Parted/ Jumbled' message automatically.

5.15.2 Loco unit of trains approaching the parted/jumbled train, on getting the 'Train Parted/ Jumbled' message, shall apply brakes to bring the train/locomotive to a stop short of safe distance from parted/ jumbled train.

5.15.3 Loco unit shall have provision for material trains, ARTs and other similar trains which are required to be parted for handling the work at site. In such case, Loco unit shall not transmit 'Train Parted/ Jumbled' message.

5.15.4 Suitable arrangement to facilitate shunting in station section/block section shall be provided.

5.16 SOS

5.16.1 Loco as well as Station unit shall have provision of sending SOS message by pressing twin SOS buttons. SOS buttons shall be so placed that these could not be pressed inadvertently. When the twin SOS buttons are pressed simultaneously in Loco or Station units, the Loco units of all the trains/locos within 3000m radius of SOS generating source as well as self-train (if SOS is generated by Loco unit), shall automatically & without any time lag apply emergency brakes so as to stop the train(s) even if reception of message is not continued after receiving it once. SOS sending as well as receiving TCAS equipments shall log sending & receiving of SOS message.

5.16.2 After the train stops due to reception of SOS, emergency brake shall be released if the Loco Pilot presses the 'Cancel' push button. However, in such condition, the Loco unit of the train shall impose a speed limit of 15 kmph. The

normal speed shall be restored only when either the SOS message is cancelled by the source which generated the SOS or when the train has moved away by more than 3000m from the source which generated the SOS or SOS message reception is discontinued from the source for more than 3 minutes, whichever is earlier.

5.16.3 In case of SOS by Loco unit, message shall be received by nearest station unit which shall relay it to other locos in its vicinity and also to station on other side of loco which has generated SOS. Further, Loco unit shall alternately transmit the SOS by inverting its frequency sothat locos in its vicinity can directly receive SOS.

5.17 Controlled Mode: The movement of the train having Loco unit in 'controlled mode' shall be as under:

5.17.1 When any Loco unit fitted train(s) is approaching the controlled mode Loco unit train within 3000m, a speed restriction of 15 kmph shall be imposed by all such trains including self-train. Normal speed can be resumed by each approaching train when it crosses the controlled mode TCAS train. Similarly, normal speed can be resumed by controlled mode TCAS train when no train is approaching it within 3000m. This process shall repeat till such time controlled mode TCAS train gets correct track identification.

5.17.2 In addition to above, while approaching a station, the speed of the controlled mode Loco unit train shall be restricted to 15 KMPH at the first point while entering the station area if any of the main line is not set to main line or if all the main lines are set to straight & any of the main line berthing portion is occupied and this speed restriction shall continue till such time complete train enters the block section where it will be governed by 5.17.1. The speed restriction by other trains shall be governed as mentioned in 5.17.1.

5.18 Communication arrangement

5.18.1 The Loco as well as Station TCAs shall have duplicated hot standby radios so that in case of failure of one radio, the train protection can be achieved through other radio for a limited distance before the loco is taken out of the service.

5.18.2 The Station unit shall have an Ethernet portfor connecting them to Centralized Management System.

5.18.3 The radio frame refresh rate shall be 2 secs.

5.18.4 If Loco unit, after establishing communication with station unit from a distance of 2000m from FSS, misses more than two continuous packets, it shall go into Restricted Mode. Loco unit shall come out of Restricted Mode as soon as it receives two continuous packets.

5.19 Health Check

5.19.1 Loco unit shall continuously check its health status including its communication with other Loco / Station unit. If the health status is not found OK, the same shall be displayed on Loco unit LP-OCIP & Loco unit shall switch to Failure Mode.

5.19.2 Loco unit units while in communication with station shall upload its health status& Brake Interface unit (BIU) isolation status to station unit. The station unit units shall transfer the information so received from Loco unit units &its own event log to a Centralized Management System on real time basis. The Centralized Management System shall have suitable management software for diagnostics, maintenance & analysis purpose.

5.19.3 Loco unit shall also transmit its health & BIU isolation information to Centralized Management System through its GSM.

5.19.4 If Loco unit, even in unhealthy condition, is able to communicate with station unit, this information shall be communicated to station unit, which then will be transmitted to the Centralized Management System located in the control room. Loco unit shall also transmit this information to Centralized Management System through its GSM.

5.20 **Interoperability:** The Loco unit of a manufacturer shall be interoperable with Station unit& track-side equipments of another manufacturer & vice versa.

5.21 Direction detection in tunnels: Duplicated RFID tags at suitable interval shall be provided on track in tunnels to detect the traffic direction of the train.

5.22 All the messages displayed on LP's and SM's OCIP shall be got approved from RDSO & shall be logged in respective data logger alongwith date, time & other relevant information.

5.23 The Loco unit shall have capability to be interfaced with two OCIPs, if required, in locomotives having two driving cabs or two driving positions in the same cab. In such cases, except the SOS buttons all other functionality of other OCIP i.e., of non-driving cab/ position shall get disabled automatically.

5.24 Loco unit, Station unit& Centralized server shall also have GSM interface for transfer of log & other events to Centralized Management System directly in addition to other communication link between Loco & Station unit and between Station unit& Central Server.

5.25 In case of more than one situations/ scenarios existing at the same time, the Loco unit shall take action as per the most restrictive situation/ scenario.The Loco unit shall make speed profile/ brake curve for different situations based on movement authority, speed restriction and other information as received from Stationary unit or Loco unit. Loco unit shall take action as per the most restricted speed profile/ brake curve at any point of time.

5.26 Wherever Station unit is referred, it shall also mean Station or IBS or Gate unit.

5.27 Once a situation is detected by Loco unit based on the information received by it, which warrants application of brake & further update of information is not available, the action for brake application shall be initiated or continued if already initiated as per the brake curve at the time receipt of last information. Further update of brake curve shall be done only after start of receipt of further information.

6. System Requirements

RFID reader & tag specifications & fitment

6.1. Each Loco unit shall have an RFID reader fitted underneath the locomotive body for reading the information from RFID tags fitted on the track, connected to MIE on RS 485 port.

6.2. The RFID reader shall be as per following technical specifications:

a. Suitable to be fitted underneath Locomotive body & shall be rugged enough to withstand vibrations.
b. Suitable for reliable working at Locomotive speed upto 160 KMPH.
c. Frequency of operation – 865-867 MHz
d. Meeting EN 50121 or equivalent standard for EMI/ EMC.
e. Communication Protocol – EPCGEN2-ISO-1800-6C
f. Shall have minimum IP 65 protection.
g. Other requirements like environmental, climatic etc. as per RDSO/ SPN/144.
h. Under field operating conditions, RFID reader shall be able to read RFID tag from a vertical distance of minimum 3 meters.

6.3. The RFID tags shall be fitted on the sleepers between the rails as per drawing in Annexure-VIII.

6.4. RFID tag shall be as per following specifications:

a. Suitable for reliable working at RFID reader speed upto 160 KMPH.
b. Frequency of operation – 865-867 MHz
c. One time programmable with user programmable area of minimum 144bits.
d. Shall be able to work even when submerged in water.
e. Meeting EN 50121 or equivalent standard for EMI/ EMC
f. Communication Protocol – EPCGEN2-ISO-1800-6C/D
g. Shall have minimum IP 68 protection.
h. Other requirements like environmental, climatic etc. as per RDSO/ SPN/144.
i. Under field operating conditions RFID reader shall be able to read RFID tag from a vertical distance of minimum 3 meters.

6.5. RFID tags shall be provided at following locations:

6.5.1. At not more than one kilometer on straight track (track without any points taking off from it).
6.5.2. At both side fouling marks of a turnout.
6.5.3. at the Block entry i.e. at the foot of the Last Stop Signals of the station for each block section.
6.5.4. at the Station entry i.e. at the end of the block overlap at the station for each block section.
6.5.5. at the foot of the signal.
6.5.6. At the end of TCAS territory

6.6. RFID tags shall be one-time programmable & shall be programmed with information in following pattern:

6.6.1. Track Identification Number (TIN) in Nominal Direction– 6 bits
6.6.2. Track Identification Number (TIN) in Reverse Direction– 6 bits
6.6.3. Absolute location in meters – 22 bits
6.6.4. Distance to next RFID tags in Nominal Direction in meters – 14 bits
6.6.5. Distance to next RFID tags in Reverse Direction in meters – 14 bits
6.6.6. Signal id – 8 bits
6.6.7. Unique ID of RFID Tag Set in Zone – 10 bits
6.6.8. Following Location based conditions are to be mapped as under:

Nominal Direction								Reverse Direction								Remarks
X15	X14	X13	X12	X11	X10	x9	x8	x7	x6	x5	x4	x3	x2	x1	x0	
						0	0							0	0	TCAS Territory Exit
						0	1							0	1	TCAS Block Section ahead
						1	0							1	0	TCAS Station Section ahead
						1	1							1	1	Spare
				0	0							0	0			Neither Converging nor diverging (Not near turnout)
				0	1							0	1			Converging at Turnout
				1	0							1	0			Diverging at Turnout
				1	1							1	1			Spare
			1								1					ABT/MBT allowed
			0								0					ABT/MBT not allowed
0	0	0						0	0	0						No single Signal identified ahead
0	0	1						0	0	1						Approaching Stop Signal approx. 3000m ahead
0	1	0						0	1	0						Approaching Stop Signal approx. 2000m ahead
0	1	1						0	1	1						Approaching Stop Signal 100-200m ahead
1	0	0						1	0	0						Approaching Stop Signal 70-100m ahead
1	0	1						1	0	1						Approaching Stop Signal 50-70m ahead
1	1	0						1	1	0						Spare
1	1	1						1	1	1						At Stop/Permissive Signal Foot

6.7. When Loco unit RFID reader passes over RFID tag, RFID tag shall transmit the above information(described in Cl. 6.6) to RFID reader. The horizontal range of RFID reader shall not be more than 750mm.

6.8. Loco unit shall calculate the location of the train between two RFID tags dynamically based on the speed sensor input & wheel diameter.GPS input for this purpose shall be used as fall back only in case of non-availability of Speed Sensor input.

6.9. The RFID tags at all locations shall be duplicated & shall have identical information.

6.10. Loco unit shall act as per the information received from even one RFID tag out of duplicated tags. However, in such case, it shall log the missing RFID tag & transmit the same to Central server.

6.11. On not receiving any information from RFID tag either due to both tags missing or due to any other reason, at the expected location with an error of $\pm$10 meters$\pm$ odometry recalibration and the Movement Authority is not available, the Loco unit shall go in 'Controlled' mode till it gets the information from next RFID tag.

Communication Network

6.12. Each station/ IBS/ mid-section interlocked Gate/ Loco unit radio equipments shall be as per specifications:

a. Shall be FCC certified
b. Shall possess RTS/CTS and DOX modes
c. Shall be capable RF Data Transfer in "Bitwise" / streaming Mode
d. RF frequency range: 405-512MHz
e. RF Channel Bandwidth : 25kHz
f. Modes of operation Full Duplex
g. Modulation : 2FSK
h. Operating frequencies :
    1) Transmission by Station / Interlocked LC Gate / IBS : 466.8 MHz
    2) Regular Transmission by Loco : 441.8 MHz
    3) Additional Transmission by Loco dedicatedly for emergency : 466.8 MHz
i. Emission : according to 16K0F2D
j. Transmitter freq. stability : 1 ppm
k. Transmitter Turn-on time (Tx. Freq. stable)/ Channel Switching time: not more than 15msec
l. Carrier Output Power: 1-10 w adjustable through software.
m. Receiver BER : 1 x 10 -6 or better at 25kHz Bandwidth
n. Receiver Adjacent Channel Rejection 70dB at 25kHz
o. Receiver Sensitivity: 35 micro-volts for 12 dB SINAD /
p. 1 x 10 -6 BER at -100 dBm Level for 19.2kbps
q. Interfaces: COM1, COM2 – RS485, dB-9, TNC Female (Tx/Rx), SMA Female (Rx).
r. RS485 ports (COM2) shall be internally wired through built-in modem for interfacing with Quad Cable Network. The modem shall support V.34 as well as V.90 modulation as per ITU-T.
s. RF Impedance : 50 ohm
t. Power 10-30V, negative ground, snap & Lock 4-pin DC Power Jack
u. Set-up and Diagnostic features to be available through separate port DE-9F.
v. Capable of being configured as Repeater.
w. Antenna Cable – Low loss Coaxial cable with 50Ω characteristic impedance, suitable for UHF applications.
x. Antenna for station/ IBS/ mid-section interlocked Gate unit– It shall be combination of vertically polarized omni and/ or directive antennae. The antenna cable & antenna shall be suitable to provide a range of 3.5 Kms radius of communication.
y. Radio modems connected through Hot-Standby Switch.
z. Height of the station antenna:
    1) Above ground level : 40m Max.
    2) Above top of building (in case antenna is proposed to be installed on the roof top of the building) : 4 m Max.

6.13. Station/ IBS/ Gate unit as well as Loco unit shall have hot standby radio for higher availability.

6.14. The power output of the radio, antenna cable & type of antenna of Station/ IBS/ Gate unit shall be so adjusted/ selected that uninterrupted communication between Loco unit' & Station/ IBS/ Gate unit is available for minimum 3.5 Kms in block section.

6.15. The Station / Interlocked LC Gates / IBS unit shall periodically transmit in a manner not to cause clashing of signals from two such stationary units. The

Loco unit, when not provided with any preferred Transmission Window, shall look for "Carrier Detect" for transmission in the nominated portion for this purpose in the frame and commence transmission accordingly. In case, collision of radio signals is detected, the Loco unit would retransmit after randomization. In order to improve the throughput, on recognition of radio signal from a fresh Loco pertaining to the territory of local interlocking, the Station unit shall nominate a preferred Window for Transmission by that particular Loco unit. Till such period nomination by Station unit continues, the Loco would continue to transmit in the same preferred Transmission Window.

6.16. In case of failure of reception from any stationary unit by Loco unit, apart from transmission by Loco on regular frequency, it would also transmit the emergency message additionally on other frequency in the portion of the frame nominated for this purpose so that the other nearby Locos can receive the messages directly.

6.17. Loco unit Antenna shall be Omni-direction & shall have vertical polarization with EIRP 15dbW or better at 5 degree elevation.

6.18. Loco unit antenna shall be able to withstand wind speed upto 200 kmph when the Loco is moving directly against the wind.

6.19. The outdoor cable for connection to Loco unit and GPS Antennae should be waterproof. This should be compliant to RDSO Spec No. **MP.0.52.00.08 (Rev.-03) or latest** as applicable.

Encryption

6.20. The data shall be encrypted by TCAS unit before sending the packet to radio equipment for further transmission or on RS485 port for OFC/Quad cable communication.

6.21. Deleted.

6.22. AAS-128 encryption method shall be used for encryption of data before transmitting from one TCAS unit to the other.

Communication between Station/ IBS/ Gate unit to other Station/ IBS/ Gate unit on OFC/ Cable:

6.23. The station / IBS unit shall have at least two (expandable upto 6 for station unit) RS485 ports & shall be connected to all adjacent station TCAS' on OFC/ Cable. In addition one USB 2.0 or higher ports shall also be provided for data transfer, diagnostic etc. purposes. RS485 ports shall be internally wired through built-in modem for interfacing with Quad Cable Network.

6.24. Gate unit shall be provided at mid-section interlocked LC gates & shall have at least two RS485 ports. Station/ IBS unit shall also be connected to any mid-section Level crossing interlocked gate unit on OFC/ Cable. In addition one USB 2.0 or higher ports shall also be provided for data transfer, diagnostic etc. purposes. RS485 ports shall be internally wired through built-in modem for interfacing with Quad Cable Network. The modem shall support V.34 as well as V.90 modulation as per ITU-T.

6.25. Station/ IBS/ Gate unit shall have at least one Ethernet port for connectivity with Centralized Management System.

6.26. As soon as a TCAS train enters in a block section, sending station/ IBS unit shall inform the receiving station / IBS unit about the entry of a Loco unit in the block section by sending packet as described in Annexure-V.

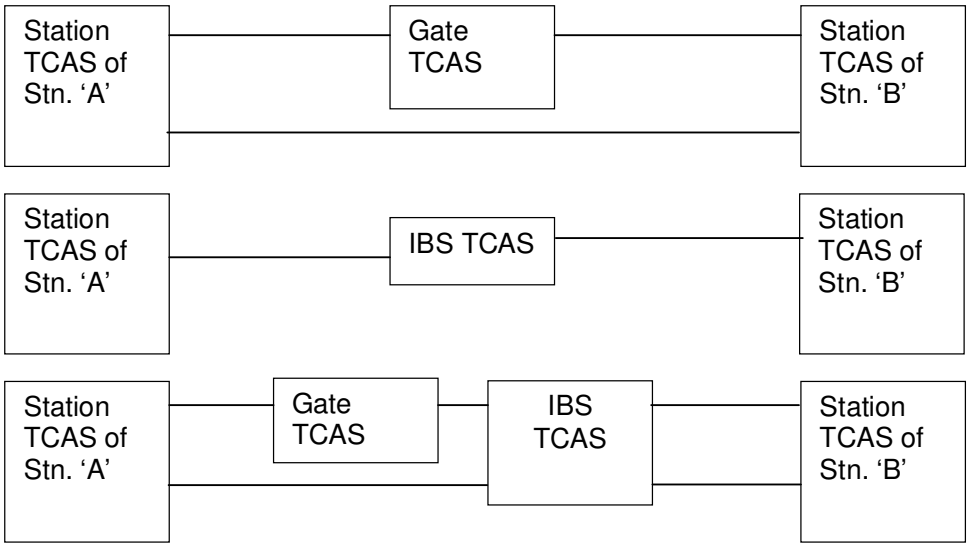
6.27. On Clearance of a train (Loco unit + Train length) from block section, Receiving Station/ IBS unit shall inform the sending station / IBS unit about the exit of a Loco unit from the block section by sending packet as described in Annexure-V.

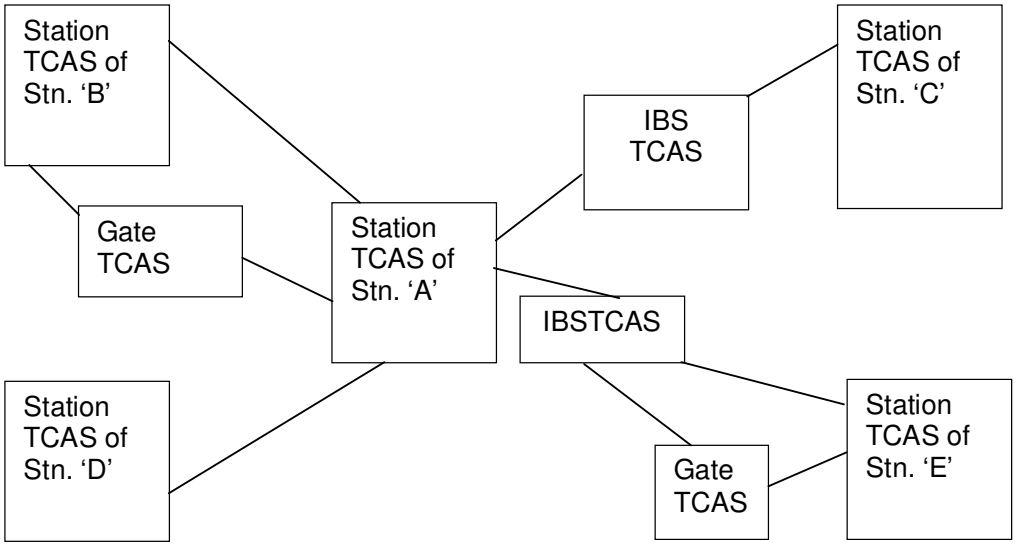
6.28. Both the station /IBS unit of a block section shall not permit any other train with same TIN into the same block section till the earlier train with same TIN has cleared the block section as per both station /IBS unit'.

6.29. Station / IBS/ Gate unit shall also send the following packets received from Loco unit to next station or IBS or Gate unit, whichever is adjacent in that block section:

a. Loco unit Normal information Packet
b. Loco unit SOS packet
c. Loco unit side collision Packet

6.30. Connectivity of various stationary unit' under some situations is depicted below for example:





Communication from Station/ IBS/ Gate unit to Loco unit:

6.31. As soon as Station/IBS unit receives the information about the entry of a train in the adjoining block section alongwith TIN, it shall start transmitting the signal information about the first two signals on approach of that train. The signal information shall be in form of packet as described in Annexure-I.

6.32. The signal aspect shall be treated as 'off' only when Station/ IBS/ Gate unit has established that all the following conditions are met:

a. The aspect of the signal is off.
b. If the signal is for main line then all the points in the route of the signal are in normal position (Only for Station unit).
c. If the signal aspect is for loop line then atleast one of the points taking off from main line is not normal (only for Station unit).
d. In case of home signal leading to berthing track, the berthing track circuit corresponding to the signal is clear (only for Station unit).
e. In case of Last Stop Signal (LSS, Advance Starter), both the concerned station unit have established that block section is free of trains of same TIN (for Station & IBS unit).

In case of any discrepancy in the conditions mentioned above, the signal aspect shall be treated as danger & movement authority shall be treated as zero.

6.33. The point status input as in Clause 6.49shall be used by station unit to identify whether a particular line is set for main line or not.

6.34. Signal information shall be linked through chain logic wherein previous signal shall give the id of the next signal and distance to the next signal.

6.35. Loco unit, based on the information received for a signal, shall have the id of the station/ IBS as well as id of the signal being approached by it. Based on this information, Loco unit shall receive the signal information packet from Station/ IBS unit for the correct signal.

6.36. The station/ IBS unit shall also transmit the information received from Loco unit' under its jurisdiction & from adjacent Station/ IBS unit as it is so that all the Loco unit which are in communication with any of the stations/ IBS of a block section get the information about each other for collision prevention, stopping the train/ reducing the speed in emergencies.

6.37. Station unit shall transmit its own SOS message in form of a packet as described in Annexure-VI.

6.38. Station unit shall transmit timings to Loco unit for train length calculation in form of packets as described in Annexure-IV.

Communication from Loco unit to Station unit

6.39. Loco unit shall transmit the information in the form of packet as described in Annexure-IIat every 2 seconds.

6.40. When Loco TCAS is not in communication with any station, it shall transmit the information by inverting the Tx & Rx frequencies alternatively in case of SOS / emergency situation.

6.41. The manual SOS & Side Collision messages shall be transmitted by Loco unit as & when required as described in Annexure-VII and on normal frequency as well as by inverting the Tx & Rx frequencies every frame.

6.42. While transmitting by inverting the frequencies as per requirement of Clauses 6.40&6.41, the time slots shall be reserved separately so as not to cause interference with transmission from Stationary TCAS.

6.43. Whenever Loco unit establishes communication with a new Stationary unit for the first time, it shall do so by Random Access Method within the time slots reserved for this purpose separately for Up & Dn Trains. Once, Loco unit receives signalling information packet from Stationary unit, Loco unit shall continue further transmission in the time slot as specified in 'Preferred Window' in the signalling information packet sent by Stationary unit

6.44. When Loco unit does not have the signal ID of the signal being approached due to either re-start of Loco unit or after passing RFID tag (which is 2000m from FSS) at the start of TCAS territory or passing Signal at Danger after following the prescribed operating rules or due to any other reason, Loco TCAS shall request for the same from Stationary unitin the form of packet as described in Annexure-II with bit details as in Annexure-VII.

6.45. When Loco passes over the RFID tag provided at the Block Entry, it shall transmit the packet as described in Annexure-II with bit details as in Annexure-VII.

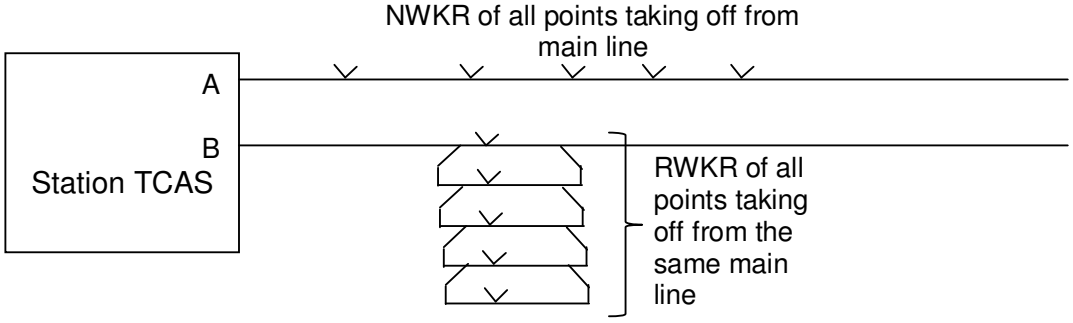
6.46. When Loco passes over the RFID tag provided at the Station Entry &then travels equal to its train length, it shall transmit the packet as described in Annexure-II with bit details as in Annexure-VII.

Connectivity of Station/ IBS/ Gate unit with interlocking

6.47. Station/ IBS/ Gate unit shall be capable of taking potential free inputs. It shall be capable of taking minimum 64inputs (expandable upto 256inputseither by providing additional I/O cards or by cascading multiple Station/ IBS/ Gate unit).

6.48. The break status of potential free contact shall indicate absence input.

6.49. Signal aspect, point position of points taking off from main line, berthing track circuit status, status of block instrument Line Closed condition etc. shall be interfaced to Station/ IBS/ Gate unit input through potential free contacts, depending upon requirement. The point position of points shall be interfaced to station unit in the form of only two inputs for each main line of the station as shown in the diagram below and depending upon the status of these two inputs, station unit shall decide whether the line is set for main line or not.



Status of		Decision of Station unit
A	**B**	
1	0	Main line set
0	1	Main line not set
0	0	No status available
1	1	Conflicting Status

Similar to as shown above, there shall be inputs like A & B for each main line of the station

6.50. IBS & Gate unit shall not require inputs for point position & berthing track circuit status. Gate unit shall not require input for status of block instrument Line Closed condition.

Collision prevention based on Loco unit decision:

6.51. Based on the messages of other Loco unit received directly or through station/ IBS/ Gate unit, each Loco unit shall identify the trains with same TIN. If two trains of same TIN find each other, then depending upon their speed, traffic direction, length, braking characteristics& distance between them, Loco unit shall take action to prevent collision, if they were perceived to be colliding.

6.52. When two Loco unit with same TIN heading towards each other as per traffic direction, they shall decide the target for stopping their train based on their speed, location& brake characteristics. While deciding the target, a safety margin of 200m shall be kept.

6.53. When two Loco unit with same TIN are following one another in the same traffic direction, there shall be no brake application in the Loco unit ahead on this account. The target for stopping the Loco unit in rear shall be 200m from the rear end of train ahead towards this train.

6.54. The distances as calculated in Clauses 6.52&6.53 above for stopping the train shall be calculated by respective Loco unit& they shall also calculate/ update speed profile/ brake curve dynamically & the braking shall be initiated or changed to higher level by both or one Loco unit, as the case may be, according to dynamically updated speed profile/ brake curve.

Train Length Calculation:

6.55. Two track circuit (say AT & BT in sequence in the traffic direction of train movement) at the entry to block section shall be identified at each station for train length measurement. The track circuits identified shall be such that all the trains entering into a block section pass over these track circuits.

6.56. The status of these track circuits shall be taken as input to station unit.

6.57. Station unit shall have provision for programming time correction with sign which shall be subtracted from the time of 'AT cleared' (last vehicle cleared over AT/ BT boundary) to take care of difference in pickup & drop away time of concerned track & repeater relays at that station. The time correction shall be programmable from -100ms to +100ms in steps of 10 ms.

6.58. Station unit, on establishing AT occupied & then BT occupied, shall communicate the time offset from frame reference for 'BT occupied' (Loco entered at AT/BT boundary) &corrected time offset from frame reference for 'AT cleared' (last vehicle cleared over AT/ BT boundary) alongwith location of boundary of AT & BT to concerned Loco unit in the form of packet described in Annexure-IV.

6.59. On receiving the Train length packet from station unit, Loco unit shall calculate the length of the train as under:

a. Compare the time of AT/ BT boundary location (Start Boundary Location communicated by Station unit) as per its log, with the time for this location sent by Station unit.

b. Time difference, if any, shall be used by Loco unit to correct the 'AT cleared' time sent by Station unit& shall find its location at that time as per its log.

c. The difference in location of AT/ BT boundary & the one as arrived in b above shall be the Train Length.

6.60. In case of failure of AT & BT track circuits i.e. remaining occupied for more than 3 minutes (programmable from 0 to 10 minutes in step of 30 seconds), Station unit shall not transmit packet described in Annexure-IV & shall log it.

6.61. The packet described in Annexure-IV shall be transmitted 5 times at an interval of 2 seconds to avoid non-calculation of train length by Loco unit due to missing of packet.

6.62. Loco unit shall log its location every 10 ms for last 20 Seconds which shall be used by Loco unit for precise location for train length calculation.

GPS Receiver

6.63. The GPS receiver used for various TCAS units shall comply following requirements:

1) L1 Frequency C/A Code with 12 (or higher) independent Tracking Module (Channels). It shall be integrated (GPS + SBAS enabled) or (GPS + GLONASS).
2) It shall support NMEA-0183 Protocol.
3) Tracking Sensitivity shall be better than -150 dBm.
4) Autonomous Positional Accuracy shall be better than 10 Meter.
5) Suitable to work upto 250 KMPH speed.
6) Update Time1Hz or better
7) Reacquisition time < 250 milli seconds.
8) Cold Start better than 45 Seconds
9) Warm Start shall be better than 38 Seconds.
10) Hot start better that 5 Seconds
11) Antenna Short Circuit Protection
12) Built-in Antenna supervisory circuit for determination of active antenna open or short state
13) Built-in non-volatile RTC with battery backup option

7. Technical Requirements

7.1 TCAS system shall adopt a structured design process, including, but not limited to the following:

7.1.1. The architecture of TCAS shall be minimum of either “single processor with diversified Software” or “2 out of 2 Hardware”.

7.1.2. System architecture, logic flow diagrams, RAM allocations, operation and maintenance philosophy and verification and test approach.

7.1.3. Software requirements specification, software architecture, requirements decomposition, logic flow diagrams, Man machine Interface for prototypes, verification and test approach.

7.1.4. TCAS design shall have open architecture (Hardware and Software) to support future expansion and technology advancements. It should be scalable & upgradable.

7.1.5. TCAS design shall use modular architecture of both hardware and software functions in such a manner that they can be partitioned to ensure the integrity of their certified design individually, without any compromise and even when their routine upgrades take place in future. Design shall provide the Safety Integrity Level of 4 (SIL-4) as per CENELEC or equivalent standards. It shall not degrade the safety level of the existing system.

7.2 No input to signalling equipment/system shall be given from TCAS. Output of any signalling equipment/system shall not be directly connected to TCAS. A repeater signalling relay will be used to give such output & the same output shall also be logged in the data logger. Such output from Signalling system shall be transmitted & processed to ensure its Safety Integrity Level 4.

7.3 TCAS System shall be verified and validated by an independent agency to Safety Integrity Level – 4 (SIL-4) of CENELEC standards or equivalent. However, in case hardware is changed or expanded, corresponding modified software version shall be used after necessary verification and validation by accredited independent agency.

7.4 Whenever TCAS software hangs due to any reason it shall recover automatically with the help of the internal watchdog timer and shall not result into any unwarranted situation.

7.5 All cabinets and enclosures used for housing the TCAS units shall be locked and keyed. Minimum 2 keys per cabinet shall be made available for stationary unit equipment. Universal keys shall be used for cabinet of mobile

Loco unit equipment for ease of maintenance. Sufficient ventilation shall be provided for the equipment cabinets and enclosures in which active equipment are housed.

7.6 The TCAS equipments shall not be prone to theft/interference. Suitable anti-theft arrangements to be made for equipments located at unmanned locations.

7.7 TCAS shall self-check continuously its own functioning including transmission/reception of information. Any improper functioning shall be advised to Loco Pilot and shall be recorded automatically in its log. This log shall be further transmitted to the Centralized Management System through suitable communication means. Loco unit shall also transmit the log directly to Centralized Management System through GSM, whichever network coverage is available. TCAS failures management procedure shall be defined for train operation staff (Loco Pilots & Station Managers).

7.8 In case Loco unit fails due to any reason & its communication is working, it shall transmit its failure message.

7.9 TCAS OCIP design shall be human friendly and shall take into account human capability to see, communicate, comprehend and act reliably to functions and circumstances required.

7.10 TCAS equipment must record information to an accuracy which shall enable a clear view of the way in which loco has been driven so as to reconstruct a certain situation (accident, equipment performance and Loco Pilot's action). Retention period of the recorded data will have two levels. Data to enable investigation of accidents need only to be stored for 72 hours and shall be detailed. Maintenance data, which will help in maintaining the TCAS, must be stored for 90 days. It shall be possible to down load and reconstruct the recorded data on a portable PC.

7.11 TCAS, if required to be shifted from its designated location regularly for operational reasons, shall be so constructed that it could be transported quickly and in such situations TCAS shall be provided with anti-theft arrangement.

7.12 The TCAS shall be networked and Centralized Management shall be provided for Monitoring, Diagnostic and Maintenance Purpose.

7.13 Version update of station data because of change in station layout, yard modification / remodelling, alteration in signalling etc. shall be incorporated in the station unit prior to its installation / commissioning. Non correspondence between the station unit data version and station layout should be given as text message, recorded and logged as a failure.

8. Logging of events

8.1. Logging of events shall be done with date, time and location stamp. Time reference for the entire TCAS network should be synchronized. Logging shall be done every second. In addition, logging shall also be done based on occurrence of certain events.

8.2. Following events related to dangerous situations shall be logged along with date, time and location stamp in all TCAS units.

- Head On Collision
- Rear End Collision
- All SOS and alert messages
- Train parting
- Side Collision

8.3. Following events of failures/abnormal/ Specific conditions and their recovery shall be logged along with date, time and location stamp in relevant TCAS unit.

- Failure of System to indicate the position.
- Communication failure of Loco units
- Input failures wherever applicable
- Failure of TCAS unit due to any reason shall be logged in central server

- Low ranges of communication
- Hanging of software and its recovery
- Brake interface unit isolation
- All types of Brake application actuated by TCAS unit with duration, speed & distance measurements
- Restart of TCAS unit Software
- Power supply failure
- Restart of TCAS unit due to any reason
- Battery low status and recovery
- All failure messages
- Failure of Loco Battery & BBU
- Coupled/ Banking Mode
- Train Length Assignment
- Mode Transition
- ABT
- MBT
- RFID read since entry to previous Block Section
- Odometry Recalibration Factor for last 20 recalibrations
- Any other events mentioned in this specification

8.4. Following information shall be logged every second or based on occurrence of certain events:

8.4.1 In Loco unit data logger:

(i) Event, if any, which led to logging
(ii) Date
(iii) Time
(iv) Loco ID
(v) Speed
(vi) Location
(vii) Traffic Direction
(viii) Train direction
(ix) Location of last RFID tag passed
(x) TIN
(xi) Whether Block section or Station section
(xii) Type of Brake application
(xiii) Brake release
(xiv) Last packet received
(xv) Any other relevant information

8.4.2 In Station/ IBS/ Gate unit data logger:

(i) Event, if any, which led to logging
(ii) Date
(iii) Time
(iv) Loco ID
(v) Status of all signalling inputs
(vi) Signalling information packets sent
(vii) Station emergency message
(viii) Loco's emergency message (redirected)
(ix) Messages to adjacent stationary unit
(x) Any other relevant information

8.5. Following events shall trigger the logging (in addition to logging at every second):

8.5.1 In Loco unit data logger:

(i) Update of Movement Authority

(ii) Initiation of brake application.
(iii) Change of type of braking application.
(iv) Removal of brake application.
(v) Change in TCAS Mode.
(vi) Acknowledgement by driver
(vii) SPAD
(viii) Passing of RFID Tag.
(ix) Change in TIN.
(x) 1 RFID tag missing out of 2.
(xi) Both (duplicated) RFID tags missing
(xii) Data mismatch between duplicated RFID tags.
(xiii) Change in Signal Aspect.
(xiv) Passing of signal.
(xv) Battery low
(xvi) Permission of emergency messages.
(xvii) Reception of emergency messages.
(xviii) Collision like situation
(xix) Any other event.

8.5.2 In Station/ IBS/ Gate unit data logger:

(i) Entry of new train.
(ii) Change in input to station unit from interlocking.
(iii) Emergency messages received from Loco unit.
(iv) Battery low (87%)
(v) Transmission of emergency messages either generated by station itself or retransmission of such messages received from Loco unit.
(vi) Block Entry.
(vii) Block Exit
(viii) Any other event.

8.6. The information to be logged & trigger events may be changed based on the requirement during the development of product.

8.7. The data should be logged in ASCII CSV format. The data should be encrypted and could only be decrypted by the PC based software supplied alongwith the system. The fetching of data should be password protected.

