

Page 1 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------



सत्यमेव जयते

**RDSO SPECIFICATION
OF
PERSONAL AND BAGGAGE SCREENING SYSTEM**

SPECIFICATION NO. RDSO/SPN/TC/94/2010

Revision 1.0

Number of Pages: 26

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

Page 2 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------

DOCUMENT DATA SHEET		
Specification RDSO/SPN/TC/94/2010		Revision 1.0
Title of Document RDSO Specification of Personal and Baggage Screening System		
Author Director/ Telecom-II/ RDSO		
Approved by Executive Director/ Telecom/ RDSO		
Abstract This document specifies technical specification of Personal and Baggage Screening System.		

DOCUMENT CONTROL SHEET

NAME	ORGANIZATION	FUNCTION	LEVEL
Director/ Telecom-II	RDSO	Member	Prepare
Executive Director/ Telecom	RDSO	-	Approve

REVISIONS:

Version	Chapter/ Annexure	Revision	Effective Month/Year
RDSO/SPN/TC/94/2010	-	FIRST ISSUE	February 2010
RDSO/SPN/TC/94/2010	All pages	Revision 1.0	June 2010

TABLE OF CONTENTS

Sr. No.	Item	Page No.
1.0	General	6
2.0	Hand Held Metal Detector	6
3.0	Door Frame Metal Detector	8
4.0	X Ray Baggage Screening System	12
5.0	Test Requirements	21
6.0	Test Procedure	22
7.0	Quality Assurance	23
8.0	Making and Packing	24
9.0	Information to be supplied by the Purchaser	24
10.0	Training	25
11.0	Documentation & Diagrams	26

Page 5 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------

I. SUMMARY:

This document covers the technical requirements of Personal and Baggage Screening System to be provided at railway stations and others railway establishments.

II. FOREWORD:

- 1.0 Specification No. RDSO/ SPN/ TC/ 94/2010, Rev. 1.0 has been prepared by RDSO, Lucknow as revision to the original specification which was prepared as per Railway Board letter No. 2009/Tele/WW/1/ISSR dated 22/04/2009.
- 2.0 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.

Page 6 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------

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

RDSO Specification of Personal and Baggage Screening System

RDSO Specification No. RDSO/SPN/TC/94/2010 Revision 1.0

1.0 GENERAL:

- 1.1 Personal and Baggage Screening System shall be located at entrance gates of platforms of railway station or other places as per site requirement to screen passengers and their baggage before permitting entry to platforms and vital locations of railway premises.
- 1.2 Screening System for persons shall mainly consist of following:
 - a. Hand Held Metal Detector
 - b. Door Frame Metal Detector
- 1.3 Hand Held Metal Detector & Door Frame Metal Detector shall be provided at all entry points to platforms of railway stations and other vital locations as decided by purchaser.
- 1.4 Baggage Screening System shall consist of X Ray Baggage Screening System and to be provided at entry points to platforms of railway stations and other vital locations as decided by purchaser.

2.0 HAND HELD METAL DETECTOR:

2.1 SCOPE:

- 2.1.1 The specification of Hand Held Metal Detector (HHMD) covers technical specification and requirement of screening system for persons consisting of highly sensitive hand held metal detector along with associated accessories at different locations of railway stations and other establishments.
- 2.1.2 The hand held metal detector should be capable of helping operators/ screeners to easily differentiate between harmless objects and potential threats.

2.2 SYSTEM DESCRIPTION:

- 2.2.1 The Hand Held Metal Detector shall be rugged and sensitive. This shall screen people from head-to-toe and should pinpoint small, hard to- find weapons and threats as small as a needle. It should be accurate and fast for threat detection and shall not cause hindrance to movement of persons being screened.

Page 7 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------

2.2.2 The HHMD shall be versatile and weatherproof and shall be able to detect even floor level small weapons.

2.3 GENERAL REQUIREMENTS:

2.3.1 The equipment shall adopt widely accepted technology for its operation and shall be of proven performance. The equipment shall conform to international & national standards/regulations for safety & EMC requirements.

2.3.2 The HHMD should be user friendly and easy to operate.

2.3.3 The HHMD shall be based on the pulse induction/ very low frequency technology for higher level of control & accuracy.

2.3.4 The HHMD should preferably be provided at entrance/exit points, platforms, etc. or any other locations of railway station and other establishments as decided by purchaser.

2.3.5 The HHMD should work satisfactory in temperature range of -5° C to $+50^{\circ}$ C and humidity of 95% non-condensing.

2.3.6 The HHMD shall be manufactured by firm having established quality system in place and shall possess ISO 9000 certification.

