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**RDSO SPECIFICATION
OF
ACCESS CONTROL SYSTEM**

SPECIFICATION NO. RDSO/SPN/TC/93/2010

Revision 0.0

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**TELECOM DIRECTORATE
RESEARCH DESIGNS & STANDARDS ORGANISATION
LUCKNOW-226011**

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This document specifies technical specification of Access Control System.		

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I. SUMMARY:

This document covers the technical requirements of Access Control System to be provided at railway stations and others railway establishments.

II. SOURCE:

Specification RDSO/ SPN/ TC/ 93/2010, Rev. 0.0 has been prepared by RDSO, Lucknow as per Railway Board letter No. 2009/Tele/WW/1/ISSR dated 22/04/2009.

III. FOREWORD:

RDSO/ SPN specification is issued as draft specification. This specification is circulated to customers/ Railways and field inspection units for comments. In the absence of IRS specification, procurement may be made as per RDSO/ SPN specification.

Wherever, reference to any specifications appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

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**RESEARCH DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW**

RDSO Specification of Access Control System

RDSO Specification No. RDSO/SPN/TC/93/2010 Revision 0.0

1.0 SCOPE:

- 1.1 The specification of Access Control System covers the technical specification and requirements of Under Vehicle Inspection System comprising of the camera, lighting assembly & housing, activation sensors, traffic lights, analysis software, suitable computer system with sufficient data storage capacity.
- 1.2 The scope of this specification also covers the integration of this system to auxiliary camera systems including those for hard-to-view areas of the underside, license plate capture & recognition and driver image capture & retrieval.
- 1.3 The Under Vehicle Inspection System shall be located at the entrances to the railway station or other places as per site requirement to inspect the undercarriage of all vehicles entering the railway station premises. After verified by the system, the inspected vehicles will be permitted to proceed to the parking or dis-embarking areas.
- 1.4 The system shall be able to record the undercarriage images, and affix to each record, details like entry/exit, date, time, etc. The system shall be able to work at all times of day or night and during all types of weather conditions.

2.0 SYSTEM DESCRIPTION:

- 2.1 The Under Vehicle Inspection System shall be able to record the undercarriage images of vehicles in motion without requiring to be fully stopped and display these as a composite & high resolution image on the monitor(s). The system should be able to take into consideration the different heights of the undercarriage (truck/car), widths and the lengths of the vehicles as they pass over the system.
- 2.2 The system should also comprise additional auxiliary camera system to capture videos of hard to image areas of the underside.
- 2.3 The system should be integrated to a license plate recognition system suitable for a wide range of fonts type & sizes generally found in average Indian license plates. This License Plate Recognition System should be able to read the license plate number of the vehicle and enter the same into the vehicle entry/exit log

database with sufficient accuracy level. If the system fails to read the license plate number due to any reason, there should be provision to enter this manually.

- 2.4 In addition, there shall be another camera system to capture the image of the driver of the vehicle and assign the image to the records of the license number and under vehicle image.
- 2.5 The system shall have enough storage to be able to record undercarriage, number plate, driver images and auxiliary videos, in the database for a period of 30 days. The capacity of storage should be calculated considering the number of vehicle at a station.
- 2.6 Schematic diagram of Under Vehicle Inspection System has been shown in Para 15.

3.0 GENERAL REQUIREMENTS:

- 3.1 The Original Equipment Manufacturer (OEM) or its authorized distributor shall have local office(s) in India and a service facility for after sales support of the equipment.
- 3.2 Manufactured products shall have quality system compliance and shall be UL/EN/VDS/CE approved or tested by a reputed independent inspection agency.
- 3.3 The Under Vehicle Inspection System should be able to communicate with other security systems such as Smart Cards or RFID based ID-card for access control (optional).
- 3.4 It shall be possible to upgrade the system software in a standard manner without intervention by the manufacturer. All software and/or firmware upgrades shall be free of cost for period of not less than one year.
- 3.5 The system should be capable of storing and retrieving the previous composite images of the undercarriage of the same vehicle identified by its license plate. The system should also be able to conduct an automatic comparison of the current and last stored image and give an alert in case it finds any anomalies or differences in the two images. The system should be able to automatically detect all such anomalies larger than 4" x 4".
- 3.6 The Under Vehicle Inspection System shall be able to operate in all weather and lighting conditions during any time of the day or night. It shall be able to work without a break inspecting one vehicle after another.
- 3.7 The power supply available at the stations shall be 230 V / 50 Hz AC which may vary from 160 Volts to 270 Volts. The system should work using this power