9. User Interface

9.1. Loco Pilot/ Station Master's OCIP

Following indications/ buttons/ buzzers shall be given in the Loco Pilot's / Station Master's OCIP wherever required:

i) 7" LCD display (for Station Master's OCIP) & 10.4" (for Loco Pilot's OCIP as per Annexure-X) Loco unit
ii) SOS indication
iii) Health indication
iv) Audio Buzzer
v) Push Buttons.
vi) Text Display Panel.
vii) Battery Low Indication.
viii) Any other indication mentioned in this specification

For Loco Pilot's OCIP only:

ix) A LCD display to indicate aspect of next signal and other displays like mode of operation etc.
x) Mode of the System
xi) Collision situation Indication
xii) Type of brake application (Normally Lit)

xiii) Indication of working on loco Battery
xiv) Indication of status of Battery Backup Unit

Display of yard layout, signal aspects & location of various Loco unit shall also be required on 21" LCD screen, wherever provided, in some other room at station.

9.2. Brake Interface Unit

Following indications/levers/counters shall be given in this unit:

i) Loco, Normal, Full Service and Emergency Brake indications shall remain lit as long as the Loco unit does not activate these brakes.
ii) Brake Isolation Lever which shall isolate all brakes in BIU.
iii) Counter to observe the number of operations of brake isolation levers.

10. Maintenance Requirements

10.1 On line self-diagnostic shall be performed automatically at regular interval in all types of TCAS units.

10.2 TCAS units shall perform on line self-diagnostics and failure recording of the subsystems periodically and on detection of the faults mentioned below it shall turn to 'Failure Mode'

- Failure of Power supply module
- Failure of CPU
- Software Hanging

10.3 TCAS units shall also be able to detect the failures of the subsystems and for the following faults, shall turn the TCAS unit Not OK indication "ON".

- Failure of Inputs
- Isolation of Brake interface unit
- Failure of communication (except GSM), GPS, RFID reader

10.4 Stationary unit shall detect the battery low condition and the same shall be sent to the Centralized Management System

10.5 The Station unit shall be capable of detecting low range of radio communication of Loco unit and shall provide a message to the Station Master.

10.6 The Loco unit in association with stationary unit shall identify low range of radio communication of all stationary units. Loco unit shall upload this information at the next working 'station unit', which in turn will communicate it to Centralized Management System, located in the Control Office. Loco unit shall also transmit this information to Centralized Management System through its GSM.

10.7 All the failures or sub-standard performance of TCAS, as mentioned in the above mentioned paras, shall be communicated to Centralized Management System located in the Divisional Headquarter.

10.8 The TCAS' shall be networked through very reliable network.

10.9 Centralized Management System with connectivity to all Station TCAS units &GSM interface for connectivity with Loco TCAS units shall be provided for Monitoring, Diagnostic and Maintenance Purpose.

11. Power Supply Requirements

11.1 The DC power supply available in the locomotive (normally 72V DC in Diesel locomotives & 110V DC in Electric locomotives/EMU/MEMU, with a variation of -30% / +20% over nominal voltage and a ripple factor of upto 15%) shall be used as a source of power supply for loco equipment. The power supply module shall have suitable filtering arrangement to negate the effect of fluctuations in the power supply& shall derive other voltages required for the working of its sub-systems. A suitable fuse/circuit breaker protection shall be provided as close as possible to the locomotive battery. A battery back-up of

half-an-hour duration shall be provided as a part of Loco unit with internal charger.

11.2 For all stationary unit equipments, 230 V AC power supply shall be provided for the battery chargers. The battery backup in the event of power failure shall be for a minimum duration of 24 hours. However, in case reliable 230 V supply is not available; an uninterrupted power supply derived from solar panel supply shall be provided. In this case, the battery back-up shall be for 96 hours.

11.3 Low battery indication for Stationary unit shall appear when the voltage of the battery falls below 87% of the nominal voltage and it shall disappear when the voltage of the battery goes above 90 % of the nominal voltage.

11.4 The batteries to be used in TCAS shall be suitable for working up to the temperature of 55 degrees. Batteries used shall be of rechargeable types.

12. Performance Requirements

12.1 The MTBF of Station unit / IBS unit / Mid-section Interlocked LC Gate unit units shall be minimum 60,000 Hrs., that of Loco unit (excluding RFID reader) shall be minimum 20,000 Hrs, that of RFID reader as well as RFID tag shall be minimum 1,00,000 Hrs.

12.2 The operational availability in terms of successful trips (trips without spurious braking, Track Identification failures etc.) out of total train trips shall not be less than 98% on weekly basis.

13. Environmental requirements

13.1 TCAS equipment shall withstand the following environmental tests as per the specifications mentioned against each.

Sr.	Test Type	Equipment condition	Severity	Specification
1.	Dry heat test (Operation)	Operating	For functional trials: Temp. 70 ºC Duration: 16 hrs.	IS: 9000 Pt.III Section: V
	Dry heat test (Storage)	Non-operating	Temp. 75ºC Duration: 16 hrs.	
2.	Cold Test (Operation)	Operating	Temp. –10ºC, Duration: 2 hrs.	IS: 9000, Pt. II
3.	Rapid variation temperature test	Operating	-10 to 55ºC, Duration: 3 hrs. Rate of change: 1ºC per minute. No. of cycle: 03	IS: 9000 Pt. XIV Section: II
4.	Damp heat test (storage)	Non-operating	RH 95% @ 40ºC Duration = 4 days	IS: 9000 Pt. IV
5.	Damp heat test (Cyclic)	Operating	RH 95% @ 40ºC Duration: 12 + 12 = 24 hrs cyclic No. of cycles = 6	IS: 9000 Pt. V Section-II
6.	Bump Test (Package)	Non-operating	40g peak, 4000 bumps Duration: 6 milliseconds No. of axes: 03	IS: 9000 Pt. VII Section II

Sr.	Test Type	Equipment condition	Severity	Specification
7.	Mechanical shock Stationary and Loco unit	Power off Condition	11 millisecond (half sign pulse), 20g peak.	IS: 9000 Pt. VII Section-I
8.	Vibration test (i) Loco unit	Operating	5 Hz to 150 Hz Acceleration A: 3g 20 sweep cycles on 3 axes	IS: 9001 Pt. XIII
	(ii) Station unit	Operating	5 Hz to 35 Hz Acceleration A: 2g 20 sweep cycles on 3 axes	
9.	Salt Mist test	Non-operating	Salt: 2hrs, Mist: 7 days 35(+/-)3ºC, RH: 95% No. of cycles: 03	IS: 9000 Pt. XI
10.	Dust test	Operating (1 hour only)	As per IS: 9000 Pt. XII	IS: 9000 Pt. XII

13.2 **Other type tests**:

a) Variation and interruption of voltage supply to equipment tests as per clause 3.1.1.1 and 3.1.1.2 of IEC 60571 -1998 or relevant clause of latest amendment / issue.
b) Supply over-voltage, surges and electrostatic discharge tests as per clause 10.2.6 of IEC 60571 -1998 or relevant clause of latest amendment / issue..
c) Transient burst and susceptibility test as per clause 10.2.7 of IEC 60571-1998 or relevant clause of latest amendment / issue..
d) Radio interference test as per clause 10.2.8 of IEC 60571 – 1998 or relevant clause of latest amendment / issue..
e) Insulation Test as per clause 10.2.9 of IEC 60571 – 1998 or relevant clause of latest amendment / issue..

14. Documents to be submitted by the supplier

14.1 The manufacturer shall, as a minimum, submit followings hardware and software design documentation:
(1) System requirements specification
(2) Failure mode effect analysis (FMEA)
(3) Data modification manual.
(4) Operating Manual.
(5) Maintenance Manual.

14.2 The estimated Mean Time Between Failures (MTBF) & Mean Time Between Wrong Side Failures (MTBWSF) figures for each sub-system & each complete TCAS unit.

14.3 The complete details of interface communication protocols with packet structure & encryption.

15. Verification and Validation (V&V) document:

15.1 The manufacturer shall provide report containing verification and validation documents approved from accredited validation agency.

15.2 The test procedure shall be based on 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 RDSO (the various tests parameter for card level test, system level functional test, diagnostic test and performance test shall be specified for inclusion in the specification).

15.3 Verification & Validation of the software and hardware shall be done by independent assessor as per Safety Integrity Level – 4 (SIL-4) of CENELEC standards or equivalent. Further a comprehensive report from the V&V consultant, covering full terms of reference should be submitted to RDSO for final assessment.

16. Tests and Verification

16.1 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 RDSO.

16.2 The following sequence of tests shall be conducted:

- Type tests;
- Acceptance tests;
- Routine Tests;
- System acceptance tests;
- Integration Tests;

16.3 Type Tests

16.3.1 Following tests shall constitute type tests:

a) Visual inspection.
b) Insulation Resistance tests
c) Applied high voltage tests
d) Card level/ module level check
e) Card-level functional tests one card of each type.
f) System level functional tests/ performance tests
g) Environmental / climatic tests.
h) Vibration tests, abrasive environment tests.
i) System Diagnostics test.
j) Any other tests as considered necessary by the purchaser.
k) Integration Tests: Integration tests to integrate the various sub-systems of the TCAS and demonstrate correct operation of all internal and external interfaces.

16.3.2 Only one each equipment 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).

16.4 Acceptance Tests

Following shall comprise acceptance tests:

a) Visual inspection.
b) Insulation Resistance tests
c) Applied high voltage tests
d) Card level/ module level check.
e) Card-level functional test on all the cards.
f) System level functional tests/ performance tests.
g) System Diagnostics test.

16.5 Routine Tests

Following shall comprise the routine tests and shall be conducted by manufacturer on each equipment and the test results will be submitted to the inspection authority before inspection. The validation report of application software in proper format shall also be submitted to the inspection authority in advance.

a) Visual inspection.
b) Insulation Resistance tests
c) Card level/ module level check.
d) Card-level functional test on all the cards
e) System level functional tests.
f) System Diagnostics test.
g) Environmental stress screening test.

16.6 System acceptance test

The functional tests shall be carried out to demonstrate in actual field conditions that the complete TCAS system operates correctly in accordance with the Specifications. The functional tests shall sequence through all required operations to prove that the system performs in accordance with the Specification and that the local configuration of data is correct. Where necessary, input conditions shall be simulated.

17. Quality Assurance

17.1 All materials and workmanship shall be of good quality. 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 Quality Assurance Program of adequate standard.

17.2 All test instruments shall be available with the manufacturer.

17.3 The manufacturer shall have detailed Quality Assurance Plan to ensure quality of the product. The manufacturer shall also possess ISO certification for the product.

18. Packing

The equipment shall be so packed that it can withstand bumps and jerks encountered in a road/ rail journey including handling during its transit.

19. Documentation & Training

Manufacturer shall provide following documents for each equipment, which constitutes TCAS system

- Manuals of Installation, Operations and Maintenance
- Diagnostics procedure including troubleshooting charts.
- The procedure to check complete station unit, Loco unit in Loco shed & also in section.
- List of equipment to be used for carrying out various tests on Loco& Station unit.
- Detail maintenance scheduled & maintenance procedures including frequency to maintain various TCAS equipments.
- List of spares, tool kit etc. to be provided to the user.
- Adequate training in maintenance practices.to maintenance staff.

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Annexure-I

Signalling Information Packet from Station/ Interlocked LC Gate / IBS to Loco TCAS units:

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	6
FRAME_NUM	15
SOURCE_STN_ILC_IBS_ID	14
SOURCE_STN_ILC_IBS_VERSION	8
DEST_LOCO_CNT	7
DEST_LOCO_ID	14
CUR_SIG_ID	8
CUR_SIG_ASPECT	5
NEXT_SIG_ID	8
MA_W_R_T_SIG	16
GRAD_MA_W_R_T_SIG	4
NEXT_SIG_INTLKG	1
DIFF_DIST_NEXT_SIG	11 bits : when NEXT_SIG_INTLKG = 0 (same interlocking)
	16 bits : when NEXT_SIG_INTLKG = 1 (different interlocking)
TO_SPEED	3
DIFF_DIST_TO	0 bits, field not required if TO_SPEED = 111 (unrestricted)
	11 bits, if TO_SPEED = other than 111 (Speed Restriction)
PREFERRED_TX_WINDOW	6
Repeat shaded info for all Locos / Trains (DEST_LOCO_CNT)	
CRC / Checksum	16

Annexure-II

Packet from Loco TCAS unit:

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	6
FRAME_NUM	15
SOURCE_LOCO_ID	14
ABS_LOCO_LOC	22
TRAIN_LENGTH	10
TRAIN_SPEED	8
TRAFFIC_DIR	2
EMERGENCY_STATUS	3
LOCO_MODE	4
LOCO_HEALTH	1
LOCO_ABU_ISOLATION	1
LAST_RFID_TAG_8BITS	8
LOCO_RX_SUCC_RATE	7
TIN#1	6
TIN#2	6
TIN#3	6
TIN#4	6
TIN#5	6
TIN#6	6
CRC / Checksum	16

Annexure-III

Broadcasting of information received from Locos/ Trains by Station / Interlocked LC Gate / IBS:

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	6
FRAME_NUM	15
SOURCE_STN_ILC_IBS_ID	14
SOURCE_STN_ILC_IBS_VERSION	8
SOURCE_STN_ID	14
SOURCE_STN_VERSION	8
INFO_LOCO_CNT	7
SOURCE_LOCO_FRAME_NUM	15
SOURCE_LOCO_ID	14
ABS_LOCO_LOC	22
TRAIN_LENGTH	10
TRAIN_SPEED	8
TRAFFIC_DIR	2
EMERGENCY_STATUS	3
LOCO_MODE	4
LOCO_HEALTH	1
LOCO_ABU_ISOLATION	1
TIN#1	6
TIN#2	6
TIN#3	6
TIN#4	6
TIN#5	6
TIN#6	6
Repeat shaded info for all Locos / Trains (DEST_LOCO_CNT)	
CRC / Checksum	16

Annexure-IV

Station –to – Loco TCAS units: Packet providing Precise Time Offset Markers & Start location for Train Length Measurement:

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	7
FRAME_NUM	15
SOURCE_STN_ILC_IBS_ID	14
SOURCE_STN_ILC_IBS_VERSION	8
DEST_LOCO_ID	14
START_BOUNDARY_LOC	22
REF_START_FRAME_NUM	15
REF_START_OFFSET_INT	8
REF_END_FRAME_NUM	15
REF_END_OFFSET_INT	8
CRC / Checksum	16

Annexure-V

Information Exchange between Stationary TCAS units on entry/exit to/in block section by Loco / Train

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	6
FRAME_NUM	15
SOURCE_STN_ILC_IBS_ID	14
SOURCE_STN_ILC_IBS_VERSION	8
DEST_STN_ILC_IBS_ID	14
MOVEMENT_TRANSIT	1
TRANSIT_LOCO_ID	14
TRANSIT_FRAME	15
CRC / Checksum	16

Information Exchange between Stationary TCAS units for Loco TCAS normal & emergency messages

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	6
FRAME_NUM	15
SOURCE_STN_ILC_IBS_ID	14
SOURCE_STN_ILC_IBS_VERSION	8
DEST_STN_ILC_IBS_ID	14
SOURCE_LOCO_ID	14
ABS_LOCO_LOC	22
TRAIN_LENGTH	10
TRAIN_SPEED	8
TRAFFIC_DIR	2
EMERGENCY_STATUS	3
LOCO_MODE	4
LAST_RFID_TAG_8BITS	8
LOCO_RX_SUCC_RATE	7
TIN#1	6
TIN#2	6
TIN#3	6
TIN#4	6
TIN#5	6
TIN#6	6
CRC / Checksum	16

Annexure-VI

Stationary TCAS unit General Descriptor

Field	No. of bits
PKT_PRIORITY	1
PKT_TYPE	4
PKT_LENGTH	6
FRAME_NUM	15
SOURCE_STN_ILC_IBS_ID	14
SOURCE_STN_ILC_IBS_VERSION	8
STN_ILC_IBS_LOC	22
GEN_SOS_CALL	1
PREFERRED_TX_WINDOWS_STATUS	60
CRC / Checksum	16

Annexure-VII

Description & bit values for various fields of Packets

Field	No. of bits	Value	Description
PKT_PRIORITY	1	0	High Priority Packet
		1	Normal Priority Packet
PKT_TYPE	4	0000	Signalling information from Station / Interlocked LC Gate/ IBS
		0001	General Descriptor Packet from Stationary unit
		0010	Redirected from Loco - Regular
		0011	Redirected from Loco - Emergency
		0100	Start Ref to Loco for Train Length Measurement
		0101	End Ref to Loco for Train Length Measurement
		0111 - 1111	Reserved for future use
PKT_LENGTH	6	xxxxxx	Packet Length in terms of "Long Words" i.e. " 4 bytes" e.g. 011000 means 20 Long words i.e. 80 bytes
FRAME_NUM	15	000 xxxxxxxxxxx	For time GPS IST Hours 00+, 01+, 02+, 03+
		001 xxxxxxxxxxx	For time GPS IST Hours 04+, 05+, 06+, 07+
		010 xxxxxxxxxxx	For time GPS IST Hours 08+, 09+, 10+, 11+
		011 xxxxxxxxxxx	For time GPS IST Hours 12+, 13+, 14+, 15+
		100 xxxxxxxxxxx	For time GPS IST Hours 16+, 17+, 18+, 19+
		101 xxxxxxxxxxx	For time GPS IST Hours 20+, 21+, 22+, 23+
SOURCE_STN_ILC_IBS_ID	14	1x xxxxxxxxxxx	ID of Station / Int. LC Gate/ IBS transmitting the packet
SOURCE_STN_ILC_IBS_VERSION	8	xxxxxxxx	Version Number of Station / Int. LC Gate/ IBS transmitting the packet
DEST_LOCO_CNT	7	xxx xxxx	Info destined / aimed for these many Locos / Trains
DEST_LOCO_ID	14	0x xxxxxxxxxxx	ID of destined / aimed Loco / Train
CUR_SIG_ID	8	0000 0000	Invalid / unidentified
		xxxxxxxx other than 0000 0000	ID of the Signal on approach

Field	No. of bits	Value	Description
CUR_SIG_ASPECT	5	00000	Unidentified
		00001	Red without Dependent Shunt, Calling-on, IB, Gate, Auto
		00010	Yellow without Display of Route Indication
		00011	Yellow with Pos1 Junction Type Route Indication
		00100	Yellow with Pos2 Junction Type Route Indication
		00101	Yellow with Pos3 Junction Type Route Indication
		00110	Yellow with Pos4 Junction Type Route Indication
		00111	Yellow with Pos5 Junction Type Route Indication
		01000	Yellow with Pos6 Junction Type Route Indication
		01001	Yellow with other type (such as Stencil) type Route Indication
		01010	Double Yellow
		01011	Green
		01100	Red with Dependent Shunt at ON
		01101	Red with Dependent Shunt at OFF
		01110	Red with Calling-on at ON
		01111	Red with Calling-on at OFF
		10000	Auto Gate Signal at ON
		10001	Gate (other than Auto) at ON
		10010	Auto (other than Gate) at ON
		10011	IB Signal at ON
		10100	Independent Shunt Signal at ON
		10101	Independent Shunt Signal at OFF
		10110	Repeating Signal at ON
		10111	Repeating Signal at OFF
		11000	Stop Board / Buffer Stop
		11001 to 11111	Reserved for future use

Field	No. of bits	Value	Description
NEXT_SIG_ID	8	0000 0000	Next Signal to Signal on Approach is not identified
	8	xxxxxxxx other than 0000 0000	ID of the Next Signal to Signal on Approach
MA_W_R_T_SIG	16	xxxxxxxxxxxxxxxx	Movement Authority in meters beyond the Signal on approach
GRAD_MA_W_R_T_SIG	4	0000	Gradient not defined
		0001	Rising Ruling Gradient over Movement Authority beyond the Signal on approach
		0010	Level Ruling Gradient over Movement Authority beyond the Signal on approach
		0011 to 1110	Ruling Gradient slab over Movement Authority beyond the Signal on approach
		1111	Spare for future use
NEXT_SIG_INTLKG	1	0	Next Signal to Signal on Approach is from same Source Interlocking
		1	Next Signal to Signal on Approach is from different Interlocking
DIFF_DIST_NEXT_SIG	11 bits : when NEXT_SIG_INTLKG = 0 (same interlocking)	xxx xxxxxxxx	Distance in meters of "Next Signal to Signal on Approach" from "Signal on Approach"
	16 bits : when NEXT_SIG_INTLKG = 1 (different interlocking)	xxxxxxxxxxxxxxxx	Distance in meters of "Next Signal to Signal on Approach" from "Signal on Approach"
TO_SPEED	3	000	Turn-out Speed upto 15 kmph
		001	Turn-out Speed upto 30 kmph
		010	Turn-out Speed upto 50 kmph
		011	Turn-out Speed upto 75 kmph
		100 to 110	Reserved for future use
		111	Unrestricted speed on turn-out / no diversion

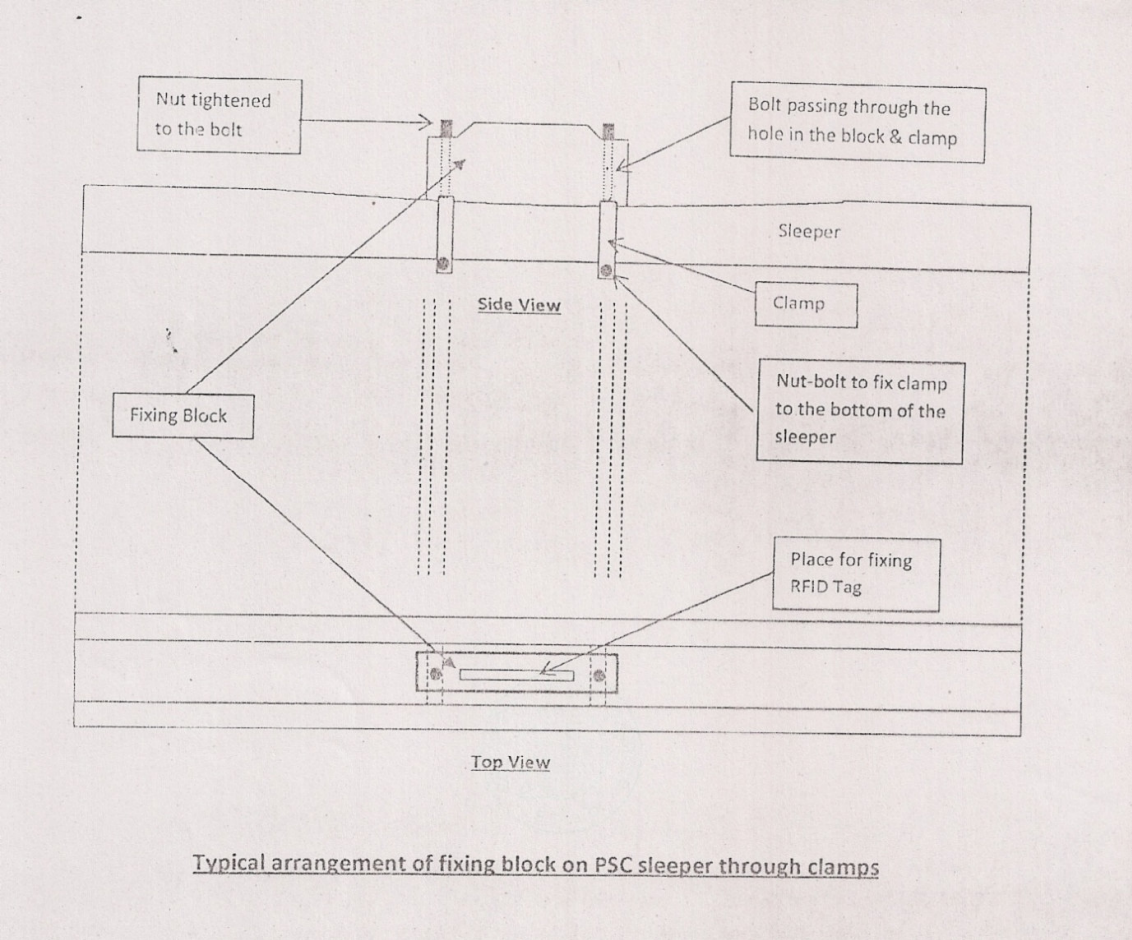
Field	No. of bits	Value	Description
DIFF_DIST_TO	0 bits i.e. field not required if TO_SPEED = 111 (unrestricted)	-----	-----
	11 bits, if TO_SPEED = other than 111 (Speed Restriction)	xxx xxxxxxxx	Distance in meters of "Turn-out" fro m "Signal on Approach"
PREFERRED_TX_WINDOW	6	00 0000	Not nominated
		xx xxxx	Transmit Window in 2 second interval
INFO_LOCO_CNT	7	xxx xxxx	Number of Locos whose information is embeded in the packet
SOURCE_LOCO_FRAME_NUM	15	0x xxxxxxxxxxx	FRAME_NUM when the Loco / Train transmitted the information
SOURCE_LOCO_ID	14	0x xxxxxxxxxxx	ID of the Loco / Train whose information follows.
ABS_LOCO_LOC	22	xx xxxxxxxxxxxxxxxxxx	Absolute Location of the Loco / Train in SOURCE_LOCO_FRAME_NUM
TRAIN_LENGTH	10	00 0000 0000	Invalid / unidentified
		xx xxxxxxxx other than 00 0000 0000	Train Length in Meters
TRAIN_SPEED	8	1111 1111	Train Speed unidentified
		xxxxxxxx	Train Speed in Meters
TRAFFIC_DIR	2	00	Traffic Direction not established / unidenfied
		01	Traffic Direction in Up direction
		10	Traffic Direction in Dn Direction
		11	Reserved for future use

Field	No. of bits	Value	Description
EMERGENCY_STATUS	3	000	Side Collision Situation
		001	Parting / Jumbling Situation
		010	Other SOS
		011	Request of Signal ID of signal on approach
		100	Block Entry
		101	Block Clearance
		110	Reserved for future use
		111	No Emergency - Regular Packet
LOCO_MODE	4	xxxx	Loco Mode
LOCO_HEALTH	1	0	Not OK
		1	OK
LOCO_ABU_ISOLATION	1	0	Isolation Mode activated
		1	Isolation Mode not activated
LAST_RFID_TAG_8BITS	8	xxxx xxxx	8 LS Bits of Last RFID Tag traversed by Loco
LOCO_RX_SUCC_RATE	7	111 1111	Unidentified
		000 0000 to 101 0100	Number of succesfully received Stationary unit General Descriptor packets by Loco unit in past 100 frames.
TIN	6	00 0000	Ignore / Don't Care
		11 1100	TIN - Controlled Mode
		11 1101	TIN - Speed Restriction Mode
		11 1110	TIN - Group
		11 1111	TIN - Locoshed
		00 0001 to 111011	Track Identity Number as per Track Section occupied
START_BOUNDARY_LOC	22	xx xxxxxxxxxxxxxxxxxxx	Absolute Location of the Stationary unit in meters
REF_START_FRAME_NUM	15	xxx xxxxxxxxxxx	Reference FRAME_NUM of Start Marker for Train Length Measurement
REF_START_OFFSET_INT	8	xxxxxxxx	Offset Interval in deci-sec (10 m.sec) in REF_START_FRAME_NUM of Start Marker for Train Length Measurement
REF_END_FRAME_NUM	15	xxx xxxxxxxxxxx	Reference FRAME_NUM of End Marker for Train Length Measurement

Field	No. of bits	Value	Description
REF_END_OFFSET_INT	8	xxxxxxxx	Offset Interval in deci-sec (10 m.sec) in REF_END_FRAME_NUM of End Marker for Train Length Measurement
DEST_STN_ILC_IBS_ID	14	xx xxxxxxxxxxx	ID of destined / aimed Station / Interlockd LC Gate/ IBS
MOVEMENT_TRANSIT	1	0	Entry of TRANSIT_LOCO_ID in section between "Local Station / Interlockd LC Gate/ IBS" and DEST_STN_ILC_IBS_ID
		1	Exit of TRANSIT_LOCO_ID in section between "Local Station / Interlockd LC Gate/ IBS" and DEST_STN_ILC_IBS_ID
TRANSIT_LOCO_ID	14	xx xxxxxxxxxxx	ID of Loco/ Train making Transit
TRANSIT_FRAME	15	xxx xxxxxxxxxxx	FRAME_NUM when the Loco / Train makes the transit
GEN_SOS_CALL	1	0	General SOS Call generated by Stationary unit
		1	No SOS
STN_ILC_IBS_LOC	22	xx xxxxxxxxxxxxxxxxxxx	Absolute Location of the Stationary unit in meters
PREFERRED_TX_WINDOWS_STATUS	60	0	Free
		1	Nominated as preferred transmission window for particular Loco unit
CRC / Checksum	16	xxxxxxxxxxxxxxx	16 bit Checksum / CRC

Annexure-VIII

Typical arrangements of fixing RFID tag on PSC Sleeper



Typical arrangement of fixing block on PSC sleeper through clamps

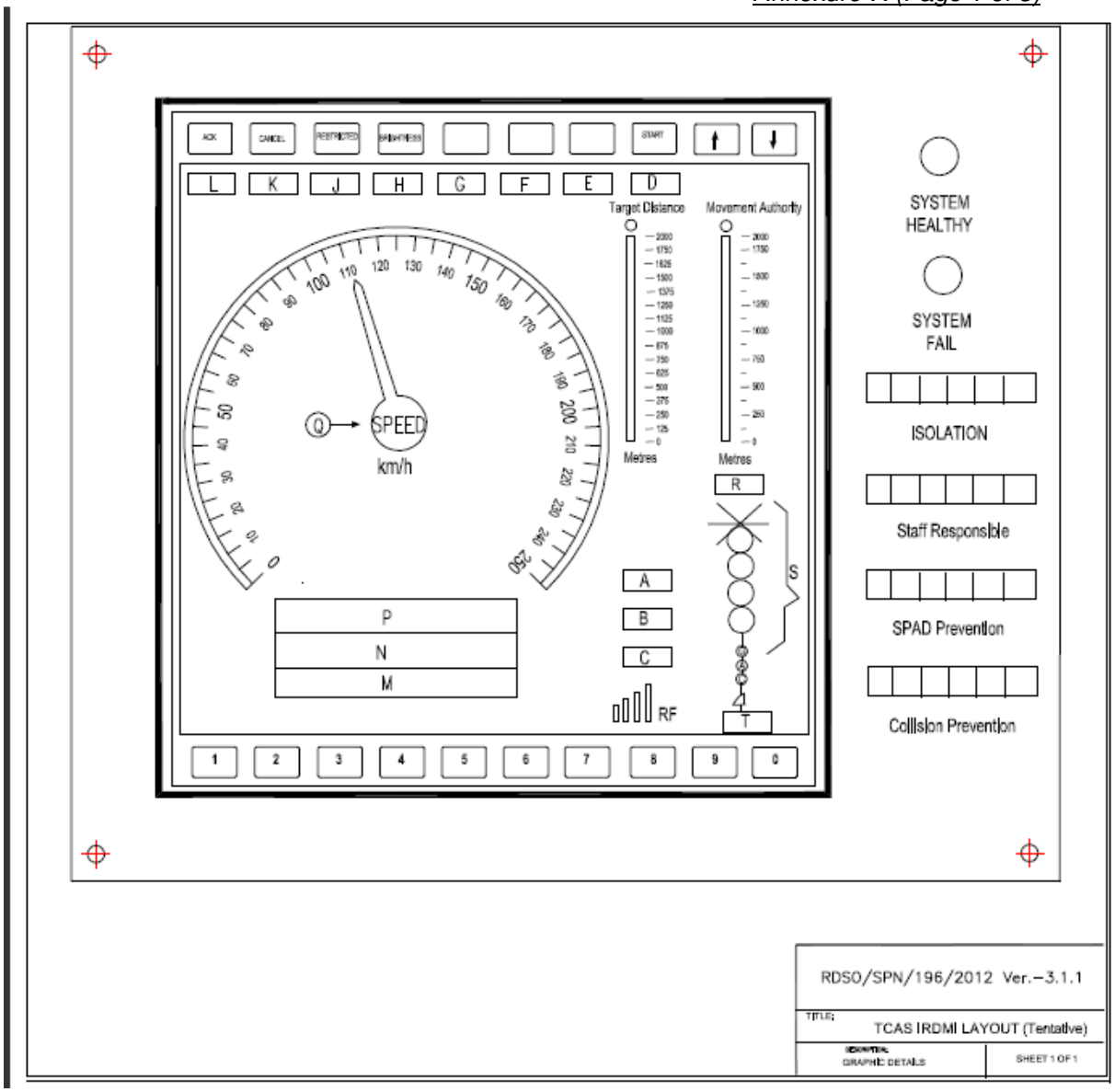
Annexure-IX

Loco TCAS unit : Mode vs Function Matrix

Mode of Loco TCAS unit→ **Functions↓**	Normal Mode	Controlled Mode	Restricted Mode	Staff Responsibl	Coupled/ Banking	Isolation Mode	Failure Mode	Unfitted Mode	Reverse Mode	Stop Mode
Checking RFID linking consistency	√									
Maintain sequence of radio packets received	√									
Check correctness of radio messages	√	√	√						√	
Prevention of Side Collision in Block Section	√	√	√						√	
Determine train location	√	√	√						√	
Determine train speed	√	√	√						√	
Protection of Reverse Movement	√	√	√							
Prevention of SPAD	√									
Braking due to no communication from 2000m from FSS on approach of station	√									
Brake due to loss of more than one packet	√								√	
Transmit normal message	√	√	√						√	
Transmit SOS message	√	√	√						√	
Transmit Side Collision Message	√	√	√						√	
Transmit Train Parted/ Jumbled message	√	√							√	
Transmit Signal Aspect request message	√									
Determine EOA, Danger Point, etc.	√	√								
Determine Most Restrictive Speed Profile based on										
• MA	√									
• TO speed	√									
• Control Mode train	√	√							√	
• SOS message, Side Collision Message, Train Parted/ Jumbled message	√	√						√	√	
Determine Collision	√									
Acquisition of TIN	√	√	√	√	√	√			√	√
Ceiling Speed Supervision based on Mode	√	√	√						√	
Command Emergency Brake	When required						√			√

'√' symbol in a cell indicates that a particular function shall be carried out in that particular mode of Loco unit.

Annexure-X (Page 1 of 3)



Indian Railways Driver Machine Interface (IRDMI) GUIDELINES

1. The IRDMI shall have LCD for display & soft-keys for operation. There shall be minimum 22 soft keys (20 in use & 2 as spare for future requirements).
2. The software of IRDMI shall be verified & validated to Safety Integrity Level (SIL) -2 of CENELEC or equivalent international standards.
3. The display area shall be LCD Module having minimum 256 colours, display size of 10.4" (diagonal) and minimum 640x480 pixels. This shall be of industrial grade & as per Clause 13.0 of RDSO specification no. RDSO/SPN/196/2012 ver – 3.1.
4. Overlay background will be black.
5. Locations for displaying various information on LCD screen have been marked on the layout. The details are as under:
   i. Location 'A' – Location for displaying current mode of the system.
   ii. Location 'B' – 'System Fail' in red colour text shall be displayed when system is faulty & 'System Healthy' in green colour text when system is healthy.
   iii. Location 'C' – 'RFID tag missing – One/ both' text in flashing red for 10 seconds shall be displayed in case of one/ both RFID tag missing/ damaged which will become steady & will remain till it finds next RFID tag. Normally, there shall be no display at this location.

      Below this Location, the Loco TCAS unit shall also display the Success Rate of communication packets received from Stationary TCAS unit in Numeral and Graphical Bar form.
   iv. Location 'D' to Location 'L' – The purpose of pressing the corresponding button (above the location) shall be displayed in text in yellow colour. The purpose of pressing of some of the buttons may change as per the context of the situation as described below:
      a. Location 'D' – After switching on the system, 'Start' shall be displayed which will become flashing once the 'Start' button is pressed. Normally, there shall be no display at this location.
      b. Location 'E', 'F' & 'G' – For selection or toggling of various modes of Loco unit which are authorized to be selected manually. For example, one button could be used for 'Reverse Mode'. The text below this button shall normally indicate 'Select'. On pressing this button, the Loco unit mode shall change to 'Reverse Mode' as per the specification, the display at Location 'A' shall display 'Reverse Mode' & the text below this button shall now change to 'Exit' so that another pressing of this button shall cause exit from 'Reverse Mode'.
      c. Location 'H' – The 'Brightness' button shall be used to activate/ deactivate brightness control of the screen. This button shall act as a toggle switch. Depending upon the function of this button, the text 'Brightness Mode' or 'Brightness exit' in white colour shall be displayed at this location. When brightness control is activated, ↑& ↓ buttons shall be used to control the brightness.
      d. Location 'J' – The 'Restricted' button shall act as a toggle switch to perform shunt request/ exit functions. Depending upon the function of this button, the text 'Restricted Mode Request' or 'Restricted Mode Exit' in yellow colour shall be displayed at this location.

e. Location 'K' – The 'Cancel' button shall be used to cancel the data fed by the Driver before pressing 'Ack' button.

f. Location 'L' – The 'Acknowledgement' button shall be used for all types of acknowledgement. Depending upon the state of the system, the purpose of pressing this button shall be displayed in yellow text.

v. Location 'M' – Here the contextual messages like reason for Application of brakes, change of mode, directions to Driver for certain operations etc. shall be displayed. While booting, this location shall be used for displaying various booting stages for easy diagnosis in case of booting failure. During bootup, the Loco Pilot shall be prompted to acknowledge for 'Staff Responsible Mode' as the case may be by blinking the corresponding message at this Location with beep.

vi. Location 'N' – Here real dates in dd/mm/yy format & time in 24 hours format shall be displayed in white colour.

vii. Location 'P' – Normally, this location shall be blank. But depending upon situation 'Overspeed' (in yellow colour), 'SB' (in red colour) or 'EB' (in red colour) shall be displayed in situation of overspeeding, Service Brake application or Emergency brake application respectively. The reason shall be displayed at location 'M'.

viii. Location 'Q' – The current train speed in 3 digits shall be displayed. The colour of the digits shall generally be as per the current status as per latest CENENEC specification CLC/TS-50459.

ix. Location 'R' – Movement Authority in 5digits in meters shall be displayed.

x. Location 'S' – for displaying the aspect of the approaching signal alongwith route indicator.

xi. Location 'T' – The distance to approaching signal, the aspect of which is being displayed above it, shall be displayed at this location & updated continuously.