2.3.7 Operation of HHMD shall not be affected by infrared, ultraviolet, electromagnetic or RF radiation. Offered equipment shall comply relevant safety/ immunity standard.

2.4 TECHNICAL REQUIREMENTS:

2.4.1 The detection should be based on Ferrous, Non-ferrous & Alloys. The detector should be able to detect metal without being in direct contact. The HHMD shall be sensitive enough to detect 0.1 gram of metal object from a distance of 25 mm.

2.4.2 The detector shall be of compact design & easy to handle/ carry. Maximum length of HHMD should not be more than 50 cm.

2.4.3 The detector shall be of light weight. The carrying weight should not be more than 500 gm.

2.4.4 The HHMD should have selectable alarms for audio & visual indications. It shall be possible to select audio & visual alarms separately.

2.4.5 The magnetic field generated by HHMD should be harmless to humans, magnetic media & electronic devices. Wearers of heart pacemakers and pregnant women shall not be affected by such magnetic fields.

Page 8 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------

2.4.6 The detector shall work on commonly available rechargeable battery. Rechargeable battery along with charger shall be provided. The battery capacity shall be adequate for continuous usage of minimum 40 hours after recharge. Rechargeable battery should be easily replaceable without disturbing any electronic circuit.

2.4.7 Materials used in HHMD should be light weight, non- breakable and scratch resistant.

2.4.8 Following minimum LED indications should be available in the HHMD.

- (a). ON indication,
- (b). Metal detection indication,
- (c). Low battery Indication.

3.0 DOOR FRAME METAL DETECTOR

3.1 SCOPE:

3.1.1 The specification of Door Frame Metal Detector covers technical specification and requirement of screening systems for persons consisting of multi-zone, highly sensitive door frame metal detector and associated accessories at different locations of railway stations and other establishments.

3.1.2 The door frame metal detector should be capable of helping operators/screeners to easily differentiate between harmless objects and potential threats.

3.2 SYSTEM DESCRIPTION:

3.2.1 Door Frame Metal Detector (DFMD) shall be provided at entry points of railway stations and other railway installations as specified by purchaser. It shall be rugged and sensitive. These walk-through units shall screen people from head-to-toe and shall detect small, hard to- find weapons and threats as small as a needle. It should also detect small stainless steel knife, 9 volt battery, Lithium Ion battery (CR123A) etc. It should be accurate and fast for threat detection and shall not cause hindrance to movement of persons being screened.

3.2.2 The DFMD shall be robust, lightweight, versatile and weatherproof and shall be able to detect even floor level small weapons.

3.2.3 The performance of the DFMD should be independent of the speed of the person passing through.

3.3 GENERAL REQUIREMENTS:

Page 9 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
--------------	---------------------------	---------------------	----------

- 3.3.1 The equipment shall adopt widely accepted technology for its operation and shall be of proven performance. The equipment shall conform to international standards/regulations for safety & EMC requirements.
- 3.3.2 The DFMD shall be manufactured by firm having established quality system in place and shall possess ISO 9000 certification.
- 3.3.3 The DFMD shall conform to international & national standards for electrical safety.
- 3.3.4 The DFMD shall be based on the pulse induction technology for higher level of control & accuracy.
- 3.3.5 The DFMD should be user friendly & easy to operate. Operation of DFMD shall not be affected by infrared, ultraviolet, electromagnetic or RF radiation. Offered equipment shall comply relevant safety/ immunity standard.
- 3.3.6 The DFMD shall be cardiac pacemaker, magnetic tape & film safe. Manufacturer/ system integrator shall submit certification to this effect with supporting documents to purchaser.
- 3.3.7 The DFMD shall have built-in circuitry for noise suppression.
- 3.3.8 The circuitry of the DFMD shall be easily accessible and programmable.
- 3.3.9 The system should be capable of adapting to diverse operational requirements and evolving security challenges through easy customization of software-based controls and tools. The DFMD should have floor mounting kit to prevent the unauthorized movement of the DFMD.
- 3.3.10 The power supply available at the stations shall be 230 V / 50 Hz AC which may vary from 160 Volts to 270 Volts. All modules of the DFMD should work using this power supply only with requisite converters & voltage stabilizers of suitable capacity, if required. However, if felt necessary UPS of requisite capacity may be provided based on requirement of purchaser to ensure continuous availability of power supply.
- 3.3.11 The DFMD should preferably be provided at entrance/exit points, platforms, etc. or any other locations as decided by purchaser.

3.4 TECHNICAL REQUIREMENTS:

- 3.4.1 The DFMD shall detect objects of ferrous, non-ferrous, ferrite & alloys. The design of DFMD should be such that its level of performance is constant over long period of time.
- 3.4.2 The DFMD shall be of standalone type at stations/locations where requirement is limited. However, at stations/locations where a number of DFMD are required

Page 10 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

to be provided, the purchaser based on requirement may opt for DFMD which are capable of being networked.