supply only with requisite converters & voltage stabilizers of suitable capacity, if required.

- 3.8 The inspection unit shall be equipped with suitable sensors which should switch on the inspection unit on detection of any vehicle before the vehicle reaches the unit. This should help in conserving electrical energy and to enhance the life of the inspection unit. It shall also be possible to trigger the inspection of vehicles manually.
- 3.9 The Under Vehicle Inspection System should be able to capture image of any moving vehicle up to 20 Km (minimum) per hour.
- 3.10 The Under Vehicle Inspection System shall provide an image of high quality resolution for easier inspection, observation and identification of suspicious or foreign objects by the operator. The undercarriage of the vehicle shall be shown as a single picture without any obstruction.
- 3.11 In case of any anomaly, the operator shall have the facility to zoom into any particular area of the picture to take a closer look before taking further action.
- 3.12 Electrically operated lifting barrier with single boom should be provided if specified by purchaser to regulate traffic movement after passing through under vehicle inspection system. Electrically operated lifting barrier should be conforming to specification No. RDSO/SPN/180/2005 with amendment No. 1 of RDSO. It should be possible to integrate operational control of lifting barrier with under vehicle inspection system. (Optional)

4.0 TECHNICAL REQUIREMENTS:

- 4.1 The Under Vehicle Inspection System for all type of railway stations and other premises should mainly consist of the following:

i.	Main Inspection Unit
ii.	Traffic Light and Sensors to switch Surveillance Unit
iii.	Computer System (Work Station)
iv.	License Plate Recognition System
v.	Driver Image Capture System
vi.	Auxiliary Camera System for hard-to-view areas of vehicle underside
vii.	Pit air-conditioning system for protection against severe ambient heat

- 4.2 Depending on the site conditions, inspection systems should be placed at the entrances of the railway station premises and other areas in such a manner that all vehicles are inspected before they are allowed to enter the area, irrespective of whether the vehicle is going to the parking lot or to offload the passengers and their luggage.

- 4.3 The inspection unit shall be embedded in the road and suitably protected from damage due to external hazards.
- 4.4 The license plate recognition camera should be placed so as to capture the frontal view of the vehicle particularly the registration number.
- 4.5 The Driver Image Capture system should be installed so as to capture an image of the driver and front passenger of suitable quality for later analysis and identification.
- 4.6 The Computer System and the Display Monitor should be located in the operator cabin by the side of the entrance.
- 4.7 The connecting cables from the inspection unit, license plate recognition system, driver image capture system & auxiliary camera unit to the workstation and from the traffic light to the computer unit should be armoured and suitable for heavy duty outdoor applications and should be protected suitably by conduits and/or buried.
- 4.8 The inspection unit shall be equipped with a protection case and guide to facilitate the correct movement and positioning of the vehicle over it. This shall enable complete coverage for inspection of the full vehicle undercarriage and to avoid damage to the inspection unit from oncoming vehicles.
- 4.9 All components of Under Vehicle Inspection Unit should be heavy duty suitable for outdoor and should be weatherproof and waterproof/splash proof under wet weather conditions. All metal parts of the system should be fabricated out of non-corrosive material like stainless steel etc.
- 4.10 The Under Vehicle Inspection System should be rugged and able to withstand the weight and vibration of standard vehicles upto a total vehicle load of 40 tons. The vendor shall specify the type of guidance system and paving required to have the vehicle correctly pass over the unit while avoiding direct contact.
- 4.11 The Under Vehicle Inspection System should be able to operate without any problems in the range 0⁰C to +50⁰C and humidity of 95% RH non- condensing. A suitable pit air-conditioning system should be provided to protect the system against severe ambient temperature & heat during the peak summer seasons.