6. The Size of Character,fixture dimensions of IRDMI, Colour of speed dial, speed pointer & other remaining messages/ indications shall generally be as per latest CENENEC specification CLC/TS-50459 & shall be decided in consultation & approval of RDSO.

7. This drawing shows the general layout of IRDMI. However, button/ indication layout, colours of indications, size of indications/ buttons& procedure of operationmay be required to be changed based on requirement. These shall be finalised along with layout drawing at design stage with the approval of RDSO.

8. Loudspeaker with volume control shall be provided for audio warnings.The volume control shall have fixed minimum level so that alarm is audible even at minimum setting of volume control.

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GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

BID DOCUMENTS

PART-II

(SECTION-II)

SPECIAL CONDITIONS OF CONTRACT (SCC)

Research Designs and Standards Organization
Manak Nagar, Lucknow
INDIA – 226011

PART-II
SECTION –II

SPECIAL CONDITIONS OF THE CONTRACT
(SCC)

0. Preamble:

0.1 It is proposed to develop product of Train Collision Avoidance System, which is meant to provide protection by preventing trains to pass signal at Danger (Red), excessive speed over turnouts / Speed restrictions and to avoid the situation in which more than one trains are coming close on the same track to cause collision by automatic application of brakes in the train, in case operations are not able to control so. It also provides assistance to Loco Pilots by means of pseudo-real-time display of signal aspects in Loco Pilot's cab.

0.2 This is a development project of RDSO. This is based on new and innovative technology. Its Functional Requirements have been developed through the process of open Expression of Interest. The minutes of various EoI and other general meetings for development of product have been kept on website.

0.3 Having ascertained technology demonstration through field concept trial in October'2012 and Novemeber'2012, it is now worth making this system ready for implementation as early as possible since early implementation of this safety system on development might even save loss of human lives by preventing accident and thus it would serve cause to humanity.

0.4 The ultimate goal for development of Train Collision Avoidance System (TCAS) is to have system conforming to Functional, System and Technical requirements by RDSO which shall have features of multi-vendor interoperability. In order to test the compatibility among various Locomotive units, Stationary units and track-side units from different vendors for the purpose of multi-vendor inter-operability, itis imperative to have the products from the multiple vendors. It is utmost necessary to look for multiple sources since the onset of development. Therefore, The developmental work has been segregated in different packages which are aimed to be awarded to different vendors.

0.5 This activities through this tender shall involve Research & Development (R&D) which incorporate improvement and modifications in the product and finalization of Specification accordingly for the purpose of upgradation, improvement and compatibility requirements during the course of repeated trials.

0.6 The objective is to develop multiple indigenous sources with the product consisting of few generic components. For analogous situation, personal computers are vastly available and used in India but these also contain certain components which are manufactured abroad only.

0.7 The project with the design developed may get proliferated on mass-scale on Indian Railways in the future.

1. General:

1.1 The tender shall be governed by IRS Conditions, Instruction to Tenderers (ITT), additional clauses extracted from General Conditions of the Contract (GCC as Part I Sec IV) and Special Conditions of the Contract/tender (SCC). Wherever Instruction to tenderers and SCC differ from IRS conditions of contract, the provision of ITT and SCC shall prevail. Wherever Instruction to tenderers and SCC differ from Part-GCC (Part I Sec IV), the provision of ITT and SCC shall prevail. Wherever ITT differs from SCC, the provision of SCC shall prevail. Wherever RDSO Specification given in Part-II Sec-I differs from SCC, the provision of SCC shall prevail.

1.2 RDSO shall be associated for **design, development and trial of Train Collision Avoidance System with provision of multi-vendor interoperability feature**. The words "Tenderer and Vendor" have been used interchangeably in this document and represent the same meaning.

1.3 For all the major bought out items/components, the essential details should be given in the offer. The details must include – Name and Address of Original Equipment Manufacturer, Model Number, Printed Leaflet/Brochure/Literature for the concerned Model, mode & configuration parameters setting for TCAS application and other essential Technical Details including environmental conditions required for reliable and safe working.

1.4 The equipment shall be sturdy and reliable in operation and incorporate components that can withstand the hostile environmental conditions of the Engines and track such as Dust, Water, Fuel/Lubricating Oil, Extreme Temperatures & Humidity as per Indian Weather and Electrostatic Interferences. The Electromagnetic compatibility (both emission and immunity levels) of the equipment shall be at such level so as to minimise errors.

1.5 **Technical requirement for the developmental work:**

1.5.1 The purpose of the tender is to develop and carryout trials for Train Collision Avoidance System (TCAS) and to develop multiple sources with interoperable product.

1.5.2 RDSO's specification for TCAS – RDSO/SPN/196/2012 ver.3.1.1 provides detailed Functional Requirements, Technical requirements, and systems requirements for interoperable multi-vendor product. As such, the equipment to be developed and supplied should meet the requirements of above specification, which might get modified to further version/ amendment, retaining the same basic requirements, during course of development.

1.5.3 Since the product is being developed for the first time meeting the above specification, some changes may be required while conducting either the testing of the equipment in the lab or during the field trial or during interoperability tests. These modifications shall be approved by RDSO and firms will have to carry out necessary modifications to meet the above changes without additional cost.

1.5.4 The development of the equipment to meet RDSO's specification may take time and in case the firm has developed system meeting most of the functional requirement of the specification and further upgradation to meet RDSO's specification is mainly change in the software, RDSO may permit field trials after necessary testing in the lab to expedite the developmental process. However, firm will have to confirm the time frame in which the equipment will be upgraded to meet the technical requirement of the tender.

1.5.5 Once the system has been developed by multiple vendors, interoperability test shall be conducted in RDSO by first simulating the set up in the Lab at RDSO and thereafter the interoperability test shall be conducted in the field. Any changes required either in software or hardware shall be carried out by the firms in the defined timeframe. In order to ensure interoperability, firms have to ensure that product being developed should have open architecture interface protocol and no proprietary interface/protocol/sub-system/component is used while designing the system.

1.5.6 While designing the system, it needs to be ensured that system should be able to work even in situations of prolonged failure of GPS/GNSS and there shall be no need for storing any geographical map of the section/station or section details in the loco equipment.

1.5.7 The firms have to develop a computer simulator to create the actual field condition in the lab for testing of station, track or loco equipment. It should also be possible to upload the actual field data collected from the NMS to simulate actual movement and find out any problems for carrying out improvement. Such equipment needs to be supplied to RDSO alongwith prototype equipment for testing that will be undertaken at RDSO.

1.5.8 It is proposed to use existing output of the tacho generator of locomotive for calculating the speed and distance travelled. The output of the tacho generator may be affected due to slip/slide of the wheels on which tacho sensor is provided on the locomotive. Since GPS/GNSS output is available, the system should be designed in such a way that necessary algorithm is able to detect slip or slide and carry out necessary correction to keep the error in speed and distance within the limits specified. The firm shall submit the algorithm proposed to be used to overcome this problem.

1.5.9 RFID tags provided on the sleepers need to withstand various expected track conditions like getting covered with ballast, getting submerged in water, drop of various objects and damages by the personnel working/walking on the track. The tag should be rugged and be able to withstand and continue to work satisfactorily in such situations.

1.5.10 Each locomotive or locomotives in multi configuration needs to be provided with RFID reader on either side of the locomotive. This is to take care of error due to distance of the RFID reader from the front wheel and shall also provide redundancy in case of failure of one RFID reader.

1.5.11 Railways will provide 2MB connectivity from station to station on existing OFC network of the railways. TCAS tenderer need to provide necessary interface equipment like modems and cable from station to OFC hut which are generally close to station. The distance of OFC huts shall be given to the firms.

1.5.12 The entire network of station/IBS/ mid-block section interlocked Level Crossing Gates and locomotive TCAS equipments needs to be monitored from divisional control office in Secunderabad. The network connectivity upto Secunderabad shall be arranged by the railways and necessary hardware, power supply etc. will have to be provided by the firm. It is expected that common centralised system should be interfaced with station/loco equipment of different firms. As such, Network Monitoring System is be included as a part of contract package A and it will be the responsibility of the other tenderers to interface with this Network Monitoring System.

1.5.13 It is expected that firms undertaking the development of TCAS have already appointed independent safety assessor (ISA) for SIL-4 certification of the system. The details of the certifying agency may be submitted for software, hardware and complete system. The ISA certification needs to be completed before the system is finally accepted after the trials. Even though, specification indicates SIL-4 certification for entire system, it may not be possible that all functional requirements specifically the requirement of collision prevention shall meet SIL-4 level. All ATP functionalities shall meet SIL-4 level and collision prevention functionality independent of signalling shall meet atleast SIL-2 level.

1.5.14 Lot of equipment needs to be provided in the locomotives of the different types and there are space constraints for installing such systems. Therefore, the size of the equipment should be kept to minimum and if required, it should be possible to split the equipment in smaller parts to accommodate in the space available. Tenderers are advised to see the Locomotive themselves, explore and arrange to ensure this. The placement of various equipment in the engine room, operators panel, roof of the locomotive and at the bottom of the locomotive as proposed, needs to be approved by Electrical and Motive Power directorates of RDSO. It shall be ensured that cabling, connector, relays and necessary filter devices as provided in loco shall withstand the environment in locomotive and are as per standard sources approved for such item for use in electric or diesel locomotives.

1.5.15 Brake interface unit (BIU) needs to be provided in each locomotive based on the requirement of a particular locomotive and to meet the specification. All safety features needs to be provided in BIU and it needs to be approved by Motive Power and Electrical Directorate of RDSO before it is used in the locomotive. RDSO is also developing universal brake interface and in case the same is developed during the trial, the firm will be required to test it with the TCAS system.

1.5.16 The ultimate objective of the system is to detect the collision like situation or driver likely to cause SPAD or unable to control the speed for loop line or speed restrictions and as such, the system needs to monitor the current speed

and generate brake curve based on the target distance, target speed and other parameters like gradients, deceleration constant and brake characteristics of the rolling stock. The firms are required to give brake algorithm proposed to be used for the above and shall also carry out tests in different sections and load conditions to ensure that it meets the required safety.

1.5.17 The frequency of the operation for TCAS has been defined in RDSO specification. National frequency allocation plan include these frequencies for use by Indian Railways for anti-collision device. The firms are required to take necessary clearance from the WPC and SACFA for obtaining necessary license and site clearance. Any letter required in this respect from railways shall be arranged from Railway Board.

1.5.18 Time-stamp shall also be affixed with transmission of any non-current information,

1.5.19 In Non-TCAS territory, the typical information regarding location of train, if required to be transmitted, shall be as under for leading locomotive:

LOCO_LAT_DEG	7 bits	Absolute Degrees of Latitude of Loco Location (0-90)
LOCO_LAT_MIN	16 bits	Absolute Minutes of Latitude of Loco Location
LOCO_LAT_N_S	1 bit	Northern Hemisphere = 1, Southern Hemisphere or Equator = 0
LOCO_LONG_DEG	8 bits	Absolute Degrees of Longitude of Loco Location (0 – 180)
LOCO_LONG_MIN	16 bits	Absolute Minutes of Longitude of Loco Location
LOCO_LONG_E_W	1 bit	East = 1, West = 0

1.5.20 For train length measurement, start and end event markers are required to be through separate packets so as to conserve Memory on Loco Equipment.

1.5.21 The typical minimum information to be stored in user programmable field of RFID Tags is shown below:

ABT/MBT allowed in Nominal direction : 1 bit
ABT / MBT allowed in Reverse Direction : 1 bit
Unique ID of RFID Tag Set in Zone – 8 bits
Distances to next RFID tags and next signals in Nominal and Reverse Directions in meters

Nominal Direction								Reverse Direction								Remarks
X15	X14	X13	X12	X11	X10	x9	x8	x7	x6	x5	x4	x3	x2	x1	x0	
					0	0	0						0	0	0	TCAS Territory Exit
					0	0	1						0	0	1	TCAS Block Section ahead
					0	1	0						0	1	0	Spare
					0	1	1						0	1	1	Spare
					1	0	0						1	0	0	Dead Stop ahead
					1	0	1						1	0	1	Station Sec only Normal Movement ahead
					1	1	0						1	1	0	Station Section only Shunting Movement ahead
					1	1	1						1	1	1	Station Section Normal and Shunting movement ahead.
			0	0							0	0				Neither Converging nor diverging (Not near turnout)
			0	1							0	1				Converging at Turnout
			1	0							1	0				Diverging at Turnout
			1	1							1	1				Spare
0	0	0						0	0	0						No single Signal identified ahead
0	0	1						0	0	1						Approaching Stop Signal approx. 3000m ahead
0	1	0						0	1	0						Approaching Stop Signal approx. 2000m ahead
0	1	1						0	1	1						Approaching Stop Signal 100-200m ahead
1	0	0						1	0	0						Approaching Stop Signal 70-100m ahead
1	0	1						1	0	1						Approaching Stop Signal 50-70m ahead
1	1	0						1	1	0						Last Stop Signal (LSS) 1500 ~ 2000 m in rear
1	1	1						1	1	1						At Stop/Permissive Signal Foot

2. **Qualifying Requirements of Tenderers-**

2.1 This para lays down minimum acceptable qualification criteria in various areas for the tenderer to make an offer for executing the developmental work specified in scope of work.

2.2 The firm shall have ISO 9000-2008 certification.

2.3 The firm shall be indigenous manufacturer and shall have carried out design and development of software embedded control systems with its field trials in the field of Train Protection or Train Collision Avoidance or indigenous manufacturer of software embedded Railway Signalling products such as Electronic Interlocking (EI), Single Section Digital Axle Counter (SSDAC), Multi Section Digital Axle Counter (MSDAC), Dataloggers for logging signalling events, Solid State Block Proving Axle Counter (SSBPAC) and Universal Fail-Safe Block Interface (UFSBI).

2.4 The total turnover of the firm shall be atleast Rs. 30 Crores during last three financial years excluding current financial year**.**

2.5 The firm must have at least 10 such graduate engineers which have been employed for atleast 12 months in the field of Electronics, software, computer science other than other technical staff conversant with railway signalling. The tenderer need to furnish information of all such graduate engineers by name and the duration of association with tenderer as employee in terms of months.

2.6 The tenderer must have procedures in place for internal safety validation as per CENELEC standards and shall have R&D centre for development and testing of such equipments.

2.7 Tenderers not submitting the requisite information may note that their offer is liable to be ignored.

3. Evaluation Criteria and Allotment of work:

3.1 Tenderer shall submit their offer in two packets which shall contain the following:

a) PACKET-I : Technical & commercial bid
b) PACKET-II: Financial bid

3.2 This being a development work of new indigenous technology for Railway Safety with need for early implementation and with requirement of multi-vendor interoperability through multiple vendors (Tenderers), special scheme has been adopted for evaluation of Technical & commercial bid, financial bid and methodology for award of Tender for this developmental work.

3.3 Scope of work of this tender is divided into three contract packages A, B and C. Sections pertaining to these Contract Packages are in vicinity to each other. Tenderer is not allowed to differentiate rates quoted for different contract packages. It may be noted that tenderer shall be considered for awarding either of three contract packages A, B and C according to the inter-se ranking; and shall be asked to enter into Contract Agreement accordingly. However,

Tenderer is not allowed to quote the rates in part for any specific package or part of package. Tenderer is required to quote unit rates individually for all items of the Schedule (except for AMC) only against the respective items in the Rate Sheet of Schedule of Requirement and only in the Financial Bid. The AMC Rates are to be quoted by Tenderers separately with detailed breakup. The rates or costs of AMC shall not be considered for determination of inter-se ranking during evaluation of Financial Bid.

3.4 Clarification of bid : To facilitate evaluation of bids, the purchaser may at its discretion ask tenderer(s) for clarification of their offer(s). Any clarification submitted by the tenderer after opening of the tender that is not in response to the request by the purchaser may not be considered. The purchaser's request for such clarifications and response shall be in writing. No change in the prices or substance of the bid shall be sought, offered or permitted except to confirm the correction of arithmetic errors discovered by the purchaser in the evaluation of financial bids. If tenderer does not provide clarifications of its bid by the time line set by the purchaser, its bid may be rejected.

3.5 Technical & commercial Bid

3.5.1 The purchaser shall examine all the general and technical aspects of the bid submitted in accordance with tender conditions. The technical bid should conform to all the tender requirements.

3.5.2 Further technical evaluation shall be carried out only if the conditions laid in Para 2 for Pre-qualification are satisfied. The technical offer shall be examined by technical evaluation committee who will verify and check the development in firm's premises and demonstration of development done for TCAS.

3.5.3 Tenderer is required to indicate the status of his Technical Capabilities in form of "YES" or "NO" of the items enumerated in Para 3.5.5 in the Self Assessment Sheet for Technical Capabilities in Part-II Sec-II Annexure-1. This assessment by Tenderer shall be based not on the presumptive status but on the actual status as on the date not later than that of submission of the tender. Tenderer is required to mention the place in India for lab demonstration for the purpose of Technical Evaluation of technical status by RDSO Team. It shall be responsibility of the tenderer to carry out the arrangements for lab demonstration.

3.5.4 Tenderer is required to mention the place in India for lab demonstration for the purpose of evaluation of technical status by RDSO Team. On the basis of the Technical & Commercial offer, Purchaser shall decide the visit of RDSO Team to firm's premises for verification of Lab demonstration of development of TCAS to carry out technical evaluation. Tenderers are required to be ready with full preparations for lab demonstration after opening of the tender so as to enable RDSO Team to complete technical evaluation on the same day. RDSO Team is not bound to revisit for lab demonstration.

3.5.5 The basis for Technical Evaluation and proposed marks shall be as under:

SN	Description	Max. Marks	Total of Sec
1	Tenderer is manufacturer of any of the indigenously developed software embedded RDSO approved products in the field of Railway Signalling Applications such as Electronic Interlocking (EI), Single Section Digital Axle Counter (SSDAC), Multi Section Digital Axle Counter (MSDAC), Dataloggers for logging signalling events, Solid State Block Proving Axle Counter (SSBPAC) and Universal Fail-Safe Block Interface (UFSBI).	10	10
2	Carried out the system level primitive scheme design of TCAS with its sub-system & components and submitted the same along with all necessary drawings, documents and datasheets, configuration and parameters in the Technical & commercial bid. The marks shall be awarded on the basis of submission of following design components according to design approach adopted by Tenderer:		15
(i)	Schematic Diagram with High -Level design	2	
(ii)	Low-Level Hardware design upto Card-Level	2	
(iii)	Design of Loco Vital Computer Peripheral Interface Controllers	2	
(iv)	Design of Radio network with calculation of power budget and process used for time slot allocation	2	
(v)	Logics used in Software for achieving Functional Requirements enumerated in specification	5	
(vi)	Bill of Quantity of Material for Station, Locomotive and Trackside equipment with details of bought out items, if any.	2	
3	Capability for Lab demonstration of following functions using any hardware with readiness to demonstrate following items to designated Railway Committee:		20
(i)	Exhibiting Full Duplex communication Over-The-Air using Full Duplex Radio.	2	
(ii)	Demonstration of Prototype lab model for loco equipment	2	
(iii)	Demonstration of Prototype lab model for station equipment	2	
(iv)	Display of distance from a fixed point using Latitude / Longitude information received through GPS/GNSS receiver simulator.	2	
(v)	Displaying Speed of Locomotive Unit using output of Tachometer Simulator.	2	
(vi)	Generation of electric or pneumatic command for Brake application through Software	2	
(vii)	Reading user programmed data in RFID tag and interfacing it with loco TCAS	2	

SN	Description	Max. Marks	Total of Sec
(viii)	Interfacing of interlocking information with station TCAS and transmission through radio	2	
(ix)	Display of information on loco TCAS received from station TCAS	2	
(x)	Relaying of information from one loco to other loco through station TCAS	2	
	Note: It is possible that some tenderer is able to demonstrate above items of S.No. 3 as an integrated approach through items of S.No. 4 and 5. In such case, the tenderer demonstrating through items of S.No. 4 and 5 shall be awarded marks for corresponding items of S.No. (3), S.No.(4) and S.No. (5)		
4	Capability of carrying out integrated in-house testing of Prototype Lab model through Simulator with two stations unit lab models and two locomotive unit lab models {except for item 4(x)} communicating each other at RF level and using train movement simulated through RFID tags with readiness to demonstrate following items to designated Railway Committee.		25
(i)	Display of Red, Green, Yellow, Double Yellow Signal Aspects in Loco Cab	2	
(ii)	Distance to next Signal at Red (Stop / Danger Aspect) at same interlocking in Loco Cab	2	
(iii)	Command for application of brakes to a train approaching too fast to a signal at Red.	2	
(iv)	Release of command for application of brake when the Movement Authority is increased by taking off a signal which was earlier at Red.	3	
(v)	Demonstration of provision for passing a signal at Red by Override from Driver Machine Interface	2	
(vi)	Generation of Brake Application Command to prevent Head-on collision between trains on same track not otherwise prevented to be so on same track.	3	
(vii)	Generation of Brake Application Command to prevent Rear-end Collision between trains on same track not otherwise prevented to be so on same track.	2	
(viii)	Generation of Brake Command on reception of SOS message from a train or station in vicinity.	3	
(ix)	Generation of Brake Command on reception of "Unusual Stoppage message" from other train in vicinity while approaching it.	3	

SN	Description	Max. Marks	Total of Sec
(x)	Handling of RF Reception of transmission generated from four simulated stationary TCAS Units by four simulated Locomotive Units (Simulation may be exclusively for the purpose of demonstration of TDMA concept only which may even be without using or involving full-fledged lab models).	3	
5	Capability to demonstrate following functions in Field Trial (Based on report if already done with RDSO)		10
(i)	Display of Red, Green, Yellow, Double Yellow Signal Aspects in Loco Cab, Distance to next Signal at Red (Stop / Danger Aspect) at same interlocking in Loco Cab	1	
(ii)	Application of brakes to a train approaching too fast to a signal at Red and release of brakes by TCAS when the Movement Authority is increased by taking off a signal which was earlier at Red.	1	
(iii)	Assessment of braking characteristics of train through Brake Test and its application while calculating braking distance	3	
(iv)	Application of brakes by TCAS to prevent Head-on collision and rear-end collision between trains on same track not otherwise prevented to be so on same track.	1	
(v)	Application of brakes on reception of "Unusual Stoppage message" or SOS message from other train in vicinity while approaching it.	1	
(vi)	Handling of RF Reception from four stationary TCAS Units by four Locomotive Units	3	
6	Final product developed meeting FRS, technical requirements and SRS as per RDSO specification for type testing and trial	10	10
7	Equipment is certified for SIL 4 as per CENELEC or equivalent standards by ISA	10	10
	Total marks	100	

3.5.6 Based on technical evaluation, the firms shall be divided in two categories based on marks obtained as under. The marks and category of Technical Evaluation shall be uploaded on Website:

(a) Category I if marks obtained are 60 or more
(b) Category II if marks obtained are 45 or more but less than 60.

3.5.7 If there are three or more firms in category I, firms in category I only shall qualify for next stage of bid evaluation otherwise all firms in category I and II shall qualify for next stage of evaluation.

3.5.8 The marking pattern is such that the tenderers get either zero or full marks against any sub-item and it shall not be divided further to the fraction of the indicated Maximum Marks for that sub-item.

3.6 **Financial Bid:** Format for Financial offer is given in Part –II Section-II Annexure-2 as Schedule of Rates. Financial Offer of all tenderers qualified in category I and II shall only be opened. Comparative statement shall be prepared separately for category I and II to determine the standing of each offer among the tenderers of same category based on their quoted prices.

3.6.1 Financial offer shall be examined and it will be checked that financial offer given by firms are valid and they have quoted for all items including cost for Annual Maintenance Contract (AMC) after warranty. Tenderers are again advised to quote AMC charges for 5 years beyond completion of initial Warranty Period of 2 years. These charges to be quoted on annual basis. These charges will not be taken for comparison purpose.

3.6.2 While preparing comparative statement, rates quoted by firms for all items of schedules for all packages shall be added. However, cost of AMC shall not be added while calculating total cost for this evaluation.

3.6.3 Tenderers may please note that being an R&D activity of RDSO, it shall be exempted from Central Excise Duty and entitled for Concessional Custom Duty.

3.6.4 **Evaluation of financial bid:**

a) The financial evaluation shall be done separately for firms in category I and II.
b) Evaluation criteria in respective category shall be based on total costs calculated by adding up costs of all packages A, B and C for all schedules (except for AMC) as quoted by the firms.

3.7 Award of tender:

3.7.1 Since this is a tender for development of new innovative indigenous technology and no standard reference for rates is available for most of the items in schedule, the tender committee may negotiate the rates with firm before considering for award of the tender to firms in both category I and category II. Negotiation in each category shall be held with eligible L1 tenderer only. Rates so negotiated and considered reasonable shall be awarded to L1 tenderer and shall also be counter offered to other firms in same category who have quoted higher cost compared to the total cost of the relevant package worked out by taking item-wise quantities of same relevant package with item-wise unit rates negotiated with L-1. However, while negotiating with tenderer with Category-II, it should be ensured that the negotiated offer of this tenderer should not be more than the total cost of the relevant package worked out by taking the item-wise quantities of same relevant package for Category-II with item-wise unit rate of negotiated L-1 from Category-I.

3.7.2 The tender includes 2 years warranty after completion of trial, acceptance of system and acquiring certification by Independent Safety Assessor. The rates for AMC for 5years are being taken but not considered for financial evaluation. This rates if considered high shall also be negotiated. These rates shall be available for operation of the AMC by the Railways at their

discretion at the time during the 5 years after completion of warranty Period.

3.7.3 Process for award for firms in Category I:

(a) In case, in category I there are 1 or more firms, the distribution of work based on their total cost of all schedules shall be as under:

No. of firms in category I	L1	L2	L3
At least three qualified Tenderers	Approx. 50% (Contract Package A)	Approx. 30% (Contract Package B)	Approx. 20% (Contract Package C)
Two qualified Tenderers	Approx. 50% (Contract Packages – A)	Approx. 30% (Contract Package B)	-
One qualified Tenderer	Approx. 50% (Contract Packages – A)	-	-

(b) The process of negotiation and cost of award of contract shall be as per para 3.7.1. In case, L2 and / or L3 firm refuses to accept the counter offer made at par with the rates negotiated, other remaining firms in category I shall be considered for award or else those contract package(s) shall be considered for firms in category II.

3.7.4 Process for award to firms in category II:

a) The firms in category II shall only be considered for award of contract package/packages left out due to insufficient number of firms in category I.

b) Since, the firms in this category would not have actually demonstrated yet developed the product and are only considered adjudged capable of developing, initially the firm shall be given Letter of Intent (LOI) and shall be given 2 months time from issue of LOI to complete the development with equipment ready for field testing which will be verified by Technical Committee nominated by Competent Authority. Firm shall be required to submit the Security deposit equivalent to 10% of LOI value with validity of at least 5 months on issue of LOI itself in form of Bank Guarantee. In case, such tenderer(s) do not submit Bank Guarantee on issue of Letter of Intent within 15 days, it shall be assumed that they are not interested in the development of TCAS at this stage and the Earnest Money submitted by them shall be forfeited.

(i) If the tenderer is able to demonstrate his capability, his LOI shall be converted into formal Contract Agreement subject to Bank Guarantee being extended for Delivery Period + 90 days as per Para 8 as Contract Performance Guarantee.

(ii) In case of unsuccessful demonstration, the bank guarantee submitted by the Tenderer on issue of LOI would be forfeited. Further, the Railway Administration shall be under no legal obligation to enter into Agreement. The tenderer will have no legal recourse in case the

demonstration for which he had opted for the attempt is could not be successful.

c) The number of packages available to be awarded to tenderer in category II shall be either 3 or 2 or 1. The distribution of packages based of total quoted cost for all three packages shall be as under:

Contract packages to be awarded in category II	L1	L2	L3
Three	Approx. 50% (Contract Package A)	Approx. 30% (Contract Package B)	Approx. 20% (Contract Package C)
Two * assuming one tenderer in category I	Approx. 30% (Contract Packages – B)	Approx. 20% (Contract Package C)	-
One * assuming two tenderers in category I	Approx. 20% (Contract Packages – C)	-	-

*Note : It is assumed here that there shall be at least three vendors who shall be fulfilling 45 marks. If there is no tenderer qualifying for 60 marks and above & there are only two tenderers who have 45 marks and above then L1 & L2 shall be awarded Package A & B respectively. Similarly, if there is only one tenderer fulfilling 45 marks and above and below 60 marks, he shall be awarded Package A and balance contract package may not be awarded through this tender.

d) The process of negotiation and cost of award of contract shall be as per para 3.7.1. In case, L2 or L3 firm refuses to accept the counter offer made at par with the rates negotiated, the remaining firm in category II shall be considered for award or else the balance contract package shall not be awarded through this tender.

4.0 Scope of Requirement:

The Scope of Requirement involves Design, Development, Manufacture, Supply, Installation, Testing and Field Trial of Software and Hardware of Train Collision Avoidance System (TCAS) as per the functional requirements of the RDSO Spec No. RDSO/SPN/196/2012 with latest amendments. The Design of Train Collision Avoidance System shall meet CENELEC requirements to achieve SIL (Safety Integration Level) certification of the system as a whole as elaborated in Technical Specifications and to have a multi-vendor interoperable system in which Loco TCAS equipment, Stationary TCAS equipment and the Trackside TCAS equipment from different tenderers shall be both-ways fully compatible among themselves. The scope of work also covers manufacture, supply, installation, testing and commissioning of Lab Model in RDSO, Lucknow (UP) and Field Model in nominated section of South Central Railway.

4.1 The section of total approx. 250 km has been divided into three sub-sections covered in three different contract packages. Each contract package comprises of stationary equipments, loco equipments and trackside equipments. The corresponding sub-sections and divisions are depicted hereunder**:**

4.1.1 Contract Package A (Approx. 50%) : Wadi (excluding) – Vikarabad – Sadashivpet Road (including) – Chitgidda (including) section of approx. 140 km.

4.1.2 Contract Package B (Approx. 30%) : Sadashivpet Road (Excluding) - mid- block section interlocked level crossing gate no. 13 (between Sadashivpet Road – Marpalli) (including) – Bidar (Including) section of approx. 70 km.

4.1.3 Contract Package C (Approx. 20%) : Chitgidda (Excluding) - Gullaguda (including) – Lingampalli (including) section of approx. 40 km.

4.2 Deleted.

4.3 In case, only one tenderer is awarded the work through this tender, although multi-vendor interoperability shall not be feasible to be tested but the tenderer shall be liable to provide all information and requirement to achieve so at later stage and shall undertake the commitment to do so should the need so arise at a later date beyond the completion period of the contract. The tenderer shall also be required to undertake the commitment to continue providing professional services to Indian Railways with regard to this product in future in terms of supply, installation and maintenance of the product in long term on further proliferation.

4.4 The System Software development includes development of generic software and application data and development of failsafe communicate protocol also considering mutual interference on account of communication in normal conditions and over-reach.

4.5 Apart from multi-vendor interoperable functioning of various TCAS components viz. Loco Equipment, Stationary Equipment and Trackside Equipment, Tenderer shall provide by converging design that the front-end of man-machine interface is identical by different tenderers in terms of formats, methods and interpretation to the extent possible and agreed by RDSO so as to have unified operating instructions, decided on the basis of experience and during the course of development through this contract.

4.6 Software validation of the system shall be carried out as per applicable CENELEC standards to ensure SIL (Safety Integrity Level) as specified in Technical Specifications from an independent approved software test house or any other agency agreed to by the purchaser. The software validating agency shall be reputed such as IIT, Jadavpur University, DRDO etc. who have experience in carrying out validation of safety critical software.

4.7 The tenderer shall follow the laid down development process and prepare all the documentation for design and development of the complete system in accordance with applicable CENELEC standards. All documents shall be property of RDSO, Ministry of Railways (India)

4.8 Every station/IBS/ mid- block section interlocked level crossing gate needs to be provided with UHF transmitter/ receiver to provide adequate radio coverage around the station/ IBS/ mid- block section interlocked level crossing gate for communication with the locomotives. The firms are required to carry out the design of the antenna, power output requirement. The firms are also required to

give the design of such towers alongwith site proposed to be installed and safety certificate by the independent consultant. The site for each tower is required to be got approved by the competent Railway authority also.

4.9 Loco equipment shall be maintained in the Electric and Diesel locosheds nominated by South Central Railway. The firms are required to provide test bench for maintenance and repair at these sheds and also to test and troubleshoot loco equipment when it is coming out from locoshed. A kit for configuring, programming and downloading the Loco Equipment is also required to be provided by the firm.

4.10 The firm is also required to supply programming kit for RFID tags and test setup for station equipment for maintenance and repair of way side equipment at a location identified by Railways. A kit for configuring, programming and downloading the Station Equipment in both modes - locally and remotely- is also required to be provided by the tenderer.

4.11 Testing in Lab. :

4.11.1 The testing & demonstration of Lab Model shall be carried out by the vendor to the RDSO team at their premises or lab or at RDSO where two Loco and Stationary equipments shall be exchanging information at RF Level through antennae.

4.11.2 A Simulator shall be used for demonstration and testing which shall have provision only of receiving the transmissions made by various Loco and Stationary units. All the real-time communication between various Loco and Stationary TCAS units shall be captured and logged by Simulator with facility of real-time and offline display of raw data, interpretable presentation through fields decoded from communication packets and functional GUI display alongwith configuration parameter settings, analysis summary, generation of exceptions and Statistics.

4.11.3 The speedometer information shall be fed to the Loco Equipment model through a simulator. The output of Brake Interface Unit shall also be demonstrated by physical operation of solenoid valves to control venting of air in case of Air-Vent type BIU. The movement of train shall be simulated through physical swiping of RFID Tags across the RFID Reader of the Loco Lab Model and GPS Receiver Simulator application. The Speed information shall be through Tachometer output simulator in form of Pulse Generator. For simulating interface with interlocking, a switch panel shall be used.

4.11.4 The changes informed by RDSO Committee shall be complied, tested along with submission of compliance and testing report before the system is deployed in the field for further demonstration.

4.12 Testing in Field :

4.12.1 The testing & demonstration of field system shall be carried out by tenderer to RDSO team in the nominated section. All the real-time communication received by TCAS system shall be captured and logged by Simulator with facility of real-time and offline display of raw data, interpretable

presentation through fields decoded from communication packets and functional GUI display alongwith configuration parameter settings, analysis summary, generation of exceptions and Statistics. In case of generation of exceptions, alarms shall be raised with facility to generate SMS to nominated list of mobile numbers.

4.12.2 The changes informed by RDSO Committee shall be complied, tested along with submission of compliance and testing report, before the system is modified or the firmware is upgraded for further testing and demonstration.

4.12.3 The execution shall include integration using universal brake interface, integration with standard DIALS monitor for Loco Pilot and study of braking characteristics for varying loads, varying speeds and varying gradients as per the requirement of RDSO.

4.12.4 Functional Testing of the validated software after modifications, if any, shall be carried out by RDSO's engineer to ensure that all requirements of the tender specifications are complied.

4.13 The supply and testing in field shall be first be in confined section with limited, say two, number of locomotives. It shall be proliferated later on with advancement of Field Trial on advise of the RDSO Engineer In-Charge. In order to optimally utilize Locomotive, it shall be responsibility of the Tenderer to demonstrate the readiness to Railway Engineer. If felt proper, Railway Engineer may decide to have trial with Tower Wagon instead first. The indicative sections for initial trial are as under:

4.13.1 **Contract Package A (Approx. 50%) :** Godumgura – Vikarabad – Sadashivpet Road - Chitgidda

4.13.2 **Contract Package B (Approx. 30%) :** Sadashivpet Road (Excluding) – Kohir

4.13.3 **Contract Package C (Approx. 20%) :** Chitgidda (Excluding) - Shankarpalli.

4.14 The tenderer is required to provide the Testing Procedure which shall be in accordance with the documents for the certification of Safety Integrity Level mentioned in CENELEC standards and as defined by OEMs wherever applicable. The testing procedures should be modular and RDSO Engineer can carry out piecemeal testing during the stages of execution and not limited only at the end. However, the tenderer shall be provided reasonable opportunity to set right the design anomalies if found so.

4.15 The Tenderer is required to be equipped with all required instruments for testing of TCAS system and its components, such as Spectrum Analyzer (Desktop type and Portable / Hand-held type), RF dBm meter for the frequency range, Vector Network Analyzer, Logic Analyzer, RFID Tag Programming Tool etc. with relevant softwares.

