भारत सरकार (GOVERNMENT OF INDIA)
रेल मंत्रालय (MINISTRY OF RAILWAYS)
रेलवे बोर्ड (RAILWAY BOARD)
*****

Azadi Ka Amrit Mahotsav

आज़ादी का अमृत महोत्सव

No. : 2019/M(N)/951/13 **Dated:** 17/10/2022

The Managing Director
CRIS
Chanakyapuri
New Delhi – 110 001

Sub.: GPS sets for freight wagons.

Ref.: Pink Book Item No. 1285 of 2022-23 (RSP).

Vide reference above, the work of "GPS sets for freight wagons" has been sanctioned in Railway Board's Pink Book 2022-23 under Plan Head -21 (RSP) as item no. 1285.

CRIS is hereby nominated as "Executing Agency" for this work.

CRIS may undertake this work on priority, duly factoring in it's experiences of RFID work execution. An action plan to this effect may be made and submitted to Railway Board at the earliest.

Further, RDSO has floated a draft specification of GPS for freight wagons. The same may be actively contributed to facilitate priority execution of this work.

This has the approval of Competent Authority.

17/10/2022

(Anirudh Kumar)
EDME (Modernization)
रेलवे बोर्ड / Railway Board

O/C

Copy:

1. **DG/RDSO** : For kind information please

Pl. issue
17.10.2022

रेल मंत्रालय
Ministry of Railways
रेलवे बोर्ड/Railway Board
अनुलग्नक सहित जारी
Issued with Enclosure
16-10-22

E-3322674

रेलवे बोर्ड

RAILWAY BOARD

2022-23 के लिए चल स्टाक कार्यक्रम / Rolling Stock Programme for 2022-23

(आंकड़े हजार रू. में) (Figures in thousand of Rupees)

मद सं. / Item No.	विवरण / Particulars	आबंटन / Allocation		स्वीकृत लागत / Sanctioned Cost	मार्च 2021 के अंत तक व्यय / Exp. at the end of March 2021	2021-22 के लिए संशोधित परिव्यय / Revised Outlay for 2021-22	2022-23 के लिए प्रस्तावित परिव्यय / Outlay proposed for 2022-23
	ब - नई खरीद	B - NEW ACQUISITION					
1282	**10000 अदद एडवांस परफार्मेंस माल बोगियों का डिजाइन व विकास, दर रु.12.5 लाख** Design and development of 10000 advanced performance freight bogies @ Rs.12.5 lakh	पूंजी	Cap.	1250,00,00	..	..	1
1283	**मालडिब्बों के लिए 5,000 रोटरी कपलर, दर रु.1 लाख** 5,000 rotary couplers for freight wagons @ Rs.1 lakh	पूंजी	Cap.	50,00,00	..	..	1
1284	**25 सेट माल यातायात ईएमयू (16 यान लंबाई का सेट) का प्रापण, दर रु.60 करोड़ प्रति सेट** Procurement of 25 sets of freight EMU (set of 16 car length) @ Rs 60 cr per set	पूंजी ईबीआर(बॉण्ड)	Cap. EBR(IRFC)	200,00,00 1300,00,00	.. ..	.. ..	1 ..
1285	**मालडिब्बों के लिए जीपीएस सेट - 300000 मालडिब्बे, दर रु.20000 प्रति डिब्बा** GPS sets for freight wagons - 300000 wagons @ Rs. 20000 per wagon	पूंजी	Cap.	600,00,00	..	..	1
1286	**5000 बाक्स-एनएचएल मालडिब्बों का पुनर्वसम, दर रु.4.74 लाख** Rehabilitation of 5000 BOXNHL wagons @ Rs.4.74 lakh	मूआनि	DRF	237,00,00	..	..	1
	जोड़ -माल डिब्बे / TOTAL-Wagons-EXT	पूंजी मूआनि ईबीआर(बॉण्ड)	Cap. DRF EBR(IRFC)				1,05 1,01 ..
	जोड़ -माल डिब्बे / TOTAL-Wagons	पूंजी मूआनि ईबीआर(बॉण्ड)	Cap. DRF EBR(IRFC)				1,05 1,01 ..
	जोड़ - नई खरीद / Total-New Acquisition	पूंजी मूआनि ईबीआर(बॉण्ड)	Cap. DRF EBR(IRFC)	.. .. ..	.. .. ..	.. .. ..	3,43 3,14 2
	जोड़ - चल स्टाक / **Total - Rolling Stock**	**पूंजी** **मूआनि** **वित्तिं (1)** **रारेसंको** **ईबीआर(बॉण्ड)**	**Cap.** **DRF** **DF(1)** **RRSK** **EBR(IRFC)**	.. ..	.. ..	.. ..	**3880,00,00** **766,84,00** **5,00,00** **2650,00,00** **31000,00,00**

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No.: MW/GENL/GPS Date: 07.10.2022

EDME (Modernisation)
Railway Board
Rail Bhawan
New Delhi – 110 001

Sub: Specification for GPS device used on Freight Wagons.
Ref : (i) Railway Board letter No. 2022/M(N)/60/1 dated 03.02.2022.
(ii)This office letter of even No. 06.07.2022.