- 3.4.3 The DFMD should have multi zone capability with uniform sensitivity in all zones. The DFMD should have minimum 8 (eight) overlapping detection zones. Multi-loop search coils shall be housed in two side panels of the DFMD. Control panel should be built inside the frame on the top with built-in operating controls. It should have plug –in cards for easy maintenance. The DFMD should be able to provide detection to flat and rod shaped objects, regardless of their orientation.
- 3.4.4 The DFMD should have user-programmable access codes, tamper-proof settings, multiple channels permitting several detectors to operate simultaneously in close proximity to one another for effective multi-lane performance. It should be automatic and have continuous self-diagnostic testing capability. The settings shall not get lost in event of a power loss or interruption.
- 3.4.5 The system shall have suitable control panel for easy operation and programming. The arrangement shall be such that only authorized person shall have access to such control panel.
- 3.4.6 All the equipments installed outside the control room shall be able to withstand -5° C to $+50^{\circ}$ C and humidity of 95% non-condensing.
- 3.4.7 Interference, which is 'mains-borne' or radiated by an external source, should not cause the DFMD to raise the alarm spuriously. It should be possible to use equipment such as radio, cordless telephone, walkie-talkie sets, X-ray monitors etc. at a distance of one meter from the archway without causing spurious alarms in the DFMD system.
- 3.4.8 Moving metal beyond one meter from the DFMD should not affect performance of the DFMD. It should be possible to move metallic items like trolleys one meter away from the DFMD without the generation of false alarm.
- 3.4.9 There should be both visual and audible alarms. It should be possible to adjust volume of the audible alarm. At its loudest setting, the volume should be adequate to overcome ambient noise present nearby.
- 3.4.10 Detection circuit shall be continuously active for detection of metals and alloys. The equipment shall have comprehensive self diagnostic features that shall be able to pin point the defects by constantly monitoring the internal circuitry, external connections and environment. The DFMD shall also have inbuilt feature of auto calibration.
- 3.4.11 The DFMD should be tamper proof. All settings should be secured with a key lock & two levels of access codes. Further security should be accomplished with a cabinet lock which prevents unauthorized access to physical cables, connectors & electronics.

Page 11 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

- 3.4.12 DFMD can be installed close to fixed sheets or pieces of metal, which form part of the building or its fittings. The DFMD should compensate for the presence of such metals and its performance should not be degraded.
- 3.4.13 The DFMD should have traffic & alarm counter. The system should also be functional bi-directional.
- 3.4.14 The DFMD shall reset itself within 3 seconds after an alarm condition.
- 3.4.15 The DFMD system should have an in-built memory system of sufficient capacity to maintain data.
- 3.4.16 The DFMD for networked mode shall have control, monitor and analysis interface module to provide remote access to data collection, alarm statistics and real time detector events for monitoring and analysis.
- 3.4.17 The DFMD for networked mode shall be networkable irrespective of the numbers of detectors and should be accessible from a centralized location for monitoring and analysis.
- 3.4.18 The DFMD for networked mode shall enable end users to change the settings from a remote location.
- 3.4.19 The DFMD system for networked mode shall enable end users to integrate it with other security systems like Access Control System, Video Surveillance System etc.

3.5 HARDWARE REQUIREMENTS:

- 3.5.1 Internal dimensions of DFMD shall not be less than 0.75m (width) x 2.0m (height) x 0.5m (depth).
- 3.5.2 The DFMD should also have in-built rechargeable battery back-up for minimum 2 hrs operation in case of interruption of 230 Volts AC power supply.
- 3.5.3 **Alarms & Indications:**
 - 3.5.3.1 There should be both visual and audio alarms. It shall be possible to adjust volume of audible alarm. The setting of the volume shall ensure that alarm is audible despite ambient noise.
 - 3.5.3.2 **Ready Light:** The green ready light shall appear when power is on and the DFMD is ready to detect metal. The ready light shall be illuminated before a person is permitted to enter the walk-through.
 - 3.5.3.3 Indications with "wait" and "proceed" symbols should be located on the entrance side of each panel and should allow smooth and efficient traffic flow.

