



## **SPECIFICATION**

### **MOBILE RADIATION MONITORING LABORATORY**

#### **1. Scope**

This specification describes the requirements for a mobile radiation monitoring laboratory, hereinafter referred to as the “laboratory vehicle” or “System”.

#### **2. Applicable Documents and prerequisites for the Contractor**

The following documents shall be applicable for this Specification to the extent specified hereinafter:

- IEC60532
- ANSI N42.34
- IEC62327
- ANSI N42.33
- IEC 60846
- ANSI N42.43
- IEC 62438

In the event of conflict between the documents listed above and the content of this Specification, the content of this Specification shall take precedence to the extent of the conflict.

The Contractor shall have proven records of experience in achievement of at least 5 similar projects.

#### **3. Requirements**

##### **3.1. Functional Requirements**

The System shall meet the following functional requirements:

- 3.1.1. Include a vehicle;
- 3.1.2. Include the radiation monitoring equipment;
- 3.1.3. Include additional equipment as described below;
- 3.1.4. Be fully integrated, in the sense that the equipment shall be integrated in the vehicle to constitute the laboratory vehicle or System;
- 3.1.5. Be able to go on and off-road;
- 3.1.6. Provide an “office working space” for an operator at the rear when parked;
- 3.1.7. Provide an “mobile working space” for an operator in the front when moving;
- 3.1.8. Perform mobile radiation monitoring survey and mapping, including dose-rate and gamma spectrometry surveys, and report to the operator in the laboratory vehicle in real-time;



- 3.1.9. Be able, thanks to the supervision system, to store locally, aggregate, analyse and map the data collected by the mobile radiation monitoring survey and mapping, with the possibility to export the data in IRIX formatted files at a later stage (no need of capability of transmission of the data from the System);
- 3.1.10. Monitor and analyse the airborne alpha and beta particulates activity (air monitoring survey) and report to the operator in the laboratory vehicle in real-time;
- 3.1.11. Embed 2 portable and deployable dose-rate meters with gamma spectrometry capabilities;
- 3.1.12. Embed 2 portable and deployable contamination meters;
- 3.1.13. Embed a set of sampling equipment for soil, water and vegetables;
- 3.1.14. Embed a set of Personal Protective Equipment (PPE);
- 3.1.15. Embed an additional battery able to supply electricity for all the equipment in the laboratory vehicle;
- 3.1.16. Embed a diesel-generator, which once deployed outside the laboratory vehicle, powers the additional battery;

3.2. The vehicle shall meet the following technical and performance requirements:

- 3.2.1. Be driven with a standard driving license (light-weight vehicle);
- 3.2.2. Have the steering wheel on the left;
- 3.2.3. Include 3 seats in the front row, the seats shall be used when driving;
- 3.2.4. Include a partition wall to separate the seats from rear part;
- 3.2.5. Have an "office working area" in the rear, including a desk (shelf at desk's height) where 2 laptops and a seat for the operator can fit when the laboratory vehicle is parked;
- 3.2.6. Have a "mobile working space" in the front, including a dedicated location for 1 laptop for the operator when the laboratory vehicle is moving;
- 3.2.7. Have shelves and storage spaces in the rear;
- 3.2.8. Have 4 additional mains plugs in the rear, in addition to the plugs needed for the radiation monitoring equipment;
- 3.2.9. be diesel powered;
- 3.2.10. Have off-road capabilities;

3.3. The radiation monitoring survey and mapping equipment shall meet the following technical and performance requirements:

- 3.3.1. Be securely and appropriately integrated in the laboratory vehicle, so that it can perform radiation monitoring surveys while moving;
- 3.3.2. Be removeable from the laboratory vehicle with minimum intervention by the operator(s), e.g. by unscrewing, unlocking...;
- 3.3.3. Be delivered with 1 dedicated laptop and 2 spare laptops;
- 3.3.4. Be delivered with a supervision software, installed on the 3 laptops, able to store locally, aggregate, analyse and map the data collected;



- 3.3.5. Identify and quantify the radionuclides using gamma spectrometry (with by default assumption of a fresh deposit on the ground) in real-time;
- 3.3.6. Include preferably and at least 2 x 2L NaI detectors;
- 3.3.7. Have a resolution of <8% (Cs-137);
- 3.3.8. Have energy range of at least 20 keV-2.5 MeV;
- 3.3.9. Analyse and map in real-time the radionuclides detected;
- 3.3.10. Report the results, namely dose-rate, identification and quantification of radionuclides, and build a map of radionuclides and/or dose-rates in the area, via a supervision software in real-time on a dedicated laptop to the operator in the laboratory vehicle, including while driving;
- 3.3.11. Make the data available for post-processing;
- 3.3.12. Make the data available for export in IRIX formatted files;
  