1. Railway Board vide reference (i) above has instructed for preparation of technical specification of GPS for fitment in wagon. Accordingly, this office has prepared a technical draft of GPS for fitment in wagon and forwarded to Railway Board vide reference (ii) above for concurrence.

2. Since the working of RFID device is already going on, it was directed that further deliberations will be done on the GPS device. Accordingly GPS specification was kept on hold.

3. Detailed discussions have been held and as advised by Board the draft specification is being sent along with this letter. Since backend services and data have been proposed to be hosted on CRIS server, necessary advice to CRIS may be considered. Further, necessary instructions, if any, on the draft specification may be advised to this office.

Encl: Nil

Digitally Signed by Manish Thaplyal
Date: 10-10-2022 17:58:38
Reason: Manish Thaplyal

(Dr. Manish Thaplyal)
Exec. Director/Wagon

Specification No. ----------

GOVERNMENT OF INDIA MINISTRY OF RAILWAYS

सत्यमेव जयते

SPECIFICATION FOR

SELF-POWERED FIXED GPS DEVICES FOR FREIGHT STOCK TRACKING & TRACING OVER INDIAN RAILWAYS

ISSUED BY

WAGON DIRECTORATE

RESEARCH DESIGNS & STANDARDS ORGANISATION

MANAK NAGAR, LUCKNOW-22601

Specification No. ----------

FOREWORD:

- This specification covers the general requirement of design, development construction, performance, testing, supply, commissioning and after sales service of self-powered GPS fixed device for freight stock tracking and tracing over Indian Railways.
- This specification covers the technical requirements/provision related to material/ tests and does not include all the necessary provisions of contract.
- This specification draws reference of some specifications & drawings. The latest versions of the relevant specifications shall be taken as reference.
- This specification requires the reference to the following specifications:

Specification	Description
IEC 60571	The Safety and reliability requirement of electronic signaling equipment.
EN 50155	International standard covering on electronic equipment used in rolling stock for railway applications

DISCLAIMER

This document is based on the studies of various literatures/papers available worldwide. Although every care has been taken in specifying details adequately and unambiguously, Wagon Directorate, RDSO shall not be liable for any kind of damages / losses incurred by any and all due to errors or omissions in this document.

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INDEX

ANNEXURES

Specification No. - - -

SPECIFICATION FOR
SELF-POWERED FIXED GPS DEVICES FOR FREIGHT STOCK TRACKING & TRACING OVER INDIAN RAILWAYS

1. SCOPE:

This specification for "specification for self-powered fixed GPS devices for freight stock tracking & tracing over Indian Railways" covers three parts. **Part-I** covers general requirements regarding supply, installation, commissioning and after sales service while **Part-II** covers the functional & Design requirements and method of quality control of the system. **Part –III** covers the Minimum M&P and Test Equipment's for the manufacturing and testing of the system.

2. INTRODUCTION:

Wagon Directorate, RDSO is developing and implementing a vendor-neutral, standards-based solution for tracking and tracing of Freight stock as they move over Indian Railways network. Self-Powered GPS Fixed Devices are attached to the Freight stock and encoded. As the Freight stock moves and stables over Indian Railway, its location and Speed (kmph) to be captured at fixed time duration (generally 30 minutes to 6 hours) & transmitted to the Railway/CRIS server. The system should be equipped with GPS technology to send information like speed, location of Wagons and calculating kilometer run by the Wagon on per day/month/year basis.

