



Workshop on BCP projects preparation
Hotel Planinka, Kursumlijska banja, Serbia

27-28.02.2025

**CEL BET Methodology for developing technical and functional
specification for BCP equipment**

Lauris Krivans
Leader of the CELBET
Equipment team



Content of the session

- What is CELBET
- Equipment team of the CELBET
- Classification of customs control equipment
- Categorization of BCPs
- Equipment life cycle
 - gap analysis
 - market research
 - prepurchase tests
 - development of technical specifications
 - training needs
 - etc
- Group work

What is CEL BET

EU Eastern and South-Eastern land border
expert team

BCP Evaluation team

Risk Management team

Customs Controls team

Equipment team

Training team

Cooperation team

Feasibility Study team

FACTS & FIGURES OF CEL BET



172 land border BCPs on 9 300 km
that CEL BET takes care



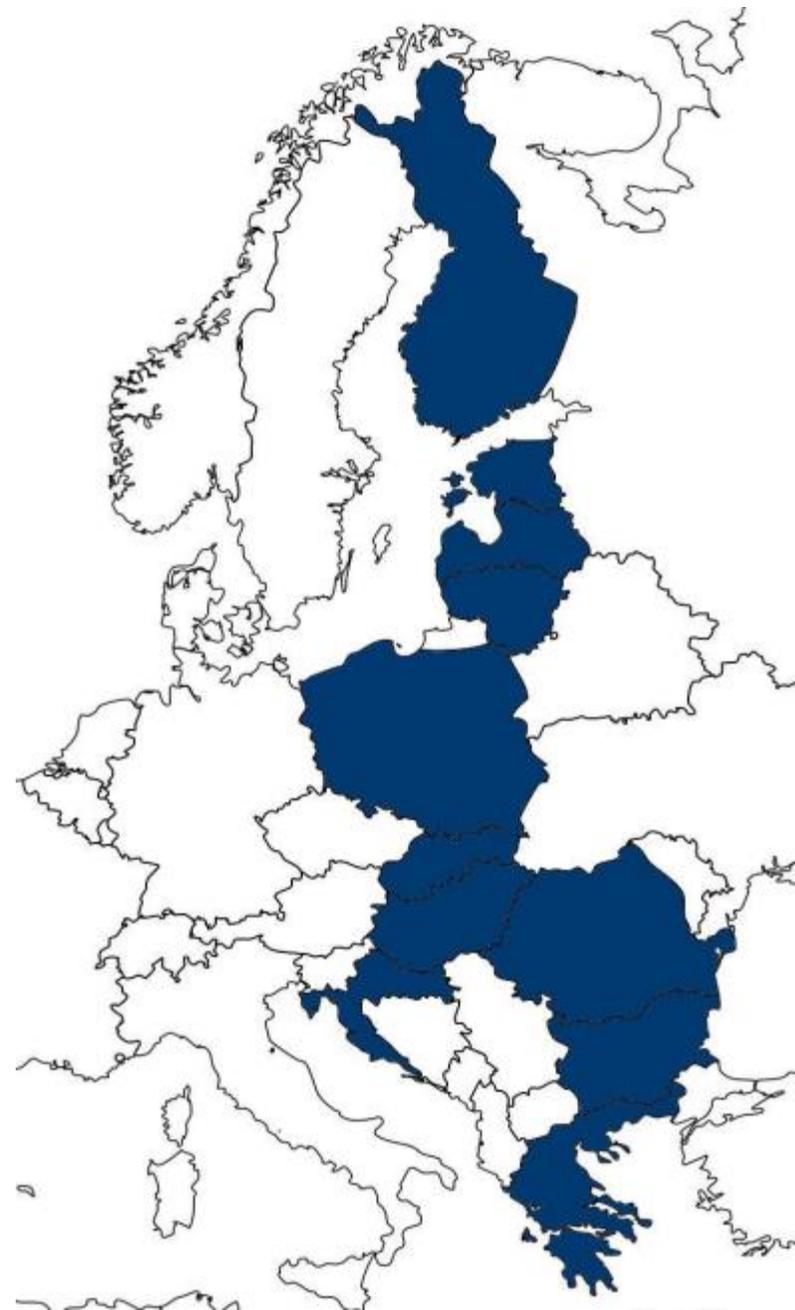
over **300** people are involved in
CEL BET activities



148 customs officers in 7 networks
collaborating

FI, EE, LV, LT, PL, SK, HU, RO, BG, HR, GR

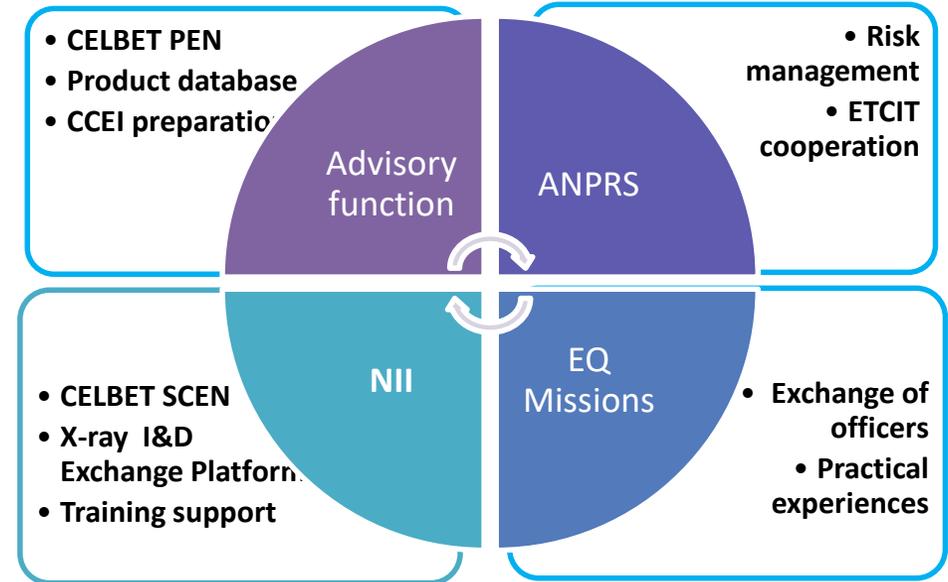
Sept 2016 – May 2025



CEL BET Equipment team

- Group of 5 experts from five different EU Member States

- **Main task:** *Provide advisory function in supporting MSs to plan procurement of customs detection equipment*



 **Procurement experts network**

- Workshops
- Technical specifications
- Market research
- Market representatives
- Sharing of good practices

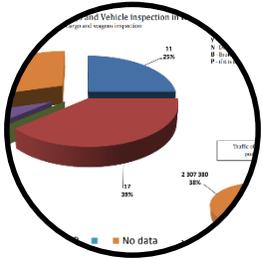


 **Scanner cooperation experts network**

- Support for X-ray image analysis training sessions
- Artificial Intelligence
- Centralized solutions
- Exchange of X-ray cases
- Sharing of good practices