4.16 Any act of apprehension in way to facilitate testing or supplying the test results or configuration parameter settings by the tenderer to RDSO shall be presumed as violation of the provisions of the contract. In order to achieve the purpose of this contract, RDSO reserves the right to use and discriminately share these test results for upgradation and further improvement of the product.

4.17 The firmware and application tools provided shall not have any time-bar limit.

4.18 The Radio Transmission from any of the Loco or Stationary TCAS unit shall be switched on only with consent of RDSO.

4.19 The application data shall have to be modified by the tenderer in case alteration in the layout is carried out by the Railway during the execution of the work.

4.20 The tenderer shall inform RDSO in advance and obtain approval in writing whenever they change system software or application data or software or any of the mode/ configuration setting of the system or equipments used in the sub-system.

4.21 As part of design and development, Vendor is required to provide and install the system in RDSO with two Stationary (Station) TCAS units, two Locomotive TCAS units, set of RFID tags with spares including all components and Simulator with final firmware suitable for Lab demonstration as well for functioning in the field with facility to test Multi-vendor interoperability.

4.22 The firmware versions with all configuration parameter settings of TCAS units and simulator wherever applicable, of Lab demonstration, Field demonstration with multi-vendor interoperability stage and modified on account of Safety Assessment for SIL certification shall be provided to RDSO such that the same should be possible to be used for the system provided for RDSO Lab. The tenderer is also supposed to provide the hardware component in case he changes it during the course of development.

4.23 **Brief Description of Signalling & Telecom assets in the Wadi (Excluding) – Vikarabad – Lingampalli – Bidar section:**

4.23.1 The section is having all Panel Interlocked stations with IBS and mid Block Section Level Crossing Gates as shown in the table. The section from Lingampalli to Wadi (Excluding) is double line Electrified section with Double Line Lock and Block Instruments. Block Proving / IBS Axle Counter is presently provided in Lingmapalli – Vikarabad – Tandur section. The section from Vikarabad to Bidar is Single Line Non-electrified section with podanur type push button block instruments.

4.23.2 All the stations are Central Panel interlocked stations except for Vikarabad. Vikarabad Station is having two end-panels and one panel for the purpose of slotting at Central Location. However, the status of all signal aspects, Track circuits, points, block section occupation is covered by both the end-panel locations. Status of all the signal aspects of Level Crossing Gate no. 3 (mid- block section interlocked Level Crossing Gate between Sadashivpet Road and Vikarabad) are covered by Vikarabad and Level Crossing Gate no. 4 (mid- block section interlocked Level Crossing Gate between Sadashivpet Road and Vikarabad) in such a way that they are available at either of Vikarabad and Level Crossing Gate no. 4. Therefore, separate stationary TCAS unit is not required at Level Crossing Gate no. 3. Similarly, Status of all the signal aspects of Level Crossing Gate no. 43 (mid- block section interlocked Level Crossing Gate between Matalkunta and Bidar) are covered by Bidar and Level Crossing Gate no. 42 (mid-block section interlocked Level Crossing Gate between Sadashivpet Road

and Vikarabad) in such a way that they are available at either of Bidar and Level Crossing Gate no. 42. Therefore, separate stationary TCAS unit is not required at Level Crosiing Gate no. 43 also.

4.23.3 OFC connectivity is available at all stations but all IBS locations and mid-block section interlocked Level Crossing Gates are provided with Quad cable. Railway shall provide 2 MB connectivity between stations and Quad Cable connectivity at all IBS locations and mid-block section interlocked Level Crossing Gates.

4.23.4 Vikarabad and Nawandgi stations are having approx. 75m high existing Microwave towers which can be used for TCAS purpose. VHF Tower, wherever provided, may be used for TCAS purpose after having assessment of suitability and safety for such use. In no case, the TCAS installation should affect or interfere with the existing communication systems.

4.24 None of the tenderer is allowed to directly interfere in the matters of contract package(s) awarded to other tenderers. Any such communication shall be through RDSO only.

4.25 **Training**: Tenderer shall arrange training of IR Personnel for 200 man-days split in 4 batches for understanding of functioning, manufacturing, and design processes pertaining to hardware & software, quality control system in place. This also includes demonstration of interoperability, operation, maintenance, data preparation & configuration of the system.

4.25.1 The training shall include Software & hardware installation and maintenance of the system including troubleshooting, site date preparation & modification to undertake activities like relocation of signals, changes in the interlocking, speed restriction etc

4.25.2 Training of bought out items/ equipment/ component shall be by the OEM (Original Equipment Manufacturer). Details of training proposal shall be submitted by the contractor for approval of Railways.

4.25.3 The training courses should, apart from formal class room training, include hand on practical experience and visits to working installation. It also includes orientation to operating & running staff such as Loco Pilots, Station Masters and Gatemen.

4.25.4 The quality of training should be of such a level that at the end of the training, the IR Personnel should be able to install/commission the equipment in similar or modified layout, do the necessary hardware changes required in future, configure and also organize, locate and rectify the faults besides maintenance. They shall be trained in all aspects of system design, engineering, inspection, testing, execution, commissioning, fault diagnosis operation and maintenance of the system as whole and also all constituent equipments.

4.25.5 Set of documents related to training in adequate quantity shall be provided. Apart from it one set of document in hard copies and soft copy as well shall be given to each trainee deputed by railway for training.

4.25.6 Training shall include real-time simulator and offline simulator, data log and its utilization.

4.26 **Spares**: Tenderer shall quote for mandatory spares along with storage cupboard for keeping the spares under lock & key at site. It shall include all the common modules/sub-modules/card frames & accessories including connecting cable, indoor & outdoor installation material. This shall include proper identification tag for identifying the spare, proper antistatic cover for cards/module to keep the spares. Quantity of spares to be supplied shall be as per Bill of Quantities.

4.26.1 All units which may include but not limited to circuit packs, modules, plug in units, ancillary equipment connectors, couplers of each type, which may be lowest level filed replaceable assembly/device.

4.26.2 Power supply equipment. Connectors and couplers of each type with cables, crystals, MCBs switches

4.26.3 Software back up in two sets of CDs /DVDs / Pen Drive/ Memory Chips.

4.26.4 Three times the quantity of fuses used in the equipment for each type. Spares which are considered essential by the Railways but not quoted by the tenderer shall be assumed by the Railways that those shall be required to be supplied without any additional cost.

4.26.5 Quantity of Spare RFID Tags shall be minimum 20% and other spares shall be minimum 10%.

4.26.6 In addition to the essential spares, tenderer shall indicate additional recommended quantities of spares for efficient maintenance of the equipment and the systems which is considered necessary by the tenderer for a period of 5 years after expiry of **Warranty** period (not to be included in the spares referred mandatory as above) to ensure that the quality & reliability is achieved. The details, unit price and the total cost of recommended spares shall be included in the tender as an option. T**he cost of such recommended spares meant for use after expiry of Warranty** period **shall not be considered for tender evaluation.**

4.27 **Supply of Technical Documents:**

4.27.1 Railway shall provide permanent Way plan (indicating the gradients), Signalling Interlocking Plan for the sections and yards to successful tenderer so as to study braking related issues.

4.27.2 The tenderer shall supply all necessary documents as per Railway's requirement without any additional cost. This shall include following. Six sets each of documents mentioned below should be supplied in neat bound books. Diagrams including tracings shall be handed over to Railways. All documents in PDF format and drawings in AutoCAD format shall be given on six sets of CD/ DVD / Pen Drive. All the installation drawings pertaining to a section/station/shed shall be supplied in a good quality folder for each section/ station/shed. During installation, a folder containing all the drawings, testing procedures, commissioning procedure shall be kept at the stations :

4.27.2.1 For On-Board Equipments

i. Installation details, Equipment layout & Brake interface details duly approved by OEM and Railways,
ii. Manual describing details of equipments, their purpose & specification, principle of operation and details of power supply arrangement. It should also include details of various components of the equipment.
iii. Manual of Installation by OEM
iv. Manual of Maintenance
v. Pre-Commissioning Checklist
vi. Diagnostic Procedure including troubleshooting
vii. User manual with Do's and Don'ts
viii. Any other documents required by Railways for the normal operation & maintenance

4.27.2.2 For Stationary Equipments

i. Installation details and Equipment layout duly approved by OEM and Railways,
ii. Manual describing details of equipments, their purpose & specification, principle of operation and details of power supply arrangement. It should also include details of various components of the equipment.
iii. Manual of Installation by OEM
iv. Manual of Maintenance
v. Pre-Commissioning Checklist
vi. Diagnostic Procedure including troubleshooting
vii. User manual with Do's and Don'ts
viii. Any other documents required by Railways for the normal operation & maintenance

4.27.2.3 For Track Side Equipment

i. Site installation details.
ii. Equipment disposition layout,
iii. Manual describing details of equipments, their purpose & specification, principle of operation and details of power supply arrangement. It should also include details of various components of the equipment.
iv. Manual of Installation by OEM
v. Manual of Maintenance
vi. Diagnostic Procedure including troubleshooting
vii. Pre-Commissioning Checklist
viii. User manual with Do's and Don't
ix. Any other drawings/ documents as required by Railway for the successful operation maintenance of this system

4.27.2.4 For Central Monitoring Unit

i. Installation details and Equipment layout duly approved by OEM and Railways,
ii. Manual describing details of equipments, their purpose & specification, principle of operation and details of power supply arrangement. It should also include details of various components of the equipment.
iii. Manual of Installation by OEM
iv. Manual of Maintenance
v. Pre-Commissioning Checklist
vi. Diagnostic Procedure including troubleshooting
vii. User manual with Do's and Don'ts
viii. Any other documents required by Railways for the normal operation & maintenance

4.27.2.5 Quality Assurance Manual of the OEM

4.27.2.6 Details of test accessories, test and measuring instruments required. Test facilities required for the installation, testing & commissioning and maintenance of the system.

4.27.2.7 A list of all cards/Modules used in each set system

4.27.2.8 Typical testing sheets and detailed testing procedures

4.27.2.9 Successful Tenderer shall supply all documents as per RDSO specification RSDO/SPN/196/2012 Version 3.1.1 with latest amendments/ Version.

4.27.2.10 Pre-Commissioning Checklist

4.27.2.11 Diagnostic Procedure including troubleshooting

4.27.2.12 User manual with Do's and Don'ts

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

4.27.2.14 System Requirement Specification to address multi-vendor interoperability so that it should be possible to inter-operate Loco TCAS Equipment, Stationary TCAS Equipment and Track-mounted TCAS equipment of different vendors / tenderers with full Compatibility

4.27.2.15 All the Test Log, Raw Data in form of softcopy and interpretable data in softcopy and hardcopy, shall be provided to RDSO immediately after each trial session.

4.28 The Contract Package-wise details are as under:

Broad details are given as under. Further details are mentioned in Schedule of Requirements.

S. No.	Description	Section	On board Systems
a)	**Contract Package – A** **Design and Development of Train Collision Avoidance System (TCAS) on Sadashivpet Road – Viakarabad – Chitgidda – Wadi (Excluding) section of Secunderabad Division**	Sadashivpet Road LC 9 (between Sadashivpet Road – Vikarabad) LC 4 (between Sadashivpet Road – Vikarabad) IB (between Vikarabad – Chitgidda) Chitgidda Vikarabad Godamgura IB (between Godamgura - Dharur) Dharur Rukmapur IB (between Rukmapur - Tandur) Tandur Mantatti Nawandgi Kurugunta Seram IB (between Serum – Malkhaid Road) Malkhaid Road IB (between Malkhaid Road and Chittapur) Chittiapur Sulehali Wadi (Excluding)	Loco-motives : 20

S. No.	Description	Section	On board Systems
b)	**Contract Package – B** **Design and Development of Train Collision Avoidance System (TCAS) on Sadashivpet Road (Excluding) – Bidar section of Secunderabad Division**	Sadashivpet Road (Excluding) LC 13 (bet. Sadashivpet Road – Marpalli) Marpalli Kohir LC27 (between Kohir – Zahirabad) Zahirabad LC 32 (between Zahirabad – Matalkunta) LC 33 (between Zahirabad – Matalkunta) Matalkunta LC 41 (between Matalkunta - Bidar) LC 42 (between Matalkunta - Bidar) Bidar	Loco-motives : 12
c)	**Contract Package – C** **Design and Development of Train Collision Avoidance System (TCAS) on Chitgidda (Excluding) – Lingampalli section of Secunderabad Division**	Chitgidda (Excluding) Gullaguda IB (between Gullaguda and Shankarpalli) Shankarpalli IB (between Shankarpalli and Nagalpalli) Nagalpalli IB (between Nagalpalli and Lingampalli) Lingampalli	Loco-motives : 8

4.29 The sketches of stations, IBS, mid- block section interlocked level crossing gates and block sections have been provided in this Section for broad assessment and guidance. Railway may carry out the alterations and modifications in the interlocking or other arrangements at site during the course of execution in the intervening period. The Contractor also shall have to modify or reconfigure the installation to suit the latest conditions at site without additional cost.

5.0 The model time frame is as under :

Stage.	Activities	Indicative Period (months)
b.	Supply of items	'D'+ 2
c.	Installation of equipment at site	'D'+ 3
d.	Up-gradation of equipment to specification	'D'+ 6
e.	Completion of trial & ISA certification	'D'+ 12 (='E')
f.	Successful completion of Warranty period	'E' + 24

Note: For Category I & Category-II tenderers, D shall be date of award of tender

6. Intellectual Property Right (IPR):

6.1 RDSO is awarding this tender for development of TCAS technology based on the scheme and specification prepared by RDSO and asking tenderers to carry out the development and thereafter trials on sections identified. After successful development of the system, the same shall be deployed on large scale over Indian Railways. Also, there will be possibility of export of the system to other world railways.

6.2. As such, the products so developed shall have joint IPR of RDSO and the tenderers who have been awarded the tender. For this, they have to sign a separate Memorandum of Understanding (MoU) which is mandatory on award of contract.

6.3. For supply of equipment to Indian Railways, no royalty needs to be shared with RDSO. However, any export of the equipment during 10 years period from the date of acceptance & approval of the system, 2% of the total payment received against supply of TCAS shall be shared as royalty with RDSO.

7. CONTRACT PERFORMANCE GUARANTEE BOND/BANK GUARANTEE

The Contract Performance Guarantee shall be governed by IRS conditions with clarification that Acceptance / Provisional acceptance as specified in Para 20 the SCC shall be considered as "performance and completion" as mentioned in Para 0604 of IRS conditions subject to submission of bank guarantee for an amount of 10% of contract value, as warranty security as mentioned in Para 8.

8. WARRANTY

The Warranty Performance Guarantee of 10% of Contract Value with validity of total 24 months + 90 days for covering duration of 24 months warranty period shall be governed by IRS conditions with following additional items as under.

8.1 All equipment and system supplied by the contractor shall be guaranteed against the defects for a period of twenty four months from the date of Acceptance / Provisional acceptance of system by RDSO.

8.2 During the period of warranty, the contractor shall remain responsible for setting right the equipment and software/hardware changes if any required due to problem if any noticed or modification if any needed during interoperability tests done with other firms at his own cost. This decision of the Railway's representatives in this regard to direct the contractor to attend to any damage or defect shall be final and binding on the contractor.

8.3 During the period of warranty, the contractor shall be responsible to the extent expressed in this clause for any defect that may develop under the conditions provided for by the contract and under proper use, arising from faulty check up of hardware & software or form faulty execution by the contractor but not otherwise and shall rectify such defects without an additional cost when called upon to do so by the purchaser.

8.4 If it becomes necessary for the contractor to replace or renew any defective portions of the software or hardware under this clause, the provision of this clause shall apply to the portion of the equipment replaced or renewed until the expiry of six months from the date of such replacement or renewal or until the end of the warranty period whichever may be later.

8.5 For ensuring the functioning of system during warranty period, the firm shall provide all spares and manpower at loco shed/s and also for maintenance support of line side equipment as decided by RDSO/Railways.

8.6 During the Warranty period, the performance of the system shall be evaluated in terms of Para 12 of the RDSO Specification No. RDSO/SPN/196 Version 3.1.1.

9. PLACING IN SERVICE AND MAINTENANCE

9.1 After the installation is placed in service, the contractor shall be responsible for the proper functioning of the equipment without struck up and malfunction for a period of 24 months.

9.2 Any lacuna noticed in the functioning of the equipment as a result of any wrong checking feature shall be rectified by the contractor free of cost during this period.

9.3 During analysis of failures, if software bug or any deficiency is pointed out by the Railway, the contractor shall rectify the deficiency at his own cost and get modifications validated.

9.4 The firm shall also give cost for AMC of equipment for a period of 5 years after warranty and in service maintenance. The order for AMC shall be placed on year to year basis by Railway and rates awarded shall be valid till the end of AMC period. The firm has to ensure required performance of system during the AMC period as defined in specification of TCAS and for this necessary spares and manpower shall be deployed by firms at loco sheds and other location as decided in consultation with Railways.

10. INSPECTION

RDSO's authorised representative would carry out inspection of the validation process during validation and or at the place of manufacture before validated software is submitted. Also, inspection of all items supplied shall also be done by RDSO at the firms premises.

11. TESTING

11.1 Testing of the validated software after doing modification if any, shall be carried out by RDSO's engineer to ensure that all requirements of the tenders specifications are complied.

11.2 If so desired by the RDSO's engineer, some or all of the modifications, tests if necessary, will be done before actual use of software.

11.3 FACILITIES FOR TEST AND EXAMINATION

The contractor shall, at his own expense, extend all responsible facilities as may be necessary for satisfying inspecting official and himself that the validation is in accordance with the specified/ identified requirements. The Inspecting Officer shall have full and free access to the company's work for the purpose aforesaid, any time during the execution of the contract. Inspecting official may require the contractor to make arrangements for the tools/test equipments needed to test/validate the system at his premises or at any other place specified by the Inspecting Officer. 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 as above.

11.4 COST OF TEST

The contractor shall provide without any extra change all materials, testing equipment, tools, labour and assistance of every kind which the Inspecting Officer may demand of him for any test and examination, other than special or independent test, which he shall require to be made on the contractor's premises and the contractor shall bear and pay all costs attendant thereon. If the contractor fails to comply with the conditions aforesaid, the Inspecting Officer shall, in his sole judgement, be entitled to change the place for test and examination related to all or any of the validation processes 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 tests 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.

11.5 DELIVERY OF WORK FOR TEST

The contractor shall also provide and deliver for test, free of charge, at such place other than his premises as the Inspecting Officer may specify such material or stores he may require.

12. **INDEMNITY**

12.1 The contractor shall at all times indemnify the purchaser against all claims which may be made in respect of stores for infringement of any right protected by patent, registration of designs or trademark, provided always that in the event of any claim in respect of alleged breach of letters patent registered designs or trademark being made against the purchaser, the purchaser shall notify the contractor of the same and the contractor shall at his own expense, either settle any such dispute or conduct any litigation that may arise there from.

13. **PACKING**

13.1 The contractor shall pack at his own cost the equipment 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.

14. **FREIGHT**

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

15. SUPPLY AND CUSTODY OF MATERIAL

15.1 The contractor shall be entirely responsible and shall bear all expenses towards supply of equipment (s) from the source of supply to the Railway's/RDSO's premises / representative nominated at site. The responsibility for damage during transportation and till it is taken over by Railways/RDSO after commissioning shall be that of the contractor.

15.2 The contractor shall be responsible for any loss or damage to the equipment supplied by the Railways and shall execute an Indemnity Bond for the works that will remain in his custody and which have been supplied by the Railways. The cost of stores lost or damaged when under the custody of the contractor will be realised by the Railways with the help of Indemnity Bond.

15.3 During the trial period, it shall be the Tenderer's responsibility to safeguard the equipment from any type of damage, theft etc. He would take suitable measures to prevent the same.

16. QUALITY ASSURANCE

16.1 The tenderer shall submit alongwith the tender the quality control plan including full details of in-house quality assurance organization, procedures and documentation. During the validating process, proper record shall be maintained for the inspection and tests carried out according to this plan.

17. LIQUIDATED DAMAGE

17.1 The time for completing the schedule of work stipulated in the SSC shall be deemed to the essence of the agreement. If the contractor fails to complete the contract as a whole or schedule of sub-work within the prescribed time, or extended time, Purchaser shall, if satisfied that the work can be completed by the contractor within a reasonable short time, thereafter, be entitled without prejudice to any other right or remedy available on that behalf to deduct or recover by way of liquidated damage and not as a penalty a sum equivalent to one half of 1% of the value of agreement for each week or part thereof for which the contractor is in default subject to a maximum of 10% of the value of agreement and allow to contractor such further extension of time as Indian Railway may decide. The recovery or deduction of sub-damages shall not relieve the contractor from his obligation or liabilities under the agreement.

17.2 If, before the completion of the whole of the contract, any part or section of the work has been certified by the engineer as completed, and occupied or used by the purchaser, the liquidated damages for delay shall, for any period of delay after such certificate and in the absence of alternative provisions in the contract be reduced in the proportion which the value of the part or section so certified bears to be value of the whole of the contract.

18. **TAXES**

For working out FOR prices all taxes, duties levied by Central/State/Local bodies shall be indicated at the current applicable rates. Sales Tax shall be paid against form 'D' to be obtained by the contractor from Railways. Work Contract Taxes for Schedule-Q, Schedule-R and Schedule-S shall be recovered from the bills.

19. **MODVAT**

The price to be quoted by the tenderers should take into account the credit availed on inputs under the MODVAT scheme. The tenderers should give a declaration that any set-offs in respect of duties on inputs as admissible under law is being totally and unconditionally passed on to the purchaser in the price quoted by him.

20. PAYMENT TERMS: <u>As per Schedule of Payment</u>

20.1 Since the development shall be undertaken in phases and field trial will start once the equipment has been developed meeting basic functional requirements subject to confirmation by the firm that any required up-gradation of the equipment shall be possible with mainly software upgrade. As such, following stage of payment shall be applicable:

Stage	Activities	Indicative Period (months)	Payment Schedule for Sch-P	Payment Schedule for Sch-Q	Payment Schedule for Sch -R
X-1	Design, Development and Supply	D+2	30%	--	--
X-2	Installation and Successful Field trial for one month	D+4	25%	60%	80%
X-3	Compliance of equipment to finalized specification except for availability of ISA certification	D+6	15%	10%	--
X-4	Demonstration of Multi-Vendor Interoperability	D+ 9	10%	10%	--
X-5	Completion of trial and ISA certification and Acceptance / provisional acceptance by RDSO	D+ 12 (='E')	10%	10%	10%
X-6	Successful completion of Warranty period	'E' + 24	10%	10%	10%

Stage	Activities	Indicative Period (months)	Payment Schedule for Schedule -S	Payment Schedule for Schedule -T
Y-1	Design, Development, Supply	D+8	60%	--
Y-2	Installation and Successful functioning for one month	D+9	30%	--
Y-3	Training to Staff	D+10	--	90%
Y-4	Successful completion of Warranty period	'E' + 24	10%	10%

20.2 (a) For Category I & Category-II tenderers, D shall be date of award of tender.

(b) Demonstration of Multi-Vendor interoperability is to be made both-ways with Track-side, Locomotive and Station Equipment of all other tenderers.

(c) The system shall be accepted on completion of all the stages X-1, X-2, X-3, X-4, X-5, Y-1, Y-2 and Y-3 of the above tables of Para 20.1 as decided by the RDSO Engineer-In-charge. However, in case the multi-vendor inter-operability could not be possible within 360 days from the date of award of the tender on

account of another vendor not being available or not being ready by that time should all other conditions, not dependent on testing of multi-vendor interoperability, are certified by RDSO Engineer-In-charge to have been fulfilled, the provisional acceptance shall be made as decided by the RDSO Engineer-In-Charge.

(d) Warranty period shall be Twenty Four months from the date of acceptance or provisional acceptance (E) of the system by RDSO.

(e) In case of provisional acceptance as defined above, the tenderer shall be liable to carry out these activities to complete the residual stages during warranty period as and when feasibility permits. The residual amount shall be released as and when the residual stage(s) are completed subsequently during the warranty period or on successful completion of Warranty Cover whichever is earlier.

(f) Work shall be treated as completed on Acceptance or successful completion of Warranty period whichever is earlier.

(g) The retention mentioned under item no. X-6 and Y-4 of Para 20.1 is in addition to Warranty Performance Guarantee Bond.

(h) Part payments for various items under various schedules would be permitted subject to due certification by competent authority of RDSO.

21. DEDUCTIONS:

21.1 Payment shall be subject to the deduction of any amount for which the Tenderer is liable under the contract against this tender or any other contract in respect of which the President of India is the purchaser. Income tax plus surcharges thereof will be deducted at source wherever applicable.

21.2 Sales Tax and surcharges on it, as applicable, will be deducted at source. Supply of the material shall be FOR Destination.

21.3 Work Contract Taxes for Schedule-Q, Schedule-R and Schedule-S shall be recovered from the bills.

22. **Quantity variation and option clause**

"The Purchaser reserves the right to vary the ordered quantity by (+) 30% at any time, till final delivery date of the contract, by giving reasonable notice even though the quantity ordered initially has been supplied in full before the last date of Delivery Period."

Quantity variation and option clause against each individual purchase order (even though issued from the same tender) shall not exceed +/- 30% of the ordered quantity against each purchase order.

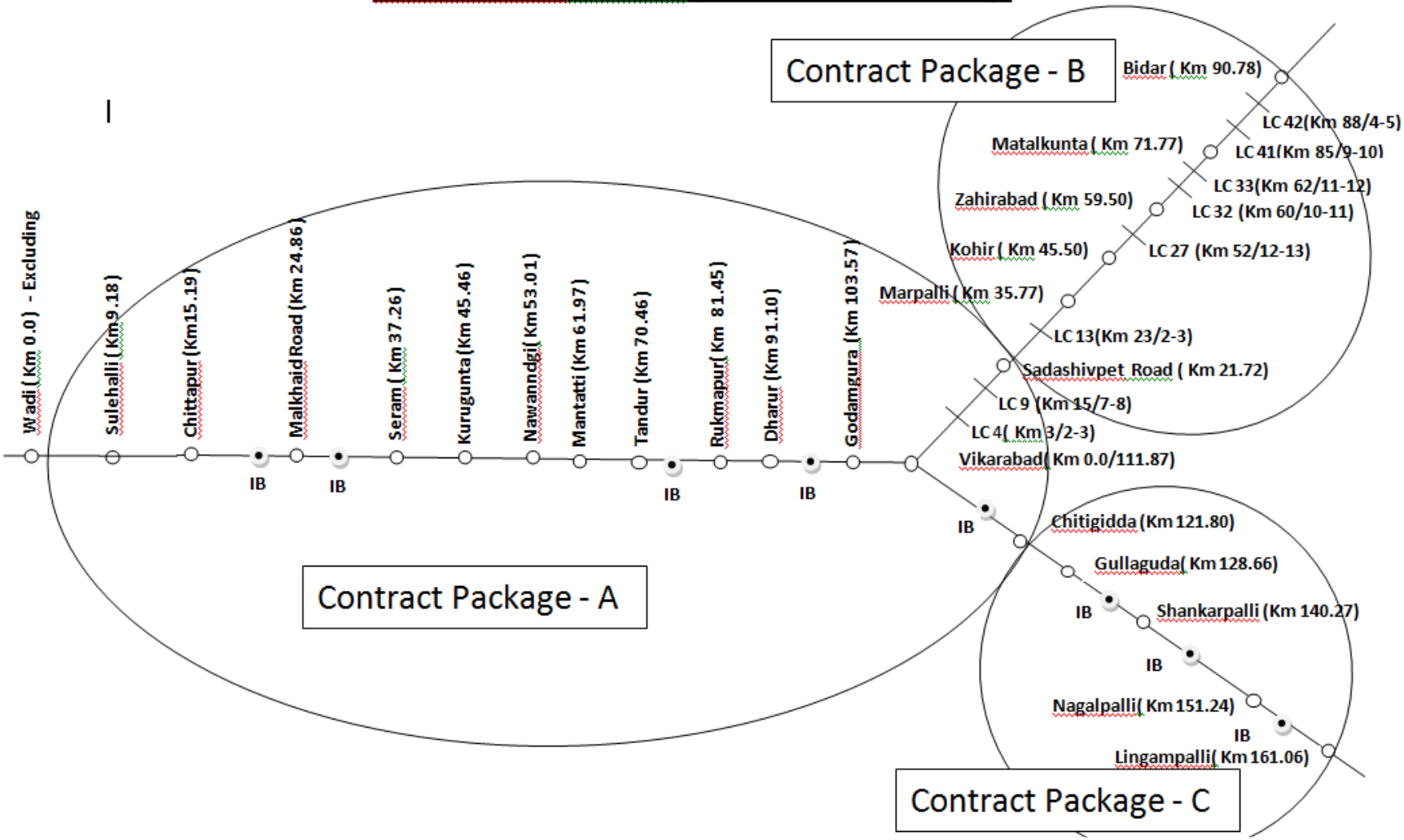
Option clause shall be exercised during the currency of the contract such that the contractor has reasonable time/notice for executing such increase or decrease, +30% option clause can be exercised even if the original ordered quantity is completed before the last date of delivery.

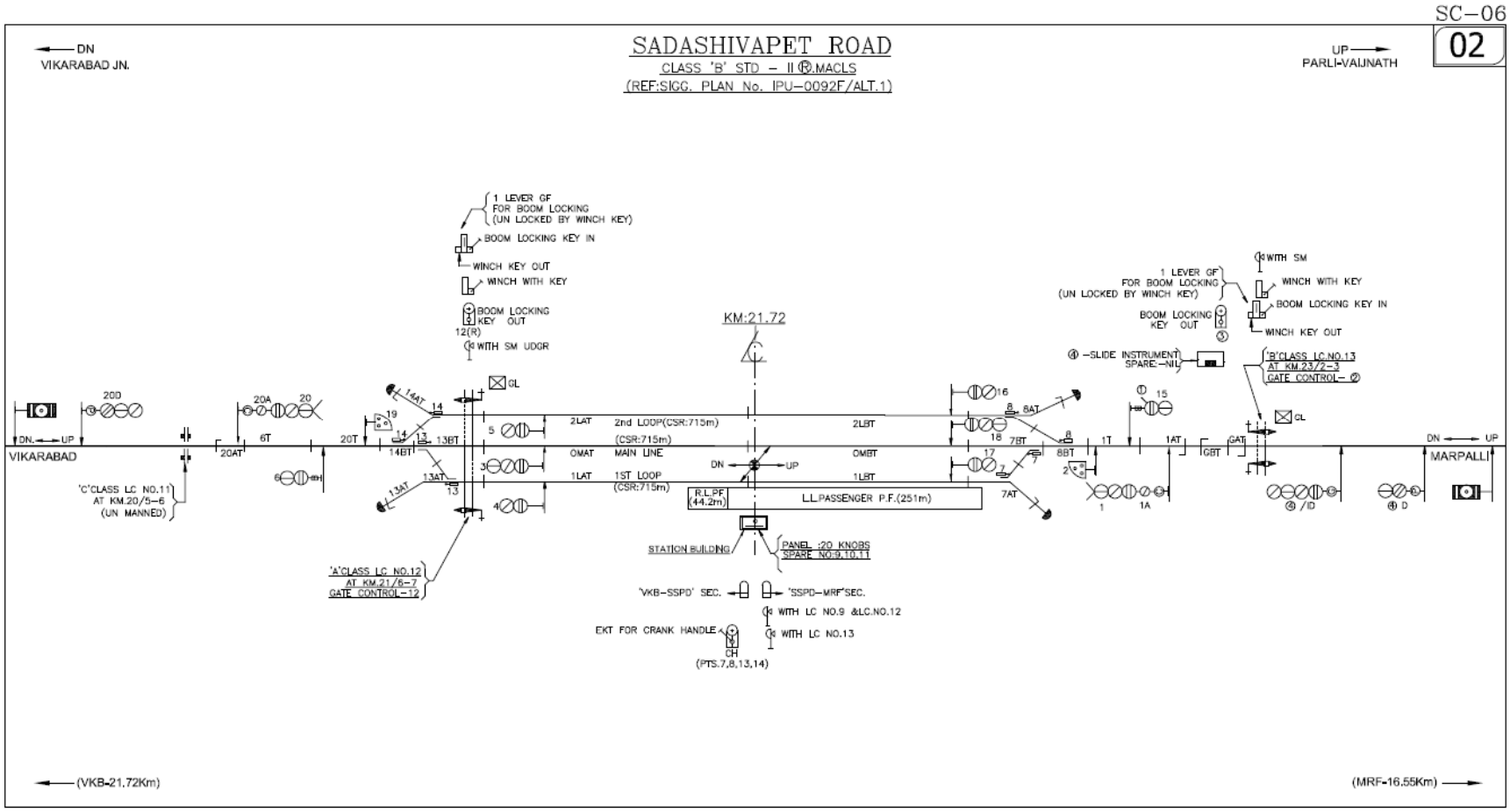
Clarifications : —Reasonable notice as mentioned above is only for the purpose of allowing the contractor suitable time to make necessary arrangements for the supplies and not for seeking any consent from the contractor towards exercise of the contractual Option Clause. To this end, a reasonable delivery schedule for the enhanced ordered quantity stipulated in the relevant amendment to the contract will suffice.

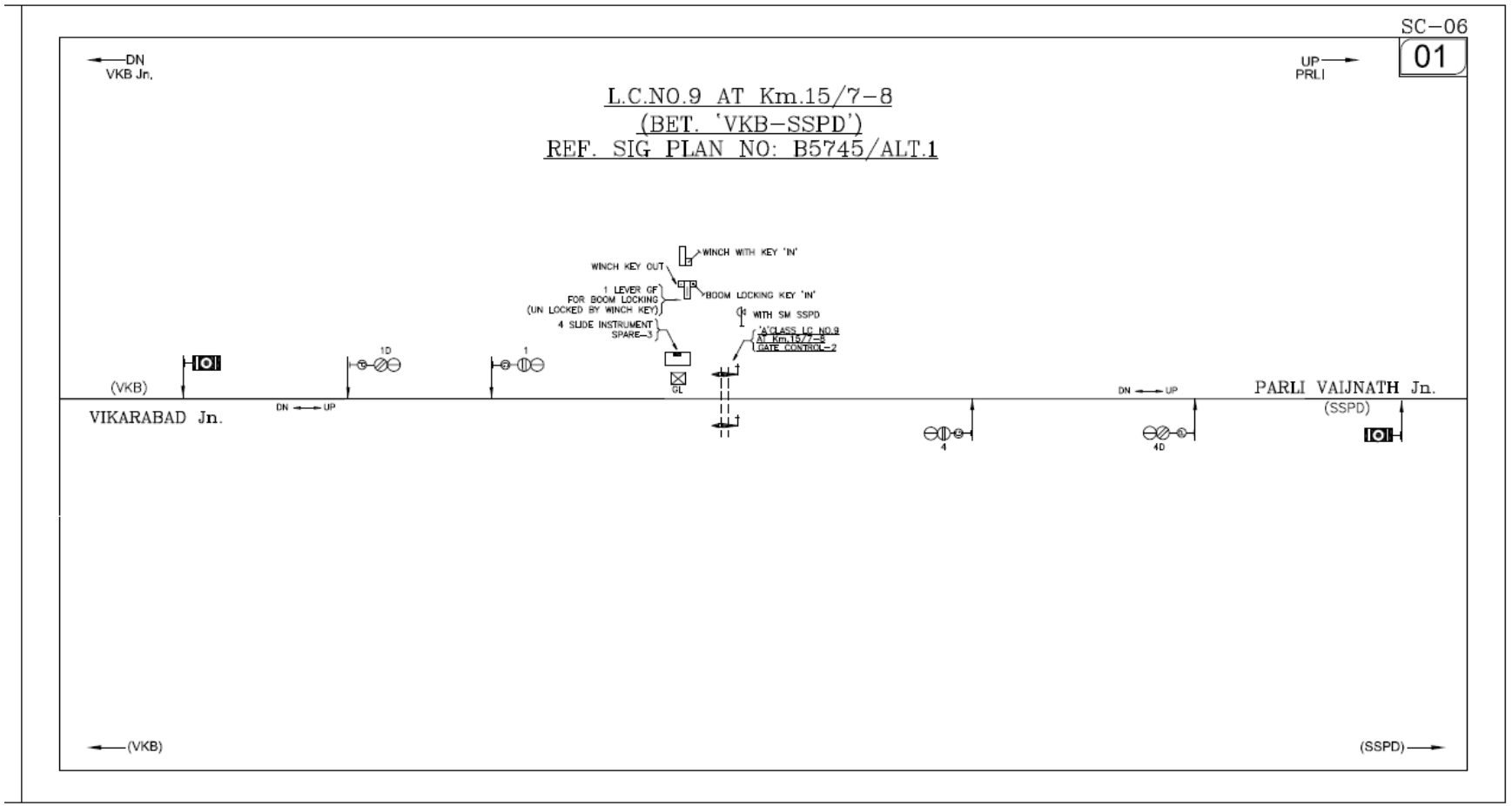
In case DP is extended in a contract with (+) 30% Option Clause either for the full ordered quantity or a part quantity which remained unsupplied on the date of expiry of the original DP, then during the extended delivery period also, quantity variations can be made on the total ordered quantities.