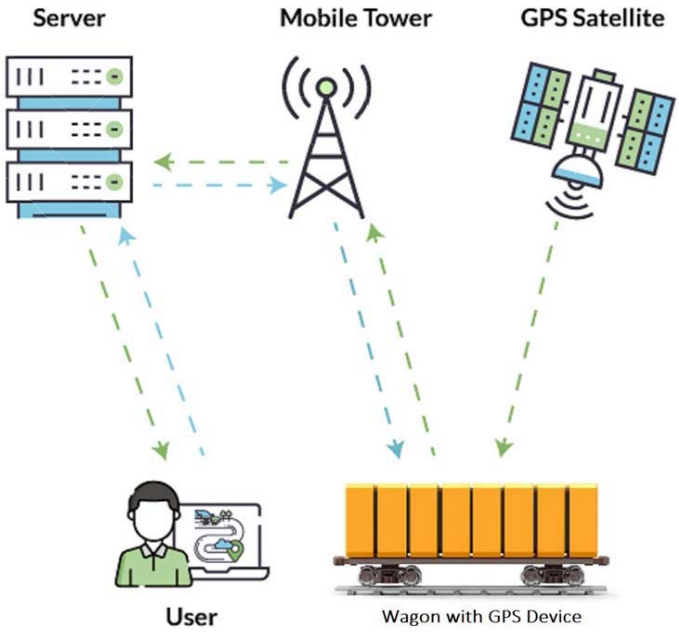

Figure-1

3. DEFINITION & EXPLANATION:

3.1. '**Specification for self-powered fixed GPS devices for freight stock tracking'** means "complete system including all related equipment, such as GSM/3G/4G/5G modem, GPS system, IP67 rated box /enclosure for exposed system etc. to make system fully functional".

3.2. **`Supplier'** means the firm/company to whom the order for the manufacture, supply, installation and commissioning and maintenance of the self-powered fixed GPS devices.

3.3. **'Purchaser'-** means Zonal Railways/Workshop/PU/Wagon Manufacturers or any other agency procuring the device/material on behalf of the President of India.

3.4. '**INSPECTING AUTHORITY'** means the Organization or its representative nominated by the Purchaser to inspect the system on his behalf.

3.5. RDSO means Research Designs and Standards Organization, Manak Nagar, Lucknow (India) - 226011.

3.6. Indian Railways is hereafter referred to as IR.

3.7. In case of any clarification in respect of any clause of this specification or drawings, the same shall be obtained from purchaser/ DG (Wagon), RDSO.

4. SCOPE OF SUPPLY:

4.1. The scope of supply includes the following systems and sub systems: wagon wise requirement along with accessories (if any):-

Description of unit	Quantity
Self-powered fixed GPS devices	01 per Wagon
Software & Manual **1.**Application software manual **2.**User manual, operating manual and troubleshooting manual for the systems/ sub systems.	01 set per 1000 Wagon

4.2. All the module / units may be mounted in an IP67 compliant enclosure unit, designed with anti-pilferage features. Enclosure units shall be mounted at suitable location in the wagon with mutually identified or allotted locations in the Wagon.

4.3. **Internet connectivity:** - SIM and data charges for selected service provider are in scope of supply.

4.4. **Centralized Web Server:** For hosting of online services and database of all the train routes, rake formations of trains a web server (server availability 100 % uptime round the clock) shall be made available by Indian Railway/CRIS to serve the entire fleet of Wagons as well as prospectus users of the system.

4.5. The scope of the supply includes acceptance testing, installation and commissioning of the complete system on the Wagons, On-Site Replacement Warranty and complete backend/ frontend services with website and interface.

5. ELIGIBILITY CRITERIA:

5.1. Firm /manufacturer shall have adequate experience of design, development and manufacturing of similar system like onboard vehicle tracking, monitoringof assets, Wagon tracking or online management of data interchange between control center system and onboard system in rollingstock (rail) application and shall be capable of developing material to the required quality and standard.

5.2. Firm/manufacturer should have installed successfully at **least 500** such systems in worldwide Railways (Standard Gauge or BG) system/IR in past and have completed minimum two years satisfactory service. The list of supplies made along with contact details of the customers and performance certificate should be submitted as documentary evidence.

6. PROTOTYPE APPROVAL AND FIELD TRIAL PERFORMANCE MONITORING

6.1. The prototype approval by RDSO shall be mandatory followed by field trial Performance monitoring of the system offered on Railways advised by RDSO. Parameters for the performance monitoring of field trial are specified at **Annexure '1'**.

6.2. Trials for commissioning of Prototype device shall be performed with test trains.

6.3. A freight train which has at least 59 working devices, one on single wagon of the train can be designated as the test train. The Freight train should run for at least 03 months.

6.4. Complete data of the test trains must be received at the backend on real time basis.

7. COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT:

Break down Maintenance

Concerned Railway /ROH Depot/POH shop shall inform the supplier regarding 'self-powered fixed GPS' devices failure/malfunction of any equipment of system. After receipt of information, firm should attend the failure not later than 03 days.

8. SUPPLIER'S RESPONSIBILITY:

The Supplier shall be responsible for the execution of the contract strictly in accordance with the terms and the conditions of this specification and the conditions of contract made with purchaser.

9. WARRANTY/GUARANTEE

On-Site Replacement Warranty for 72 months from date of fitment or 84 months from date of receipt whichever is earlier.

10. AFTER SALES SERVICE:

10.1. Installation, commissioning, and proper functionality in warranty period is responsibility of supplier.

10.2. Supplier shall associate with Indian Railways during the trials of system. He shall also undertake to modify the equipment supplied, if required as a result of trials.