Page 12 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

- 3.5.3.4 Red indication as visual indication of an alarm should appear when the unit detects a targeted amount of metal within the walk-through according to the program and base sensitivity settings. When a target is detected, the alarm light should appear even if the audio volume is off.
- 3.5.3.5 **Display:** A visual display should be located in the overhead panel. The display should provide calibration and operational information, including program and sensitivity settings, operator functions and fault indication. The display should display all self-prompting regulation and control functions as well as traffic count information.
- 3.5.4 **Control Panel:** A suitable control panel shall be provided to turn unit on, access and adjust setup and programming.
- 3.5.4.1 The control panel shall be used to turn the DFMD on. The unit should be ready to operate within ten seconds. The manual self-test shall be activated at any time by pressing suitable control.
- 3.5.4.2 The control panel shall be used to turn the DFMD off, ensuring that all of the information and settings are stored in memory before shut down.
- 3.5.5 **Counter:** The DFMD shall have a traffic counter that should track the number of people that have passed through the detector, the number of alarms and should calculate the alarm percentage. The counter should be used to obtain an automatic update on the traffic count. If operator access is enabled, the counter may be resetted by pressing the counter control for approximately ten seconds.
- 3.5.6 **Accessories:** The DFMD shall have accessories including a battery back-up module for emergency, accessories for remote use, desktop remote control, a wheel assembly for easy portability, adhesive floor mounts and a microprocessor based control, monitor & analysis interface module as applicable for standalone/ networked DFMD. The software should provide network capabilities for remote access for data collection and alarm statistics for monitoring and analysis of networked DFMDs.

4.0 X RAY BAGGAGE SCREENING SYSTEM:

4.1 SCOPE:

- 4.1.1 The specification of X Ray Baggage Screening System covers technical specification and requirement of baggage screening systems consisting of X ray machine, entry/exit stainless steel roller tables, LCD colour monitors, image management software, operator control console etc. for baggage screening at different locations of railway stations and other establishments of railways.
- 4.1.2 The system shall be able to work continuously without interruption and should be capable of storing images which can be retrieved from a USB port using an external drive.

Page 13 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

4.1.3 X Ray Baggage Screening System which is networkable shall be provided, if specified by purchaser.

4.2 SYSTEM DESCRIPTION:

4.2.1 X Ray Baggage Screening System to be provided at stations and other railways installations shall consist of X ray machine, operator control console with suitable controls, stainless steel roller tables on entry side and exit side, LCD colour monitor, power cable, Combined Test Piece (CTP), Threat Image Projection (TIP) software, network supervisory workstation (optional) etc.

4.2.2 The tunnel size of machine should conform to the purpose for which machine is used and shall be as specified by purchaser. Commonly available minimum tunnel sizes are 600mm x 400mm, 1000mm x 1000mm and 1450mm x 1650mm.

4.2.3 The X ray baggage screening system should enable the operator/supervisor to perform all related tasks for screening & monitoring of objects.

4.2.4 The X ray baggage screening system required to function in network mode should be easily networkable using any standard software platform. The networked machines should be capable of allowing data and images to be accessed in real time by a centralized supervisory workstation. The system should enable the supervisor to perform key tasks for multiple units including second level screening of suspect objects, centralized monitoring of operators' performance using Threat Image Projection feature, and administration of all X ray systems on the network.

4.3 GENERAL REQUIREMENTS:

4.3.1 The equipment shall adopt widely accepted technology for its operation and shall be of proven performance. The equipment shall conform to international & national standards/regulations for safety & EMC requirements.

4.3.2 The X ray baggage screening system shall be manufactured by firm having established quality system in place and shall possess ISO 9000 certification.

4.3.3 The X ray baggage screening system shall comply with requirements of health and safety regulations with regard to mechanical, electrical and radiation hazards. The baggage screening system shall have approval from Atomic Energy Regulatory Board (AERB) of India.

4.3.4 The X ray machine shall comply with the film safety standards for photographic film.

4.3.5 The computer of the machine shall be easily accessible and programmable.

- 4.3.6 The system should be capable of adapting to diverse operational requirements and evolving security challenges through easy customization of software-based controls and tools.
- 4.3.7 The power supply available at the stations shall be 230 V / 50 Hz AC which may vary from 160 Volts to 270 Volts. All modules of the screening system should work using this power supply only with requisite converters & voltage stabilizers of suitable capacity, if required. However, if felt necessary UPS of requisite capacity may be provided based on requirement of purchaser to ensure continuous availability of power supply.
- 4.3.8 Anti rodent and dust proof cover shall be provided for the system.
- 4.3.9 The X ray baggage screening system shall be capable of bidirectional screening operation.
- 4.3.10 The supervisory workstation and X ray machines of baggage screening system required to function in network mode shall be capable of getting connected to the Ethernet network.