5.0 HARDWARE REQUIREMENTS:

The Under Vehicle Inspection System will consist of the following:

5.1 Inspection Unit:

- 5.1.1 The inspection unit including camera and lighting shall be placed together in a protective housing. The system shall have a high resolution CCD type line-scan camera which should record the composite image of the vehicle undercarriage.
- 5.1.2 The Under Vehicle Inspection System shall ensure suitable & uniform illumination of the undercarriage for a quality picture.
- 5.1.3 The inspection unit shall work on 230V AC voltage/ 24V AC/12V DC. However, the power supply available at the stations shall be 230 V / 50 Hz AC which may vary from 160 Volts to 270 Volts. The system should work using this power supply only with requisite converter & voltage stabilizer of suitable capacity, if required.
- 5.1.4 The inspection unit shall meet the following minimum technical requirements.

A.	Camera Specification		
i.	Type of Camera	:	High Resolution Colour Linear CCD
ii.	Camera Scanning	:	Colour Digital Line Scan
iii.	Camera Resolution	:	4000 Pixels (Minimum)
iv.	Temperature Range	:	0 °C to +50 °C
v.	Humidity	:	No limitation
vi.	Approval	:	UL/EN/VDS/CE
vii.	Video Output	:	Real Time
B.	Vehicle Parameters		
i.	Minimum Speed	:	20 Kilometers per hour
ii.	Maximum Length	:	25 meters
iii.	Maximum Width	:	2.80 meters
iv.	Vehicle Height from ground	:	Up to 60 Centimeters
v.	Precision Accuracy	:	3 Millimeters
vi.	Maximum Load	:	40 Tones
vii.	Image Composing	:	Instantaneous, within 2 second

5.2 Traffic Light and Sensors:

- 5.2.1 A photo sensor shall automatically initiate the registration procedure. In order to ensure an efficient vehicle checkpoint, an integrated traffic light shall stop vehicles for the time it takes for a vehicle to be processed.
- 5.2.2 The traffic light shall have the following minimum requirements/ modes of operation.

	Automatic Mode		
i.	Green Light 1	:	Vehicle can pass over the inspection unit.
ii.	Red Light	:	Image composition in process.
iii.	Green Light 2	:	Process over. Current vehicle can move and next vehicle can proceed to scanner.

5.2.3 It shall also be possible to trigger the start of inspection of vehicles manually.

5.3 Computer System & Work Station for the Operator:

5.3.1 The workstation shall consist of a suitable computer system with interfaces for all cameras, sensors, traffic light and any other device such as barriers. The workstation shall process the input from the inspection unit and shall display the undercarriage of the vehicle on the monitor.

5.3.2 It should also be possible to connect this workstation to a printer to take print out, if required.

5.3.3 The system shall have a minimum of 500 Gigabyte of hard disk space to store to the under carriage images and videos on a rolling FIFO (First In First Out) basis.

5.3.4 The workstation shall be able to provide high graphics display with DVD-Drive, USB/ PS/2 mouse and keyboard.

5.3.5 The workstation shall consist of following minimum items:

- (a). HDD Interface SAS/SATA/IDE or better, RAM 4 GB upgradable upto 24 GB, OS – Windows XP Professional/ Linux or latest.
- (b). 256 MB DVI Graphic Card: NVIDIA NVS 295 or better.
- (c). Workstation should have minimum 600 W power supply, 5 PCI slots (preferably 1 PCI express Gen 2x16 slot, 1 PCI Express Gen 1 x4 – with x8 connector, 1 PCI express Gen 2 x4 with x8 connector, 2 legacy PCI 32 bit / 33 MHz).