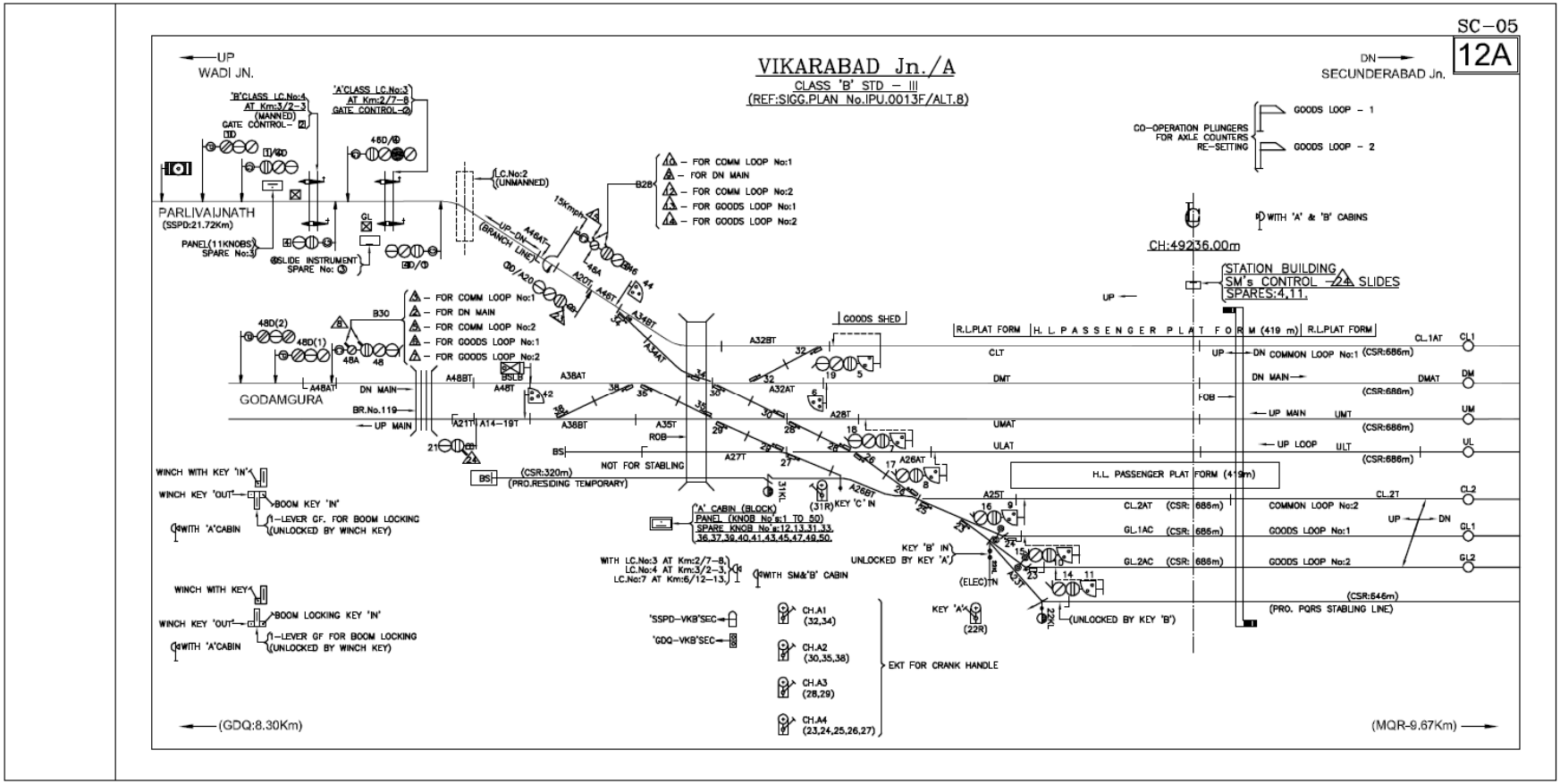
In regard to operation clause in Stores contracts, it has been decided that while operating +30%option clause, the practice of rounding off the number to the nearest whole number is appropriate as well as logical and the same may be adopted. Less than 0.5 should be ignored and 0.5 or more should be rounded off to the next whole number as far as practicable.

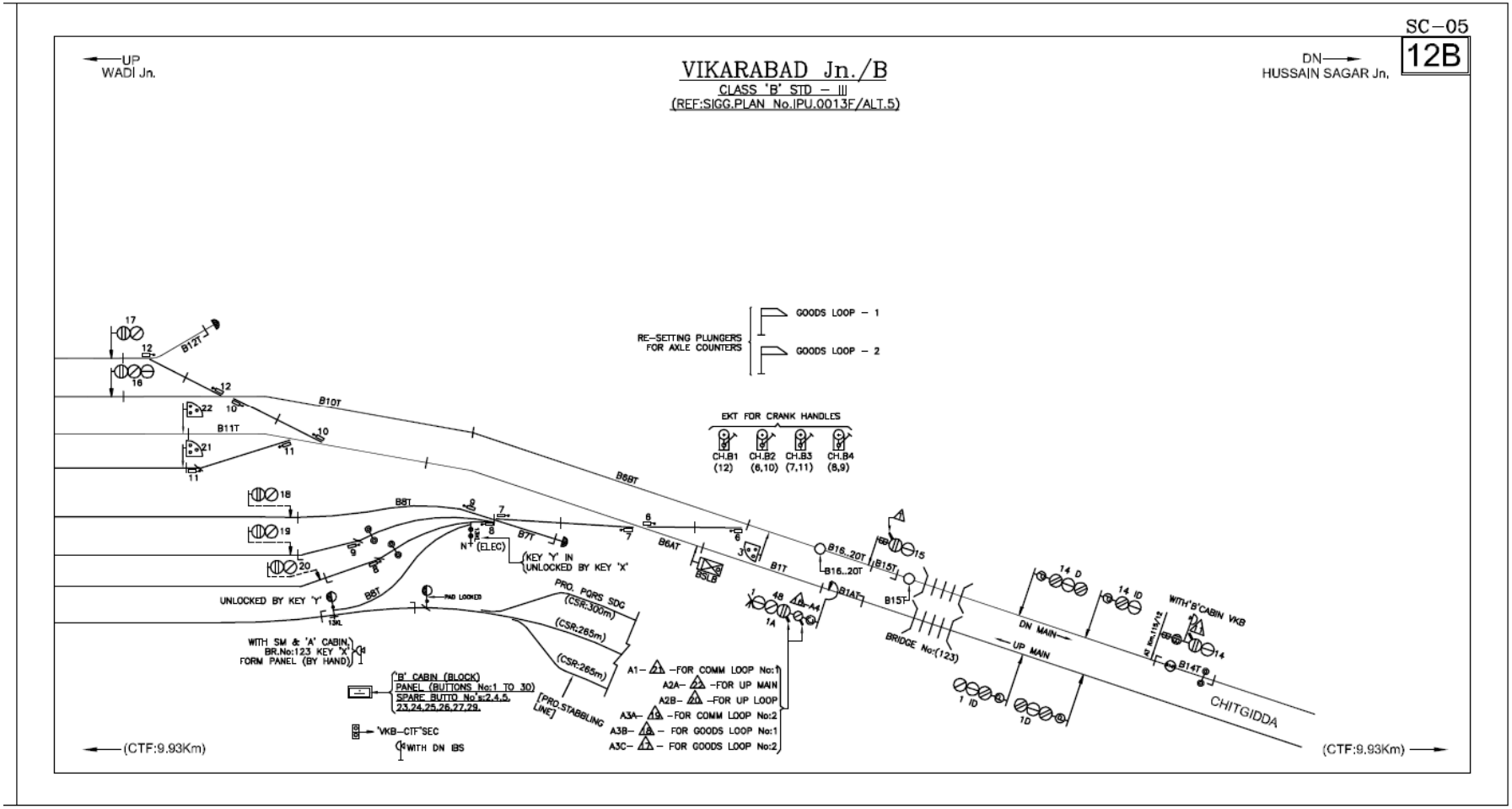
Section for Development of Train Collision Avoidance System:
Secunderabad Division (South Central Railway)

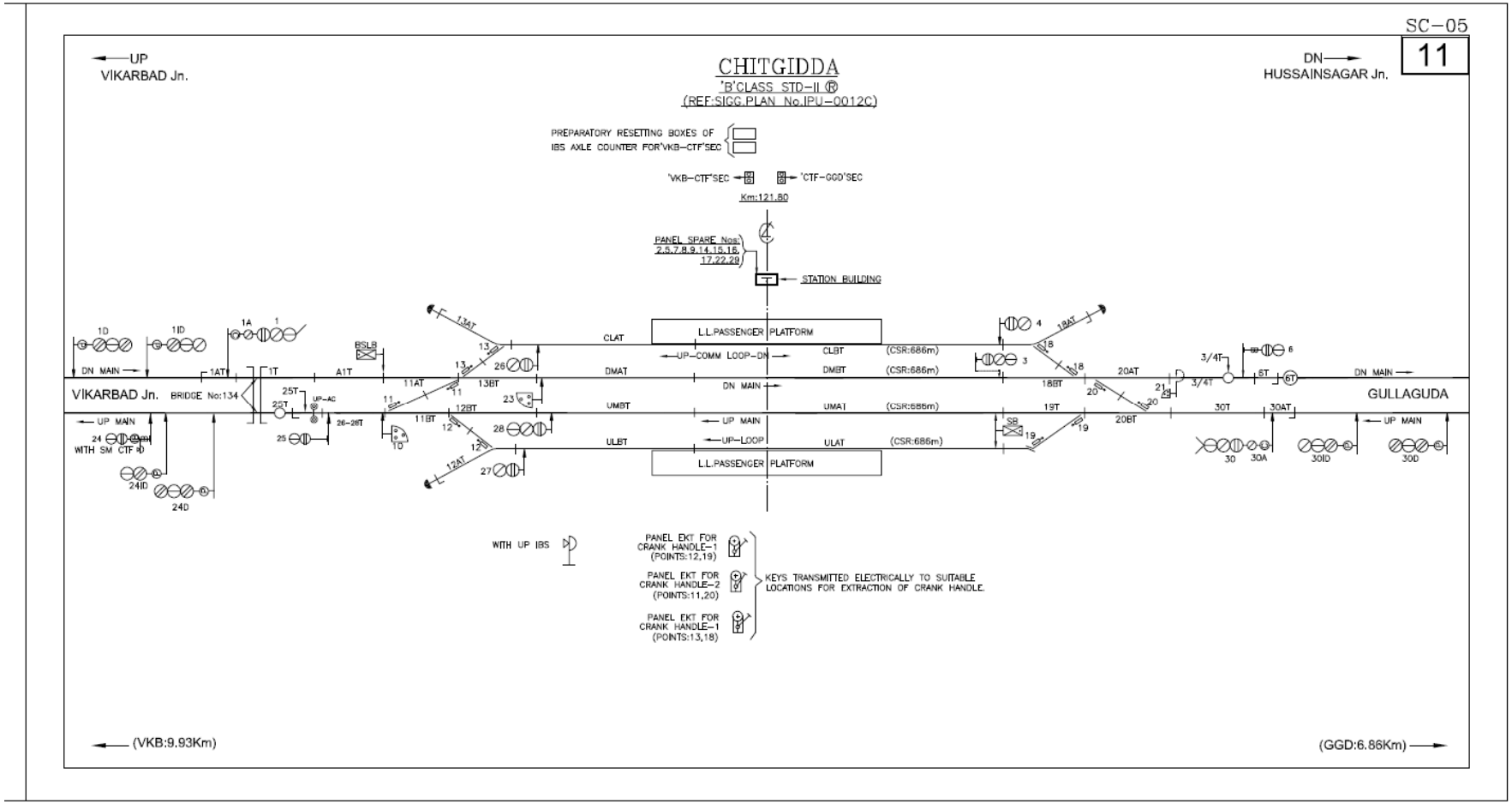


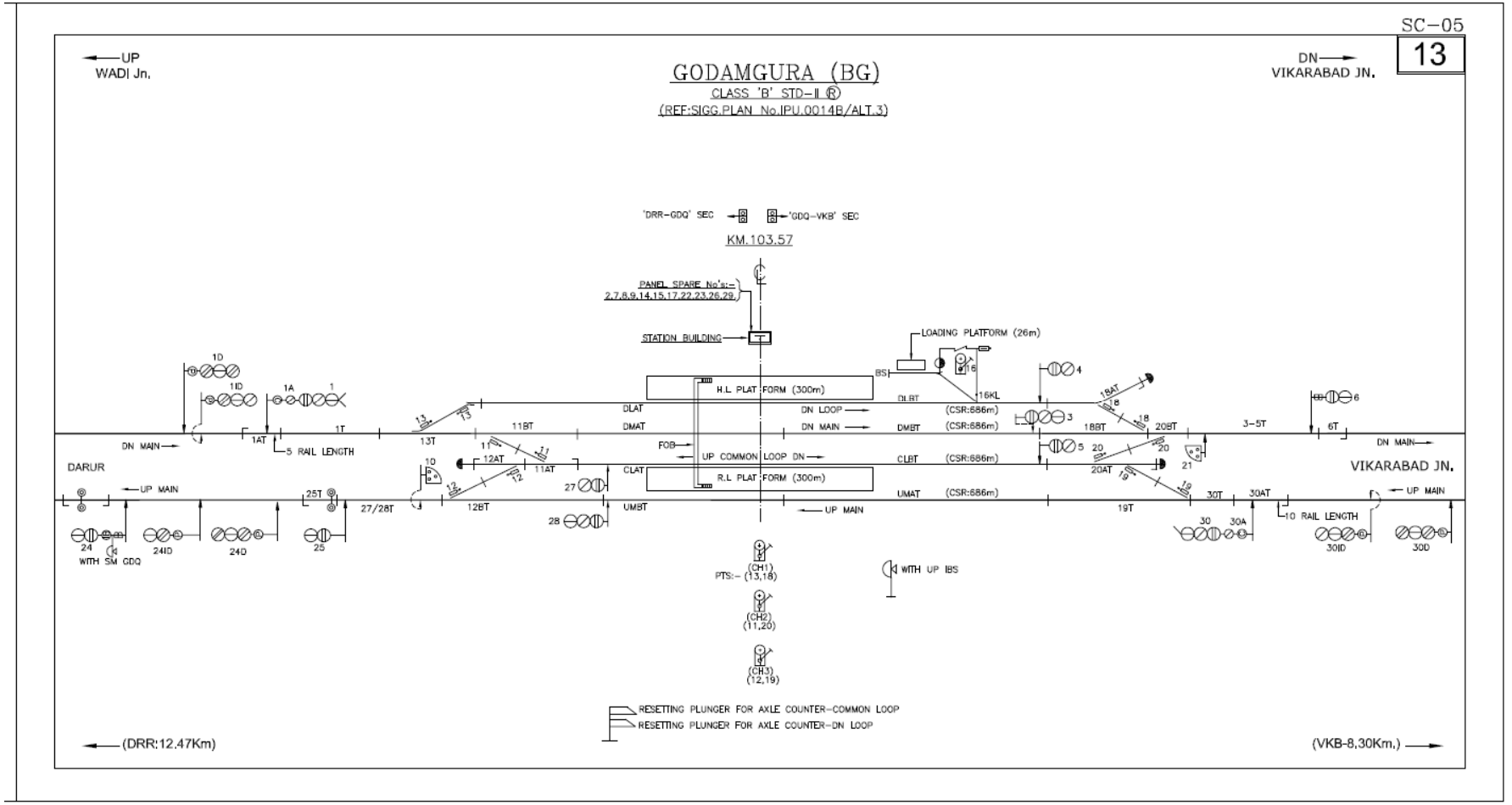

SC–06
02
SADASHIVAPET ROAD
CLASS 'B' STD – II ®.MACLS
(REF:SIGG. PLAN No. IPU–0092F/ALT.1)
DN
VIKARABAD JN.
UP
PARLI-VAIJNATH
KM:21.72
VIKARABAD
MARPALLI
DN
UP
1 LEVER GF
FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
BOOM LOCKING KEY IN
WINCH KEY OUT
WINCH WITH KEY
BOOM LOCKING
KEY OUT
12(R)
WITH SM UDGR
WITH SM
WINCH WITH KEY
BOOM LOCKING KEY IN
WINCH KEY OUT
BOOM LOCKING
KEY OUT
④ –SLIDE INSTRUMENT
SPARE:–NIL
'B'CLASS LC NO.13
AT KM.23/2–3
GATE CONTROL– ②
'C'CLASS LC NO.11
AT KM.20/5–6
(UN MANNED)
'A'CLASS LC NO.12
AT KM.21/6–7
GATE CONTROL–12
2nd LOOP(CSR:715m)
(CSR:715m)
MAIN LINE
1ST LOOP
(CSR:715m)
R.L.PF.
(44.2m)
L.L.PASSENGER P.F.(251m)
STATION BUILDING
PANEL :20 KNOBS
SPARE NO:9,10,11
'VKB–SSPD' SEC.
'SSPD–MRF'SEC.
WITH LC NO.9 &LC.NO.12
EKT FOR CRANK HANDLE
WITH LC NO.13
(PTS.7,8,13,14)
(VKB-21.72Km)
(MRF-16.55Km)

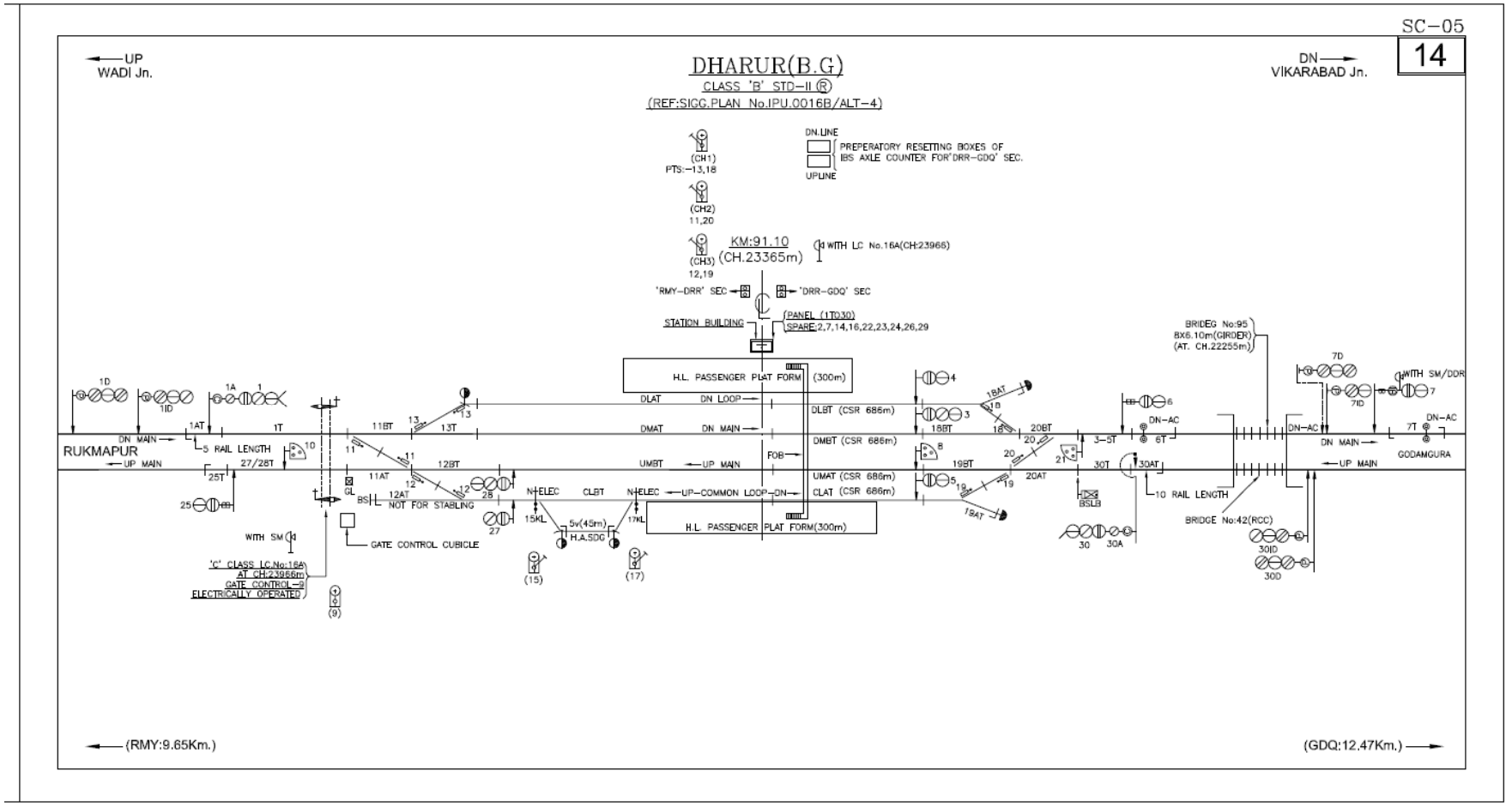

SC–06
01
DN
VKB Jn.
UP
PRLI
L.C.NO.9 AT Km.15/7–8
(BET. 'VKB–SSPD')
REF. SIG PLAN NO: B5745/ALT.1
WINCH WITH KEY 'IN'
WINCH KEY OUT
1 LEVER GF
FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
BOOM LOCKING KEY 'IN'
WITH SM SSPD
4 SLIDE INSTRUMENT
SPARE–3
'A'CLASS LC NO.9
AT Km.15/7–8
GATE CONTROL–2
GL
1D
1
(VKB)
VIKARABAD Jn.
DN UP
DN UP
4
4D
PARLI VAIJNATH Jn.
(SSPD)
(VKB)
(SSPD)

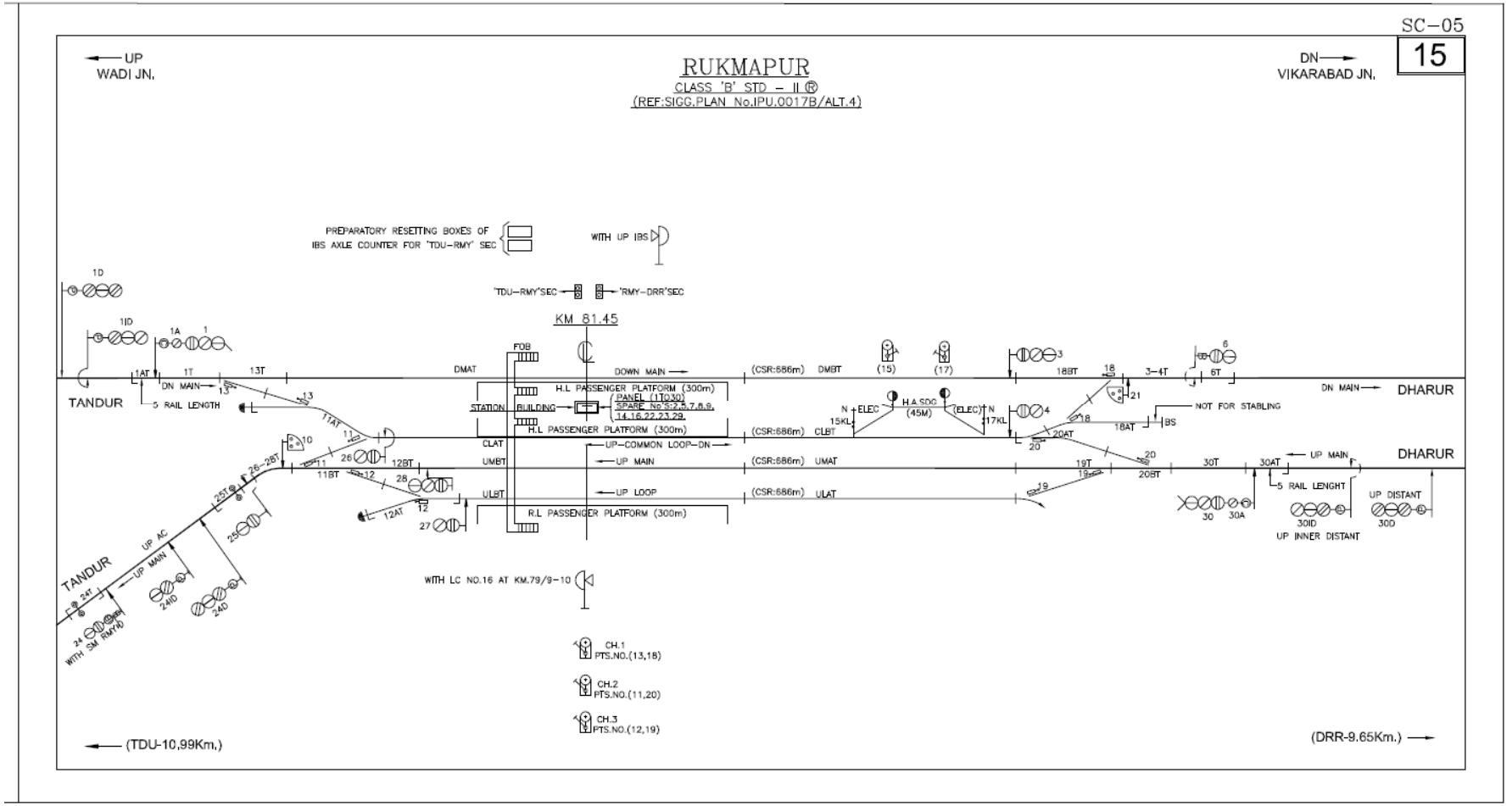

SC–05
12A
VIKARABAD Jn./A
CLASS 'B' STD – III
(REF:SIGG.PLAN No.IPU.0013F/ALT.8)
UP
WADI JN.
DN
SECUNDERABAD Jn.
PARLIVAIJNATH
(SSPD:21.72Km)
GODAMGURA
DN MAIN
UP MAIN
BR.No.119
GOODS SHED
R.L.PLAT FORM
H. L. PASSENGER PLAT FORM (419 m)
R.L.PLAT FORM
H.L. PASSENGER PLAT FORM (419m)
STATION BUILDING
SM's CONTROL
SPARES:4,11.
SLIDES
CH:49236.00m
WITH 'A' & 'B' CABINS
GOODS LOOP – 1
GOODS LOOP – 2
CO–OPERATION PLUNGERS FOR AXLE COUNTERS RE–SETTING
NOT FOR STABLING
(CSR:320m)
(PRO.RESIDING TEMPORARY)
'A' CABIN (BLOCK)
PANEL (KNOB No's:1 TO 50)
SPARE KNOB No.s:12,13,31,33,
36,37,39,40,41,43,45,47,49,50.
WITH LC.No:3 AT Km:2/7–8,
LC.No:4 AT Km:3/2–3,
LC.No:7 AT Km:6/12–13,
WITH SM&'B' CABIN
KEY 'B' IN
UNLOCKED BY KEY 'A'
KEY 'A'
(UNLOCKED BY KEY 'B')
'SSPD–VKB'SEC
'GDQ–VKB'SEC
CH.A1 (32,34)
CH.A2 (30,35,38)
CH.A3 (28,29)
CH.A4 (23,24,25,26,27)
EKT FOR CRANK HANDLE
(GDQ:8.30Km)
(MQR–9.67Km)
CL_1AT
CL_2T
CL_2AT (CSR: 686m)
GL_1AC (CSR: 686m)
GL_2AC (CSR: 686m)
COMMON LOOP No:2
GOODS LOOP No:1
GOODS LOOP No:2
(CSR:646m)
(PRO. PQRS STABLING LINE)

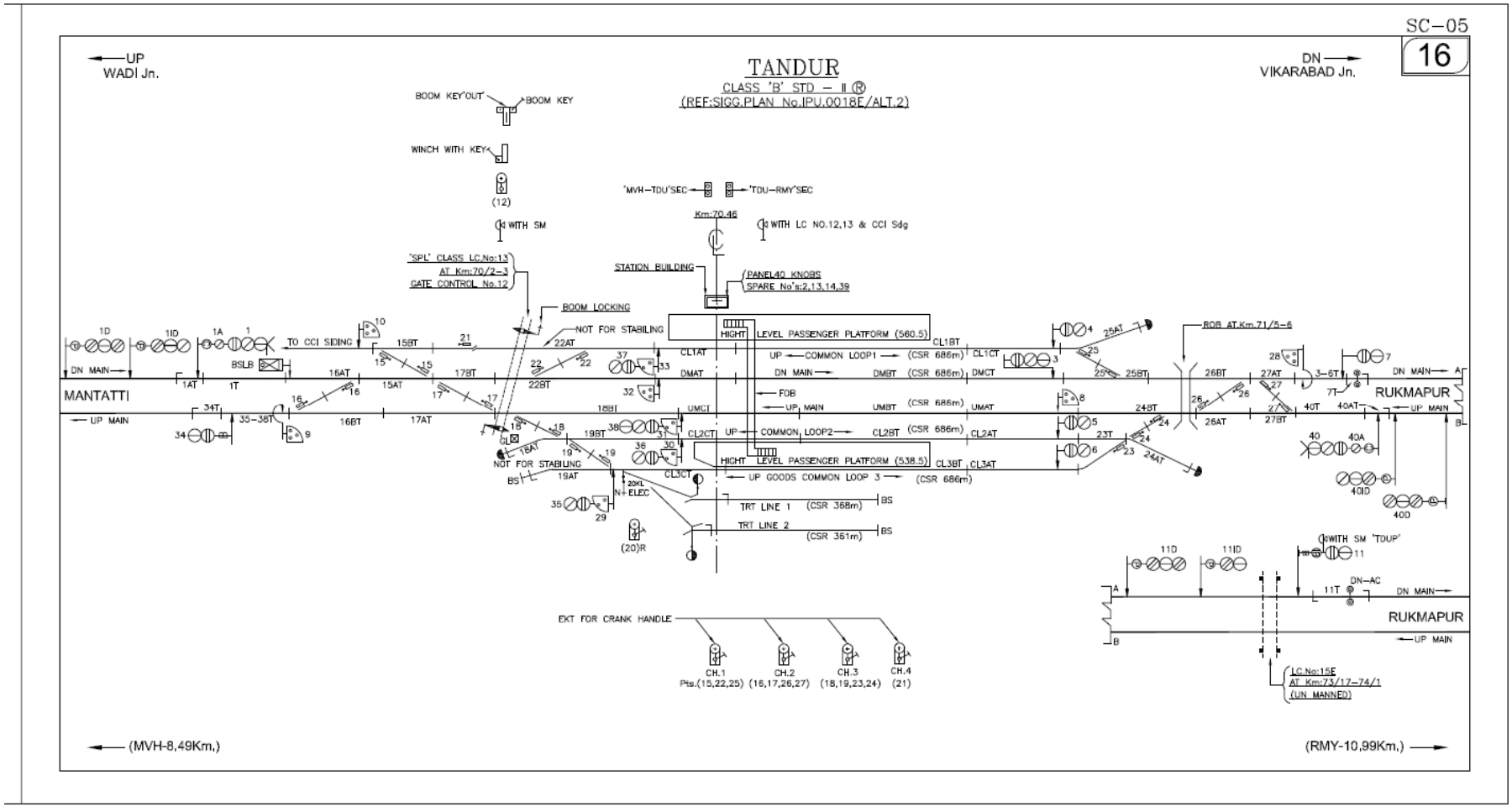

SC–05
12B
UP
WADI Jn.
DN
HUSSAIN SAGAR Jn.
VIKARABAD Jn./B
CLASS 'B' STD – III
(REF:SIGG.PLAN No.IPU.0013F/ALT.5)
RE–SETTING PLUNGERS FOR AXLE COUNTERS
GOODS LOOP – 1
GOODS LOOP – 2
EKT FOR CRANK HANDLES
CH.B1 (12)
CH.B2 (8,10)
CH.B3 (7,11)
CH.B4 (8,9)
B12T
B10T
B11T
B6BT
B8T
B7T
B6AT
B1T
B16..20T
B15T
B1AT
B14T
N (ELEC)
KEY 'Y' IN UNLOCKED BY KEY 'X'
UNLOCKED BY KEY 'Y'
PAD LOCKED
PRO. PQRS SDG
(CSR:300m)
(CSR:265m)
(CSR:265m)
WITH SM & 'A' CABIN, BR.No:123 KEY 'X' FORM PANEL (BY HAND)
'B' CABIN (BLOCK) PANEL (BUTTONS No:1 TO 30) SPARE BUTTO No's:2,4,5, 23,24,25,26,27,29.
'VKB–CTF'SEC
WITH DN IBS
PRO.STABBLING LINE
A1– –FOR COMM LOOP No:1
A2A– –FOR UP MAIN
A2B– –FOR UP LOOP
A3A– –FOR COMM LOOP No:2
A3B– – FOR GOODS LOOP No:1
A3C– – FOR GOODS LOOP No:2
BRIDGE No:(123)
DN MAIN
UP MAIN
WITH 'B' CABIN VKB
CHITGIDDA
(CTF:9.93Km)
(CTF:9.93Km)

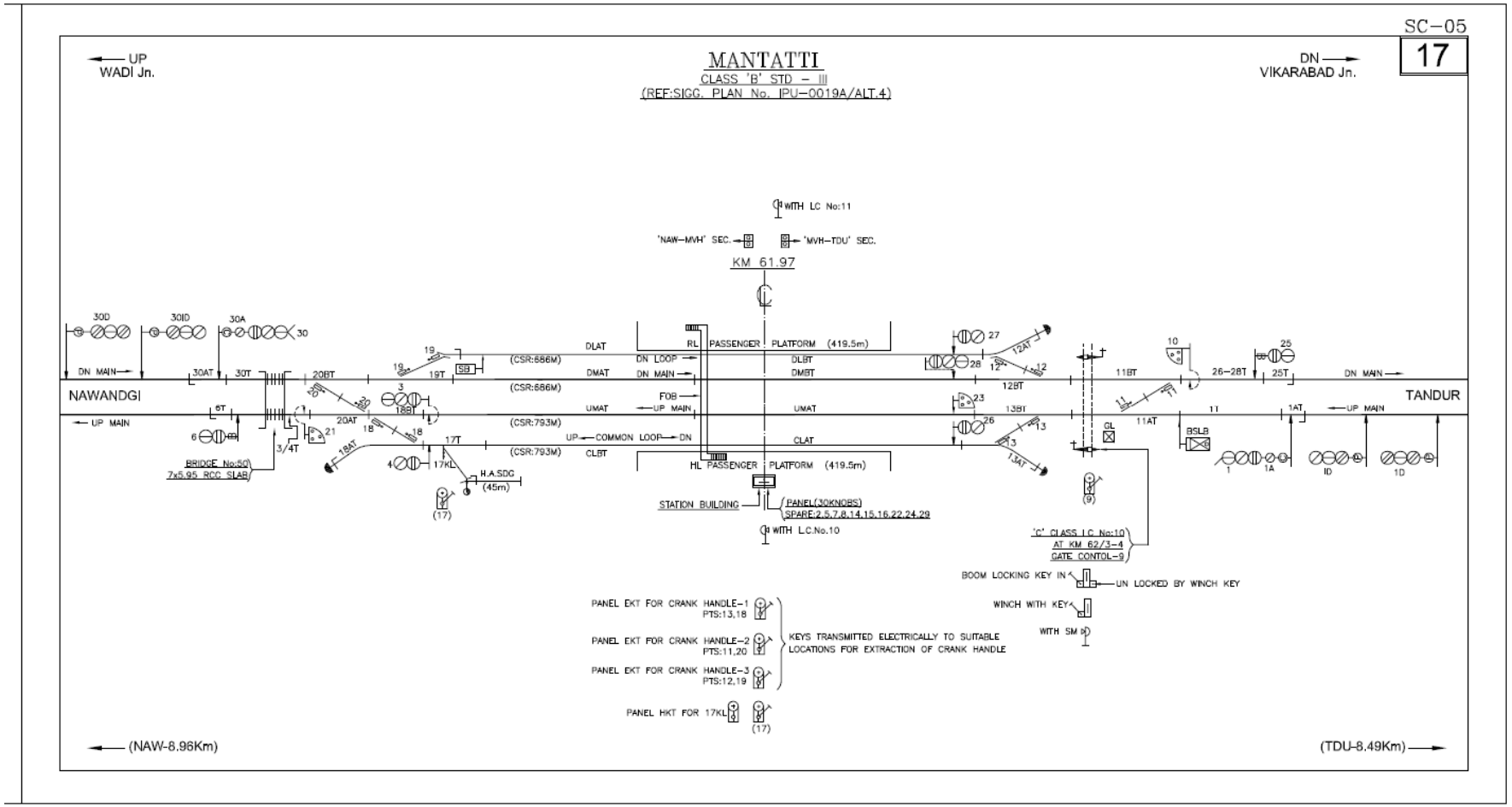

SC–05
11
UP
VIKARBAD Jn.
DN
HUSSAINSAGAR Jn.
CHITGIDDA
'B'CLASS STD–II ®
(REF:SIGG.PLAN No.IPU–0012C)
PREPARATORY RESETTING BOXES OF IBS AXLE COUNTER FOR'VKB–CTF'SEC
'VKB–CTF'SEC
'CTF–GGD'SEC
Km:121.80
PANEL SPARE Nos: 2,5,7,8,9,14,15,16, 17,22,29
STATION BUILDING
L.L.PASSENGER PLATFORM
UP–COMM LOOP–DN
DN MAIN
UP MAIN
UP–LOOP
VIKARBAD Jn.
BRIDGE No:134
GULLAGUDA
CLAT
CLBT
DMAT
DMBT
UMBT
UMAT
ULBT
ULAT
(CSR:686m)
WITH SM CTF 9D
WITH UP IBS
PANEL EKT FOR CRANK HANDLE–1 (POINTS:12,19)
PANEL EKT FOR CRANK HANDLE–2 (POINTS:11,20)
PANEL EKT FOR CRANK HANDLE–1 (POINTS:13,18)
KEYS TRANSMITTED ELECTRICALLY TO SUITABLE LOCATIONS FOR EXTRACTION OF CRANK HANDLE.
(VKB:9.93Km)
(GGD:6.86Km)

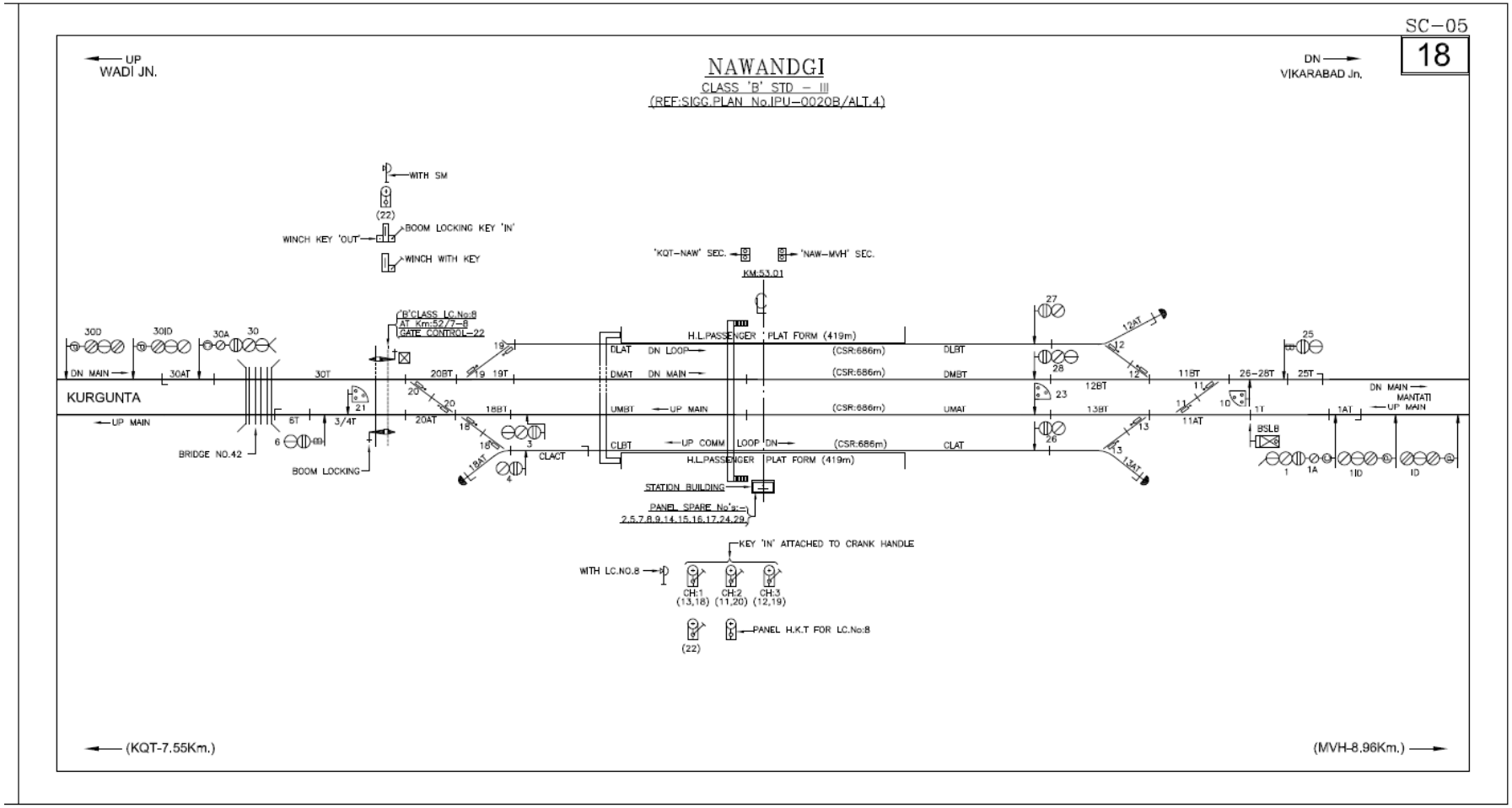

SC–05
13
UP
WADI Jn.
DN
VIKARABAD JN.
GODAMGURA (BG)
CLASS 'B' STD–II ®
(REF:SIGG.PLAN No.IPU.0014B/ALT.3)
'DRR–GDQ' SEC
'GDQ–VKB' SEC
KM.103.57
PANEL SPARE No's:–
2,7,8,9,14,15,17,22,23,26,29.
STATION BUILDING
LOADING PLATFORM (26m)
H.L PLAT FORM (300m)
R.L PLAT FORM (300m)
UP COMMON LOOP DN
DN LOOP
DN MAIN
UP MAIN
DLAT
DMAT
CLAT
UMAT
DLBT
DMBT
CLBT
UMBT
(CSR:686m)
FOB
BS
16KL
5 RAIL LENGTH
10 RAIL LENGTH
DARUR
VIKARABAD JN.
WITH SM GDQ
WITH UP IBS
PTS:– (13,18)
(CH1)
(CH2)
(11,20)
(CH3)
(12,19)
RESETTING PLUNGER FOR AXLE COUNTER–COMMON LOOP
RESETTING PLUNGER FOR AXLE COUNTER–DN LOOP
(DRR:12.47Km)
(VKB–8,30Km.)