Main focuss of the EQ team

for procurement and effective use of equipment



Inventory of the
equipment



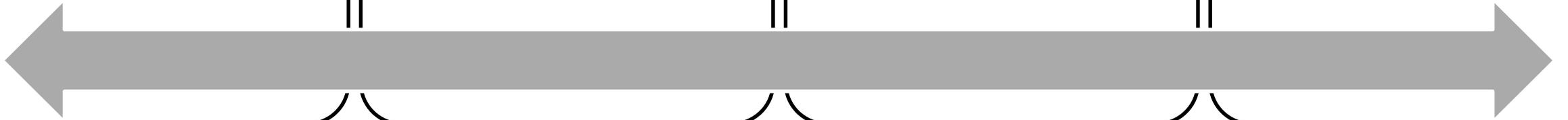
Catigorization of
BCPs



Classification of
customs control
equipment



Life circle of
equipment



Categorization of BCPs

- **Category A:** road border crossings with truck traffic
- **Category B:** road border crossings only with non-commercial traffic
- **Category C:** rail border crossing

x = must have to provide sufficient border control

x = it would help customs control

Personal hand tools					
	Pocket tools	Mechanics tool kit	Trolley for checking vehicle underbody	Fuel unloading system	Telescoping mirror
Category A	x	x	x	x	x
Category B	x	x	x	x	x
Category C	x	x			x

Scanners for NII of:					
	Passenger baggage	Pallets	Body scanners	Cargo and Vehicle inspection	X-ray scanning image library
Category A	x	x	x	x	x
Category B	x		x	x	x
Category C	x	x		x	x

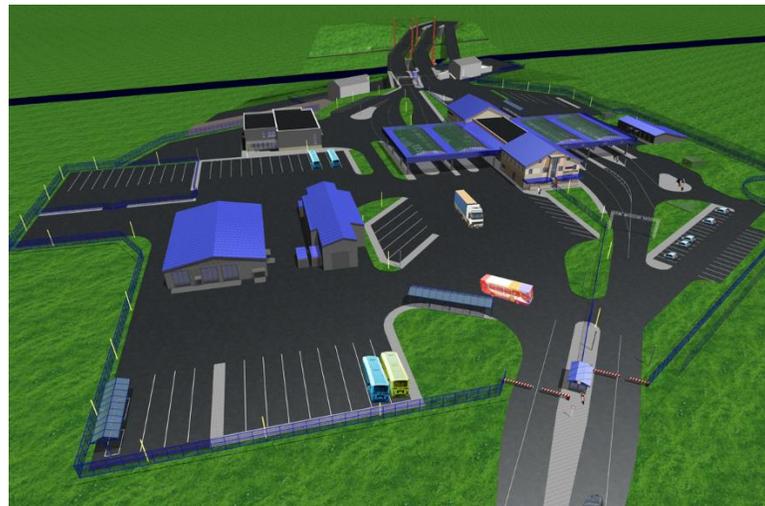
Classification of customs control equipment

Stationary equipment

- Radiation detection equipment
- X-ray scanners
- Automatic number plate recognition system
- Scales

Equipment that cannot be moved on day to day control operations

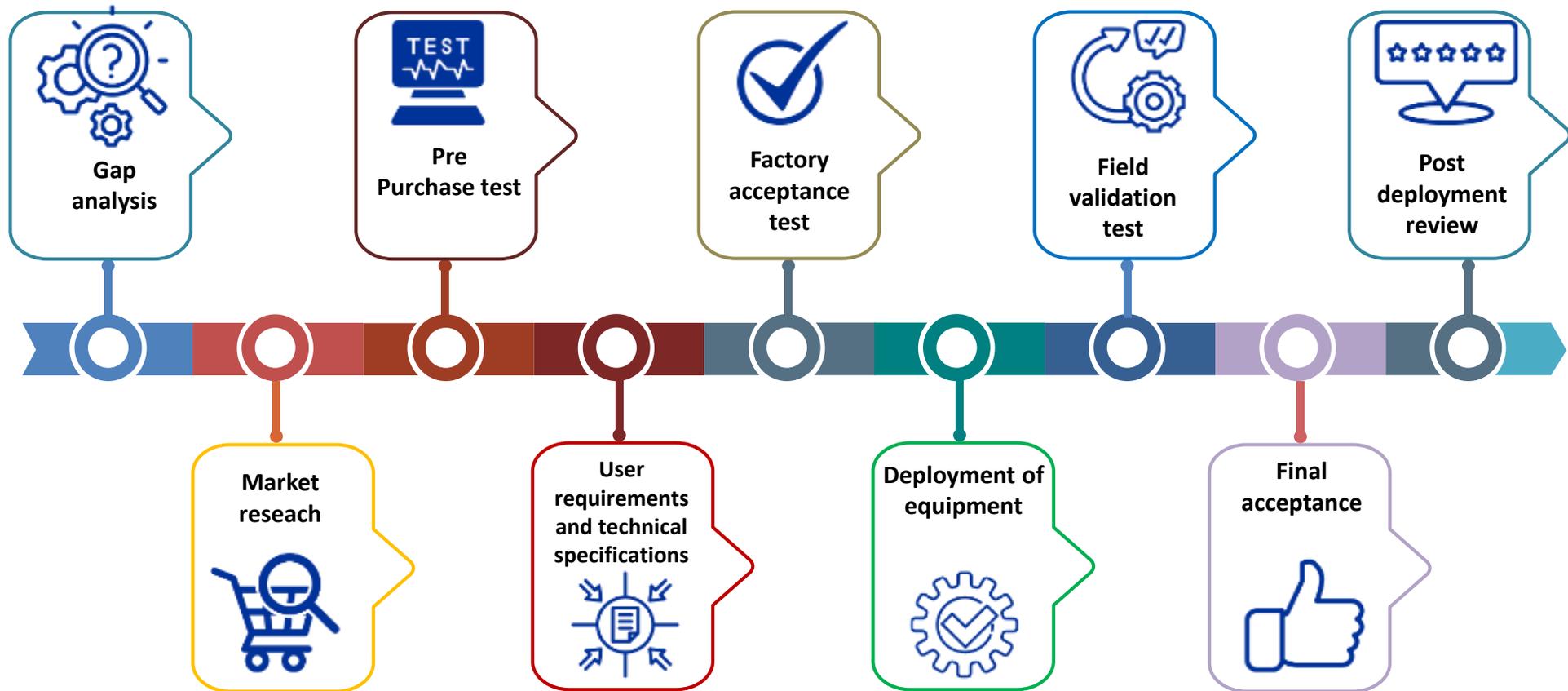
- Part of BCP infrastructure
- Part BCP Standard operating procedures



Movable equipment

- Handheld scanners
- Endoscopes
- Ramage tools
- Spectrometer
- Trace detection equipment
- etc

Life circle of equipment



Equipment life circle

Analysis of BCP data

BCP – *general info*

1. CELBET member state
2. The border with 3rd country
3. Human resources
4. Road / Railways
5. By type of passenger traffic
6. By type of goods
7. IBM - using of equipment

BCP

Traffic statistics

1. Cars, Buses and Vans – traffic Members States BCP (MS)
2. Trucks (Entries+ exits)
3. Railway trafic - wagons
4. Railway trafic - passengers
5. Passengers, by Members States BCP (MS)
6. Passengers by Neighbouring Countries (NC)
7. Overall statistics - traffic of passingers and vehicles
8. Overall statistics -passengers vehicles and trucks by MS
9. Overall statistics -passengers vehicles and trucks by NC