5.3.6 The workstation shall be Quad-core processor or higher with 2 GHz. It should be DELL or IBM or HP or Fujitsu or SUN make or as specified by purchaser.

5.3.7 The workstation shall have the minimum following specifications:

i.	Processor	Intel Quad Core Xeon W5580 CPU Processors, 3.2 GHz, 8 MB L3 Cache, 4 GB ECC DDR3 SDRAM scalable upto 24GB, OS – Windows XP Professional/ Linux or latest.
ii.	Drives	DVD/CD - R/W combo

iii.	Ethernet Card	10/100/1000 Base T.
iv.	Chipset	Intel® X58 chipset
v.	HDD	SAS 15K RPM 500 GB, controller supporting SAS drives with host based RAID 0 or 1.
vi.	Peripherals	Keyboard, Mouse
vii.	Monitor	19" LCD

5.4 License Plate Recognition System:

5.4.1 The License Plate Recognition System shall include a camera to capture a front image of the vehicle particularly the license plate. This system shall automatically translate the license to a standard sortable and retrievable ASCII text format and store it with the other relevant data in the database. The system shall also have the provision for the operator to manually key in the license number of the vehicle.

5.4.2 The License Plate System shall have the following minimum specifications:

A.	Camera Specification	
i.	Effective Range	15 meter
ii.	Camera Resolution	25fps @ 752X480 pixels or 30 fps @ 640x480
iii.	Image processing speed	Real time
iv.	Camera gain and shutter	Adjustable 1/100 to 1/30000 sec
v.	Triggers	Internal, Ethernet, USB, Serial port
vi.	Power Consumption	7- 25W
vii.	Operating Temperature	0°C to +55°C
B.	Software Specification	
i.	Supported OS	Windows XP Or Linux
ii.	Type of Plates	Recognition for English fonts
iii.	Image Input	Still Image or Live Video Input
iv.	Processing Time Dependence	Image content (complexity, noise level) and Image size
v.	Sample Processing Time	100ms @ CPU 2.0 GHz, Colour images, 768x576 or 640x480 pixels (PAL/NTSC)
vi.	Output	Plate number in ASCII/ UNICODE, Confidence level

5.5 Driver Image Capture System:

5.5.1 The Driver Image Capture System shall capture the image of the driver and front passenger of the vehicle. The system shall store the images with reference to the data captured by the under vehicle scanner and the license plate systems.

5.5.2 The Driver Image Capture system shall have the following minimum specifications:

i.	Sensor Type	1/3" RGB
ii.	Varifocal lens	5.0 to 20 mm varifocal
iii.	Day Night Operation	Day & Night with minimum illumination of 0.3Lux @F1.2 (Color)
iv.	Housing	Outdoor, IP66 rated
v.	Operating Temperature	0°C to +55°C
vi.	IR Filter	Automatic, removable infrared-cut filter

5.6 Auxiliary Cameras System:

5.6.1 There should be additional cluster of high end video cameras, to provide an enhanced viewing of the hard-to-view cavities and similar voids / overhang like areas of a vehicle's undercarriage.

5.6.2 The Auxiliary Camera System shall have the following minimum specifications:

A.	Camera Specification	
i.	Effective Range	15 cm to 60 cm
ii.	Camera Resolution	25fps @ 752X480 pixels or 30 fps @ 640x480
iii.	Image processing speed	Real time
iv.	Camera gain and shutter	Adjustable 1/100 to 1/30000 sec
v.	Triggers	Internal, Ethernet, USB, Serial port
vi.	Power Consumption	7- 25W
vii.	Operating Temperature	0°C to +50°C

6.0 SOFTWARE REQUIREMENTS:

6.1 The system software shall process the images from the camera into a single complete view of the undercarriage and display it on the monitor with date, time and the license plate number/ image of the driver. The images should appear almost instantaneously in less than 2 second, whereas for the automatic foreign object detection process to complete, 3-4 seconds maximum should be the delay to register, compare, and display the image of a mid-size car. The image shall be enlarged if the operator suspects a foreign object or anomaly in the undercarriage. Operator shall be able to zoom into the suspected area and look more closely before taking further action. The system should enable a user to access history as well as allow the user to control the peripheral devices of the system, such as traffic lights and any connected barriers. It should accept the start sensor message for a vehicle and direct the other modules to accept the