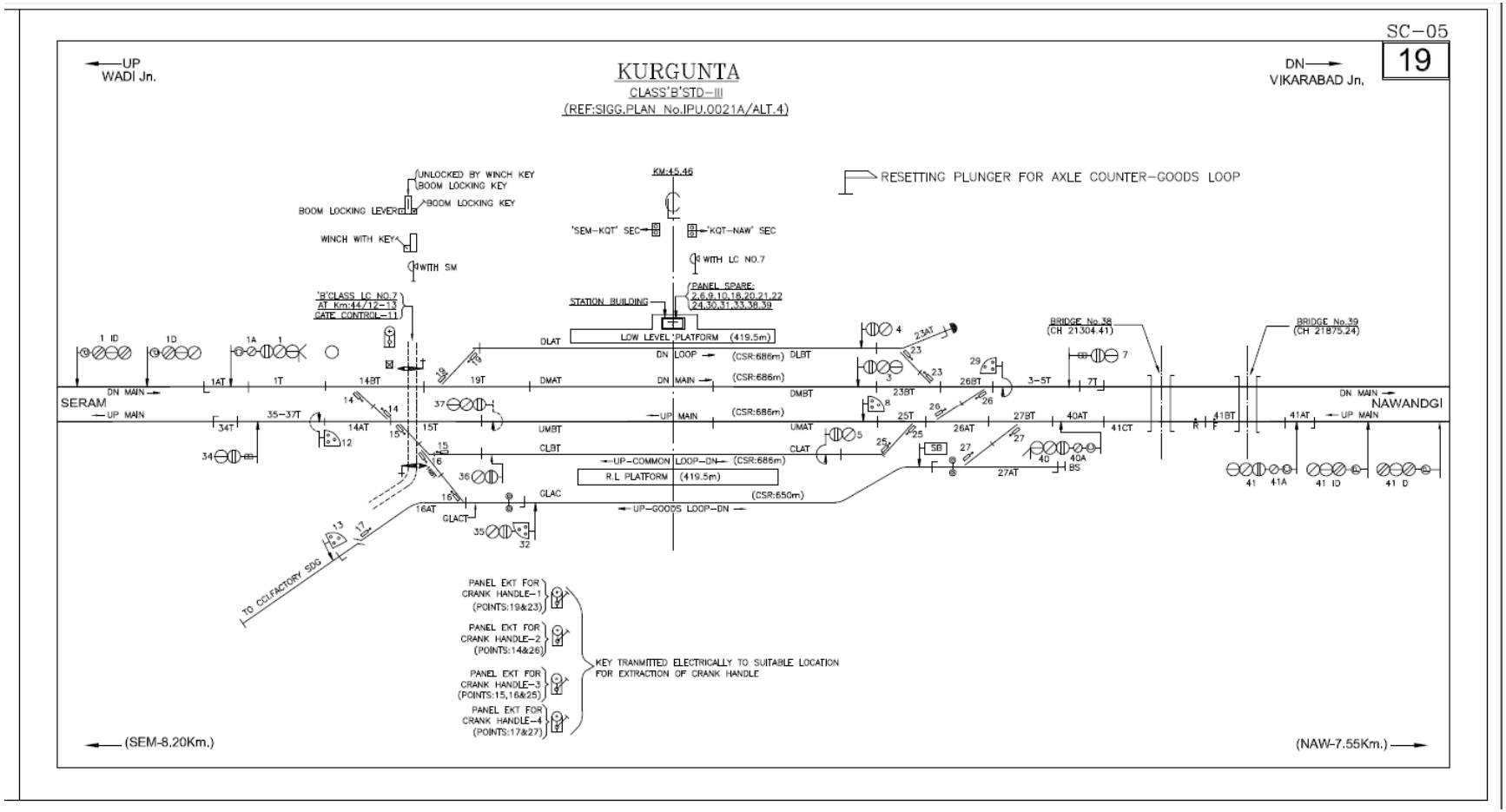

SC–05
14
UP
WADI Jn.
DHARUR(B.G)
CLASS 'B' STD–II (R)
(REF:SIGG.PLAN No.IPU.0016B/ALT–4)
DN
VIKARABAD Jn.
DN.LINE
PREPERATORY RESETTING BOXES OF IBS AXLE COUNTER FOR'DRR–GDQ' SEC.
UPLINE
(CH1)
PTS:–13,18
(CH2)
11,20
(CH3)
12,19
KM:91.10
(CH.23365m)
WITH LC No.16A(CH:23966)
'RMY–DRR' SEC
'DRR–GDQ' SEC
STATION BUILDING
PANEL (1TO30)
SPARE:2,7,14,16,22,23,24,26,29
BRIDEG No:95
8X6.10m(GIRDER)
(AT. CH.22255m)
H.L. PASSENGER PLAT FORM (300m)
DLAT
DN LOOP
DLBT (CSR 686m)
DMAT
DN MAIN
DMBT (CSR 686m)
UMBT
UP MAIN
FOB
UMAT (CSR 686m)
N-ELEC
CLBT
N-ELEC
UP–COMMON LOOP–DN
CLAT (CSR 686m)
H.L. PASSENGER PLAT FORM(300m)
DN MAIN
UP MAIN
RUKMAPUR
5 RAIL LENGTH
27/28T
25T
12AT
NOT FOR STABLING
GATE CONTROL CUBICLE
WITH SM
'C' CLASS LC.No:16A
AT CH:23966m
GATE CONTROL–9
ELECTRICALLY OPERATED
15KL
5v(45m)
H.A.SDG
17KL
3–5T
6T
DN–AC
30T
30AT
10 RAIL LENGTH
BRIDGE No:42(RCC)
WITH SM/DDR
GODAMGURA
(RMY:9.65Km.)
(GDQ:12.47Km.)

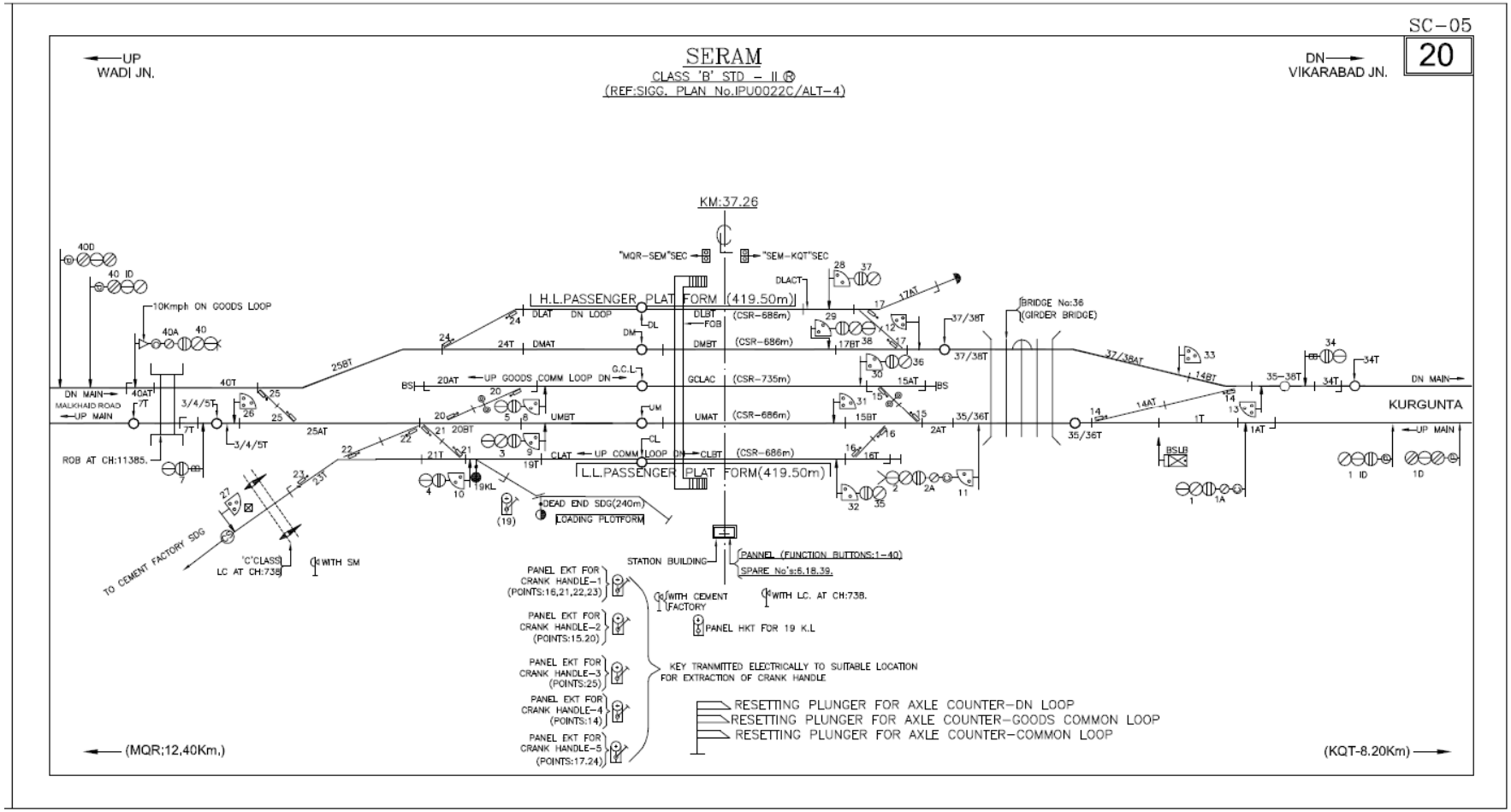

SC–05
15
UP
WADI JN.
DN
VIKARABAD JN.
RUKMAPUR
CLASS 'B' STD – II (R)
(REF:SIGG.PLAN No.IPU.0017B/ALT.4)
PREPARATORY RESETTING BOXES OF
IBS AXLE COUNTER FOR 'TDU–RMY' SEC
WITH UP IBS
'TDU–RMY'SEC
'RMY–DRR'SEC
KM 81.45
FOB
DMAT
DOWN MAIN
(CSR:686m) DMBT
H.L PASSENGER PLATFORM (300m)
PANEL (1TO30)
SPARE Nos:2,5,7,8,9,
14,16,22,23,29.
STATION BUILDING
H.L PASSENGER PLATFORM (300m)
CLAT
UP–COMMON LOOP–DN
UMBT
UP MAIN
(CSR:686m) UMAT
ULBT
UP LOOP
(CSR:686m) ULAT
R.L PASSENGER PLATFORM (300m)
(CSR:686m) CLBT
TANDUR
5 RAIL LENGTH
DN MAIN
DHARUR
NOT FOR STABLING
UP MAIN
DHARUR
5 RAIL LENGHT
UP DISTANT
UP INNER DISTANT
UP AC
UP MAIN
WITH LC NO.16 AT KM.79/9–10
CH.1
PTS.NO.(13,18)
CH.2
PTS.NO.(11,20)
CH.3
PTS.NO.(12,19)
(TDU-10.99Km.)
(DRR-9.65Km.)

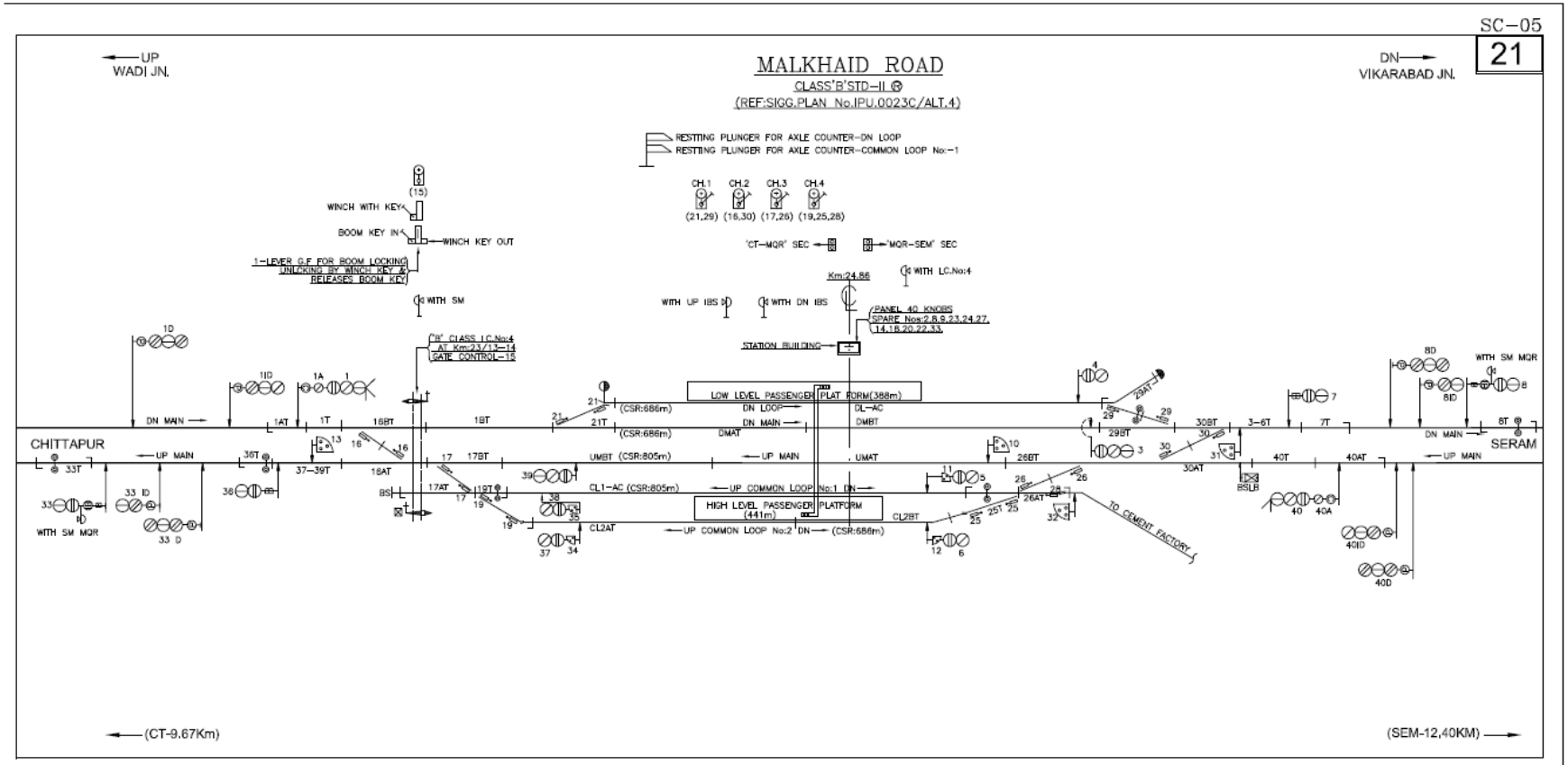

SC–05
16
UP
WADI Jn.
DN
VIKARABAD Jn.
TANDUR
CLASS 'B' STD – II (R)
(REF:SIGG.PLAN No.IPU.0018E/ALT.2)
BOOM KEY'OUT'
BOOM KEY
WINCH WITH KEY
(12)
WITH SM
'MVH–TDU'SEC
'TDU–RMY'SEC
Km:70.46
WITH LC NO.12,13 & CCI Sdg
'SPL' CLASS LC.No:13
AT Km:70/2–3
GATE CONTROL No.12
STATION BUILDING
PANEL40 KNOBS
SPARE No's:2,13,14,39
BOOM LOCKING
NOT FOR STABLING
HIGHT LEVEL PASSENGER PLATFORM (560.5)
TO CCI SIDING
BSLB
MANTATTI
UP MAIN
DN MAIN
UP COMMON LOOP1 (CSR 686m)
DN MAIN (CSR 686m)
FOB
UP MAIN (CSR 686m)
UP COMMON LOOP2 (CSR 686m)
HIGHT LEVEL PASSENGER PLATFORM (538.5)
UP GOODS COMMON LOOP 3 (CSR 686m)
TRT LINE 1 (CSR 368m)
TRT LINE 2 (CSR 361m)
ROB AT.Km.71/5–6
RUKMAPUR
UP MAIN
DN MAIN
WITH SM 'TDUP'
DN–AC
LC.No:15E
AT Km:73/17–74/1
(UN MANNED)
EXT FOR CRANK HANDLE
CH.1 Pts.(15,22,25)
CH.2 (16,17,26,27)
CH.3 (18,19,23,24)
CH.4 (21)
(MVH-8,49Km.)
(RMY-10,99Km.)

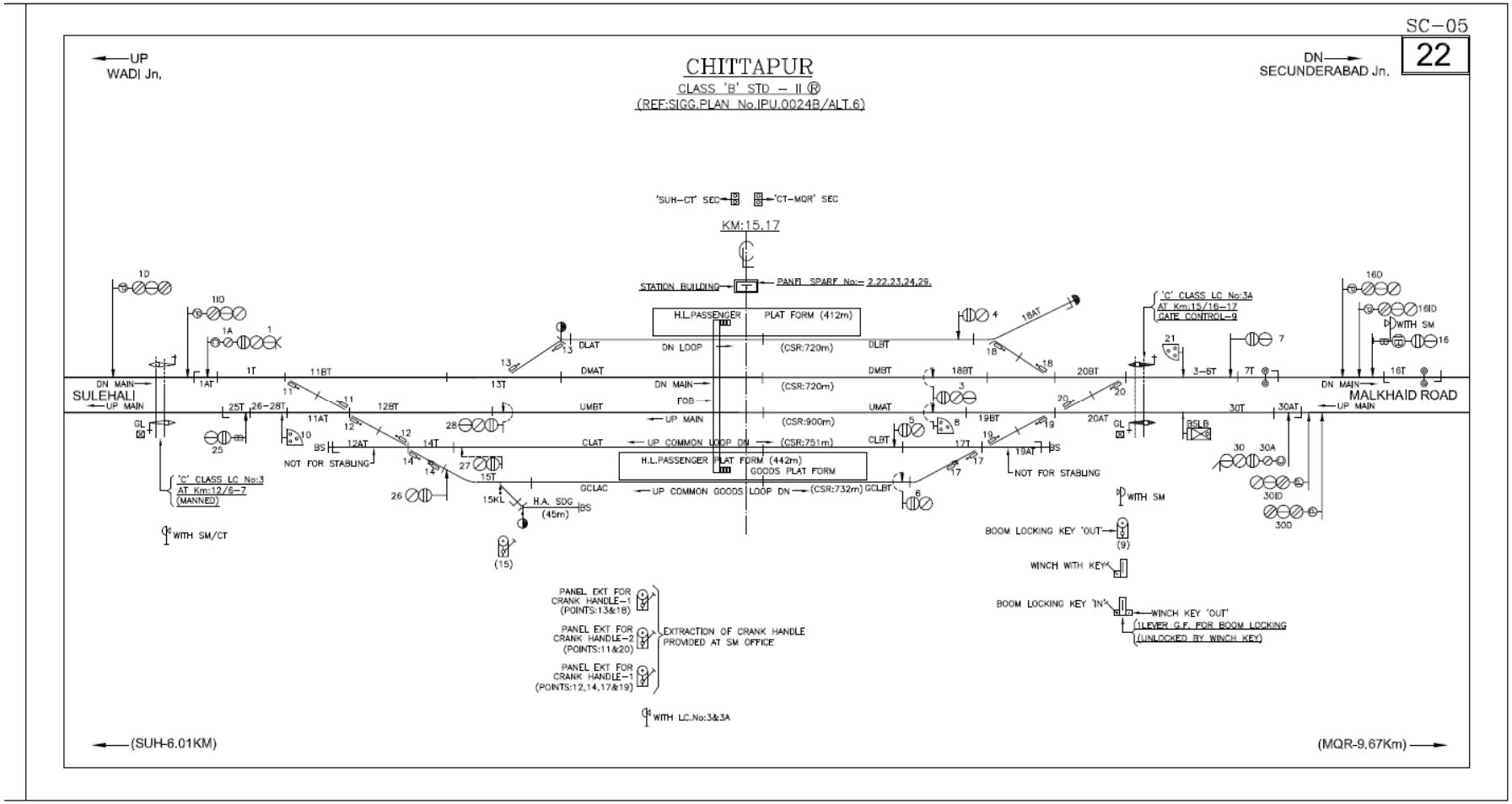

SC–05
17
UP
WADI Jn.
MANTATTI
CLASS 'B' STD – III
(REF:SIGG. PLAN No. IPU–0019A/ALT.4)
DN
VIKARABAD Jn.
WITH LC No:11
'NAW–MVH' SEC.
'MVH–TDU' SEC.
KM 61.97
NAWANDGI
TANDUR
UP MAIN
DN MAIN
RL PASSENGER PLATFORM (419.5m)
HL PASSENGER PLATFORM (419.5m)
DLAT
DMAT
UMAT
CLAT
DLBT
DMBT
UMBT
CLBT
(CSR:686M)
(CSR:793M)
DN LOOP
UP COMMON LOOP DN
FOB
STATION BUILDING
PANEL(30KNORS)
SPARE:2,5,7,8,14,15,16,22,24,29
WITH LC.No.10
'C' CLASS LC No:10
AT KM 62/3–4
GATE CONTOL–9
BRIDGE No:50
7x5.95 RCC SLAB
H.A.SDG
(45m)
17KL
BSLB
GL
BOOM LOCKING KEY IN
UN LOCKED BY WINCH KEY
WINCH WITH KEY
WITH SM
PANEL EKT FOR CRANK HANDLE–1
PTS:13,18
PANEL EKT FOR CRANK HANDLE–2
PTS:11,20
PANEL EKT FOR CRANK HANDLE–3
PTS:12,19
KEYS TRANSMITTED ELECTRICALLY TO SUITABLE
LOCATIONS FOR EXTRACTION OF CRANK HANDLE
PANEL HKT FOR 17KL
(NAW-8.96Km)
(TDU-8.49Km)


SC–05
18
UP
WADI JN.
DN
VIKARABAD Jn.
NAWANDGI
CLASS 'B' STD – III
(REF:SIGG.PLAN No.IPU–0020B/ALT.4)
KURGUNTA
UP MAIN
DN MAIN
BRIDGE NO.42
BOOM LOCKING
WITH SM
BOOM LOCKING KEY 'IN'
WINCH KEY 'OUT'
WINCH WITH KEY
'KQT–NAW' SEC.
'NAW–MVH' SEC.
KM:53.01
'B'CLASS LC.No:8
AT Km:52/7–8
GATE CONTROL–22
H.L.PASSENGER PLAT FORM (419m)
DN LOOP
DN MAIN
UP MAIN
UP COMM LOOP DN
(CSR:686m)
CLACT
STATION BUILDING
PANEL SPARE No's:–
2,5,7,8,9,14,15,16,17,24,29
KEY 'IN' ATTACHED TO CRANK HANDLE
WITH LC.NO.8
CH:1 (13,18)
CH:2 (11,20)
CH:3 (12,19)
PANEL H.K.T FOR LC.No:8
MANTATI
(KQT-7.55Km.)
(MVH-8.96Km.)

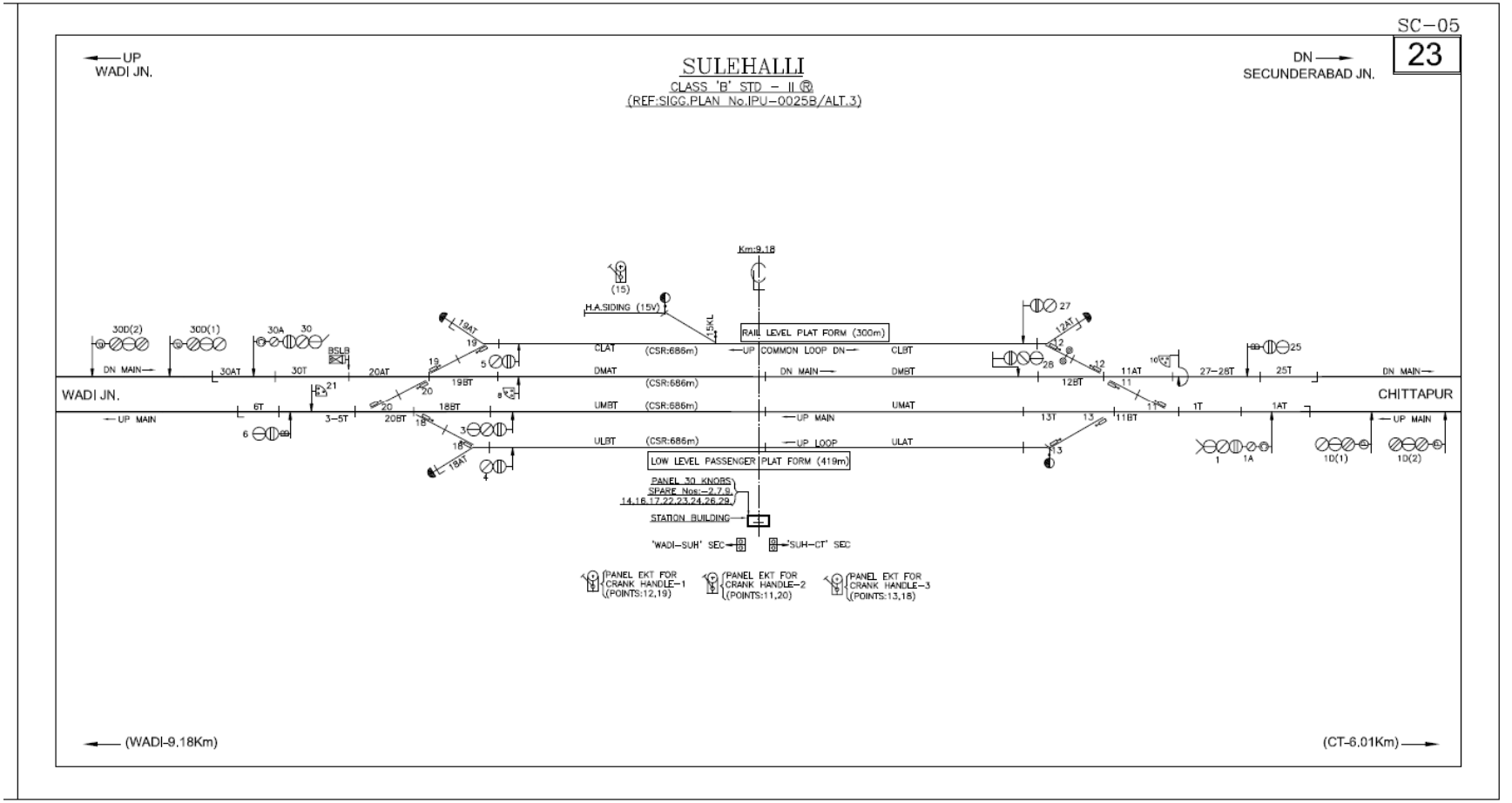

SC–05
19
KURGUNTA
CLASS'B'STD–III
(REF:SIGG.PLAN No.IPU.0021A/ALT.4)
UP
WADI Jn.
DN
VIKARABAD Jn.
KM:45.46
RESETTING PLUNGER FOR AXLE COUNTER–GOODS LOOP
UNLOCKED BY WINCH KEY
BOOM LOCKING KEY
BOOM LOCKING LEVER
WINCH WITH KEY
'SEM–KQT' SEC
'KQT–NAW' SEC
WITH SM
WITH LC NO.7
'B'CLASS LC NO.7 AT Km:44/12–13 GATE CONTROL–11
STATION BUILDING
PANEL SPARE: 2,6,9,10,18,20,21,22 24,30,31,33,38,39
LOW LEVEL PLATFORM (419.5m)
DLAT
DN LOOP
(CSR:686m)
DLBT
DMAT
DN MAIN
(CSR:686m)
DMBT
UP MAIN
(CSR:686m)
UMAT
UMBT
CLAT
CLBT
UP–COMMON LOOP–DN
(CSR:686m)
R.L PLATFORM (419.5m)
GLAC
(CSR:650m)
UP–GOODS LOOP–DN
GLACT
BRIDGE No.38 (CH 21304.41)
BRIDGE No.39 (CH 21875.24)
SERAM
NAWANDGI
DN MAIN
UP MAIN
TO COLFACTORY SDG
PANEL EKT FOR CRANK HANDLE–1 (POINTS:19&23)
PANEL EKT FOR CRANK HANDLE–2 (POINTS:14&26)
PANEL EKT FOR CRANK HANDLE–3 (POINTS:15,16&25)
PANEL EKT FOR CRANK HANDLE–4 (POINTS:17&27)
KEY TRANMITTED ELECTRICALLY TO SUITABLE LOCATION FOR EXTRACTION OF CRANK HANDLE
(SEM-8.20Km.)
(NAW-7.55Km.)