4.4 TECHNICAL REQUIREMENTS:

- 4.4.1 X Ray Baggage Screening System for all type of stations should mainly consist of the following:

i.	X Ray System
ii.	Operator Control & Display Console
iii.	Entry/Exit Roller Table
iv.	Network Supervisory Workstation (incase baggage screening systems are required to function in network mode)

- 4.4.2 X Ray machines should preferably be provided at entrance/exit points, platforms, etc. or any other locations as decided by purchaser.
- 4.4.3 Network Supervisory Workstation (incase baggage screening systems are required to function in network mode) shall be provided at a centralized location within the railway station or as decided by purchaser.
- 4.4.4 The X ray baggage screening system shall have multi energy X ray imaging capabilities using requisite detectors & filters.
- 4.4.5 The X ray baggage screening system shall have transparent colour feature providing a crisp, clear and robust colour images enabling the operator to interpret threat objects with a higher degree of confidence.
- 4.4.6 The X ray baggage screening system shall have an operator interface with a suitable control allowing operator for a continuous operation.

- 4.4.7 X ray screening system shall be capable of detecting and displaying materials in different colour under atleast three main categories- organic, inorganic & metal. The colours used to signify different categories of materials shall be as per widely accepted national & international practices. Facilities for variable contrast shall be available to allow enhancement of lighter and darker portion of the image.
- 4.4.8 The machine should be capable of material discrimination (organic/inorganic/metal), reverse video, pseudo colour imaging, real time continuous diagnostics and edge enhancement features.
- 4.4.9 The machine should have image zooming capability of 8X or better. Such feature shall be key board controllable.
- 4.4.10 Each machine should have Threat Image Projection (TIP) software which can insert fictitious threat image at periodic intervals and tracks operator responses, allowing supervisors to assess the effectiveness of screening operations and encouraging operators to stay alert.
- 4.4.11 The system shall have image archive option supporting storage of minimum 20,000 images.
- 4.4.12 The system shall have audio and visual alarm for a threat after it has compared scanned objects with data on known threats and shall highlight suspect items for further analysis. Also if the machine fails to penetrate a particular item than an audio-visual alarm should be generated to notify the operator.
- 4.4.13 Administrator shall be able to access the recorded image of any machine within the railway station or railway establishment from his supervisory workstation incase baggage screening systems are required to function in network mode.
- 4.4.14 All the equipments installed outside the control room shall be able to withstand -5⁰C to +50⁰C and humidity of 95% non condensing.

4.5 HARDWARE REQUIREMENTS:

- 4.5.1 **X Ray Imaging and Performance:** The X ray machine shall have the following minimum technical specifications and features for imaging:

i.	Resolution	:	Single uninsulated tinned copper wire of 40 SWG
ii.	Steel Penetration	:	26 mm thickness of steel or more
iii.	Video Resolution	:	1024 x 768 pixels or better
iv.	Video Display	:	17" LCD high-resolution, flicker-free display or better
v.	Computer Processor	:	Intel Pentium or better

Page 16 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

4.5.2 Conveyor belt speed of X ray machine shall be between 180 mm per second to 300 mm per second.

4.5.3 The conveyor of the X ray baggage system with minimum tunnel sizes of 600 mm (width) x 400 mm (height), 1000 mm (width) x 1000 mm (height) and 1450 mm (width) x 1650 mm (height) shall be capable of carrying baggage weighing up to 100 Kg, 150 Kg & 1500 Kg respectively.

4.5.4 Operator Control Console:

4.5.4.1 Operator interface shall provide a simple, flexible and powerful means for operator to control the system and make maximum use of imaging information.

4.5.4.2 The operator interface shall combine conveyor control with a suitable pad for allowing continuous operation.

4.5.5 Entry/Exit Roller Table:

4.5.5.1 Two stainless steel roller tables shall be provided with each system, one at the entry side and other at the exit side.

4.5.5.2 Each roller table shall be of at least 1 meter length. The height should be adjustable according to the height of the system's conveyor.

4.5.6 Combined Test Piece (CTP):

4.5.6.1 Each system shall have a Combined Test Piece (CTP) for testing the steel penetration, wire resolution, organic, inorganic & metal discrimination of the machine.

4.5.7 Network Supervisory Workstation (NSW):

4.5.7.1 Network Supervisory Workstation shall be provided at a centralized location incase baggage screening systems are required to function in network mode.

4.5.7.2 A Network Supervisory Workstation shall allow a supervisor at another location to view and inspect a bag image that the X ray machine operator has deemed suspect. In the meantime, the operator may continue to scan additional bags.

4.5.7.3 Network Supervisory Workstation should have following minimum features:

- a). It should use standard 10/100 Mbps Base-T Ethernet connectivity to access X ray machines installed at different locations.
- b). A log on and log off feature should be available on both the X-ray machine and the NSW.
- c). Same Operator Graphical User Interface (GUI) should be used at NSW as well at X ray machine.