- appropriate data from the license plate recognition system. All data shall be stored in an SQL or equivalent database with a minimum capacity of 30 days.
- 6.2 The software should have a secured password protection to access the system. It should log the operator's login and time of usage. It shall be possible to create different user levels (like user, administrator). The software should make different functions accessible to different users to prevent the misuse by unauthorized personnel. In user mode, the functions which should be permitted are processing, entry procedures, traffic light control and display of faults in the system. In the administration mode, an administrator should enjoy all the above and can additionally manage the user list, view data set, log report and export the data from database with the use of the CD drive to a disk or any other external storage device. The application should be able to be operated with minimal training.
 - 6.3 The software shall provide high resolution image composition for improved and easier observation of the complete undercarriage image irrespective of the size of the vehicle. The underside of the vehicle should be displayed as a single composite picture without any obstruction, with an automatic adjustment of brightness & contrast for the best suited human-eye view.
 - 6.4 The system should give a real time output and the composite image should be displayed on the monitor almost simultaneously. In event of the image being suspected, the operator should be able to zoom into any area of the image to take a closer look before taking any further action.
 - 6.5 It is planned that no vehicle will be required to fully stop for getting scanned; the software should be able to capture images of a moving vehicle upto the speed of minimum 20 Km per hour. The undistorted picture of the undercarriage should be displayed regardless of the variations in speed over the inspection unit.
 - 6.6 If an unsatisfactory or partial image is captured then the system should create an alarm and the signal & barrier (if provided) should signal the vehicle to halt.
 - 6.7 It should be possible for the software to automatically compare pictures and analyse for changes in the underside of the vehicle, since the last scanned image, if available in the storage device. Maximum analysis time should not be longer than 5 seconds depending on the vehicle. The software should be able to do an automatic comparison of the current image and last composite image of the underside for the same vehicle or a pre-stored image of the same make vehicle identified by the software through a type-detection method. The vehicle should be identified by its license plate number and the software should highlight the abnormalities if any, in the two images. Apart from this automatic comparison, there should be a provision for the user to visually compare the current image with a recorded image or images.

- 6.8 The system software should have the features of intelligent abnormality and foreign object detection which should be highlighted to the user. Real time images and templates can be zoomed in simultaneously for a detailed examination.
- 6.9 The software shall provide for an entry/exit log of the vehicles sorted by license plate number. The system should be capable of storing and retrieving this information in the data base and to export it to any back-up storage media and should also generate print/reports archiving and recording on CD/DVDs on daily, weekly and any other desired basis for post event analysis of the information stored.
- 6.10 The captured image shall remain on the screen even after the vehicle passes for continued inspection. With help of software, zoom in and out shall be done through keyboard & mouse control and control should be instantaneous. There shall not be any lag in the picture display while zoom in and out. The zoom capabilities and accuracy level shall be down to 3.0 mm.
- 6.11 There should be minimum 3 numbers high end video cameras forming an auxiliary camera system, to provide an enhanced viewing of the hard-to-view cavities and like areas of a vehicle's undercarriage.
- 6.12 The software shall be able to activate the License Plate Recognition System, which shall automatically capture the license number of the vehicle into the database. In case, the license number plate is not read due to any reason, it shall be possible for the operator to manually key in the license number of the vehicle.
- 6.13 It is required to add the front image of the vehicle into the database, with a clear picture of the driver and front seat passenger. The software shall be able to import one, and up to three personal pictures of the expected drivers from another database, for comparison of the pictures by operator.
- 6.14 The system should be remotely operable for remote monitoring, control and maintenance. There should be no constraints on the location of the operator control room in terms of the physical distance from the inspection unit.
- 6.15 It should be possible to network all under vehicle inspection systems of a station or a section as specified by purchaser. It should be possible to store database of all such systems on a storage device at centralized location other than the location of inspection units for further analysis and as disaster recovery.