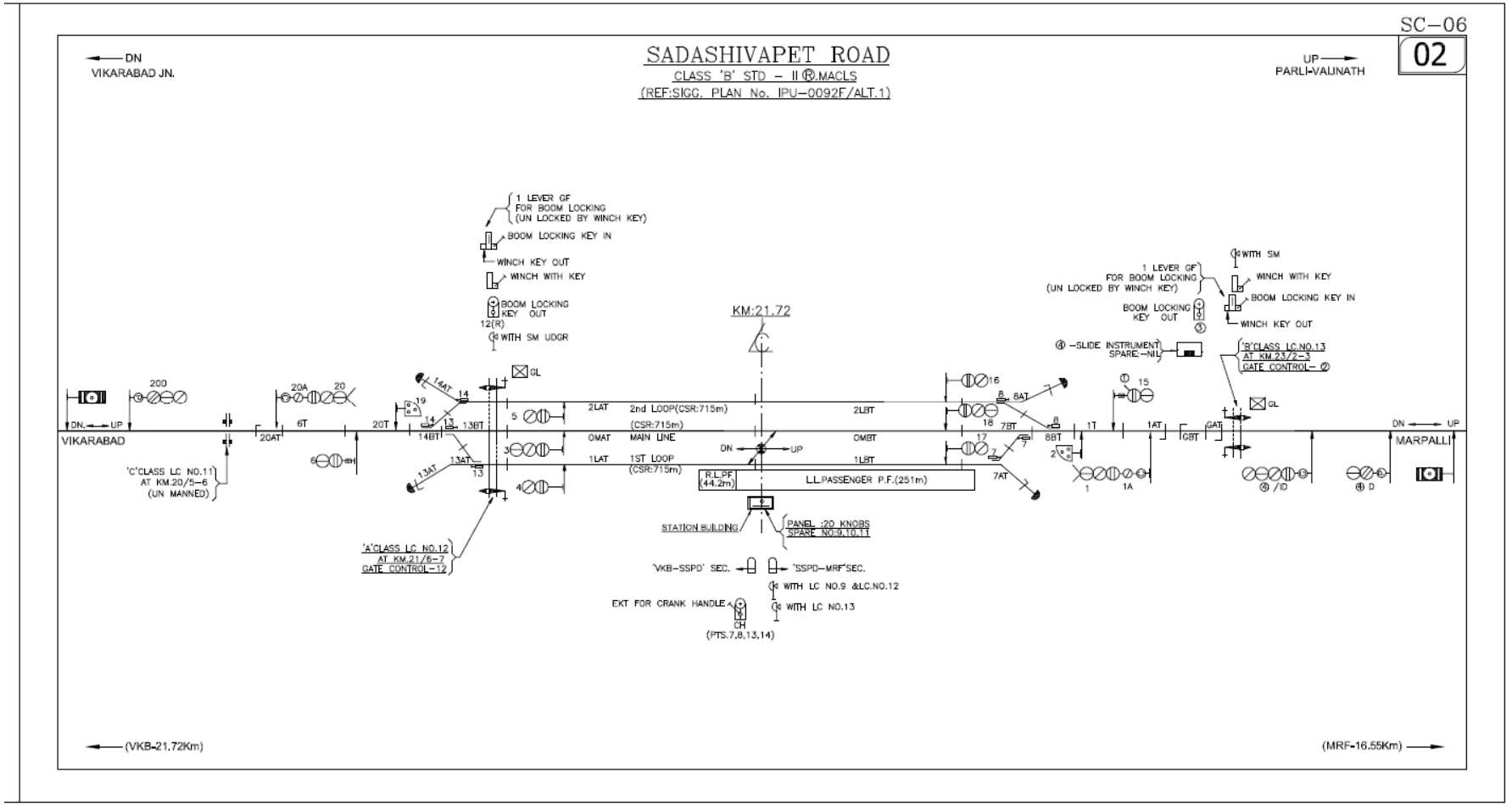

SC–05
20
SERAM
CLASS 'B' STD – II ®
(REF:SIGG. PLAN No.IPU0022C/ALT–4)
UP
WADI JN.
DN
VIKARABAD JN.
KM:37.26
H.L.PASSENGER PLAT FORM (419.50m)
L.L.PASSENGER PLAT FORM(419.50m)
10Kmph ON GOODS LOOP
DN LOOP
UP GOODS COMM LOOP DN
UP COMM LOOP DN
DEAD END SDG(240m)
LOADING PLOTFORM
BRIDGE No:36
(GIRDER BRIDGE)
KURGUNTA
DN MAIN
UP MAIN
MALKAJGIRI ROAD
ROB AT CH:11385.
TO CEMENT FACTORY SDG
'C'CLASS
LC AT CH:738
WITH SM
STATION BUILDING
PANNEL (FUNCTION BUTTONS:1–40)
SPARE No's:6,18,39.
WITH CEMENT FACTORY
WITH LC. AT CH:738.
PANEL HKT FOR 19 K.L
PANEL EKT FOR CRANK HANDLE–1 (POINTS:16,21,22,23)
PANEL EKT FOR CRANK HANDLE–2 (POINTS:15,20)
PANEL EKT FOR CRANK HANDLE–3 (POINTS:25)
PANEL EKT FOR CRANK HANDLE–4 (POINTS:14)
PANEL EKT FOR CRANK HANDLE–5 (POINTS:17,24)
KEY TRANMITTED ELECTRICALLY TO SUITABLE LOCATION FOR EXTRACTION OF CRANK HANDLE
RESETTING PLUNGER FOR AXLE COUNTER–DN LOOP
RESETTING PLUNGER FOR AXLE COUNTER–GOODS COMMON LOOP
RESETTING PLUNGER FOR AXLE COUNTER–COMMON LOOP
(MQR;12,40Km.)
(KQT-8.20Km)

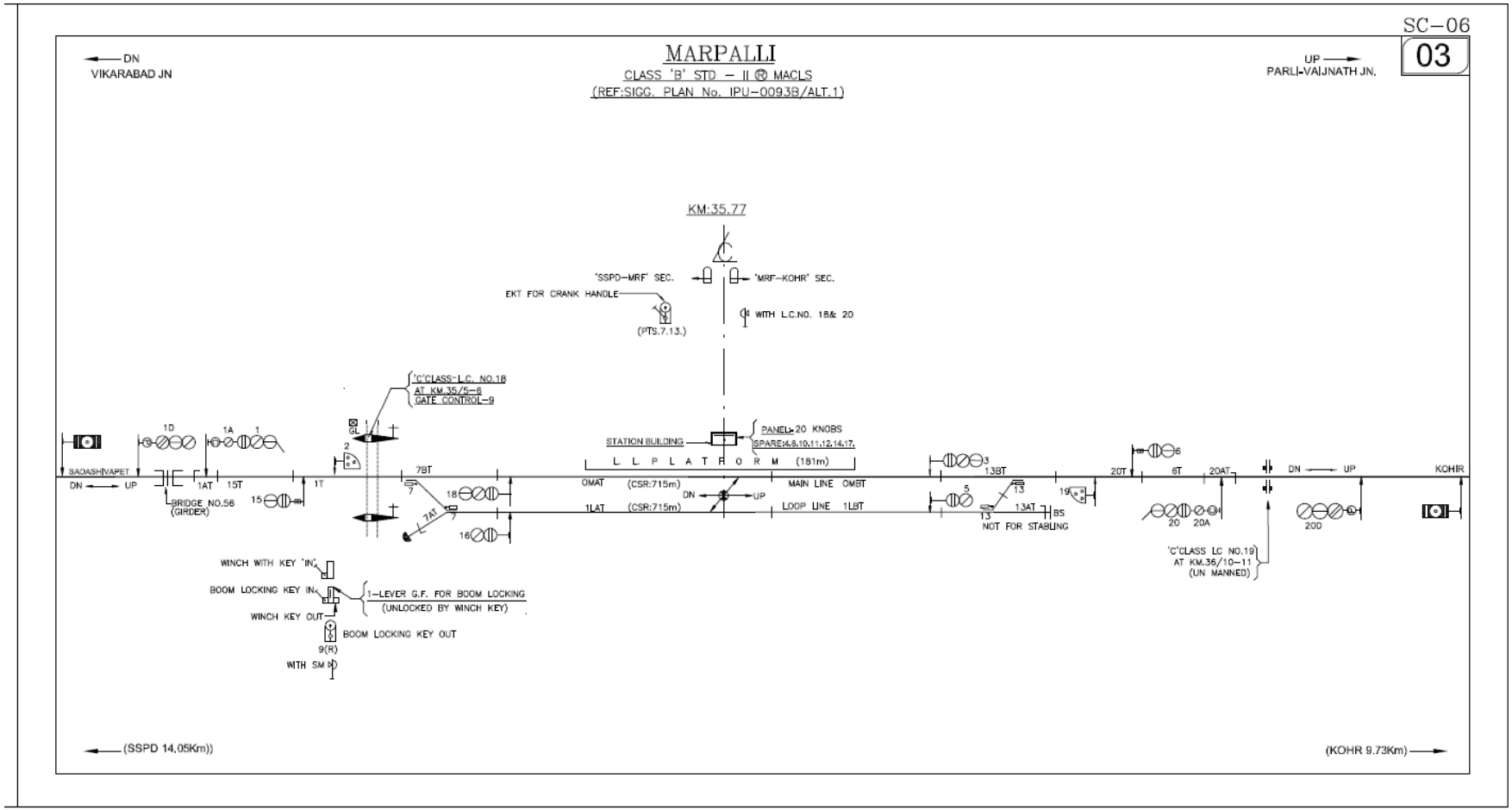

SC–05
21
UP
WADI JN.
DN
VIKARABAD JN.
MALKHAID ROAD
CLASS'B'STD–II
(REF:SIGG.PLAN No.IPU.0023C/ALT.4)
RESTTING PLUNGER FOR AXLE COUNTER–DN LOOP
RESTTING PLUNGER FOR AXLE COUNTER–COMMON LOOP No:–1
CH.1 CH.2 CH.3 CH.4
(21,29) (16,30) (17,26) (19,25,28)
WINCH WITH KEY
BOOM KEY IN
WINCH KEY OUT
1–LEVER G.F FOR BOOM LOCKING UNLOCKING BY WINCH KEY & RELEASES BOOM KEY
'CT–MQR' SEC
'MQR–SEM' SEC
WITH SM
WITH UP IBS
WITH DN IBS
WITH LC.No:4
Km:24.86
PANEL 40 KNOBS
SPARE Nos:2,8,9,23,24,27, 14,18,20,22,33.
STATION BUILDING
'B' CLASS LC.No:4 AT Km:23/13–14 GATE CONTROL–15
LOW LEVEL PASSENGER PLAT FORM(388m)
HIGH LEVEL PASSENGER PLATFORM (441m)
DN LOOP
DN MAIN
UP MAIN
UP COMMON LOOP No:1 DN
UP COMMON LOOP No:2 DN
CL1–AC (CSR:805m)
CL2AT
CL2BT
UMBT (CSR:805m)
UMAT
DMAT
DMBT
DL–AC
(CSR:686m)
TO CEMENT FACTORY
WITH SM MQR
CHITTAPUR
SERAM
(CT-9.67Km)
(SEM-12,40KM)

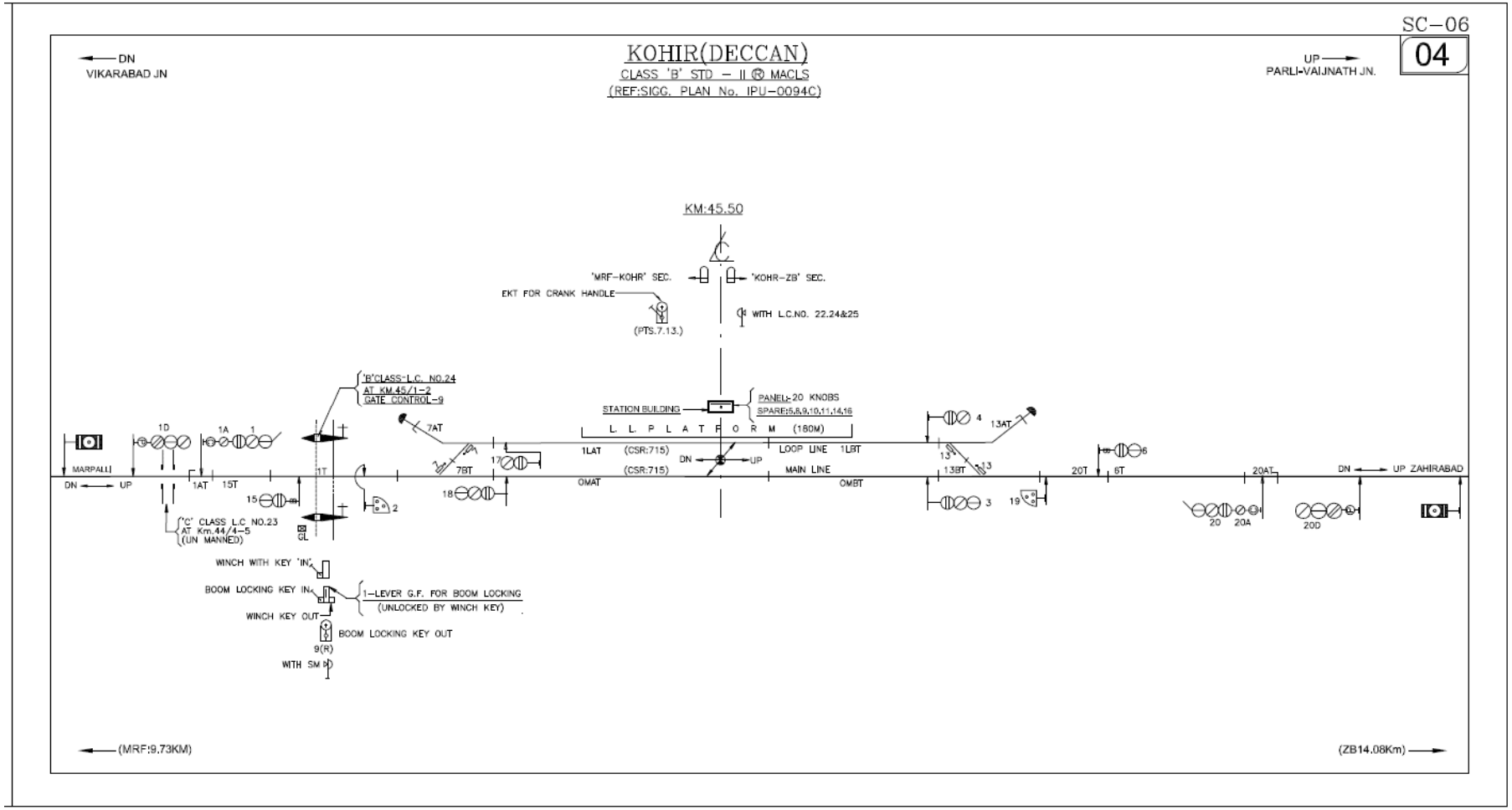

SC–05
22
UP
WADI Jn.
CHITTAPUR
CLASS 'B' STD – II ®
(REF:SIGG.PLAN No.IPU.0024B/ALT.6)
DN
SECUNDERABAD Jn.
'SUH–CT' SEC
'CT–MQR' SEC
KM:15.17
STATION BUILDING
PANEL SPARE No:– 2,22,23,24,29.
H.L.PASSENGER PLAT FORM (412m)
DN LOOP
(CSR:720m)
DN MAIN
UP MAIN
SULEHALI
MALKHAID ROAD
FOB
(CSR:900m)
UP COMMON LOOP DN
(CSR:751m)
H.L.PASSENGER PLAT FORM (442m)
GOODS PLAT FORM
UP COMMON GOODS LOOP DN
(CSR:732m)
'C' CLASS LC No:3
AT Km:12/6–7
(MANNED)
WITH SM/CT
NOT FOR STABLING
H.A. SDG
(45m)
'C' CLASS LC No:3A
AT Km:15/16–17
GATE CONTROL–9
WITH SM
BOOM LOCKING KEY 'OUT'
WINCH WITH KEY
BOOM LOCKING KEY 'IN'
WINCH KEY 'OUT'
LEVER G.F. FOR BOOM LOCKING
(UNLOCKED BY WINCH KEY)
PANEL EKT FOR CRANK HANDLE–1 (POINTS:13&18)
PANEL EKT FOR CRANK HANDLE–2 (POINTS:11&20)
PANEL EKT FOR CRANK HANDLE–1 (POINTS:12,14,17&19)
EXTRACTION OF CRANK HANDLE PROVIDED AT SM OFFICE
WITH LC.No:3&3A
(SUH-6.01KM)
(MQR-9.67Km)

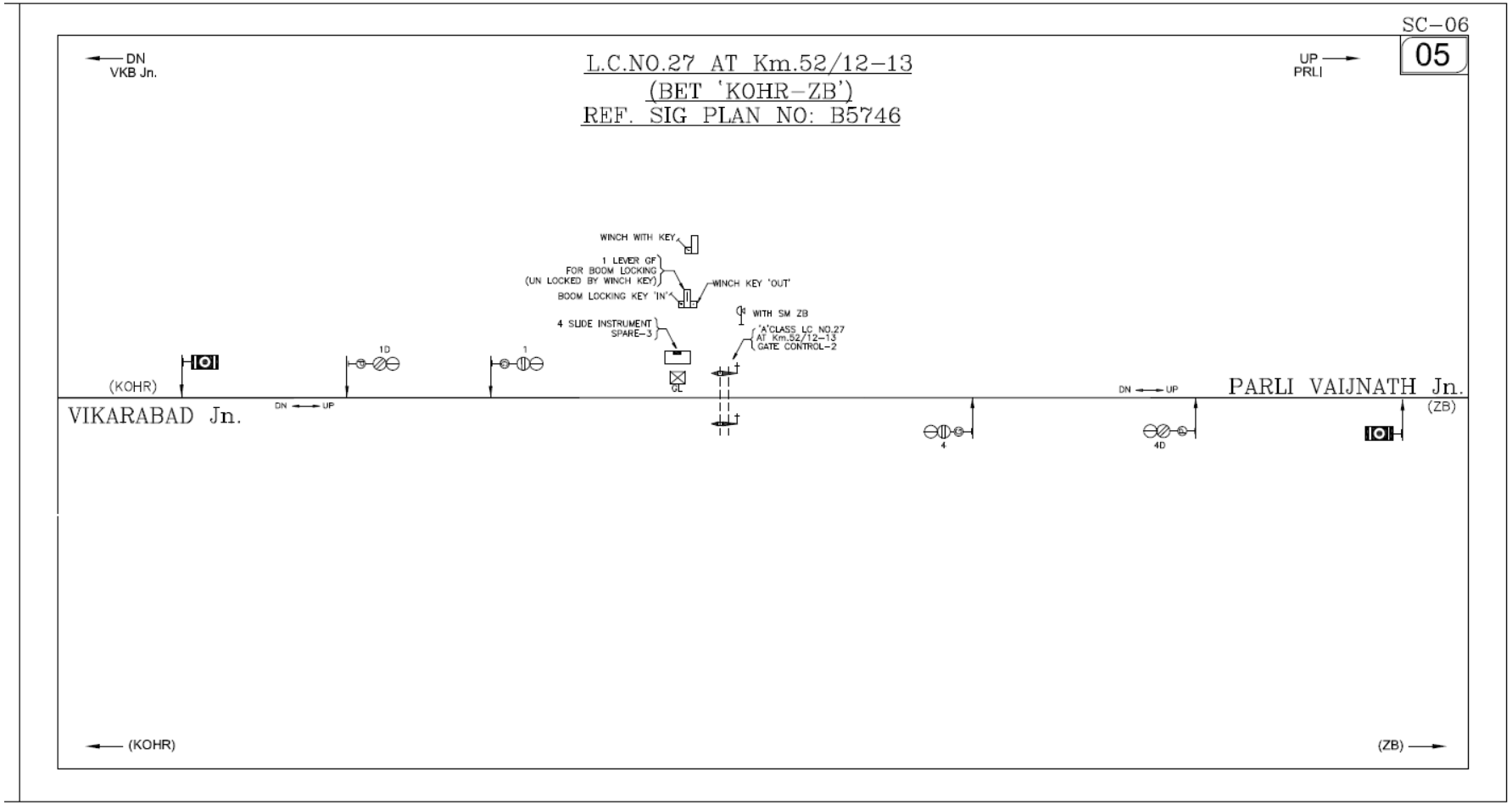
Contract Package A : Wadi (Excluding) – Vikarabad – Sadashivpet Road - Chitigidda

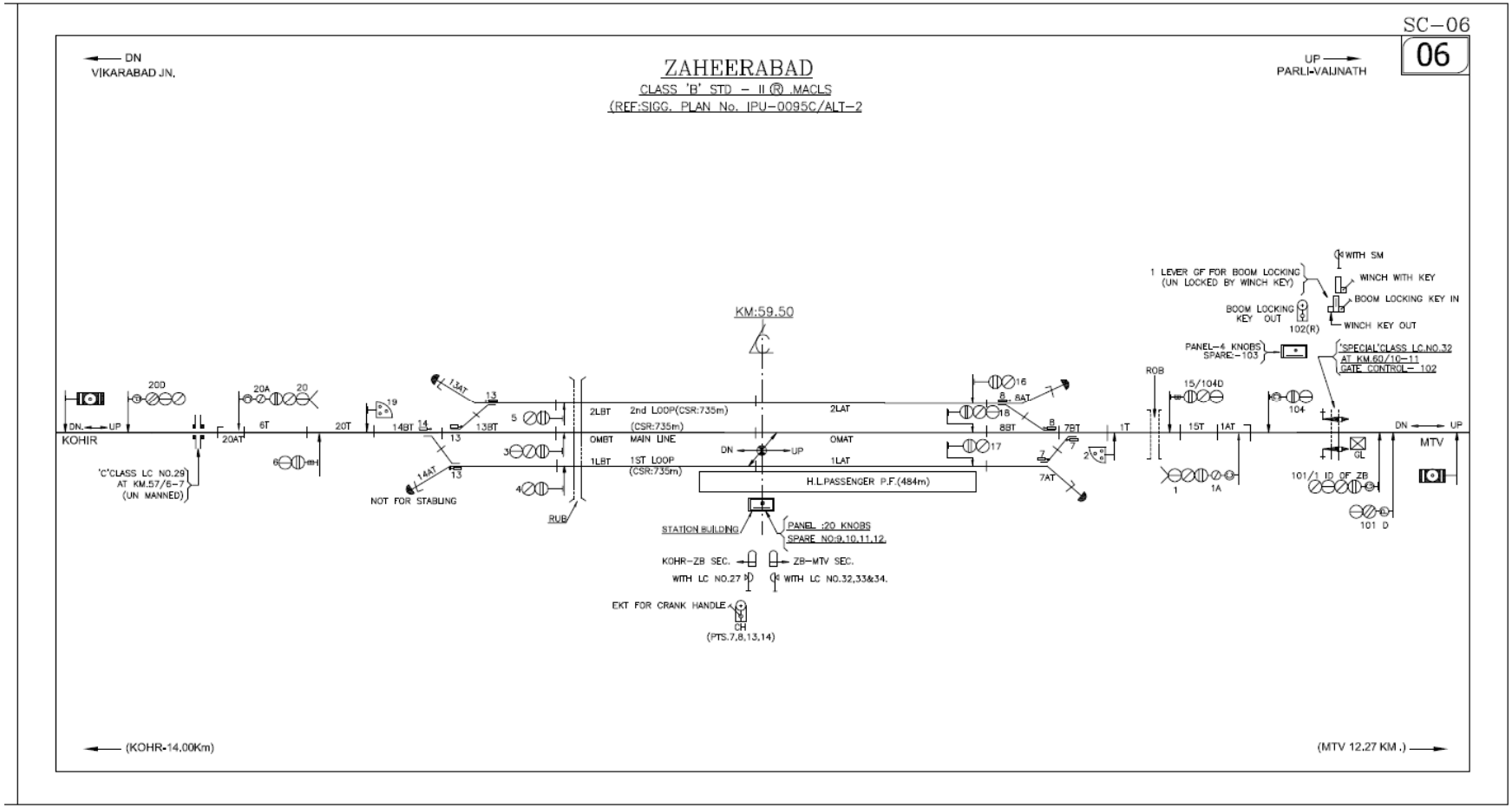


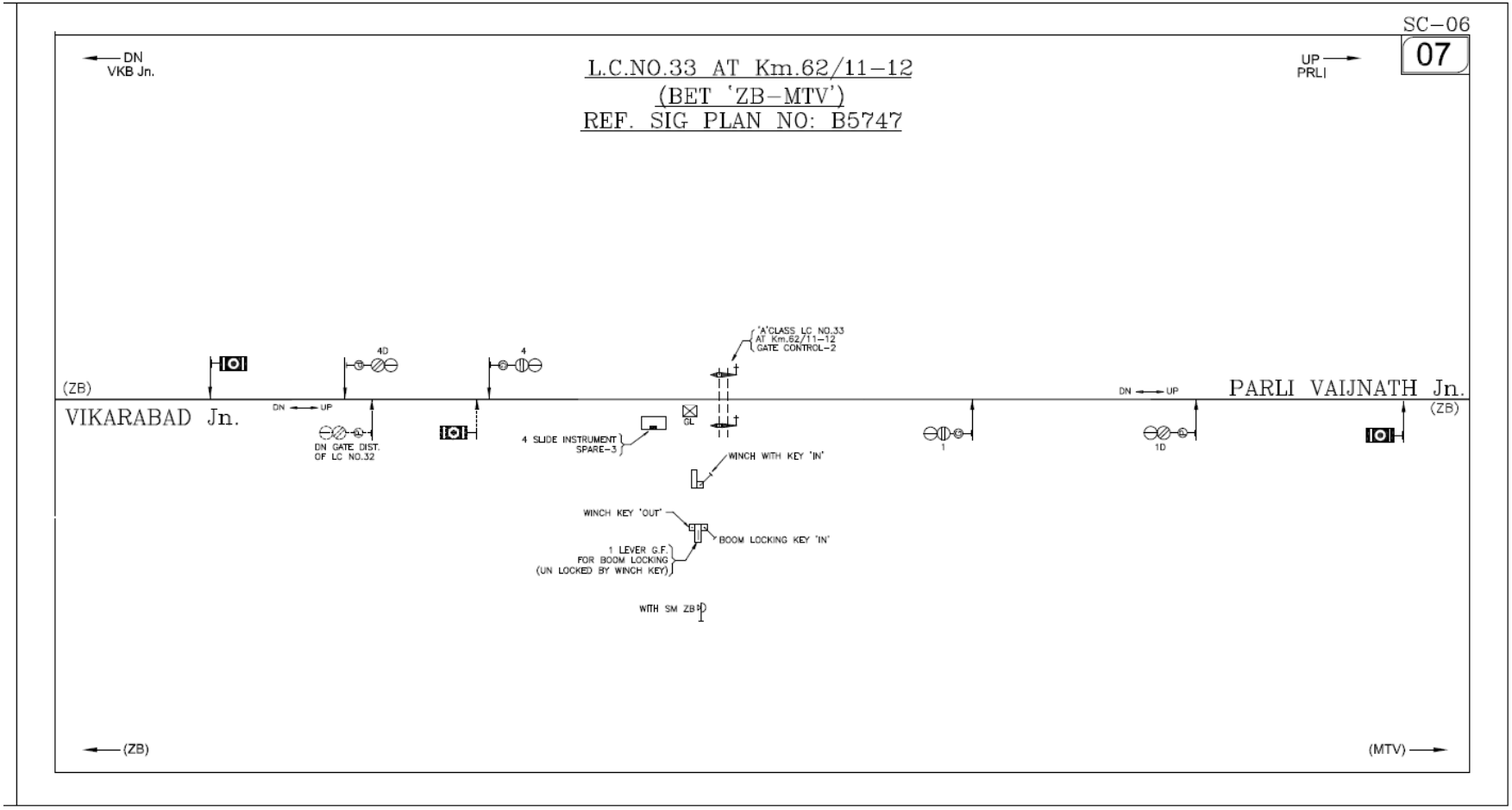

SC–06
02
SADASHIVAPET ROAD
CLASS 'B' STD – II ®.MACLS
(REF:SIGG. PLAN No. IPU–0092F/ALT.1)
DN
VIKARABAD JN.
UP
PARLI-VAIJNATH
KM:21.72
VIKARABAD
MARPALLI
DN. UP
2nd LOOP(CSR:715m)
MAIN LINE
1ST LOOP
(CSR:715m)
2LAT
2LBT
OMAT
OMBT
1LAT
1LBT
R.L.PF (44.2m)
L.L.PASSENGER P.F.(251m)
STATION BUILDING
PANEL -20 KNOBS
SPARE NO:9,10,11
1 LEVER GF
FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
BOOM LOCKING KEY IN
WINCH KEY OUT
WINCH WITH KEY
BOOM LOCKING KEY OUT
12(R)
WITH SM UDGR
GL
'C'CLASS LC NO.11
AT KM.20/5–6
(UN MANNED)
'A'CLASS LC NO.12
AT KM.21/6–7
GATE CONTROL–12
'VKB–SSPD' SEC.
'SSPD–MRF'SEC.
WITH LC NO.9 &LC.NO.12
EKT FOR CRANK HANDLE
CH
(PTS.7,8,13,14)
WITH LC NO.13
WITH SM
WINCH WITH KEY
BOOM LOCKING KEY IN
WINCH KEY OUT
④ –SLIDE INSTRUMENT
SPARE:–NIL
'B'CLASS LC NO.13
AT KM.23/2–3
GATE CONTROL– ②
(VKB-21.72Km)
(MRF-16.55Km)

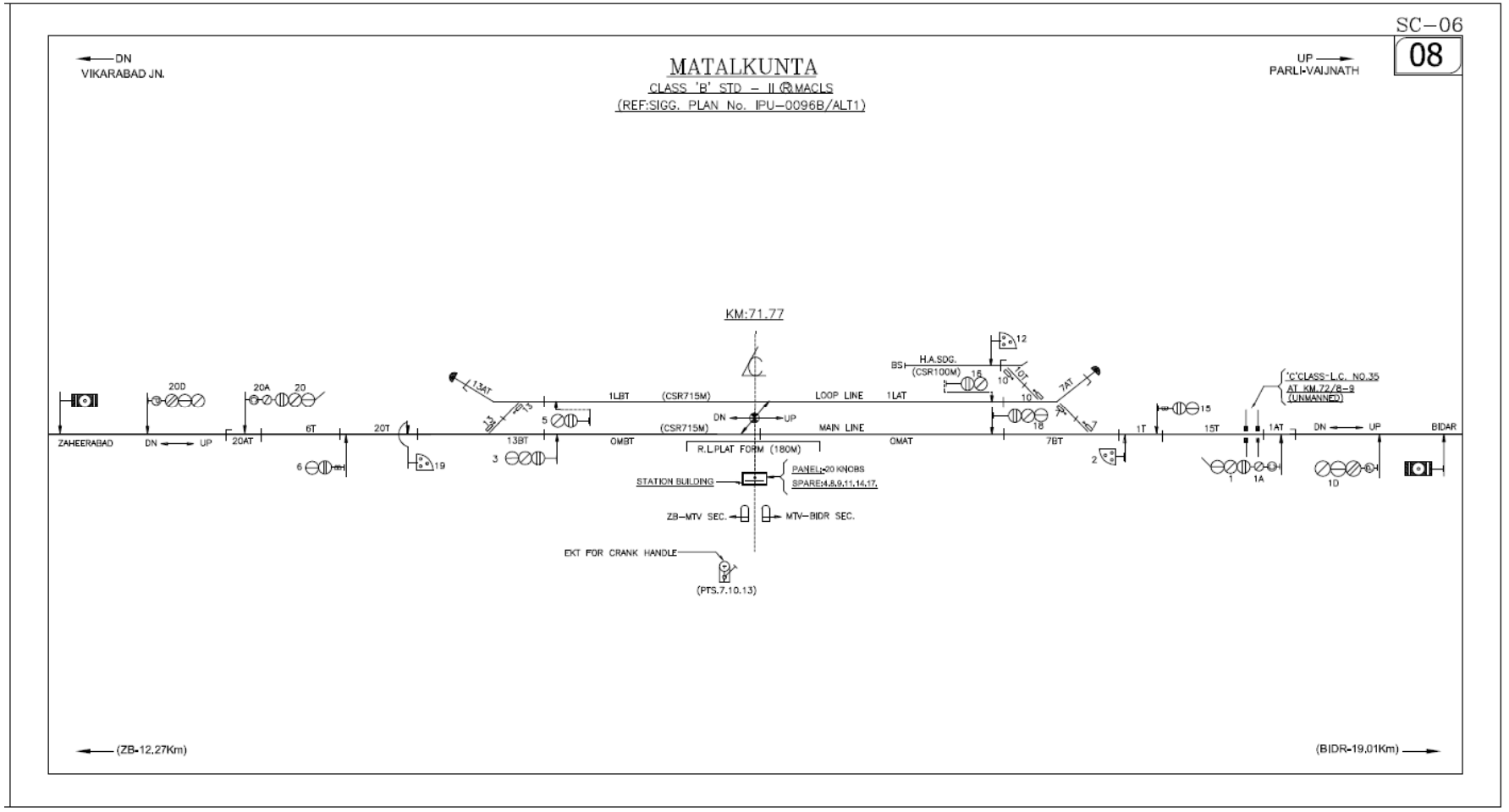

SC–06
03
MARPALLI
CLASS 'B' STD – II @ MACLS
(REF:SIGG. PLAN No. IPU–0093B/ALT.1)
DN
VIKARABAD JN
UP
PARLI-VAIJNATH JN.
KM:35.77
'SSPD–MRF' SEC.
'MRF–KOHR' SEC.
EKT FOR CRANK HANDLE
(PTS.7.13.)
WITH L.C.NO. 18& 20
'C'CLASS-L.C. NO.18
AT KM.35/5–6
GATE CONTROL–9
STATION BUILDING
PANEL-20 KNOBS
SPARE:4,8,10,11,12,14,17.
L. L. P L A T F O R M (181m)
SADASHIVAPET
BRIDGE NO.56
(GIRDER)
OMAT
(CSR:715m)
MAIN LINE OMBT
1AT
(CSR:715m)
LOOP LINE 1LBT
NOT FOR STABLING
'C'CLASS LC NO.19
AT KM.36/10–11
(UN MANNED)
KOHIR
WINCH WITH KEY 'IN'
BOOM LOCKING KEY IN
WINCH KEY OUT
1–LEVER G.F. FOR BOOM LOCKING
(UNLOCKED BY WINCH KEY)
BOOM LOCKING KEY OUT
9(R)
WITH SM
(SSPD 14.05Km))
(KOHR 9.73Km)

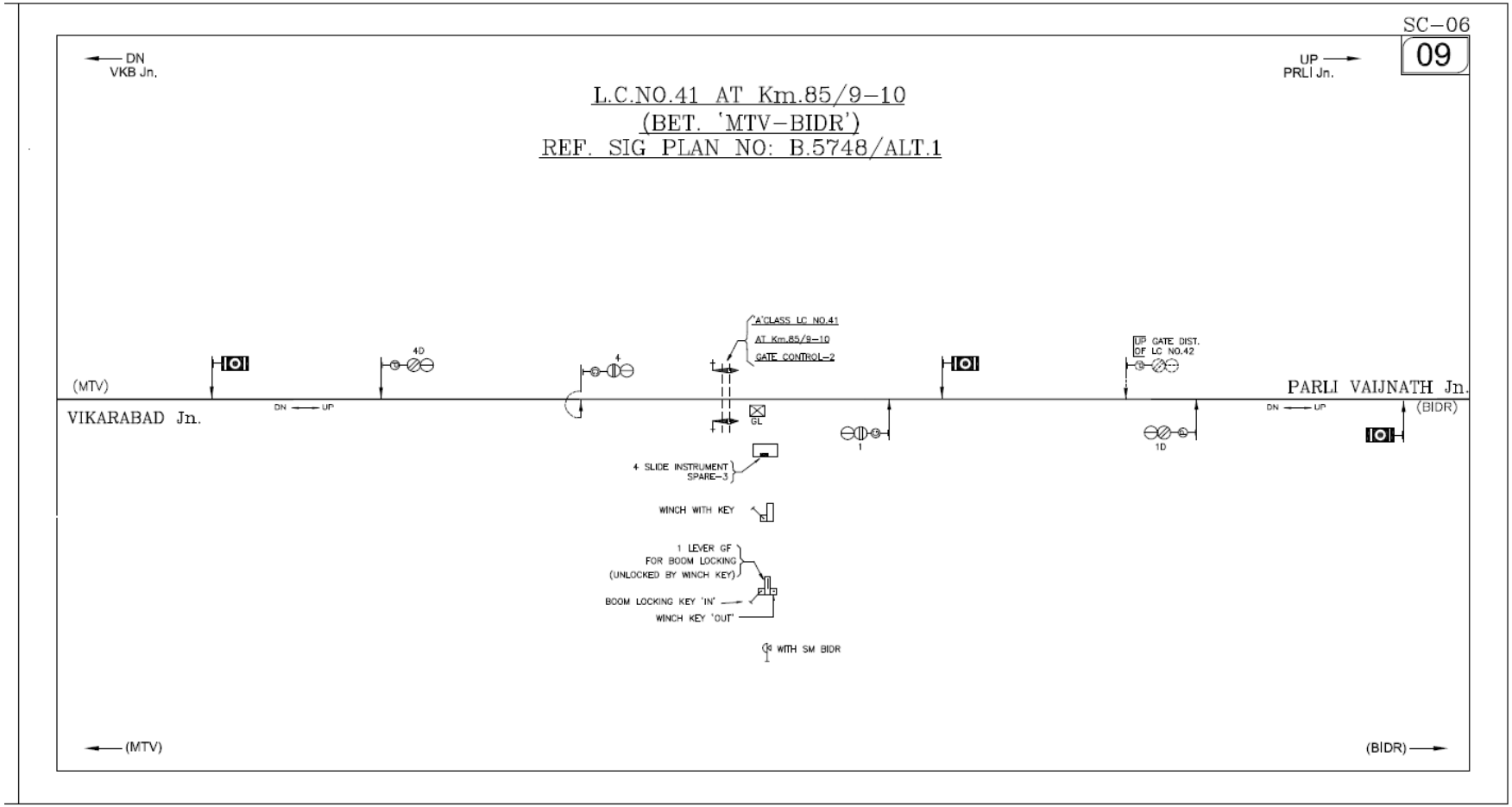

SC–06
04
KOHIR(DECCAN)
CLASS 'B' STD – II ® MACLS
(REF:SIGG. PLAN No. IPU–0094C)
DN
VIKARABAD JN
UP
PARLI-VAIJNATH JN.
KM:45.50
'MRF–KOHR' SEC.
'KOHR–ZB' SEC.
EKT FOR CRANK HANDLE
(PTS.7.13.)
WITH L.C.NO. 22,24&25
'B'CLASS L.C. NO.24
AT KM.45/1–2
GATE CONTROL–9
STATION BUILDING
PANEL-20 KNOBS
SPARE:5,8,9,10,11,14,16
L. L. P L A T F O R M (180M)
LOOP LINE
MAIN LINE
MARPALLI
DN UP
'C' CLASS L.C. NO.23
AT Km.44/4–5
(UN MANNED)
GL
WINCH WITH KEY 'IN'
BOOM LOCKING KEY IN
WINCH KEY OUT
1–LEVER G.F. FOR BOOM LOCKING
(UNLOCKED BY WINCH KEY)
BOOM LOCKING KEY OUT
9(R)
WITH SM
DN UP ZAHIRABAD
(MRF:9.73KM)
(ZB14.08Km)


SC–06
05
DN
VKB Jn.
UP
PRLI
L.C.NO.27 AT Km.52/12–13
(BET 'KOHR–ZB')
REF. SIG PLAN NO: B5746
WINCH WITH KEY
1 LEVER OF
FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
BOOM LOCKING KEY 'IN'
WINCH KEY 'OUT'
WITH SM ZB
4 SLIDE INSTRUMENT
SPARE–3
'A'CLASS LC NO.27
AT Km.52/12–13
GATE CONTROL–2
(KOHR)
VIKARABAD Jn.
1D
1
DN UP
OL
DN UP
PARLI VAIJNATH Jn.
(ZB)
4
4D
(KOHR)
(ZB)

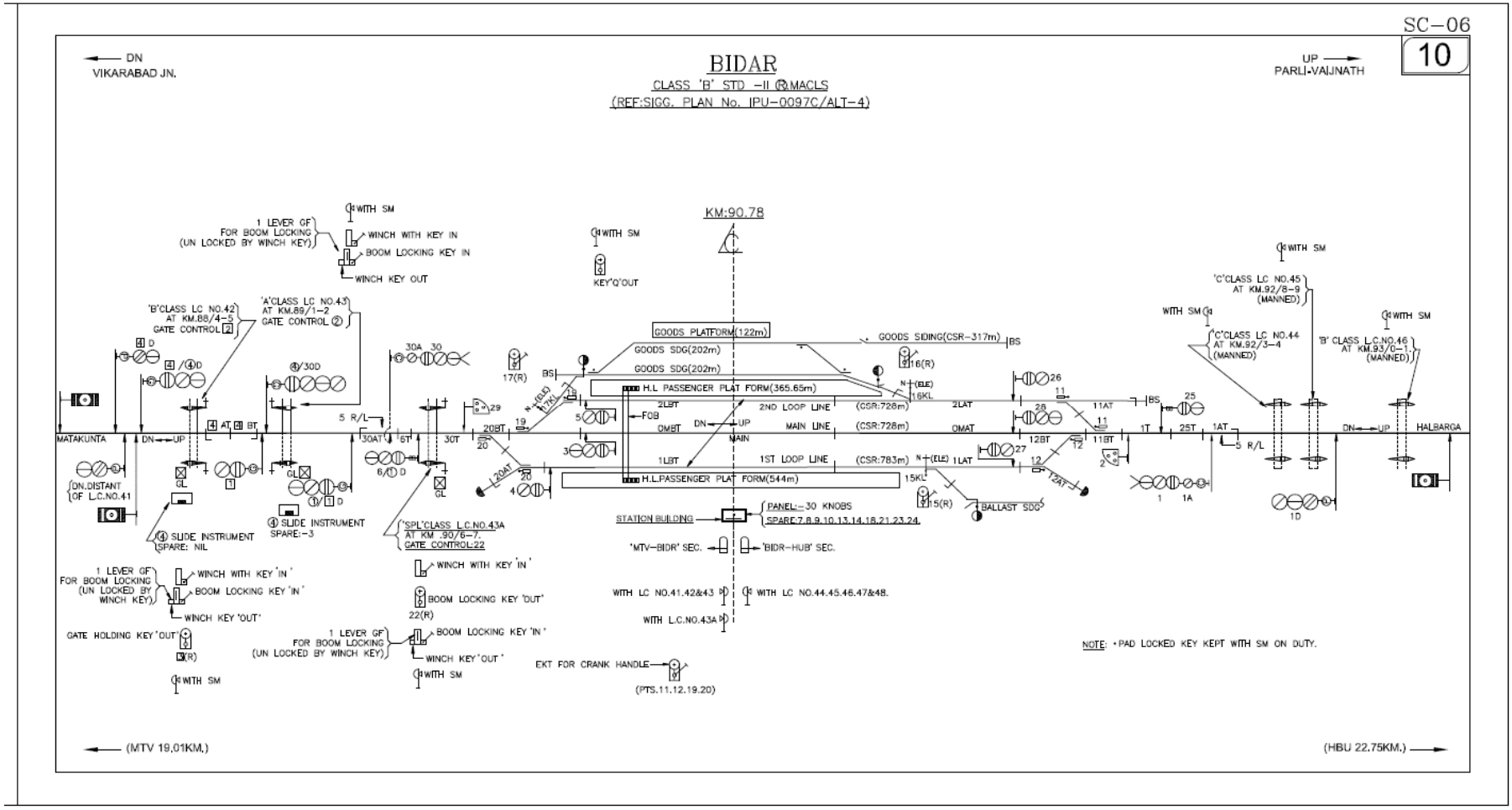

SC–06
06
DN
VIKARABAD JN.
ZAHEERABAD
CLASS 'B' STD – II (R) .MACLS
(REF:SIGG. PLAN No. IPU–0095C/ALT–2
UP
PARLI-VAIJNATH
KM:59.50
KOHIR
MTV
2LBT
2nd LOOP(CSR:735m)
(CSR:735m)
OMBT
MAIN LINE
OMAT
1LBT
1ST LOOP
(CSR:735m)
2LAT
1LAT
H.L.PASSENGER P.F.(484m)
'C'CLASS LC NO.29
AT KM.57/6–7
(UN MANNED)
NOT FOR STABLING
RUB
ROB
STATION BUILDING
PANEL :20 KNOBS
SPARE NO:9,10,11,12.
KOHR–ZB SEC.
WITH LC NO.27
ZB–MTV SEC.
WITH LC NO.32,33&34.
EKT FOR CRANK HANDLE
(PTS.7,8,13,14)
1 LEVER GF FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
WITH SM
WINCH WITH KEY
BOOM LOCKING KEY IN
WINCH KEY OUT
BOOM LOCKING
KEY OUT
102(R)
PANEL–4 KNOBS
SPARE:–103
'SPECIAL'CLASS LC.NO.32
AT KM.60/10–11
GATE CONTROL:– 102
101/1 ID OF ZB
101 D
(KOHR-14.00Km)
(MTV 12.27 KM .)