Page 17 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

- d). It should show X-ray system information.
- e). NSW should have option to display or not to display potential threat information.

4.5.7.3 After a successful logon of Network Supervisory Workstation, system verification should be performed.

4.6 SOFTWARE REQUIREMENTS:

4.6.1 Image Management Software:

4.6.1.1 It shall offer a complete X ray image analysis solution that shall be pre-installed in the system's computer.

4.6.1.2 The software shall provide the following:

4.6.1.2.1 Visual alerts to the operator in case of a threat or high density object.

5.6.1.2.2 Operator logs

4.6.1.2.3 Date, time and operator ID.

4.6.1.2.4 Entire toolbar shall be available on the screen/keyboard for the operator to select and use required icon of the image analysis feature.

4.6.2 Threat Image Projection (TIP) Software Features: The TIP software shall perform the following applications:

4.6.2.1 TIP software facility shall be incorporated in the X-ray machines to assist supervisors in testing the operator alertness and training X-ray screeners to improve their ability in identifying specific threat object. The system shall create a threat object and the same should be superimposed on monitor screen while a bag is being screened. To acknowledge that the operator has seen the false object, operator shall press the control panel key that will cause the computer generated threat object to disappear from x-rayed bag image on the VDU screen. Each operator's action shall be recorded in the hard disc of the computer for the auditing purpose by the supervisor or other authorized person.

4.6.2.2 Design of the system: TIP software should be compatible with other X-ray technologies such as automatic reject unit, dual X-ray screen technologies, automatic threat recognition system etc. All X-ray image functions shall be available at the same time along with the TIP.

4.6.2.3 Image Library:

4.6.2.3.1 The TIP facility should have an image library containing at least 100 explosive devices, 100 knives and 100 firearms in various sizes, shapes, locations & orientations. However, the system shall have

Page 18 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

facility to expand the library to incorporate additional images by user without assistance of the manufacturer.

4.6.2.3.2 The image library should contain images of threats at different orientations. Both plane and end-on orientation should be used. Images of threats should be assigned different file names and references, however, it shall be possible to cross-reference these as the same threat. All threat image projection images shall be realistic, representative and non distinguishable from real threat items.

4.6.2.4 Time Interval:

4.6.2.4.1 Programming facility shall be available to project threat images at different intervals. The time period for threat image as well as image mix in percentage shall be user programmable e.g. software shall select 40 % images of explosive devices, 35 % of fire arms & 25 % knives or random etc.

4.6.2.4.2 Once the screener has responded to identify the computer generated threat image, it should remain on the screen for a predefined user programmable time for analysis. The image should be highlighted, upon identification, and feedback message shall be visible to the screener.

4.6.2.5 System Administration:

4.6.2.5.1 The threat image projection facility shall have details of user database such as station name, screener name, organization, user ID number, level of access such as screener, administrator etc. with password protection.

4.6.2.5.2 Access to start up menu should be restricted only to the authorized individuals. A log - in procedure by means of "Password" or "Security Key", should be able to restrict access to each of the comment. The log - in procedure should not take longer than 20 seconds. The system should have facility to bypass the TIP facility, if programmed so by the system administrator. It should be ensured that the TIP software shall not be hindrance to normal functioning of X-ray machines.

4.6.2.5.3 When the operator logs - in or logs - out, message should be displayed on X- ray screen to confirm that operator has been correctly logged - in or logged - out.

4.6.2.6 Feed Back Report:

4.6.2.6.1 The threat image projection should be capable of giving feedback "HIT, MISS or FALSE ALARM" message. No message shall be presented if a screener has correctly passed a clear bag.

Page 19 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

- 4.6.2.6.2 A “HIT” message shall be presented when a screener has correctly identified a threat image projection image. A “MISS” message shall be presented when screener fails to identify the TIP image. A “False Alarm” message shall be given when screener incorrectly indicate TIP image when in fact no threat image projection is present. The feedback should clearly indicate on screen that a TIP object has been correctly identified / TIP object has been missed / no TIP object was present and all such information should be recorded in the database.
- 4.6.2.6.3 Different colour coding shall be used for feedback to the screener. It is recommended that colour code red for “MISS”, green for “HIT” and yellow for “False Alarm or Interrupt” should be used.
- 4.6.2.6.4 The system shall automatically prepare the daily log of events for each shift and for each screener performance. TIP log shall include particulars of location/station, X ray machine, name of screener, time & date of threat image, whether threat image was successfully identified or missed etc.
- 4.6.2.6.5 The report on Threat Image Projection system should have date and time as per requirement, screener particulars, and decision/ outcome i.e. MISS, HIT or False Alarm in percentage as well in absolute numbers, number of bags screened, categories such as explosive devices, knife or weapon etc.
- 4.6.2.6.6 As a standard practice, daily / weekly / monthly report shall be retrieved. Report shall be for any given time and period as per command.
- 4.6.2.6.7 All data should be stored on the system for a minimum of two months after it has been down loaded or as specified by purchaser. Threat image projection data on the X-ray machine shall be read only file so that no individual, regardless of access rights to the threat image projection components shall be able to delete or amend any of threat image projection data or time.

4.7 COMBINED TEST PIECE (CTP) TESTS REQUIREMENTS:

4.7.1 Single Wire Resolution (Test No. 1):

- 4.7.1.1 The requirement is to display 40 SWG wire not covered by step wedge. A tick should indicate the visibility of appropriate wire. A set of un-insulated tinned copper wire of different sizes in SWG should be placed on a Perspex sheet. Wires are to be laid out in S shaped curves. The wires should be placed behind varying thickness of aluminum. Metallic marker should be provided using high density material, so that SWG numbers in the Video Display Unit (VDU) are clearly visible.

Page 20 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

4.7.2 Useful Penetration (Test No. 2):

4.7.2.1 The test defines what level of details can be seen behind a thickness of known material. The CTP should have different gauges of wire behind varying thickness of aluminum. The requirement of this test is that the 26 SWG wire should be seen under second step wedge (5/16”).

4.7.3 Material discrimination (Test No. 3):

4.7.3.1 The requirement is that different colours should be allocated to the sample of organic, inorganic and metal substances. With multi energy X-ray, it should be possible to distinguish between materials of different average atomic number for differentiating between organic, inorganic and metal substances. The use of sugar and salt samples encapsulated on the test piece and various materials used in the construction of CTP should check the material discrimination facility.

4.7.4 Simple Penetration (Test No. 4):

4.7.4.1 The requirement is that the lead should be visible beneath 26 mm of steel. This test defines what thickness of steel the machine should be able to penetrate. The steel step wedge on the CTP should have steps of 2 mm from 16 mm to 30 mm with a lead strip to check that the machine is above or below the requirement.

4.7.5 Spatial Resolution (Test No. 5):

4.7.5.1 The requirement of this test is that vertical and horizontal grating to be seen. This test defines the ability of the system to distinguish and display objects which are close together. The CTP should have 16 copper gratings at right angles to each other.

4.7.6 Thin Metal Imaging (Test No. 6):

4.7.6.1 The requirement of this test is to image 0.1 mm thick steel. This tests the machine ability to image thin metal. A number of thin metals strips of various thickness should be placed in a row.

4.7.7 Method of Testing:

4.7.7.1 The CTP should be used as a quick routine test to be carried out daily to ensure that equipment is working properly and satisfactory image is obtained.

4.7.7.2 The CTP should be placed on the belt and passed through the belt at least once in a day before the baggage is screened or after the X ray equipment is switched on to ensure that the equipment is working properly and image is satisfactory.

Page 21 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

4.7.7.3 The CTP should be viewed by using image enhancing facility till the operator is satisfied that the machine is working properly. The optimum position of CTP on the belt will depend on X-Ray source and detector arrangements. This should be ascertained from the service engineer, if need arises.

4.7.8 Results:

4.7.8.1 The best result out of multiple scanning of CTP in both colour and black and white images shall be taken in to account for a particular machine.

5.0 TEST REQUIREMENTS:

5.1 Conditions of Tests:

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

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

5.1.3 Inspection shall be carried out for one complete unit of Hand Held Metal Detector, Door Frame Metal Detector and X Ray Baggage Screening System along with associated accessories.

5.2 Type Tests:

5.2.1 For type test, one complete system of Hand Held Metal Detector, Door Frame Metal Detector and X Ray Baggage Screening System shall be subjected to following tests as applicable:

- a) Visual inspection (Clause 6.1)
- b) Performance test (Clause 6.2)
- c) Factory acceptance test (Clause 6.3)
- d) Endurance test (Clause 6.4.1)

5.2.2 Following systems with all required accessories should be offered for testing.

- a) Hand Held Metal Detector
- b) Door Frame Metal Detector
- c) X Ray Baggage Screening System of all tunnel sizes covered in the specification

5.2.3 Only one complete system of Hand Held Metal Detector, Door Frame Metal Detector and X Ray Baggage Screening 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

Page 22 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

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).

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

5.3 Acceptance Tests:

5.3.1 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 6.1)
- b) Performance test (Clause 6.2)
- c) Endurance test (Clause 6.4.2)

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

5.4 Routine Tests:

5.4.1 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, wherever applicable, shall also be submitted to the inspecting authority in advance.