Equipment life circle

Analysis of BCP data



Gap analysis

Infrastructure of BCP

ANPRS

1. ANPRS -jurisdiction of system
2. Description of needs
3. Forklifts, scales and examination yard
4. Vehicle weighing Scales
5. Pallet stackers
6. Forklift
7. Examination yard/facilities
8. X-ray scanners

Search tools

Personal hand tools

1. Pocket tools
2. Mechanics tool kit
3. Trolley for checking vehicle underbody
4. Fuel unloading system
5. Telescoping mirror

Devices

1. Endoscopes
2. Stationary metal detector and handheld metal detector
3. Cameras for check vehicle underbody
4. Distance measuring electronical device
5. Ultrasonic device
6. Density meter
7. Co2 detector or similar devices
8. Drone

Equipment life circle

Analysis of BCP data



**Gap
analysis**

Equipment for analysis

1. Traces
 1. Trace detector devices
 2. K9 – Dogs
2. Samples
 1. Chemical colorimetric tests
 2. Raman spectroscopy
 3. X-ray fluorescence

Detection of radiation for Scanning

RN Detection

1. PRM
2. RIID
3. RPM

Scanners for NII:

1. Passenger baggage
2. Pallets
3. Body scanners
4. Cargo and Vehicle inspection
5. X-ray scanning image library

Seizure data

Contrabands

1. Tobacco
2. Cigarettes
3. Alcohol
4. IPR
5. Money
6. Narcotics
7. Weapons

Equipment life circle

Identification of BCPs equipment needs



Country	infrastructure BCP					Search tools											Equipment for analysis					Detection and using of radiation for Scanning						
	ANP RS	Forklifts, scales and examination yard				Personal hand tools					Devices						Traces		Samples			RN Detection			Scanners for NII of:			
	Automated Number Plate Recognition System	Vehicle Weighing Scales	Pallet stacker	Forklift	Examination yard/facilities	Pocket tools	Mechanics tool kit	Trolley Vehicle Checking the Mirror for scrutinizing the under-side of vehicles	Fuel unloading system	Telescoping mirror	Endoscope	Stationary or handheld metal detector	Cameras for checking the under-side of vehicles	Distance measuring electronic device	Ultrasonic device	Density meter	Trace detector device	K9 - Dogs	Chemical colorimetric tests	Raman spectroscopy	X-ray fluorescence	Personal Radiation Monitor/detector (PRM)	Radiation Isotope Identification Device (RIID)	Radiation Portal Monitor (RPM)	Passenger baggage scanner	Pallets scanner	Body scanner	Cargo and Vehicle inspection scanner
Bulgaria	10	7	9	9	3	253	18	9	9	21	21	13	10	14	8	10	6	11	304	1	3	56	1	1	8	2	1	6
Croatia	0	0	17	23	0	802	33	48	0	42	35	0	0	22	0	31	0	13	38	0	0	80	0	0	0	0	0	2
Estonia	0	6	1	3	2	9	4	12	0	8	21	10	17	6	0	5	1	8	3	3	3	36	0	0	4	0	4	1
Finland	1	1	3	2	3	142	2	8	5	55	5	9	16	10	7	9	5	2	1	5	2	1	0	1	4	1	2	7
Greece	8	1	6	2	3	79	20	7	14	11	14	10	11	10	11	11	1	31	0	7	7	0	0	0	4	4	4	7
Hungary	8	0	0	4	0	518	7	21	1	30	23	20	17	6	15	15	2	0	0	0	0	32	0	0	4	0	0	0
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Lithuania	0	1	2	5	1	15	6	3	5	3	4	4	7	7	10	4	7	3	3	0	0	517	0	0	2	5	6	5
Poland	0	1	0	0	0	130	20	1	2	10	3	9	1	24	1	14	19	2	16	18	8	58	0	0	2	8	1	6
Romania	4	4	11	11	0	135	40	24	18	27	28	28	34	32	22	34	3	4	37	9	14	20	0	1	8	8	17	5
Slovakia	2	1	0	1	0	154	8	6	0	4	6	9	0	8	4	7	1	0	0	3	0	0	0	0	2	1	3	5
Total	33	22	49	60	12	2237	158	139	54	211	160	112	115	139	78	140	45	74	402	46	37	800	1	3	38	29	42	44

Equipment life circle

Market
research



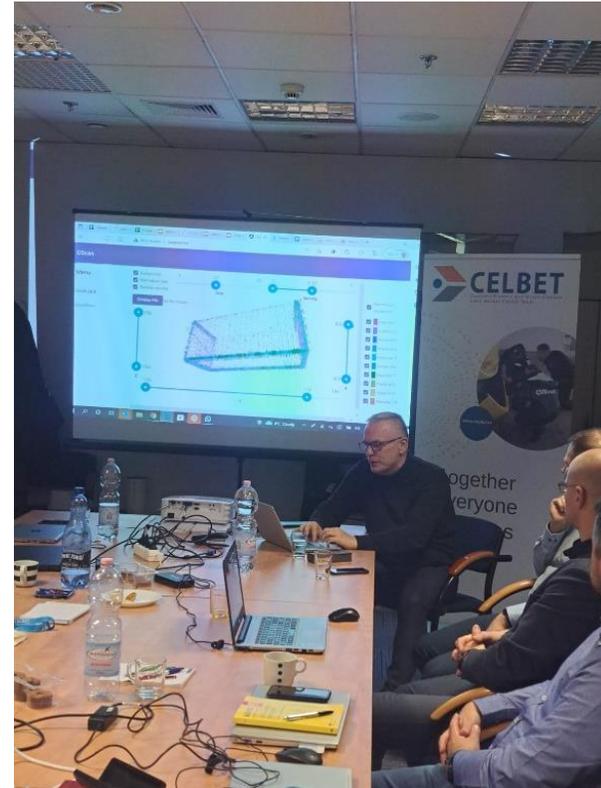
Communication and cooperation with market representatives

Obtaining information on state-of-the-art equipment and technical solutions

Equipment testing

Cooperation on Innovative Solutions

In person meetings



Equipment life circle

Market
research



Communication and
cooperation with
market representatives

Obtaining information
on state-of-the-art
equipment and
technical solutions

Equipment testing

Cooperation on
Innovative Solutions

Virtual meetings



Equipment life circle

Market
reseach



Communication and
cooperation with
market representatives

Obtaining information
on state-of-the-art
equipment and
technical solutions

Equipment testing

Cooperation on
Innovative Solutions

Factory visits



Equipment life circle

Market
reseach



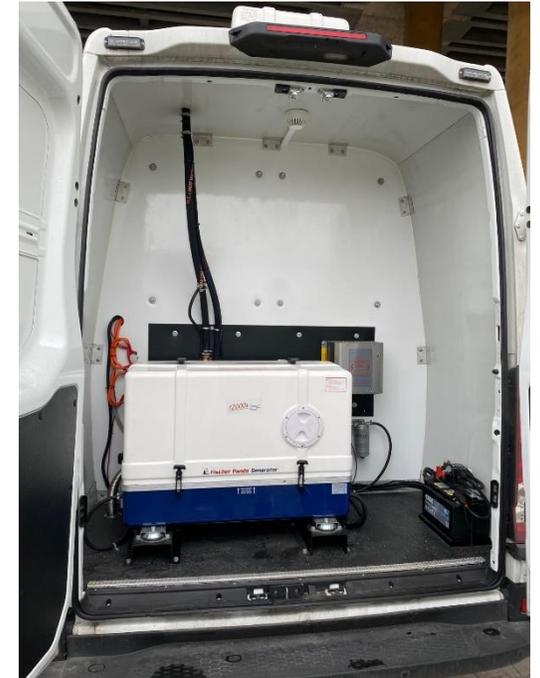
Communication and
cooperation with
market representatives

Obtaining information
on state-of-the-art
equipment and
technical solutions

Equipment testing

Cooperation on
Innovative Solutions

Visits to other customs administrations



Equipment life circle

Test capability of equipment

Find out limitations of equipment

Do we really need this equipment !?