SC–06
07
DN
VKB Jn.
UP
PRLI
L.C.NO.33 AT Km.62/11–12
(BET 'ZB–MTV')
REF. SIG PLAN NO: B5747
'A'CLASS LC NO.33
AT Km.62/11–12
GATE CONTROL–2
4D
4
(ZB)
VIKARABAD Jn.
DN ⟵ UP
DN GATE DIST.
OF LC NO.32
4 SLIDE INSTRUMENT
SPARE–3
GL
WINCH WITH KEY 'IN'
WINCH KEY 'OUT'
BOOM LOCKING KEY 'IN'
1 LEVER G.F.
FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
WITH SM ZB
1
1D
DN ⟵ UP
PARLI VAIJNATH Jn.
(ZB)
⟵ (ZB)
(MTV) ⟶

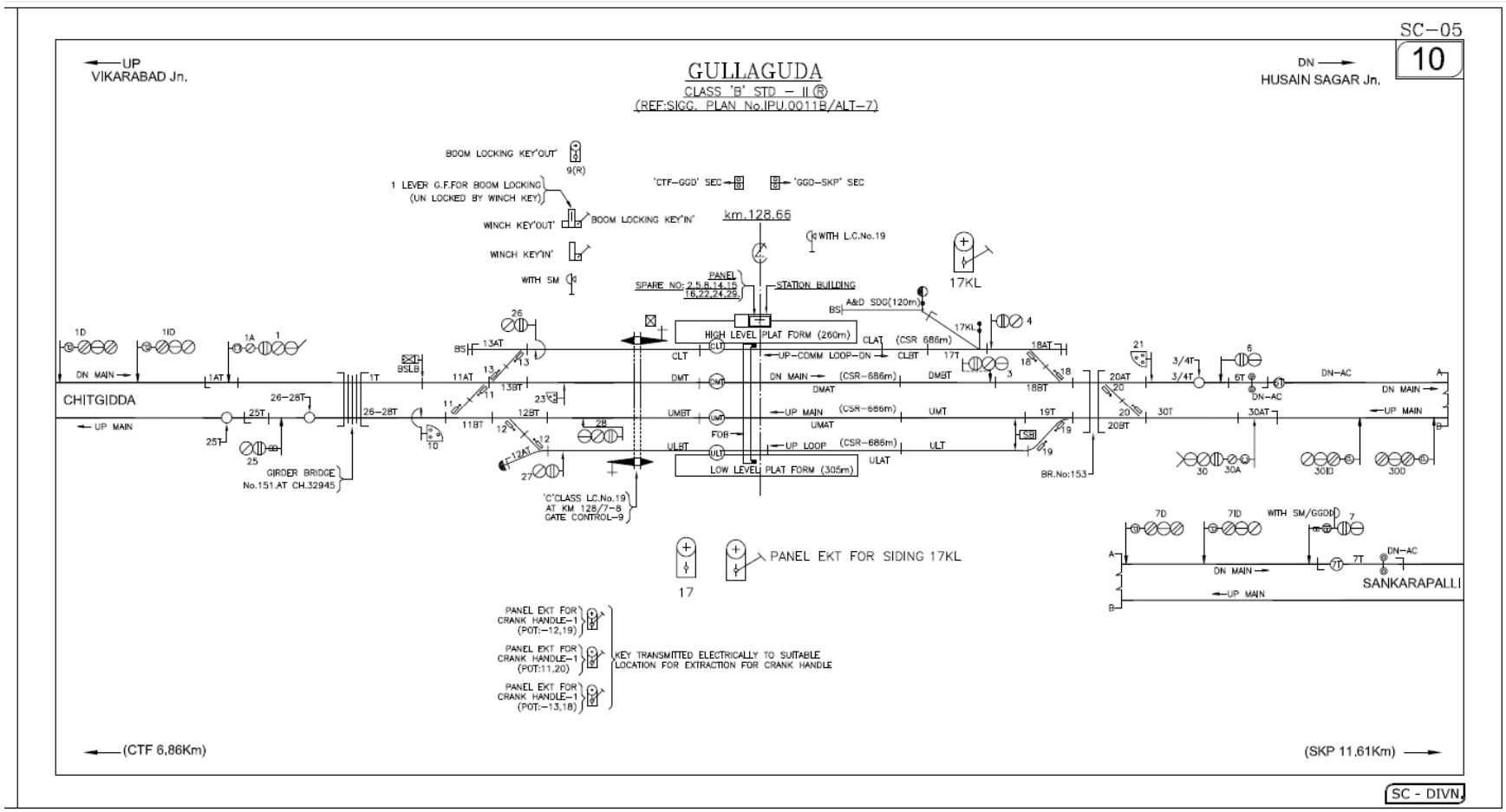

SC–06
08
DN
VIKARABAD JN.
UP
PARLI-VAIJNATH
MATALKUNTA
CLASS 'B' STD – II @MACLS
(REF:SIGG. PLAN No. IPU–0096B/ALT1)
KM:71.77
ZAHEERABAD
DN
UP
20D
20A
20
20AT
6T
20T
13AT
13BT
1LBT
(CSR715M)
OMBT
DN
UP
(CSR715M)
LOOP LINE
MAIN LINE
1LAT
OMAT
BS
H.A.SDG.
(CSR100M)
7AT
7BT
1T
15T
15
1AT
'C'CLASS-L.C. NO.35
AT KM.72/8-9
(UNMANNED)
DN
UP
BIDAR
R.L.PLAT FORM (180M)
STATION BUILDING
PANEL-20 KNOBS
SPARE:4,8,9,11,14,17.
ZB–MTV SEC.
MTV–BIDR SEC.
EXT FOR CRANK HANDLE
(PTS.7,10,13)
(ZB-12.27Km)
(BIDR-19.01Km)

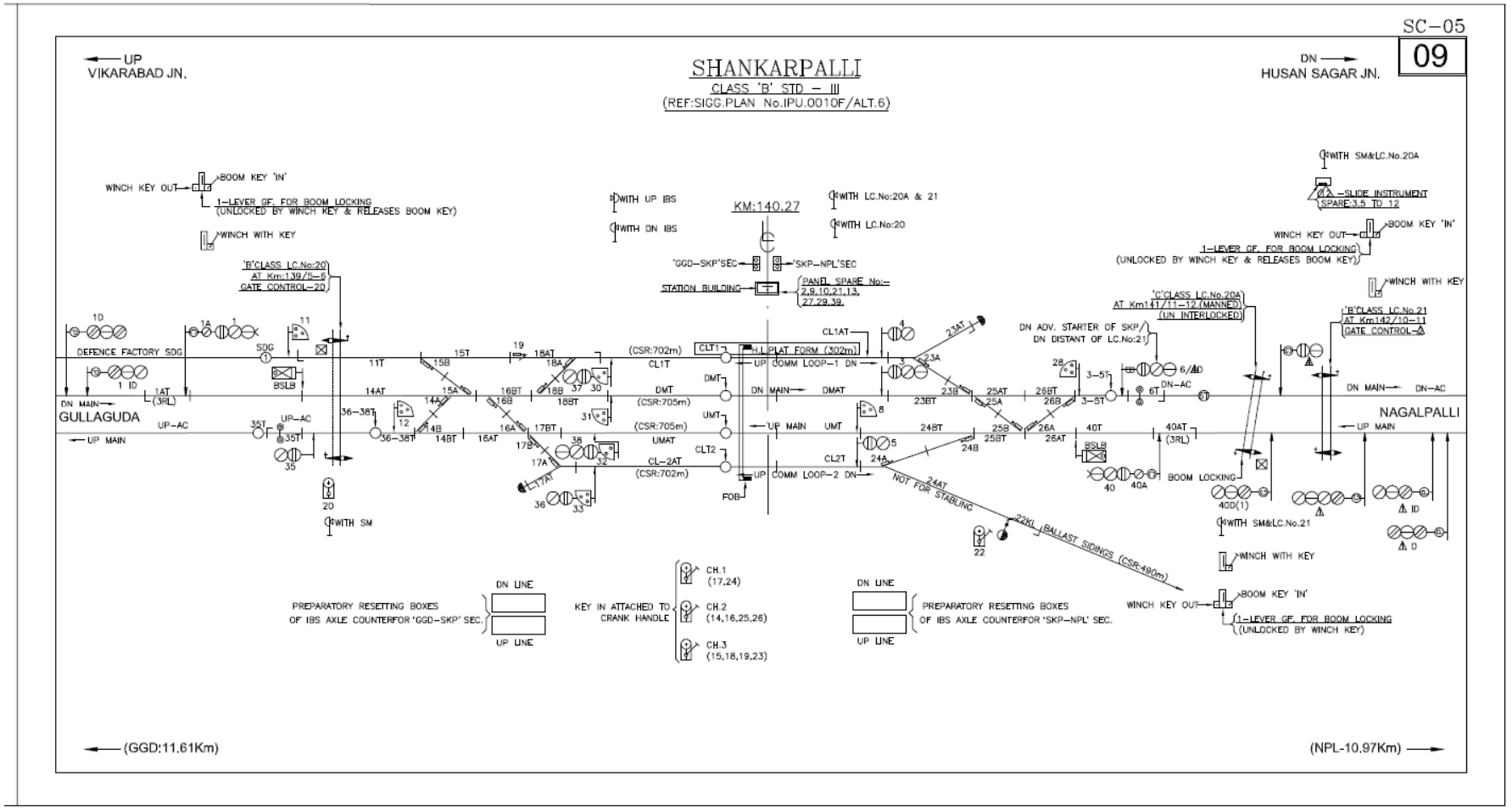

SC–06
09
DN
VKB Jn.
UP
PRLI Jn.
L.C.NO.41 AT Km.85/9–10
(BET. 'MTV–BIDR')
REF. SIG PLAN NO: B.5748/ALT.1
'A'CLASS LC NO.41
AT Km.85/9–10
GATE CONTROL–2
UP GATE DIST.
OF LC NO.42
(MTV)
VIKARABAD Jn.
PARLI VAIJNATH Jn.
(BIDR)
DN UP
GL
4 SLIDE INSTRUMENT
SPARE–3
WINCH WITH KEY
1 LEVER GF
FOR BOOM LOCKING
(UNLOCKED BY WINCH KEY)
BOOM LOCKING KEY 'IN'
WINCH KEY 'OUT'
WITH SM BIDR
(MTV)
(BIDR)

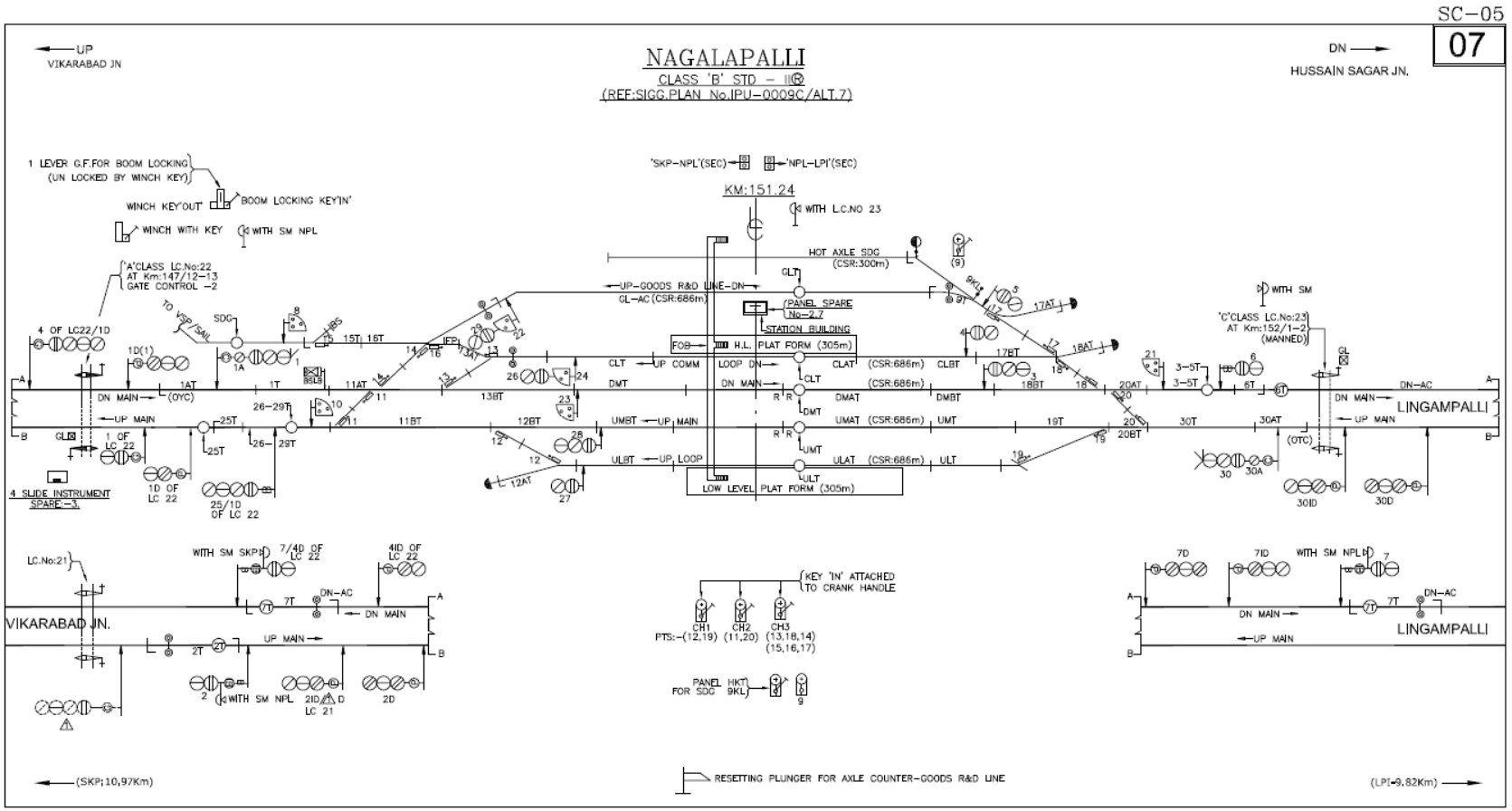
Contract Package B : Sadashivpet Road (Excluding) - Mid- Block Section Interlocked LC Gate No. 13 (between Sadashivpet Road – Marpalli) - Bidar



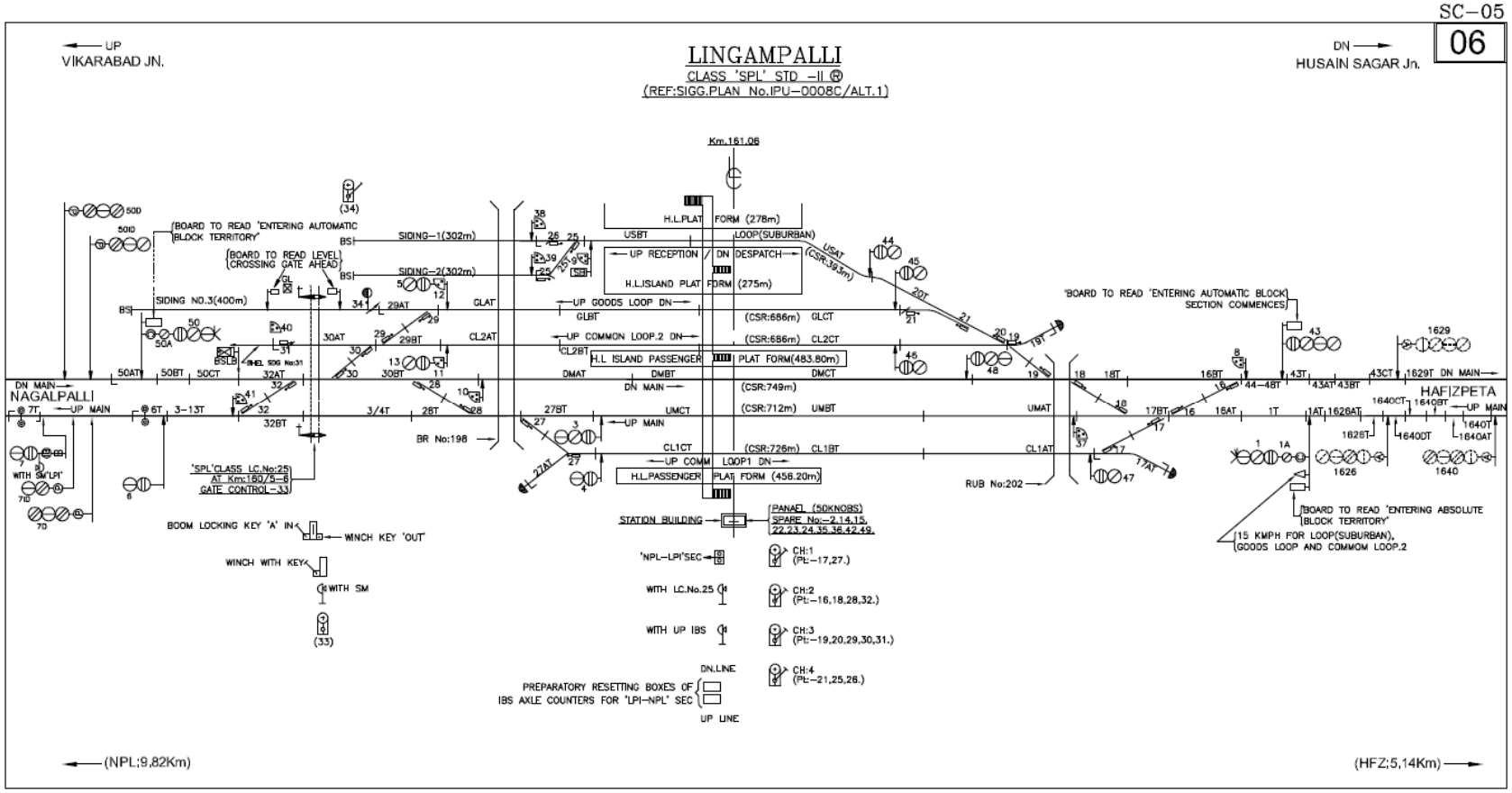
Contract Package C :
Chitigidda (Excluding) – Gullaguda - Lingampalli




SC–05
09
SHANKARPALLI
CLASS 'B' STD – III
(REF:SIGG.PLAN No.IPU.0010F/ALT.6)
UP
VIKARABAD JN.
DN
HUSAN SAGAR JN.
KM:140.27
GULLAGUDA
NAGALPALLI
DN MAIN
UP MAIN
UP–AC
DN–AC
DEFENCE FACTORY SDG
BSLB
WINCH KEY OUT
BOOM KEY 'IN'
1–LEVER GF. FOR BOOM LOCKING
(UNLOCKED BY WINCH KEY & RELEASES BOOM KEY)
WINCH WITH KEY
'B'CLASS LC.No:20
AT Km:139/5–6
GATE CONTROL–20
WITH UP IBS
WITH DN IBS
WITH LC.No:20A & 21
WITH LC.No:20
'GGD–SKP'SEC
'SKP–NPL'SEC
STATION BUILDING
PANEL SPARE No:–
2,9,10,21,13,
27,29,39
WITH SM&LC.No.20A
4–SLIDE INSTRUMENT
SPARE:3,5 TO 12
'C'CLASS LC.No.20A
AT Km141/11–12 (MANNED)
(UN INTERLOCKED)
DN ADV. STARTER OF SKP
DN DISTANT OF LC.No:21
'B'CLASS LC.No.21
AT Km142/10–11
GATE CONTROL–A
(CSR:702m)
(CSR:705m)
CL1T
CL2T
CL1AT
CL2AT
UMT
DMT
DMAT
H.L PLAT FORM (302m)
UP COMM LOOP–1 DN
UP COMM LOOP–2 DN
FOB
24AT
NOT FOR STABLING
22KL BALLAST SIDINGS (CSR:490m)
BOOM LOCKING
WITH SM
WITH SM&LC.No.21
PREPARATORY RESETTING BOXES
OF IBS AXLE COUNTERFOR 'GGD–SKP' SEC.
PREPARATORY RESETTING BOXES
OF IBS AXLE COUNTERFOR 'SKP–NPL' SEC.
DN LINE
UP LINE
KEY IN ATTACHED TO
CRANK HANDLE
CH.1
(17,24)
CH.2
(14,16,25,26)
CH.3
(15,18,19,23)
(GGD:11.61Km)
(NPL-10.97Km)


SC–05
07
UP
VIKARABAD JN
DN
HUSSAIN SAGAR JN.
NAGALAPALLI
CLASS 'B' STD – II
(REF:SIGG.PLAN No.IPU–0009C/ALT.7)
KM:151.24
WITH L.C.NO 23
HOT AXLE SDG
(CSR:300m)
UP–GOODS R&D LINE–DN
GL–AC (CSR:686m)
PANEL SPARE
No–2.7
STATION BUILDING
FOB
H.L. PLAT FORM (305m)
LOW LEVEL PLAT FORM (305m)
UP COMM
LOOP DN
CLT
CLAT
CLBT
DMT
DMAT
DMBT
UMBT
UP MAIN
UMT
UMAT
ULBT
UP LOOP
ULT
ULAT
DN MAIN
(OYC)
(OTC)
LINGAMPALLI
VIKARABAD JN.
1 LEVER G.F.FOR BOOM LOCKING
(UN LOCKED BY WINCH KEY)
WINCH KEY'OUT'
BOOM LOCKING KEY'IN'
WINCH WITH KEY
WITH SM NPL
'A'CLASS LC.No:22
AT Km:147/12–13
GATE CONTROL –2
'C'CLASS LC.No:23
AT Km:152/1–2
(MANNED)
WITH SM
'SKP–NPL'(SEC)
'NPL–LPI'(SEC)
4 SLIDE INSTRUMENT
SPARE–3
KEY 'IN' ATTACHED
TO CRANK HANDLE
PANEL HKT
FOR SDG
RESETTING PLUNGER FOR AXLE COUNTER–GOODS R&D LINE
(SKP:10,97Km)
(LPI–9,82Km)

Contract Package C :
Chitigidda (Excluding) – Gullaguda - Lingampalli



Part-II Sec.-II Annexure-1: Self Assessment Sheet for Technical Capabilities

To be submitted by Tenderer after filling "YES/ NO" against all the items (Part of Technical & Commercial bid)

SN	Description	Tenderer's Remark YES / NO
1	Tenderer is manufacturer of any of the indigenously developed software embedded RDSO approved products in the field of Railway Signalling Applications such as Electronic Interlocking (EI), Single Section Digital Axle Counter (SSDAC), Multi Section Digital Axle Counter (MSDAC), Dataloggers for logging signalling events, Solid State Block Proving Axle Counter (SSBPAC) and Universal Fail-Safe Block Interface (UFSBI).	
2	Carried out the system level primitive scheme design of TCAS with its sub-system & components and submitted the same along with all necessary drawings, documents and datasheets, configuration and parameters in the Technical & commercial bid. The marks shall be awarded on the basis of submission of following design components according to design approach adopted by Tenderer:	
(i)	Schematic Diagram with High -Level design	
(ii)	Low-Level Hardware design upto Card-Level	
(iii)	Design of Loco Vital Computer Peripheral Interface Controllers	
(iv)	Design of Radio network with calculation of power budget and process used for time slot allocation	
(v)	Logics used in Software for achieving Functional Requirements enumerated in specification	
(vi)	Bill of Quantity of Material for Station, Locomotive and Trackside equipment with details of bought out items, if any.	
3	Capability for Lab demonstration of following functions using any hardware with readiness to demonstrate following items to designated Railway Committee:	
(i)	Exhibiting Full Duplex communication Over-The-Air using Full Duplex Radio.	
(ii)	Demonstration of Prototype lab model for loco equipment	
(iii)	Demonstration of Prototype lab model for station equipment	
(iv)	Display of distance from a fixed point using Latitude / Longitude information received through GPS/GNSS receiver simulator.	
(v)	Displaying Speed of Locomotive Unit using output of Tachometer Simulator.	
(vi)	Generation of electric or pneumatic command for Brake application through Software	
(vii)	Reading user programmed data in RFID tag and interfacing it with loco TCAS	

SN	Description	Tenderer's Remark YES / NO
(viii)	Interfacing of interlocking information with station TCAS and transmission through radio	
(ix)	Display of information on loco TCAS received from station TCAS	
(x)	Relaying of information from one loco to other loco through station TCAS	
	Note: It is possible that some tenderer is able to demonstrate above items of S.No. 3 as an integrated approach through items of S.No. 4 and 5. In such case, the tenderer demonstrating through items of S.No. 4 and / or 5 shall be awarded marks for corresponding items of S.No. (3), S.No.(4) and/ or S.No. (5)	
4	Capability of carrying out integrated in-house testing of Prototype Lab model through Simulator with two stations unit lab models and two locomotive unit lab models {except for item 4(x)} communicating each other at RF level and using train movement simulated through RFID tags with readiness to demonstrate following items to designated Railway Committee.	
(i)	Display of Red, Green, Yellow, Double Yellow Signal Aspects in Loco Cab	
(ii)	Distance to next Signal at Red (Stop / Danger Aspect) at same interlocking in Loco Cab	
(iii)	Command for application of brakes to a train approaching too fast to a signal at Red.	
(iv)	Release of command for application of brake when the Movement Authority is increased by taking off a signal which was earlier at Red.	
(v)	Demonstration of provision for passing a signal at Red by Override from Driver Machine Interface	
(vi)	Generation of Brake Application Command to prevent Head-on collision between trains on same track not otherwise prevented to be so on same track.	
(vii)	Generation of Brake Application Command to prevent Rear-end Collision between trains on same track not otherwise prevented to be so on same track.	
(viii)	Generation of Brake Command on reception of SOS message from a train or station in vicinity.	
(ix)	Generation of Brake Command on reception of "Unusual Stoppage message" from other train in vicinity while approaching it.	

SN	Description	Tenderer's Remark YES / NO
(x)	Handling of RF Reception of transmission generated from four simulated stationary TCAS Units by four simulated Locomotive Units (Simulation may be exclusively for the purpose of demonstration of TDMA concept only which may even be without using or involving full-fledged lab models).	
5	Capability to demonstrate following functions in Field Trial (Based on report if already done with RDSO)	
(i)	Display of Red, Green, Yellow, Double Yellow Signal Aspects in Loco Cab, Distance to next Signal at Red (Stop / Danger Aspect) at same interlocking in Loco Cab	
(ii)	Application of brakes to a train approaching too fast to a signal at Red and release of brakes by TCAS when the Movement Authority is increased by taking off a signal which was earlier at Red.	
(iii)	Assessment of braking characteristics of train through Brake Test and its application while calculating braking distance	
(iv)	Application of brakes by TCAS to prevent Head-on collision and rear-end collision between trains on same track not otherwise prevented to be so on same track.	
(v)	Application of brakes on reception of "Unusual Stoppage message" or SOS message from other train in vicinity while approaching it.	
(vi)	Handling of RF Reception from four stationary TCAS Units by four Locomotive Units	
6	Final product developed meeting FRS, technical requirements and SRS as per RDSO specification for type testing and trial	
7	Equipment is certified for SIL 4 as per CENELEC or equivalent standards by ISA	

This assessment by me / us is based not on the presumptive status but on the actual status as on the date which is not later than that of submission of the tender offer.

The lab demonstration for the purpose of evaluation of technical status by RDSO Team has been arranged at following address. I / we are aware that it is responsibility of the tenderer to carry out the arrangements for lab demonstration.

.....

.....
.....

Date :.....

.....
Signature and Seal of
Manufacturer / Tenderer

Part II Section II Annexure – 2
Schedule of Rates (Part of Financial offer)

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
Schedule P - Supply of Field Components as per RDSO Specification RDSO/SPN/196 Version 3.1.1 and SCC									
P.1	Supply of complete TCAS equipment for Station	Set	14	5	4	23			
P.2	Supply of complete TCAS equipment for IBS and Interlocked LC gates	Set	7	6	3	16			
P.3	Provision of RFID tags for station	Set	14	5	4	23			
P.4	Supply of RFID tags for Block Section including IBS and interlocked LC gates	Set	14	5	4	23			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
P.5	Supply of complete TCAS equipment for Electric locomotives including Brake Interface Unit	Set	12	2	6	20			
P.6	Supply of complete TCAS equipment for Diesel locomotives including Brake Interface Unit	Set	8	10	2	20			
P.7	Spares as per Para 4.26 of the Special Conditions of the Contract. Tender has to provide bill of quantities for spares.	---	---	---	---	---	---	---	---
P.7(i)	Spares for Stationary (Station / IBS/ mid-blocksection interlocked Level Crossing Gates)	Set	21	11	7	39			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
P.7(ii)	Spares for Electric Locomotive Unit	Set	12	2	6	20			
P.7(iii)	Spares for Diesel Locomotive Unit	Set	8	10	2	20			
P.7(iv)	Spares for RFID Tags for a station	Set	14	5	4	23			
P.7(v)	Spares for RFID Tags for a Block Section	Set	14	5	4	23			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
Schedule Q - Installation & Commissioning of Field Components									
Q.1	Installation & commissioning of complete TCAS equipment for Station	Set	14	5	4	23			
Q.2	Installation & commissioning of complete TCAS equipment for IBS and Interlocked LC gates	Set	7	6	3	16			
Q.3	Installation & commissioning of RFID tags for station	Set	14	5	4	23			
Q.4	Installation & commissioning of RFID tags for Block Section including IBS and interlocked LC gates	Set	14	5	4	23			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
Q.5	Installation & commissioning of complete TCAS equipment for Electric locomotives including Brake Interface Unit	Set	12	2	6	20			
Q.6	Installation & commissioning of complete TCAS equipment for Diesel locomotives including Brake Interface Unit	Set	8	10	2	20			
Schedule R - Supply, Installation & commissioning of Towers for Stationary TCAS Units									
R.1	Supply, Installation and commissioning of 30 meter tower at stationary Unit	Set	19	11	7	37			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
Schedule S - Test, Demonstration and Supervision Facilities									
S.1	Supply, Installation & Commissioning of test bench for Electric Loco equipment for Electric Locosheds	Set	1	1	1	3			
S.2	Supply, Installation & Commissioning of test bench for Diesel Loco equipment for Diesel Locsheds	Set	1	1	1	3			
S.3	Supply, Installation & Commissioning of test bench and RFID tag programming kit for Station equipment	Set	1	1	1	3			
S.4	Supply, Installation & Commissioning ofof Network Management System for centralised monitoring of TCAS station and loco equipment as per specification and tender document for section in A, B & C packages	Set	1	0	0	1			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
S.5	Supply, Installation & Commissioning of of Lab Models of Station Equipment, Loco Equipment, Trackside Components and Simulator at RDSO, Lucknow	Set	1	1	1	3			
S.6	Supply, Installation & Commissioning of Kit for configuring, programming and downloading Electric Loco Equipment as per Para 4.9 of SCC	Set	5	3	2	10			
S.7	Supply, Installation & Commissioning of Kit for configuring, programming and downloading Diesel Loco Equipment as per Para 4.9 of SCC	Set	5	3	2	10			
S.8	Supply, Installation & Commissioning of Kit for configuring and programming RFID Tags as per Para 4.10 of SCC	Set	2	2	2	6			

S. No.	Item	Unit	Qty of Contract Package A	Qty of Contract Package B	Qty of Contract Package C	Total Qty for all packages	All inclusive Unit Rates in figure (in Rs.)	All inclusive Unit Rates in Words (in Rs.)	Details of Taxes / Duties & other charges as included
S.9	Supply, Installation & Commissioning of Kit for configuring, programming and downloading Station Equipment as per Para 4.10 of SCC	Set	2	2	2	6			
Schedule T - Training to Railway Staff									
T.1	Training to Railway Staff in India as per Para 4.25 for each training package of 200 man-days for each contract package	Training Package	1	1	1	3			

Notes: **(1) The AMC charges MUST be quoted by Tenderers separately with detailed breakup for 5 years after completion of initial Warranty Period of 24 months. The AMC charges shall not be considered for determination of inter-se ranking during evaluation of Financial Bid**.

(2) This being a developmental work, rates awarded through this contract shall not be taken as reference for future work

(3) Unit rates are to be quoted by Tenderers individually for all schedules only (except for AMC) against the respective schedules in the above Schedule of Rates and only in the Financial Bid.

I have read all the terms & conditions of the Tender and I agree to abide by the same.

Date: .....

Signature and seal of
Manufacturer/ Tenderer

****