10.3. The Supplier shall provide one hard & soft copies of the Operation, testing & Maintenance Manuals and servicing Instructions and wall chart to purchaser free of cost at every 5000 set.

10.4. Identification code numbers for main equipment and their component parts to avoid mixing of different applications by mistake.

10.5. In case of any modification, the maintenance instruction/manuals to be revised accordingly and provided to concerning Railways.

11. TRAINING

The Supplier shall undertake to train the following Indian Railway personnel free of cost.

11.1. **Railway Technicians**

Minimum two persons per depot and two persons per Wagon POH Workshop for six working days training shall be trained on site / in depot to cover maintenance and testing of the complete system.

11.2. **Officers and Engineers**

One Officer and two Engineers shall be trained at the works of the principles for a minimum period of one week. This training shall cover all the aspects of the complete system like design, manufacture, quality control, maintenance and testing etc.

12. PACKING

Supplier shall ensure that all outer and exposed portions of the various items of the system being supplied are covered with suitable protection/packing material to prevent ingress of foreign matter/damage during handling, storage, transportation and stone throwing on it etc.

13. MARKING

13.1. All the individual units shall be provided with a suitable name plate / electrical rating plate on the enclosure units. The following information shall be available either by etching process or by engraving or screen-printed.

13.2. The name/identification plates shall be of bright anodized aluminum with black letters embossed or etched on white background. These plates shall be fitted by riveting. The nameplate shall indicate the following usual information.

13.3. The following information shall be clearly marked on above mentioned marking plate at a suitable place on each equipment:

a) Name and Address of the manufacturer.
b) Month and Year of the manufacturing.
c) Serial number of Equipment
d) Specification number
e) Software and hardware version
f) Schematic diagram of the equipment on the side of the cover.
g) The first two digits shall indicate the year of manufacturing and next two digits shall indicate month. Further next five digits shall indicate manufacturing serial number.

PART II: FUNCTIONAL & DESIGN REQUIREMENTS

14. FUNCTIONAL REQUIREMENTS:

14.1. Capturing and transmitting location and speed of the freight stock on real time basis.

14.2. The device has to transmit all data to the specified server, where are data processed and stored. The system (device & specified server) should be capable of informing the path of wagon during any selected period and direction of movement. Device should be capable of working up to train speeds of 160 kmph.

14.3. The system (device & specified server) should be capable of sending a notification when the freight stock arrives to specified area like ROH depot, POH workshops, loading/unloading point etc.

14.4. It should also provide the information about freight stock being idle, mileage earned, its movement and stand-still comparison.

14.5. The system (device & specified server) should be capable of communicating with FMM. FMM may further use the location & other data from GPS device to put the data in any required information tabulate.

14.6. The device must be able to detect the removal of the unit from the freight stock.

14.7. The device should be able to be configured from remote unit by only CRIS/IR.

14.8. The device should have internal memory for storing data in the event of loss of network coverage.

14.9. The device must confirm to IP67.

14.10. It should have maximum up to 1000 gram and size L*W*H as **150 ± 30*75 ± 15*50 ±10 mm.**

14.11. Location on Freight Stock:

a) Wagons having End Panel - Above CBC and below top coping
b) Any suitable location Inside Guard's cabin for Wagons having Guards Cabin
c) Inside underframe in case of Flat wagon, Tank Wagons etc.

15. INSTALLATION REQUIREMENTS

15.1. The device shall adhere to national/ acceptable international standards wherever such standards are prescribed.

15.2. The device should be capable of performing in the Indian Railways working condition in the open.

15.3. The device should be capable of working safely and securely in non-electrified as well as in electrified sections. The electrified section of the IR works on the 25KV, 50 Hz powered rail return system with average current of 600A and fault current of up to 5000 A.

15.4. The device should be capable of performing appropriately and safely in shade temperatures of -20 to 70 degrees Celsius and RH of 5% to 100% (non-condensing) along with heavy monsoon rains and normal water runoff from passing trains. The device should be designed accordingly. All cable terminations, connectors, weld seams, joints (if any) etc. must also be designed and made keeping these working conditions in view.

15.5. The device must be installed such that they do not infringe the maximum moving dimensions pursuant to the IRSOD. The supplier must submit the installation drawings of the device for scrutiny and approval by RDSO.

15.6. The device installed on the Freight stock should be so positioned and should be sufficiently rugged to prevent them from being damaged by loading, unloading, tippling, operations and Maintenance of Freight stock

15.7. The device shall be installed in such a way that it is not prone to theft and damages. The device shall be so constructed as to prevent unauthorized access to the system. Adequate locking shall be provided for this purpose.