- a) Visual inspection of complete system (Clause 6.1)
- b) Performance test (Clause 6.2)

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

6.0 TEST PROCEDURE:

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

6.1 Visual Inspection:

Each equipment of Hand Held Metal Detector, Door Frame Metal Detector and X Ray Baggage Screening System shall be visually inspected to ensure compliance with the requirement of clauses 2, 3 & 4 respectively of this specification. The visual inspection shall broadly include:

6.1.1 Constructional details.

Page 23 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

- 6.1.2 Dimensional check.
- 6.1.3 General workmanship.
- 6.1.4 Configuration.

6.2 Performance Test:

- 6.2.1 Each equipment of Hand Held Metal Detector, Door Frame Metal Detector and X Ray Baggage Screening System shall comply with the requirements as specified in Clauses 2, 3 & 4 respectively of this specification.

6.3 Factory Acceptance Test:

- 6.3.1 Factory Acceptance Tests (FAT) results to verify compliances as mentioned in clauses 2, 3 & 4 respectively for the Hand Held Metal Detector, Door Frame Metal Detector and X Ray Baggage Screening System 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.
- 6.3.2 All software features as mentioned in clauses 3 & 4 and as applicable for Door Frame Metal Detector & X Ray Baggage Screening System respectively shall be tested in premises of vendor for which all required setups are to be arranged by the vendor.
- 6.3.3 The FAT shall be able to prove compliance of the product to the specifications through test or test certificates.
- 6.3.4 All compliances to various standards as given in specifications shall be submitted with documentary proof. These shall include certificates for EMI/EMC/Safety/ Environment protection.

6.4 Endurance Test:

- 6.4.1 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 in performance.
- 6.4.2 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 in performance.

7.0 QUALITY ASSURANCE:

- 7.1 All materials & workmanship shall be of good quality.
- 7.2 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 of adequate standard.

7.3 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.

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

8.0 MARKING & PACKING:

8.1 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

8.2 The equipment and its sub assemblies shall be packed in suitable packing/boxes and the empty spaces shall be filled with suitable filling material. Before keeping in the packing box, the equipment shall be wrapped with bubble sheet. The main 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.

9.0 INFORMATION TO BE SUPPLIED BY THE PURCHASER:

9.1 The purchaser should clearly indicate details of required items for Personal Baggage Screening System which shall mainly consist of following items as per site requirement.

SN	DESCRIPTION	QTY	REMARKS
i.	Hand Held Metal Detector with all associated accessories as per specification mentioned in Clause 2.	As specified	
ii.	Door Frame Metal Detector (standalone) with all associated accessories as per specification mentioned in Clause 3.	As specified	
iii.	Networkable Door Frame Metal Detector with all associated accessories as per specification mentioned in Clause 3.	As specified	
iv.	X Ray Baggage Screening System of minimum tunnel size of 600mm x 400mm with all associated	As specified	

	accessories as per specification mentioned in Clause 4.		
v.	X Ray Baggage Screening System of minimum tunnel size of 1000mm x 1000mm with all associated accessories as per specification mentioned in Clause 4.	As specified	
vi.	X Ray Baggage Screening System of minimum tunnel size of 1450mm x 1650mm with all associated accessories as per specification mentioned in Clause 4.	As specified	
vii.	Networkable X Ray Baggage Screening System of minimum tunnel size of 600mm x 400mm with all associated accessories as per specification mentioned in Clause 4.	As specified	
viii.	Networkable X Ray Baggage Screening System of minimum tunnel size of 1000mm x 1000mm with all associated accessories as per specification mentioned in Clause 4.	As specified	
ix.	Networkable X Ray Baggage Screening System of minimum tunnel size of 1450mm x 1650mm with all associated accessories as per specification mentioned in Clause 4.	As specified	
x.	Network Supervisory Work Station for management and monitoring of networkable X Ray Baggage Screening Systems as per specification mentioned in Clause 4.	As specified	

9.2 Purchaser shall provide detail drawings of railway premises indicating proposed locations for the installation of the door frame metal detector and X ray baggage screening system. The vendor should access requirements of various components as stated in Clause 9.1 for these systems which may vary from manufacturer to manufacturer as per their overall system design.

9.3 Any other item(s) required for working of the hand held metal detector, door frame metal detector and X ray baggage screening system depending on the site and system requirements other than stated above, shall be arranged by vendor.

10.0 TRAINING:

Page 26 of 26	Effective from 18/06/2010	RDSO/SPN/TC/94/2010	Rev. 1.0
---------------	---------------------------	---------------------	----------

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

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

11.0 DOCUMENTATION & DIAGRAMS:

11.1 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.

11.2 Detail drawings of hand held metal detector, door frame metal detector and X ray baggage screening system with all accessories 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.