Perform comparison tests

To support procurement decision making process



Pre Purchase test

Pre-purchase field-test protocols

CEL BET
Equipment Team

PRO T O C O L

Name of the tested device and its technical specifications	
Manufacturer	
Model / Type	

Testing team	
(name)	(assignment)
(name)	(assignment)

Problem statement:
Purpose/need of the equipment;

1. Overview of the device:

(product description)

Basic information - Technical specification	
The scanners dimensions (cm)	
The scanners weigh (kg)	
X-Ray Generator (KeV)	
Display resolution / pixel	
Display color / BW	
Scanning speed / cm	
Batteries / last h	
hour continuous operation (factory data);	
Operating condition;	
IP Rated	
Menu language on the screen;	
Instruction manual language;	
Internal storage space / number of scans	
Possibility of connecting external media	

CEL BET
Equipment Team

2. Compliance with the technical specification, manufacturer / user (OPTIONAL)

Testing the penetration			
Imaging capability materials	Compiled Yes / No	Remarks	
Steel	2,3 mm		
Aluminium	13 mm		
Concrete	15 mm		
Carbon fiber	32 mm		
Typical plastic	51 mm		
Sheetrock / drywall	28 mm		
Typical wood	76 mm		
Ceramic Tille	10 mm		
Rubber	51 mm		

3. Field testing according to the testing scenarios,

This protocol is addressed to you in order to obtain your opinion on this new device which is going to be introduced into the service. It is strongly depend on your opinion whether this device will be accepted and introduced or not.

Please try to use the device in your daily duties as often as possible. While you perform the duties using the device please follow bellow listed problems. Please, while answering the question be strict as much as possible. Remember your honest opinion will help as to evaluate whether the device fulfill requirements related to customs control matters and evaluate its usefulness.

a. Testing of the device on the passenger vehicle in field conditions

Testing the penetration – Field condition The hidden contraband recognizable in cars (YES/NO)			
Hiding places	Cigarettes	Weapons	Drug simulants
behind dashboard			
upholstery of the seats			
door trim			
spare wheel (in trunk)			
spare wheel (on asphalt)			
bumpers (rear lamp shade)			
rear bumper			
front bumper corner			
behind running wheel hubcaps			
under the hood trim			
engine compartment, in air filter			
interior roof lining			
trunk floor panel			
fuel tank trunk			

Equipment life circle



Test capability of equipment

Find out limitations of equipment

Do we really need this equipment

Perform comparison tests

To support procurement decision making process

RAMAN Spectrometry field-test



	Resolve	TacticID-1064 ST	Mira XTR
Wavelength	830nm	1064nm	785nm
Spectral range (cm-1)	176-2500	176-2500	400-2300
Resolution		Typical 10 cm-1	8-10 cm-1
Laser Power	Max ~ 475mW	Max ~ 450mW	≤ 100mW
Weight	2,2 kg	1.545kg	0.705 kg
Dimensions	290 x 155 x 73 mm	250 x 110 x 60 mm	128 x 88 x 45 mm
Touchscreen		3.7"	3.7" resistive
Hard buttons	Power key and laser key	8 buttons with navigation keys	-
Integrated camera		5MP	-
GPS		Not available	-
IP Rating	IP67	IP68	IP67
Battery operation hours	> 4 hours continuous use, > 7 hour normal use	> 4 hours continuous use, > 6 hour normal use	> 4 hours continuous use,

Equipment life circle

Test capability of equipment

Find out limitations of equipment

Do we really need this equipment

Perform comparison tests

To support procurement decision making process



**Pre
Purchase
test**

Handheld Backscatter X-ray device field-test



Nuctech
BXM2000

Videray
PX1

Videray
PX Ultra

Viken
HBI120

Viken
Nighthawk
PTX Series



Equipment life circle

Test capability of
equipment

Find out limitations of
equipment

Do we really need this
equipment

Perform comparison
tests

To support
procurement decision
making process



**Pre
Purchase
test**

Handheld Backscatter X-ray device field-test



Equipment life circle

IMS Trace detection equipment field-test

Test capability of equipment

Find out limitations of equipment

Do we really need this equipment !?

Perform comparison tests

To support procurement decision making process



**Pre
Purchase
test**



Equipment life circle

IMS Trace detection equipment field-test

Test capability of equipment

Find out limitations of equipment

Do we really need this equipment

Perform comparison tests

To support procurement decision making process



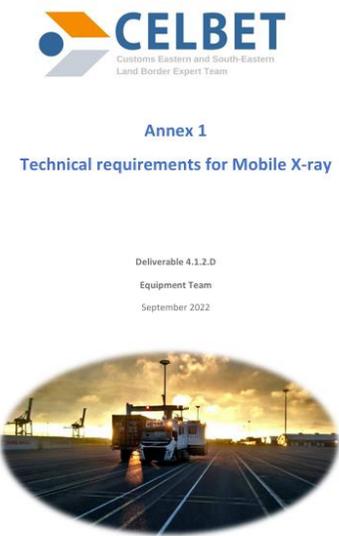
Pre
Purchase
test



Equipment life circle

Main pillars for technical specifications

User requirements and technical specifications


Annex 1
Technical requirements for Mobile X-ray
 Deliverable 4.1.2.D
 Equipment Team
 September 2022



General requirements	3
Requirements for the chassis	4
Requirements for the scanning device	5
Requirements for the image processing and data storage	8
Safety requirements	11
Requirements for maintenance and warranty	12
Operation and quality requirements	13
Requirements for acceptance testing	14
Requirements for training	15



General requirements
Introduction

This document is performed in order to support the member states of creating technical requirements when purchasing the most modern mobile scanners with X-ray accelerator. It suggests technical parameters and technical descriptions of the recently manufactured scanners available on the European market. The list of parameters basis on the latest market research as well as the experience collected by member states in relation to the introduction such an equipment into use.

All member states procuring for mobile X-ray scanners can use this technical description or directly use it when creating requirements according to their national regulations and practices by considering recommendations included in the document or changing some parameters into those that are in line with their environmental requirements.