15.8. The functioning of the device shall not get affected by the environmental and site conditions like vibrations from passing trains, track maintenance vehicles/equipment, direct sunlight on the sensitive and delicate parts of system components, heat from the sunlight, cold, rains, hail, wind, dust, lightning, heavy rain and water logging, animal trespassing, presence of OHE, trash thrown from trains, ballast flying from under the train due to passage of the train, minor animal run overs.

15.9. Vibration & Shock: The system should be able to withstand vibration and shock loads during loading, unloading, tippling, operations and Maintenance activity.

15.10. Power Supply Availability: The device is to be powered by in-built battery.

16. DESIGN REQUIREMENTS/ SYSTEM REQUIREMENTS:

The "**Self-Powered GPS Fixed Devices for Freight Stock Tracking & Tracing over Indian Railways**", including all sub-systems and equipment shall be of robust/proven design for wagon stock application.

16.1. Technical Parameters for GPS module:

16.1.1. L1 frequency C/A Code with 12 (or higher) independent Tracking Module (Channels)

16.1.2. Autonomous Positional Accuracy shall be better than 10 meters

16.1.3. Suitable to work up to 160 kmph speed

16.1.4. Update time should be 15 minutes.

16.1.5. Reacquisition time <250 milli seconds

16.1.6. Cold start better than 45 seconds

16.1.7. Warm start shall be better than 38 seconds

16.1.8. Hot start better than 5 seconds

16.1.9. Built-in nonvolatile RTC with battery backup.

16.1.10. The devices are so fixed that they do not shift easily, especially under the vibration and impacts of train operations.

16.1.11. The device time has to be synchronized with GNSS data to be always accurate.

16.1.12. The device should be so fixed that they are easy to remove and reinstall if required for the purpose of Freight Stock maintenance.

16.2. **Device for connecting to mobile internet:**

16.2.1. This is a device that allows connecting with the internet using commercial mobile telephone networks.

16.2.2. The device should be capable of simultaneously supporting two networks for ensuring redundancy. If anyone network is down or slow, the device should be capable of automatically switching to the other network. Using two SIM simultaneously or independently will be decision of railways but system should be capable of supporting such provision.

16.2.3. The system shall fall back to 3G and then 2G network when 4G network is not available.

16.3. **Power supply:**

16.3.1. Since the Freight stock does not come with any inbuilt power supply source, the power supply to the device should be through battery, in built with the device and it should be adequate for powering the complete unit up to minimum 6 years from the date of the activation of the device.

16.3.2. Batteries used for power supply must be maintenance free, leak proof causing no damages/corrosions to the Freight stocks.

16.4. **Enclosure:**

16.4.1. The enclosure shall house the Device & Battery for power supply. The enclosure shall be compact, concealed and light weight for preventing any unauthorized access or overweight.

16.4.2. The enclosure with the equipment shall be mounted on/inside/under the Freight stock. Mounting shall be decided in such a manner that the unit does not get damaged during loading, unloading, tippling, operation or maintenance of the Freight stock. Mounting shall be bolted type.

16.5. **Backend Implementation**

The information from device shall include but not be limited to:

16.5.1. Location (shown on a map and available as a downloaded data file).

16.5.2. Speed of the wagon.

16.5.3. Direction of travel of the wagon.

16.5.4. Necessary **APIs** (Application Program Interface) with for this, along with the mapping software, should be developed by the supplier of the system – including obtaining any authorization for use of Geo-mapping data and software. No fees shall be paid by Indian Railways for use of such third-party resources like maps, etc.

16.5.5. The website shall be hosted on Indian Railways/ CRIS servers. Computing system with scalability and geographical resilience with adequate redundancy and with mirrored redundant servers at each geographical location. All cost for software implementation shall be bore by supplier.

16.5.6. The User interface shall have to be preapproved by Indian Railways before the same is deployed. Any changes to dashboard shall have to be done by the firm at its own cost

to the satisfaction of Indian Railways. The website shall have multi-level query menu as per the demands of Organizational hierarchy – relevant to that particular administrative level of person logging in.

16.6. **Access to Data and Alerts:**

16.6.1. Access to the information shall be security protected to a recognised industry standard (CMMI level 3 SVC Accredited company) and shall be of hierarchical in nature depending on the administrative position/privilege of the accessing client.

16.6.2. The software shall escalate the alerts to successive end users in the event of acknowledge of the alert not being confirmed by its first intended recipient.

16.6.3. An audit trail shall be available to monitor and record website activity as well as data concentrator logs.

16.6.4. Network connection between the device and the Backend (To be provided by the GPS device integrator)

16.6.5. The network connection between the device and the Backend shall be through commercial 4G Mobile Telephony network.

16.6.6. The device design shall permit connection to be initiated and established from both directions, that is, from the device to the backend as well as from the backend to the device.