- 3.4. The air monitoring survey equipment shall meet the following technical and performance requirements:
  - 3.4.1. Be securely and appropriately integrated in the laboratory vehicle, so that it can perform radiation monitoring surveys while moving;
  - 3.4.2. Be removeable from the laboratory vehicle with minimum intervention by the operator(s), e.g. by unscrewing, unlocking so that it shall be deployed outside of the laboratory vehicle ...;
  - 3.4.3. Include 1 or 2 detector(s) of PIPS type;
  - 3.4.4. Be delivered with a set of 100 filters;
  - 3.4.5. Have an external piping for inlet and an exhaust of the air;
  - 3.4.6. Have adjustable flow meter with a range of 20-60 l/min;
  - 3.4.7. Have an efficiency of alpha > 20% and beta > 20%;
  - 3.4.8. Perform monitoring in the range of at least (alpha) 3-10 MeV and (beta) 50 keV-2.5 MeV;
  - 3.4.9. Measure activities for Radon-222 within the range 0-100 Bq/m<sup>3</sup>;
  - 3.4.10. Analyse in real-time the activity with several pre-set and customizable alarm levels;
  - 3.4.11. Report the results to the operator in the laboratory vehicle via a dedicated software in real-time on a laptop, including while moving in addition to an alarm report;
  - 3.4.12. Have the dedicated software installed on the 3 laptops;
  
- 3.5. The 2 portable contamination meters shall meet the following technical and performance requirements:
  - 3.5.1. Include a survey meter and an associated probe for alpha/beta surface contamination monitoring;
  - 3.5.2. Be portable;
  - 3.5.3. Have a probe with detector of a surface of at least 100 cm<sup>2</sup>;
  - 3.5.4. Monitor alpha, beta and gamma emitters and display results in (c/s, Bq, Bq/cm<sup>2</sup> or CPM);
  - 3.5.5. Monitor contamination in the range 0-10000 c/s;
  - 3.5.6. Be appropriately and securely stored while moving;

- 3.6. The 2 portable dose-rate meters (or radionuclide identification devices - RIID) shall meet the following technical and performance requirements:
- 3.6.1. Perform radiation monitoring survey of gamma emitters, with auto-adjustment of the background;
  - 3.6.2. Have gamma spectrometry capabilities;
  - 3.6.3. Be portable;
  - 3.6.4. Identify the radionuclide if detected, with spectrum visualisation;
  - 3.6.5. Have mapping capabilities;
  - 3.6.6. Give access to the operator to the map, the survey mode, and spectrum (if any) by swapping between the contents;
  - 3.6.7. Be based on a NaI detector with an energy range of 25 keV-3 MeV;
  - 3.6.8. And a dose rate range of at least 0.01 microSv/h to 100 mSv/h;
  - 3.6.9. Have the possibility to export the data from the RIID to the supervision system;
  - 3.6.10. Be appropriately and securely stored while moving;
- 3.7. The set of sampling equipment shall meet the following technical and performance requirements:
- 3.7.1. Include 3 similar ruggedized boxes with a size of approx. 0.8 m x 0.5 m x 0.5 m each (1 for further storage of empty containers, 1 for further storage of samples once picked up, 1 for further storage of PPE)
  - 3.7.2. Include the following tools: a shovel, a hand auger, a pick, a hand shears;
- 3.8. The additional battery shall meet the following technical and performance requirements:
- 3.8.1. Provide power supply to all equipment via standard 230V AC plugs installed in the rear part of the laboratory vehicle;
  - 3.8.2. Provide enough electricity for operating the laboratory vehicle, namely for using the air monitoring and radiation monitoring survey and mapping equipment, the laptops, and for loading the batteries of the contamination meters and dose-rate meters, for a duration of 1-2 hours;
  - 3.8.3. Be located in a dedicated and secured place;
- 3.9. The diesel-generator shall meet the following technical and performance requirements:
- 3.9.1. Power the operations of the laboratory vehicle, namely the additional battery, for a duration of 12-18 hours;
  - 3.9.2. Be used only once deployed outside the laboratory vehicle at a minimum distance of 10 m;
  - 3.9.3. Be provided with an electrical extension cord of 10-12 m;
  - 3.9.4. Be stored in a dedicated and secured place while driving;
  - 3.9.5. Be provided with 2 removable 10L fuel tanks (jerry cans) for refilling the generator (or the vehicle), the 2 fuel tanks shall be stored in a dedicated and secured place while driving;

#### 4. Homologation of the laboratory vehicle

- 4.1. The homologation of the laboratory vehicle shall be the responsibility of the End-User;
- 4.2. The vehicle chosen by the Contractor shall be at least homologated in (one or some of the) European Union States.

#### 5. Marking

The System shall have all markings, including safety markings, in English language.

#### 6. Quality Requirements

- 6.1. The System shall be manufactured, delivered and installed in accordance with the Contractor's ISO quality assurance system or an equivalent quality assurance system.
- 6.2. The Contractor shall document the compliance with this quality assurance system.

#### 7. Testing and Acceptance

The System, prior to delivery to the End-User, shall be tested for conformance of the System with manufacturer's performance specifications and the minimum requirements specified herein.

#### 8. Training and technical documentation

The Contractor shall provide 2 days training for up to three staff of the End-User in the operation and maintenance of the System at the End-User's location or virtually immediately after the delivery of the System.

The Contractor shall provide the standard operation procedures (SOPs) for all the equipment of the System in the English language.

#### 9. Deliverable Data Items

The Contractor shall provide two complete sets of operation and servicing manuals and technical drawings in the English language.

#### 10. Warranty

- 10.1. The Contractor shall provide minimum warranties for the System in accordance with the IAEA General Conditions of Contract.

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- 10.2. The Contractor shall clearly note the manufacturer's guarantee conditions, the routine or preventive maintenance required to ensure operation of the System.