7.0 TEST REQUIREMENTS:

7.1 Conditions of Tests:

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

7.1.2 Inspection and testing shall be carried out to the effect that all requirements of this specification are complied with.

7.1.3 Inspection shall be carried out for one complete unit of Under Vehicle Inspection System comprising of the inspection unit, the traffic light sensors and the workstation PC along with license plate recognition system, driver image capture system, auxiliary cameras system and lifting barrier (optional).

7.2 Type Tests:

7.2.1 For type test, one complete system shall be subjected to following tests as applicable:

- a) Visual inspection (Clause 8.1)
- b) Performance test (Clause 8.2)
- c) Factory acceptance test (Clause 8.3)
- d) Endurance test (Clause 8.4.1)

7.2.2 Following systems should be submitted to RDSO after approval.

- a) Inspection Unit
- b) License Plate Recognition System
- c) Driver Image Capture System
- d) Auxiliary Camera System

7.2.3 Only one complete system shall be tested for this purpose. The system shall successfully pass all the type tests for proving conformity with this specification. If any one of 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 the test(s) in which failure occurred. No failure shall be permitted in the repeat test(s).

7.2.4 Any other tests shall be carried out as considered necessary by the inspecting authority.

7.3 Acceptance Tests:

7.3.1 The following shall constitute the acceptance tests which shall be carried out by the inspecting authority for the purpose of acceptance on randomly selected 20% of the items offered from the lot (minimum 1 each type of item) offered for inspection by the supplier:

- a) Visual inspection of complete system (Clause 8.1)
- b) Performance test (Clause 8.2)
- c) Endurance test (Clause 8.4.2)

7.3.2 Any other tests shall be carried out as considered necessary by the inspecting authority.

7.4 Routine Tests:

7.4.1 The following shall comprise the routine tests and shall be conducted by manufacturer 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.

- a) Visual inspection of complete system (Clause 8.1)
- b) Performance test (Clause 8.2)

7.4.2 Any other tests shall be carried out as considered necessary by the inspecting authority.

8.0 TEST PROCEDURE:

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

8.1 Visual Inspection:

Each equipment of the system shall be visually inspected to ensure compliance with the requirement of clauses 2, 3, 4, 5 & 6 of this specification. The visual inspection shall broadly include:

8.1.1 System Level Checking:

- Constructional details.
- Dimensional check.
- General workmanship.
- Configuration.

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8.2 Performance Test:

- 8.2.1 The equipment shall comply with the requirements as specified in clauses 2, 3, 4, 5 & 6.
- 8.2.2 The PC Work Station for Operator as per clause 5.3 of shall be of standard make only complying with all the parameters mentioned in the specification.

8.3 Factory Acceptance Test:

- 8.3.1 Factory Acceptance Tests (FAT) results to verify compliances as mentioned in clauses 2, 3, 4, 5 & 6 for the various items of Under Vehicle Inspection Unit shall be submitted by the Original Equipment Manufacturer (OEM), if these items are being manufactured abroad, otherwise tests will be conducted in manufacturing premises of the firm.
- 8.3.2 All software features as per clause no. 6 are to be tested in premises of vendor for which all required setups are to be arranged.
- 8.3.3 The FAT shall be able to prove compliance to the specifications through test or test certificates.
- 8.3.4 All compliances to various standards as given in specifications shall be submitted with documentary proof.

8.4 Endurance Test:

- 8.4.1 During type test, endurance test shall be conducted on complete system for continuous operation which shall be 168 hrs at ambient room temperature without giving any deterioration of videos and image of undercarriage on the monitor.
- 8.4.2 During acceptance test, endurance test shall be conducted on complete system for continuous operation which shall be 48 hrs at ambient room temperature without giving any deterioration of video image of undercarriage on the monitor.