16.7. **Data evacuation to the Backend:**

16.7.1. Data shall be sent to the backend from the Device at fixed interval of 30 minutes while running and when stationary 06 hours. This interval should be adjustable as per the requirements of Indian Railways. It will improve battery life.

16.7.2. The data sent by the device to the backend will comprise of Wagon data (already fed in the device), location Data, Speed (kmph) as well as other data as found to be required for the efficient and satisfactory working of the system.

16.7.3. IR shall have complete control in selecting the various parameters to be transferred between the device and the backend in either direction.

16.8. **Mechanical enclosure**

Physical dimensions(L*W*H) & Weight	150 ± 30*75 ± 15*50 ± 10 mm. Weight up to 1000 gram
Mounting Provision	(i) Wagons having End Panel- Above CBC and Below top coping (ii) Any suitable location Inside Guard's cabin for Wagons having Guards Cabin (iii)Inside under frame in case of Flat wagon, Tank Wagons etc.
Color & Finish	Natural Metal Color, having buff finish.

17. PERFORMANCE REQUIREMENTS

17.1. All items supplied under must meet the stipulations of MEITY's Electronics and Information Technology Goods (Requirement of Compulsory Registration) Order, 2021 including its latest applicable modifications/ revisions. Battery provided in the device should conform to latest IEC & IEEE standards and other legal stipulations. The battery must be ISO 9001:2015 approved and IEC 60086 (or equivalent) approved.

17.2. The device shall transmit through its antennas only at fixed interval of 30 minutes while running and when stationary 06 hours. After it, the antennas must stop transmitting within a reasonable time. The idea is not to waste battery power.

17.3. The device must keep its internal clock synchronized using an authentic network timeserver.

17.4. Periodic software update must be provided by the contractor that should meet requirements for latest standards set by Indian Railways.

17.5. Time of reading the location and Speed of Freight stocks is of utmost importance. The device shall communicate the data in real time basis after making due adjustments for any lags etc. that may be caused by clock cycles of the device and latencies of the devices if any.

18. SAFETY REQUIREMENTS

18.1. The system shall be designed on fail-safe principles. Unsafe conditions shall not develop due to faults and adequate safety margins must be incorporated in the design for systematic and random failures. If a portion of the system or full system fails, it shall not relay any data. A fail-safe device is one that, in the event of failure, responds in a way that will cause no harm, or at least only a minimum of harm, to other devices or danger to personnel.

18.2. A fault must be detected and cleared quickly to kill the probability for another fault to occur simultaneously which can lead to unsafe conditions.

18.3. Hardware faults, both open circuit and short circuit of one or more components, shall not lead to unsafe conditions.

18.4. The equipment shall not fail on the wrong side due to any harmonic interference.

18.5. The equipment shall be insensitive to extraneous magnetic or electrical fields and shall be in compliance with IEC 60571 and tested in NABL accredited labs.

18.6. The equipment shall be suitably protected to remain functional against external EMI interference.

18.7. The equipment along with protective measures shall be so designed that it is not affected in case electrified OHE (Overhead Equipment) or lightning falls in its vicinity.

18.8. The device should be such that they do not infringe IRSOD on Indian Railways. These dimensions and the relevant envelopes are available in Indian Railways Schedule of Dimensions document along with all its correction slips & Technical Aid to it, available on Indian Railways official website www.indianrailways.gov.in.

18.9. Electromagnetic Compatibility: The system should not interfere with the operation of signaling systems or any vehicle systems on passing trains.

19. COMMUNICATION PROTOCOL

Industry standard communication protocols like http, FTP, SMTP, IMAP etc. shall be used over standard IP network for all types of the communication modes for transfer of data, software files and reports generated. No vendor specific protocol or file or data formats shall be allowed, so that interoperability of the devices selected for the system may be ensured. Internal file design /data structure for interoperability for various functions of the system between vendors shall be standardized after trial.

20. INSPECTION & TESTS BY MANUFACTURER/ SUPPLIER:

20.1. All the tests from Para 20.8 to 20.10 will be carried out by manufacturer and record will be maintained by them, and will be produced to any authorized official of RDSO/ Railway/ Inspecting authority.

20.2. All tests from Para 20.8 to 20.10 will be verified during approval and quality audit of the firm.

20.3. Regular acceptance test will be carried out as per Para 20.10, and manufacturer will produce all test record to inspecting authority.

20.4. In the event of dispute between the inspecting officer and the firm the decision of the **Inspecting Officer** shall be final and binding.

20.5. Unless otherwise specified all the tests shall be carried out at ambient atmospheric conditions. For inspection of material, IEC 60571 shall apply. Inspection and testing shall be carried out to the effect that all requirements of this specification are complied with.

20.6. Inspection shall be carried out for various types of boards, hardware module for all its parameters, and software.

20.7. This shall be checked during inspection for the functional and performance requirement of the complete system as per specification.

20.8. **Routine Tests:**

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

20.8.1. Visual inspection of complete system
20.8.2. GPS & GSM module test
20.8.3. Performance test
20.8.4. System level functional tests
20.8.5. Any other tests shall be carried out as considered necessary by the purchaser

20.9. **Environmental /Climate Tests:**

All the Environmental /climate tests shall be conducted as per IEC 60068.

20.9.1. Enclosure Unit Sealing Test -Testing of the specified units for degree of protection IP67 is to be certified by one of the Government accredited testing laboratories.

20.9.2. Shock and vibration testing - Shock and Vibration testing of the complete system to be done to the standard of IS 60571/1 by one of the Government accredited testing laboratories.

Above test shall be repeated at 1000 units manufactured.

20.10. **Acceptance Tests:**

Sampling criteria:

Constitute the acceptance tests, which shall be carried out by the inspecting authority for the purpose of acceptance on 10 units per 10,000 of lot size (minimum 5 units if lot size is less than 10,000) offered for inspection by the supplier: following test shall be carried out on sample picked for acceptance testing.

20.10.1. **Visual Inspection:**

Each equipment of the system shall be visually inspected to ensure compliance with the requirement of this specification. The visual inspection shall broadly include:

20.10.2. **System Level Checking:**

a) Constructional details.
b) Dimensional check.
c) General Workman ship.
d) Configuration.

20.10.3. **Performance test:**

All the units shall be tested for their functionality as required in service condition as per this specifications design requirements. To simulate such condition in test lab a PC based simulator shall be specially developed for this purpose by the manufacturer.

PART-III INFRASTRUCTURAL REQUIREMENT

21. SCOPE

This section covers the infrastructural requirement for Self-Powered Fixed GPS Devices for Freight Stock Tracking & Tracing over Indian Railways

22. REQUIREMENTS

All the vendors seeking registration with RDSO shall comply with all the requirements mentioned below.

23. MANUFACTURING FACILITIES

23.1. The manufacturer shall have adequate space and covered area with cemented floor to accommodate the following.

23.1.1. Damp free place for storage of raw material and finished products.

23.1.2. Independent Manufacturing area

23.1.3. Inspection area

23.2. Firm shall have following minimum M&P and Infrastructure at their works:

23.2.1. Automatic wave soldering machine or automatic SMD pick & place machine with Reflow oven.(MOU with third party for job work on pick and place machine as per OAP shall be allowed: if not available in-house)

23.2.2. In-Circuit Debugger tester.

23.2.3. Ultrasonic PCB Cleaning Machine.

23.2.4. Regulated DC power supplies.

23.2.5. Temperature controlled soldering and de-soldering work stations.

23.2.6. Electro static charge free work and storage area to prevent sensitive components from damage during manufacturing, testing and storage.

23.2.7. Micro computer based CAD work stations and developmental workstations for hardware and software for GPS device.

23.2.8. Other regular tools like Measuring tape, Measuring scale, Magnifying glass, screw drivers, cutting tools, crimping tools etc. used for manufacturing, electronic assembly line, inspection and testing of the GPS device.

23.2.9. Cleanroom for electronic product manufacturing.

23.2.10. Any other required facility for manufacturing and testing as deemed necessary by manufacturer.

24. TESTING FACILITIES

Firm should have following minimum testing facilities at their works:

24.1. Burn In test chamber for cyclic endurance testing of assembled PCBs and Dry heat chamber

24.2. Insulation tester.

24.3. Dual Beam Oscilloscope of 20 MHz bandwidth or better
24.4. Chroma Meter or Spectrometer
24.5. Digital Multimeters: 3 and 1/2 Digit Display with facility of diode & transistor testing with 1% accuracy
24.6. LCR meter.
24.7. Megger (500 Volt)
24.8. PC based Simulator
24.9. Test Jig
24.10. Equipment required for Battery testing as per IEC 60086 (or equivalent)
24.11. Any other test equipment considered necessary.
24.12. The firm should have arrangement for periodical calibration of all the equipment's and test instruments.

25. QUALITY CONTROL REQUIREMENTS

25.1. The firm should have acquired ISO: 9001certification from the agency accredited by an accreditation body which is a part of International Accreditation Forum (IAF), and the product for which the approval is sought should be broadly covered in the scope of the certification for manufacture and supply.
25.2. The Quality manual of the firm for ISO: 9001 should clearly indicate at every stage the control over manufacturing and testing of the said railway product.
25.3. There should be a system to ensure the traceability of the product from raw material stage to finished product stage. The system should also facilitate to identify the raw material composition from the finish product stage.
25.4. It should be ensured that there is a Quality Assurance Plan for the product detailing the following various aspects.
  25.4.1. Organization chart
  25.4.2. Process flow chart
  25.4.3. Process control chart
  25.4.4. Stage inspection details from the raw material stage to finish product stage.
  25.4.5. Various parameters to be checked and level of acceptance of such parameters indicated and method to ensure control over them.
  25.4.6. Disposal system of rejected raw material and components.