1. General requirements	
1.2	The system should be installed on the chassis of self-propelled road vehicle allowing transferring the system to another place of inspection without additional technical equipment.
1.3	The system should be prepared for work with two operators less than 30 minutes (time is calculated from the arrival to a place till the beginning of the first scan).
1.4	There should be a possibility to run the system in two modes: First mode: when the system is standing stationary and the inspected vehicle is continuously moving through the scanning tunnel; ¹ Second mode: when inspected object is static and the system is moving and scanning across it. It is preferred the scanning process to be highly automated and that a single operator could operate it in both modes.
1.5	The system should consist of the following main components: <ul style="list-style-type: none"> self-propelled transport chassis. ionizing radiation device. vehicle for transporting ionizing radiation device. equipment for processing, analysing, sending and collecting radiographic images. optional - integrated system for determining gamma/neutron ionizing radiation. optional - integrated system for backscatter function
1.6	The X-Ray system shall be suitable for different weather conditions in and, among other things, be able to withstand rain and all types of moisture, as well as snow and water or slush remaining on surface structures, without adverse effects on the X-Ray imaging performance, time, image quality and capacity. The installation of the X-Ray system must take into account the removal of rain and storm water as well as the heating and cooling of the equipment.

¹ In some countries it is prohibited to use scanner in stationary (portal) mode.



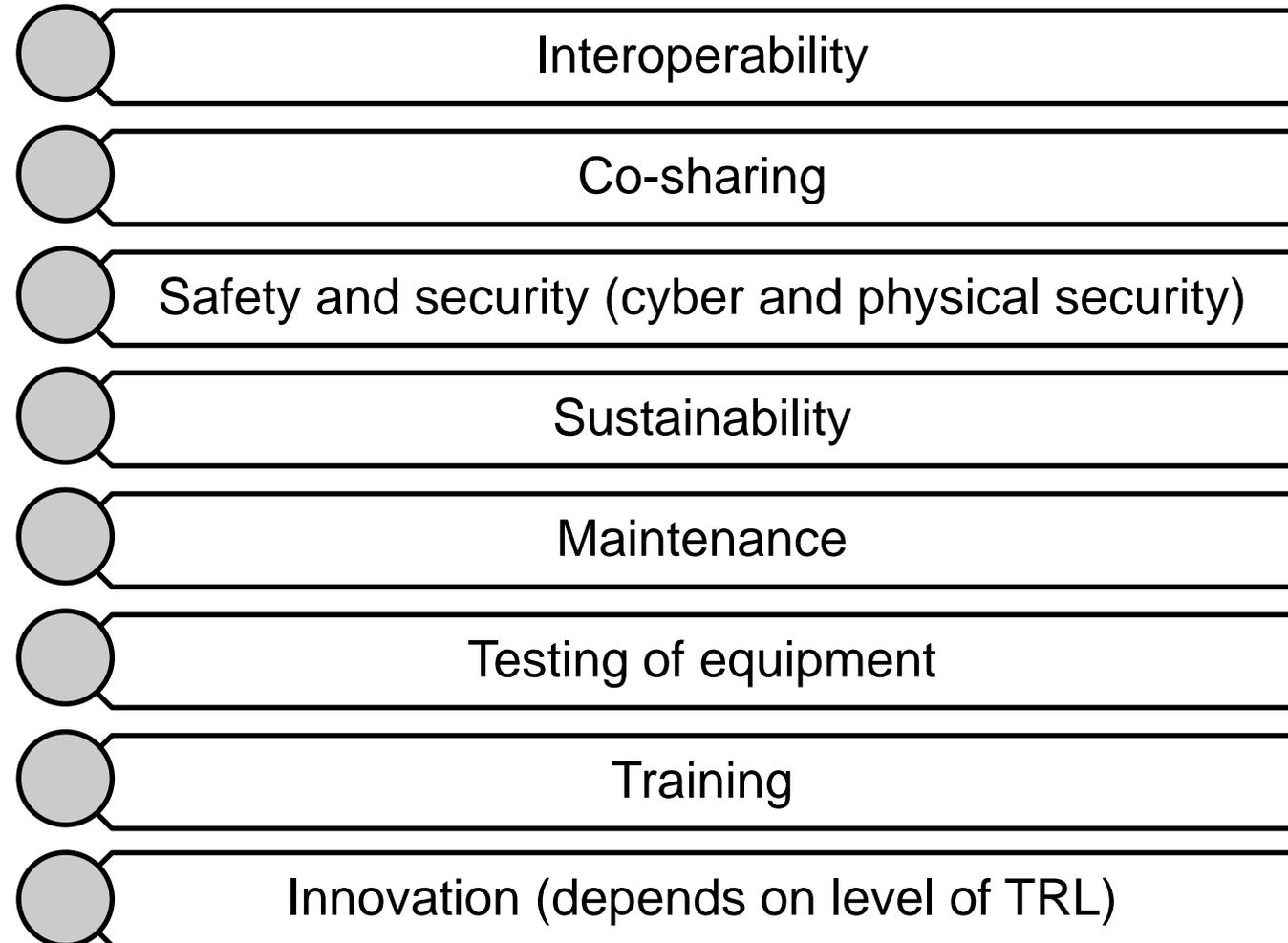
3. Requirements for the scanning device

3.1	Radiation generator (generators) should be capable of operating at minimum as well as maximum intensity (capacity) in pulse dispersion modes
3.2	The source of radiation during every individual scanning should be able to automatically transmit pulses of minimum and maximum intensity according to default algorithm or the frequency of pulses of minimum and maximum intensity could be set manually according to the selection of system operator in order to ensure the separation of different density materials in the scanned object in the received image.
3.3	The test period can consist of several consecutive test and the equipment must pass all tests successfully. Equipment must pass all test without changes or adjustment to the system between tests. Performance test should be done according to the international standards and test protocol must be agreed in advance. If it is not possible use international standards for testing, then a separate test protocol should be agreed with the equipment manufacturer. System capacity parameters should meet these minimum requirements ² : <ul style="list-style-type: none"> Steel penetration capacity of the X-Ray system must be at least 320 mm. The penetration capacity of the system must be provided in the tender (with an accuracy of 10 mm). It must be possible to distinguish, in an X-Ray image produced by the X-Ray system, an arrow-shaped steel test object with a maximum thickness of 1 mm from behind a 100 mm steel plate when measured from measurement point 1/2 h. It must be possible to distinguish, in an X-Ray image produced by the X-Ray system, an arrow-shaped steel test object with a maximum thickness of 3 mm from behind a 150 mm steel plate when measured from measurement point 1/2 h. It must be possible to distinguish, in an X-Ray image produced by the X-Ray system, an arrow-shaped steel test object with a maximum thickness of 7 mm from behind a 250 mm steel plate when measured from measurement point 1/2 h. The spatial resolution of the X-Ray system must be a maximum of 3 mm in all measuring (vertical and horizontal) positions. The minimum wire thickness detectable by the X-Ray system in air must be at least 16 AWG. The minimum wire thickness detectable by the X-Ray system from behind a 100 mm thick steel plate must be at least 10 AWG.
3.4	Dimensions of the scanning tunnel should not be smaller as follows: <ul style="list-style-type: none"> width – 3.3 m, height from the ground surface – 4.6 m. The device should be able to scan up to 30 m long vehicles
3.5	The lowest point of the image must be at maximum 15 cm from the ground. A technical solution allowing for the full scanning (including tyres) of cars and mini vans should be implemented.

² These requirements are tested by using the ANSI standard N.42.46-2008

Equipment life circle

Main pillars for technical specifications

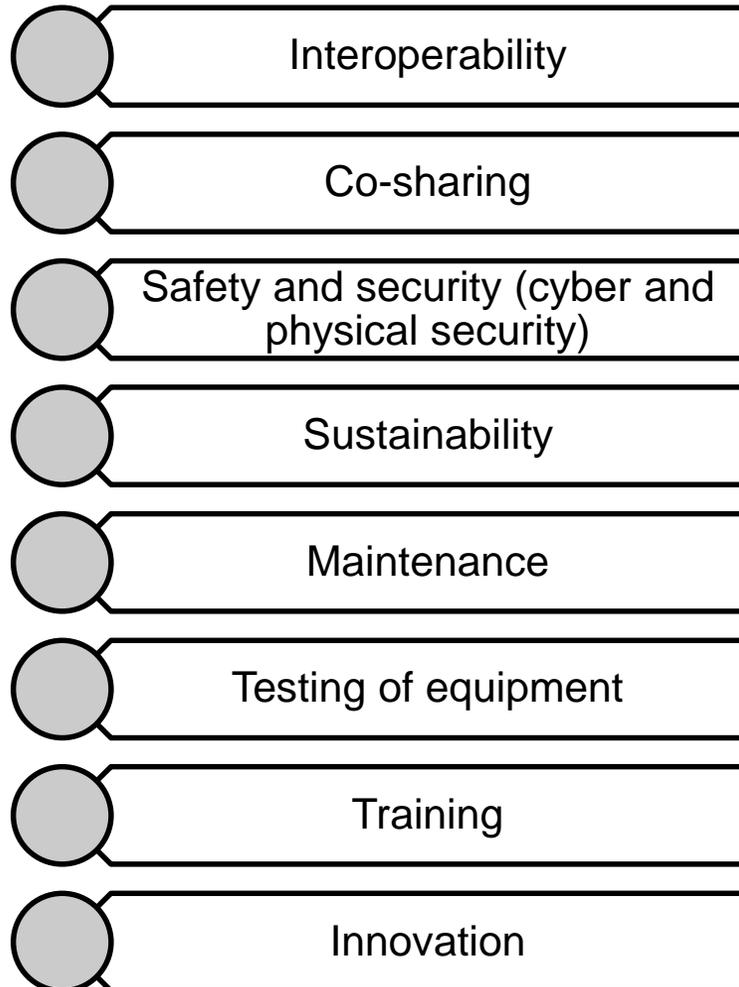


User requirements and technical specifications



Equipment life circle

Main pillars for technical specifications



Example of content for technical specifications

- General requirements
- Technical requirements
- System and software requirements
- Requirements for accessories
- Safety and security requirements
- Radiation safety
- Maintenance and warranty requirements
- Operational/functional requirements
- Requirements for acceptance testing
- Requirements for training
- Requirements for technical documentation

User requirements and technical specifications



Equipment life circle

General characteristics



**Factory
acceptance
test**



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Equipment life circle

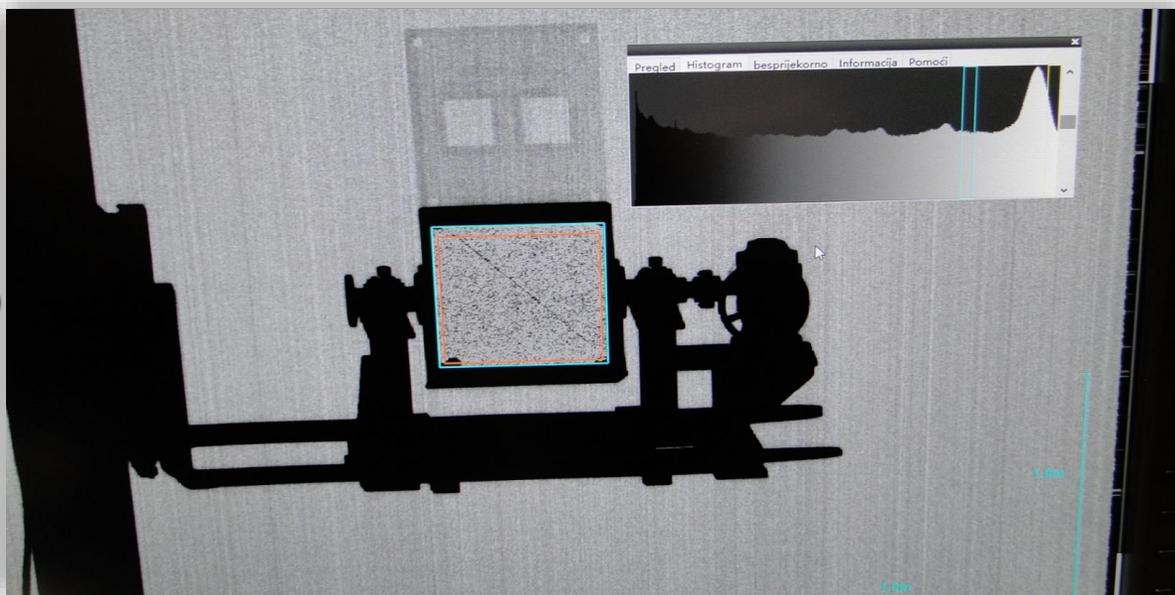
Steel penetration test



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Equipment life circle

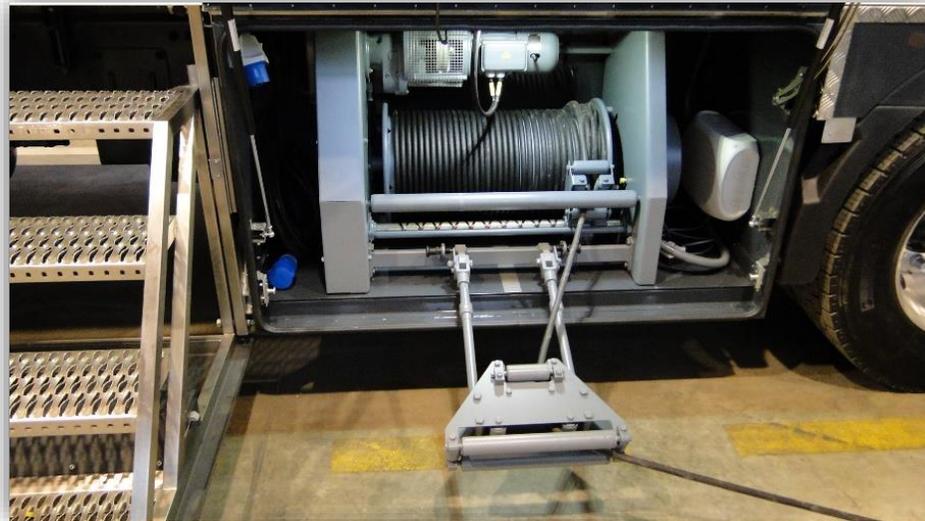
Wire detection



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Equipment life circle

Electrical safety test



Factory acceptance test

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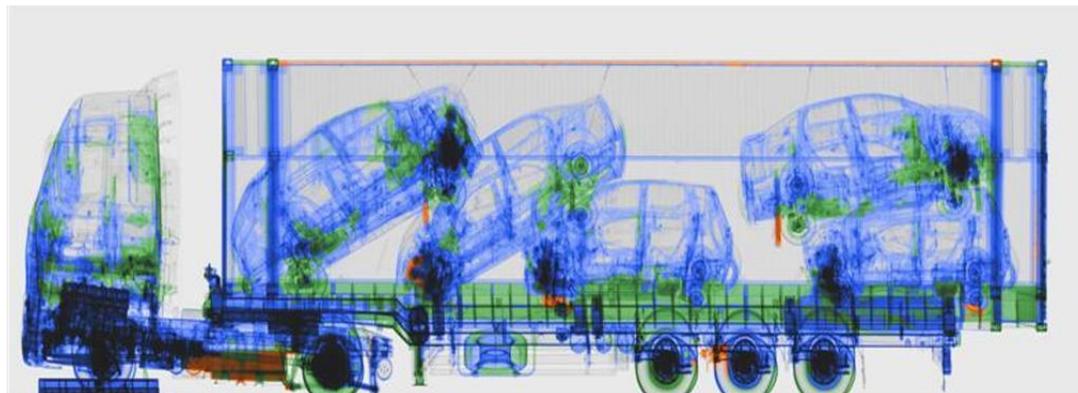
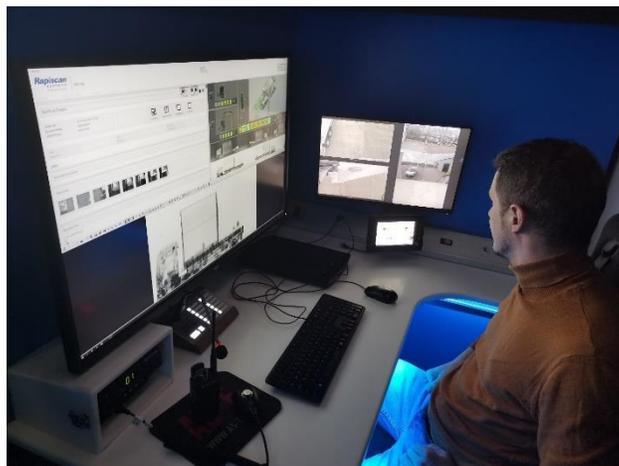
Equipment life circle

Trial period of equipment in a real working conditions and environment

X-ray equipment

ANPRS

automatic number plate recognition system

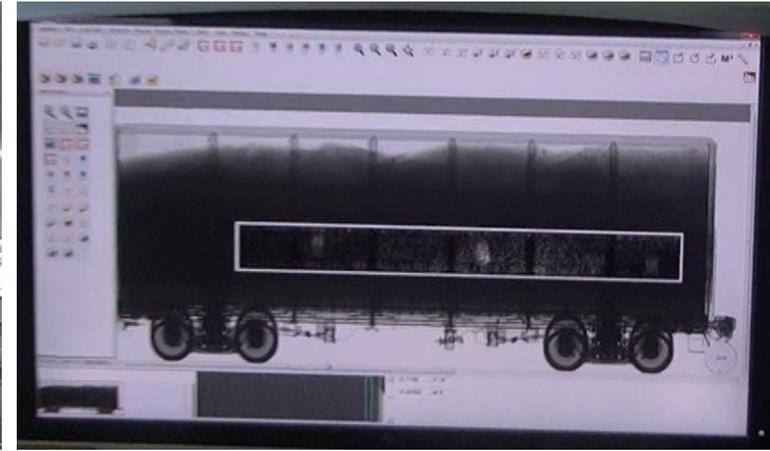


Equipment life circle

What is purpose of final acceptance?

Main aim of the Final acceptance tests is to gain confidence that the quality of the equipment mach to requirements described in technical specification

