

Technical Specifications of baggage x-ray machine

- 1.) Supply, installation, Commissioning & testing of X-ray baggage scanner machine based on dual energy x-ray imaging.
- 2.) Beam Direction: Upward
- 3.) X Ray Generator: Encapsulated for durable, reliable and safe operations.
- 4.) Conveyor Load Capacity: 160 Kg minimum or more evenly distributed.
- 5.) The system shall be capable to detect and show weapons, guns, knives, explosives.
- 6.) Conveyor height from ground: 600 to 850 mm with +/-10% tolerance
- 7.) X-Ray ON Sign: Warning indication while X-Ray ON for safe Operation
- 8.) Safety features: Safety interlocks, shielding with Lead drapes and Emergency stop are to be provided.
- 9.) Film-Safety Guaranteed safety for high-speed films up to ISO1600. The machines should be film safe. In other words photographic films must not be damaged due to X-ray examination.
- 10.) Machine should be properly sealed from all the sides for pest proof. Dust proof cover is to be provided for covering when system is not in use.
- 11.) The machine should be so designed that software enhancement can be easily implemented to take care of new technique in processing and pattern recognition.
- 12.) X-ray detector: Dual Energy detection with L-shape array arrangement of detector. In case of defective detectors scanning shall be disabled and error message should be displayed on a screen.
- 13.) Sensors > 1000 diodes, L-shaped detector (Folded array type), In case of defective diode arrays, scanning should be disabled and error message should be displayed on the screen.
- 14.) Tunnel size (W X H) : 640*430mm minimum +/- 10%
- 15.) Conveyor speed – between 0.1 to 0.3 mtr/sec
- 16.) X-ray generator cooling: Sealed Oil Bath
- 17.) Duty cycle: 100 %
- 18.) Minimum Steel penetration: 30 mm
- 19.) Scanning and conveyor movement: Bi-directional
- 20.) Scanning: X-ray generator shall be triggered on continuous basis for scanning small article or sensor based located in tunnel. This feature shall be user selectable.
- 21.) Operating temp: 0 deg to 40 deg C
- 22.) Storage Temp: -10 deg to 50 deg C
- 23.) Humidity: 93% Non Condensing minimum
- 24.) Operating environment: Machine will be installed under roof, exposed to sea shore saline atmosphere.
- 25.) Machine should have radiation emission leakages less than 0.1 mR/Hr at 5cm from all surface of x-ray cabinet. Relevant Certificate from Atomic Energy Regulatory Board (AERB), India shall be provided.
- 26.) X ray source/generator- It should be capable to operate smoothly for a period of at least 15 years.
- 27.) X-Ray voltage- maximum 160 KV

28.) Software to be password protected.

29.) Control desk with security housing and locking provision should be available. The operator personal identification number can be entered via keyboard along with generation of log.

30.) Imaging should include all of following but not limited to:

- a. Organic/inorganic/metallic objects in highly visible contrasting colour
- b. Black and white image
- c. Black and white reverse image
- d. Pseudo colour
- e. Zoom up to min. 16 time
- f. Variable contrast to allow enhancement of lighter and darker portion of the image.
- g. Image enlargement
- h. 4 colour imaging minimum
- i. Baggage counter
- j. Machine should be able to recall previous 15 to 20 images for review.
- k. Density threshold alert by means of a visible alarm when an imaged object exceeds a user specified density threshold
- l. Distortion correction as per machine requirement.
- m. Edge enhancement: Required to improve the outline and shape of each object in the X-Ray screen.
- n. Overlay to highlight: Density alert areas that are obscured by very dense material.
- o. Image resolution to be 1920 x 1080 Pixels or better.
- p. Facility of image enhancement should be available.
- q. Auto image storage shall be available for minimum 1 Lakhs with date and time stamp.
- r. The X-ray beam divergence should be such that the complete image at maximum size of bag is displayed without corner cuts.
- s. Date/ Time display stamping.
- t. Have search indicator
- u. Threat Image Projection (TIP) should be capable of giving feedback e.g. 'HIT, MISS or FALSE ALARM' message. No message will be presented if a screener correctly passed as clear bag. 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.
- v. Different colour coding shall be used for 'HIT', 'MISS' and 'FALSE ALARM' feedback to the screener.
- w. The system shall automatically prepare the daily log of events for each shift and for each screener performance. TIP log shall include particulars of Name of screener, Time and date of threat image; whether threat image was successfully identified or missed etc.
- x. The image library for threat image projection should contain at least 100 explosives devices, 100 knives and 100 firearms in various sizes, shapes, locations and orientations. However system shall have facility to expand the library to incorporate additional images by user without assistance of the manufacturer.
- y. All threat image projection must be realistic, representative and non distinguishable from real threat items.

- z. Programming facility shall be available to project threat images in 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 and 25% knives or random etc.
 - aa. All data should be stored on the system for a minimum of two months after it has been down loaded. No individual, regardless of access rights to the threat image projection components would delete or amend any of the threat image projection data or time i.e. Threat image projection data on the actual X-ray machine will be read only file.
 - bb. Access to start up menu should be restricted only to the authorized individuals. A log-in procedure by means of 'password' or 'Security key' could achieve restricted access to each of the comment. The log-in procedure should not take longer than 20seconds. The system should have facility to bypass the TIP facility, if programmed so by the system administrator. It is to be ensured that the TIP software shall not hindrance to normal functioning of x-ray machines.
 - cc. When the operator logs-in or logs-out message should be displayed on x-ray BIS VDU screen to confirm that he/she has been correctly logged-in or logged-out.
 - dd. The system shall automatically prepare the daily log of events for each shift and for each Screener performance.
 - ee. Full diagnostic built in test facility: Machine should have software controlled diagnosis report facility and system should give printout if required.
- 31.) UPS backup: min. 30 minutes. UPS is in scope of supply. UPS is required for providing proper shutdown to baggage x-ray machine PC
- 32.) Throughput around 500 bags/hr
- 33.) Windows/Linux based OS with valid OS license, 8GB minimum RAM, 1TB HDD/SSD, NVidia minimum 2GB or any other standard make graphic card, Optical mouse, CPU with min. 6 USB ports, 1 Serial Port, 1 Parallel port, 1 PS/2 Keyboard and 1 PS2 Mouse Port, audio ports.
- 34.) Machine to operate on 230VAC +/- 10%, single phase and 50Hz power supply.
- 35.) Manual Scan
- 36.) Copy of all software including X ray Software with recovery software shall be provided along with X-ray baggage machine.
- 37.) Machine should have online recording facility and images can be recorded in CD R/W or/and USB and should be able to view images so recorded on standalone PC.
- 38.) All software features should be controlled from key board of machine only. Keyboard function should be user friendly. To enable/ disable the software features, system should not be rebooted.
- 39.) If the machine fails to penetrate a particular item then an alarm should be generated to notify the operator.

Note to Bidder:

1. Scope of supply includes: X-ray baggage scanner machine fitted with x-ray generator, separate entry and exit roller table compatible with scanner, CTP kit, UPS, computer, flat panel LCD/LED monitor, mouse, keyboard, shielding with Lead drapes. Bidder to note that necessary cables and conduits accessories arrangement for installation at site is in bidder's scope.
2. Supply, installation, Commissioning & testing of X-ray baggage scanner shall be completed by bidder at TAPS-3&4 sites.
3. Testing of X-Ray machine by CTP kit shall be demonstrated at TAPS-3&4 site for followings:

Sr. No.	Parameter	Description
1	Single Wire Resolution	Thickness 26 AWG to 42 AWG. The wires are placed on Perspex sheet and laid out in 'S' shaped curves. The wires are placed behind varying thickness of aluminium. A quarter of the length of each wire is uncovered whilst the remaining 3 quarters are covered by 3 wedges of aluminium, corresponding to 4.8mm (3/16"), 7.9mm (5/16") and 11.1mm (7/16") thickness. The minimum requirement is to display 40 SWG wire not covered by step wedge.
2	Useful penetration	Different gauges of wire behind varying thickness of aluminum such as 3/16", 5/16" and 7/16". The requirement is that the 26 SWG wire is seen under second step wedge (5/16")
3	Steel Penetration	16mm to 42 mm. The steel step wedge on the CTP has steps of 2 mm from 16 mm to 42 mm with a lead strip, 1.5mm in thickness. Minimum requirement of this test is that lead should be visible beneath steel step.
4	Multi Energy X-Ray	The sugar and salt samples has to be encapsulated on CTP in transparent case distinguish between materials of different average atomic number. Different colors of sugar and salt on display should be indicated. This is required to distinguish between organic and inorganic materials, and to distinguish high density organic materials including explosives. Machine should have variable color or materials stripping to facilitate the operator to monitor images of organic materials for closer scrutiny. All suspicious items (Explosives, High density material, narcotics) should be displayed in one mode and that should be on line.
5	Spatial Resolution	The CTP has copper plate with two sets of copper gratings (1.0mm, and 1.5mm). Each set consists of a horizontal group and a vertical group. Requirement is that vertical and horizontal grating to be seen.

Sr. No.	Parameter	Description
6	Thin Imaging Metal	CTP should have three thin squares of steel of 0.05mm, 0.10mm and 0.15mm thickness placed in row. Requirement is machine's ability to image thin metal.
7	Marking	Metallic marker should be provided using high-density material, so that numbers in the Display are clearly visible.
8	Base metal	Aluminum
9	Enclosure	CTP should be kept in good quality of suitcase with proper packing and cushioning. The packing material should be removable. Suitcase make should be VIP or Aristocrat.
10	Standard	As per BCAS norms.

4. Health & Safety - The machine must comply with requirements of health and safety regulations with regards to mechanical, Electrical and radiation hazards. The supplier/manufactures should furnish Test Certificate from Atomic Energy Regulatory Board of India regarding radiation safety.
5. Radiation safety: The machine must comply with requirements of health and safety regulations with regard to mechanical electrical and radiation hazards. Before installation of the machine, the supplier/ manufacturer should furnish relevant certificate from Atomic Energy Regulatory Board of India regarding safety. The company manufacturing the equipment should have ISO certification for manufacturing and servicing of X-Ray Screening machines.
6. Equipment manufacturer should have minimum ISO 9001 certified factory in India.
7. Production license from AERB should be submitted along with bid.
8. Vendor shall submit following documents:
 - a.) Installation recommendations/ Manual
 - b.) Operation manual
 - c.) Maintenance instructions
9. Bidder should submit the declaration along with bid that service/spares support as applicable will be provided in India for minimum 5years from the date of installation at TAPS-3&4.
10. Bidder should provide set of software license.
11. In view of cyber security, precautions to be taken to ensure that machine should work in standalone mode without requirement of any network dependency. Also all external wired/wireless communication ports shall be disabled during the normal operations of the machine to ensure the cyber security. All communication provisions if any shall be with password protected with key interlock preferably only for the purpose of maintenance or troubleshooting.

12. Quality Assurance requirements:

- 1.) Please ensure that pre dispatch inspection subjected to visual, dimensional and functional inspection and testing will be done as per NPCIL approved QAP to the satisfaction of purchaser. After placement of PO, Bidder shall submit the QAP for review and approval covering the testing requirement mentioned in this tender.
- 2.) Package vendor/sub vendor shall carry out all the checks, tests and inspections required to verify the compliance of the supply with the specification requirements at his own expenses. Applicable test shall be as per the inspection and test plan.
- 3.) NPCIL QA engineer shall have free access to Package Vendor/ Sub -vendor works both during manufacturing and tests & trials.
- 4.) Package vendor/sub vendor shall perform inspections and tests in full compliance with industrial safety rules, to safeguard his own personnel as well as NPCIL QA engineers.
- 5.) Package vendor/sub vendor shall be responsible for the performance of the tests and shall provide qualified and skilled personnel with relevant certification.
- 6.) If during the execution or at the end of the supply, any non-conformances are noted, Package Vendor/ Sub -vendor shall implement and adequately document all the corrective actions necessary to restore the contractually required conditions. The documentation related to the corrective actions shall be included in the final certification report. If the non-conformance compromises the functional or safety feature of the equipment or specific interface elements, the supplier shall inform NPCIL in advance in writing on the corrective actions to be implemented. NPCIL has the right to reject (totally or partially) the proposed actions if considered inadequate or insufficient and Package Vendor/ Sub -vendor may be asked for more adequate actions. The failure to communicate such non-conformances will be considered fraudulent intention.

13. Bidder shall provide all facilities and documents for training for efficient operation and maintenance of system at plant site. Training shall also be imparted to site engineers during testing, installation and commissioning at site. Scope of training shall include:

- Installation, commissioning operation and maintenance aspects
- Functional operation of software and hardware.
- Interpretation of various diagnostics of software & hardware.
- Trouble shooting
- Vendor shall provide training manuals before the start of the training.