25.5. There should be at least one full time technologist having a minimum Master's degree in relevant field with experience of at least 3 years or Bachelor's degree in relevant field with experience of at least 5 years or a person with Diploma in relevant field with 12 years' experience. He should be free from day-to-day production, testing and quality control responsibilities. He should be mainly responsible for development of a product, analysis of products, control over raw material, and corrective action in case of difficulties in achieving the parameters.
25.6. Ensure that the in-charge of the Quality Control Section is having a qualification of minimum

Master's degree in relevant field with experience of at least 3 years or Bachelor's degree in the relevant field with a minimum of 5 years' experience or alternatively he should be a Diploma holder with minimum of 12 years' experience. He should be actively involved in day-to-day activities of quality control /stage inspection /compliance of QAP etc.

25.7. The firm must ensure that proper analysis is being done on monthly basis to examine the rejections at various internal stages and it is documented.

25.8. The firm should ensure that latest version all the relevant specifications, IS Standards are available with the firm.

26. DOCUMENTATION

Firm shall maintain the following documents/records:

26.1. A well-documented Quality Plan.

26.2. Incoming raw material register with Test Certificates references of suppliers and internal test results.

26.3. Stage inspection results including finished products results.

26.4. Records of internal rejection and its analysis vis-a-vis action plan.

26.5. Records of final products inspection by external agencies (like RDSO), Non- conformity reports and case analysis as well as action taken thereof.

26.6. Ensure that proper systems are available for dealing with customer complaint.

27. TRAINING

Training needs should be identified for all concerned officials and regular training shall be organized and imparted on maintenance of machines, quality assurance, safety parameters etc.

ANNEXURE 1

Parameters for the performance monitoring of field trial

Sl. No.	Parameter to be recorded in the field trial	Compliance (Complied /semi complied/ not complied)	Adequacy	Remarks if any
1.	Software for preparation of database of wagon in PC/Laptop and interface with web server for data entry.			
2.	The device should be capable of sending location, speed, direction of travel of the wagon/car			
3.	Data accuracy when wagon in motion/dynamic condition			
4.	When reached at ROH/POH location/shop the device shall be capable to Sending notification to backend.			
5.	Detection of removal of the unit from the freight stock			
6.	The information about freight stock being idle, mileage earned, its movement and stationary comparison			
7.	Response time of the vendor for attending the complaints. Date of fitment and details of the firm along with contact address are required to be provided.			
8.	Downloading the daily log report of the Kms. earned by the wagon.			

Specification No. - - -

ANNEXURE -2

UNDERTAKING AGAINST CARTEL FORMATION

We, ... hereby, give an undertaking that as a Registered Vendor for manufacture and supply INSTALLATION, COMMISSIONING & MAINTENANCE Of **Self-Powered Fixed GPS Devices For Freight Stock Tracking & Tracing Over Indian Railways** will not be a part of a cartel with other vendors and will be quoting competitive rates in the tenders invited by the Indian Railway/PUs.

We …… are aware of the fact that the Registering Authority i.e. RDSO may de-list the name of our firm from the Master List of Approved Vendors if complaint is received about such cartel formation from any of the Railways/Production Units.
We confirm that the information furnished is correct to the best of our knowledge.

Seal and Signature (Authorized signatory of the firm)

Date:

Place:

Seal:

ADDENDUM 01

Acronyms used in this Document

4G	4G full form of meaning is 4th generation of broadband cellular network technology.
A	amperes
CBC	Centre Buffer Coupler
CMMI-SVC	Capability Maturity Model Integration for Services
CRIS	Centre for Railway Information Systems
DC	Direct Current
EMI	Electromagnetic Interference
GPS	Global Positioning System
Hz	hertz
IEC	International Electrotechnical Commission
IR	Indian Railways
IRSOD	Indian Railways Schedule of Dimensions
ISO	International Organization for Standardization
kmph	kilometers per hour
KV	kilovolt
MEITY	Ministry of Electronics and Information Technology
PCB	Printed Circuit Board
POH	Periodic Over Hauling
OHE	Overhead Equipment
RDSO	Research Designs and Standards Organization
RH	Relative Humidity
ROH	Routine Over Hauling
SIM	Subscriber Identity Module
SMD	Surface Mount Device