Final acceptance



Equipment life circle

Test container

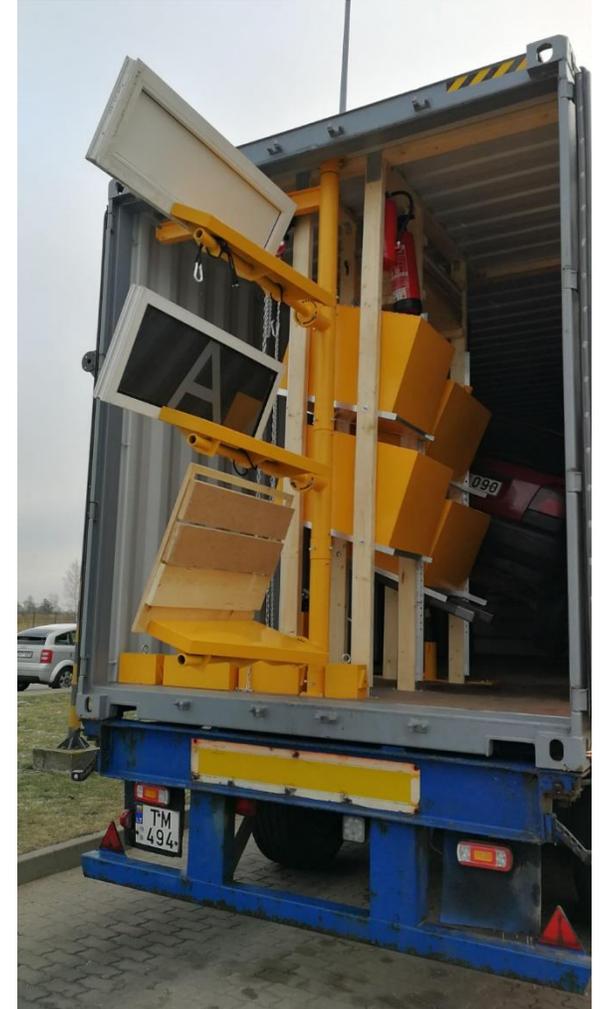
Final
acceptance



Equipment life cycle

Test container

Final
acceptance



Equipment life circle

Test container

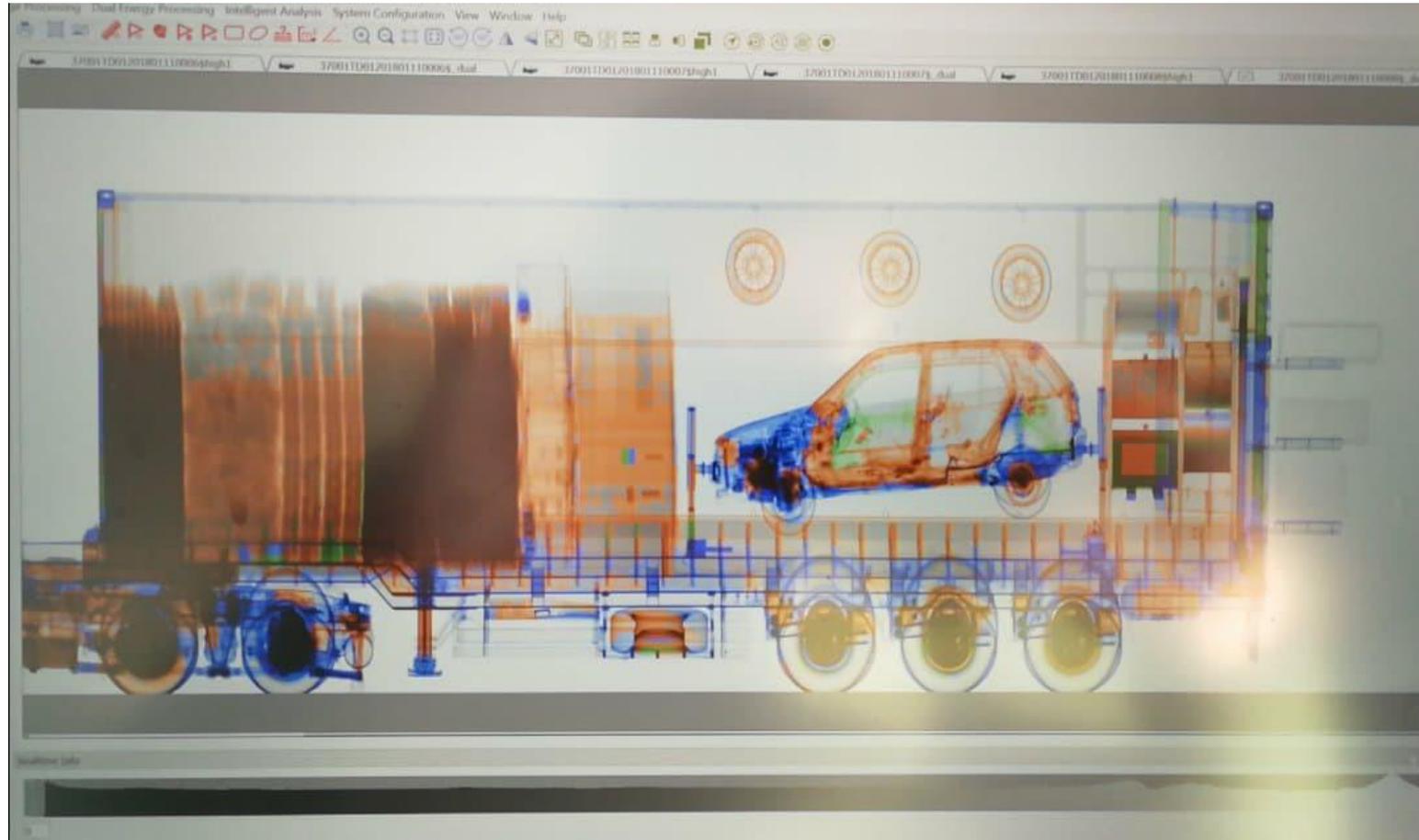
Final
acceptance



Equipment life circle

Test container

Final
acceptance



Equipment life circle

What is purpose of Post deployment review ?

Main aim of the Post deployment review are to keep the quality of the equipment as it was at the moment of installation



Image quality at the moment of installation

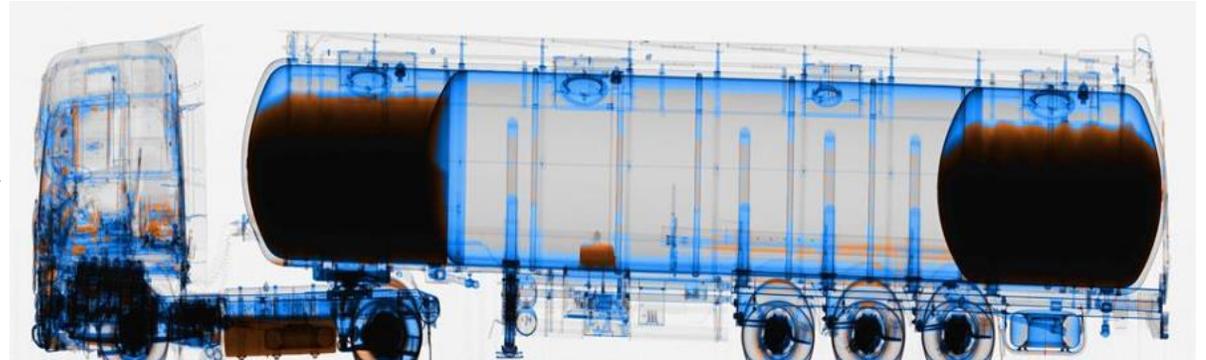
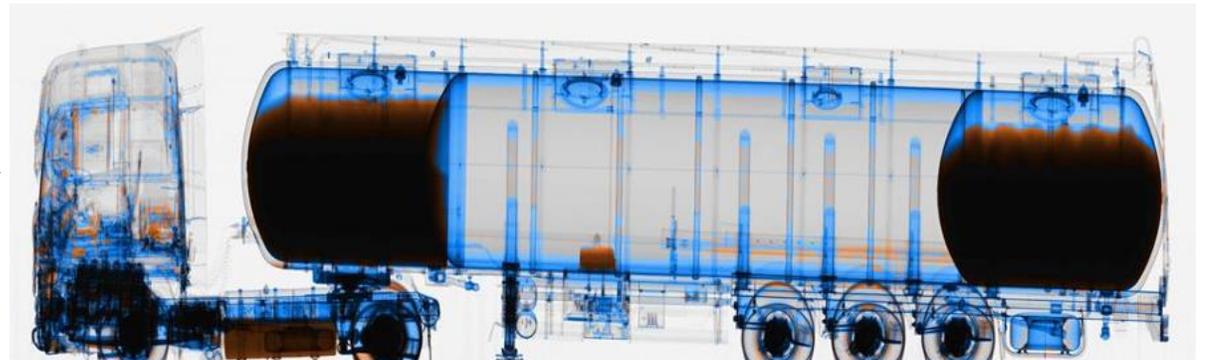
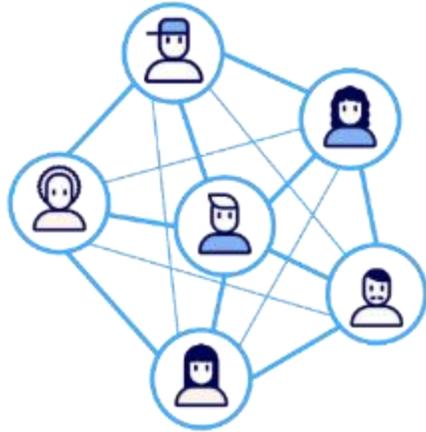


Image quality after 1, 3, 5 years (etc)



Networking

**It does not matter what we know
but who we know**



**Procurement experts
network**

- **Workshops**
- **Technical specifications**
- **Market research**
- **Market representatives**
- **Sharing of good practices**



**Scanner cooperation
experts network**

- **Support for X-ray image analysis training sessions**
- **Artificial Intelligence**
- **Centralized solutions**
- **Exchange of X-ray cases**
- **Sharing of good practices**

Group work

1. What are main threats on your borders in terms potential violations
2. What are main challenges to identify these threats
3. Identify equipment needs (pick one most needed)
4. What challenges the selected equipment should solve
5. Develop content for technical and ***functional requirements***



**Thank You
for your attention!**



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