9.0 QUALITY ASSURANCE:

- 9.1 All materials & workmanship shall be of good quality.
- 9.2 Since the quality of the equipment bears a direct relationship to the manufacturing process and the environment under which it is manufactured, the manufacturer shall ensure Quality Assurance Program (QAP) of adequate standard.

9.3 Validation and system of monitoring of QA procedure shall form a part of type approval. The necessary plant, machinery and test instruments as mentioned in Schedule of Technical Requirements (STR) shall be available with the manufacturer.

9.4 Along with the prototype sample for type test, the manufacturer shall submit the Quality Assurance Manual.

10.0 MARKING & PACKING:

10.1 The following information shall be clearly marked at a suitable place on each equipment:

- a) Name and address of the manufacturer
- b) Year of the manufacturer
- c) Serial number of equipment
- d) Schematic diagram of the equipment at suitable place

10.2 The equipment and its sub assemblies shall be packed in thermocole boxes and the empty spaces shall be filled with suitable filling material. Before keeping in the thermocole box, the equipment shall be wrapped with bubble sheet. The equipment shall be finally packed in a wooden case of sufficient strength so that it can withstand bumps and jerks encountered in a road/rail journey.

11.0 INFORMATION TO BE SUPPLIED BY THE PURCHASER:

11.1 The purchaser should clearly indicate details of required items for Under Vehicle Inspection System which shall mainly consist of following items as per site requirement.

SN	DESCRIPTION	QTY	REMARKS
i.	Under Vehicle Inspection System comprising of Inspection Unit, Traffic Light & PC Work Station for Operator	As specified	
ii.	License Plate Recognition System	As specified	
iii.	Driver Image Capture System	As specified	
iv.	Auxiliary Cameras System	As specified	
v.	Electrically operated lifting barrier with single boom as per specification No. RDSO/SPN/180/2005 with amendment No. 1 of RDSO (Optional)	As specified	

vi.	Installation, testing & commissioning & integration of the complete system.	As required	
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11.2 Purchaser shall provide detail drawings of railway premises indicating proposed location(s) for the installation of the Under Vehicle Inspection System(s). The vendor should access requirements of various components as stated in Clause 11.1 for Under Vehicle Inspection System which may vary from manufacturer to manufacturer as per their overall system design.

11.3 Any other item(s) required for completion of the Under Vehicle Inspection System depending on the site and system requirement other than stated above, shall be arranged by vendor.

12.0 WARRANTY:

12.1 Manufacturer shall provide a three years warranty from date of supply of system which shall include repairing and replacing of defective parts of system, if any or as specified by purchaser.

12.2 Manufacturer shall support the system during its life time but at least for 7 years from its commissioning. Confirmation for this is to be submitted by manufacturer.

13.0 TRAINING:

13.1 On site training shall be provided to the Railway staff which shall include complete assembly of the system through the use of various modules, integration of hardware with software and complete operation of the system.

13.2 Sets of training manual in two hard copies and two soft copies containing details of technical specifications, installation and commissioning, trouble shooting & maintenance schedule etc. shall be supplied along with the system.

14.0 DOCUMENTATION & DIAGRAMS:

14.1 The following documents should be supplied along with the system:

- a) Mechanical drawings of each sub system.
- b) Installation and maintenance manual incorporating trouble shooting exercises, printed cards patterns, software etc.
- c) Operating and trouble shooting manual including maintenance schedule.
- d). Pre-commissioning check list.

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- 14.2 Detail drawings of Under Vehicle Inspection System with all accessories, License Plate Recognition System, Driver Image Capture System and Electrically Operated Lifting Barrier (optional) are to be submitted to RDSO for approval at the time of type testing. These drawings are to be followed in all future installation. Any further amendment(s)/revision to these drawings should be done only after obtaining prior approval of RDSO.

15.0 SCHEMATIC DIAGRAM OF UNDER VEHICLE INSPECTION SYSTEM:

