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TRANSPORT ORGANIZATION AT THE EUROPEAN COMMISSION'S JOINT RESEARCH CENTRE IN GEEL (BE)

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ABSTRACT

The Institute of Reference Materials and Measurements (IRMM) - a research centre of the European Commission - is one of the leading producers of nuclear reference materials. Radioactive samples including all different types of isotopes (mainly actinides) with quantities ranging from a few Bq to GBq are regularly shipped and received to/from worldwide destinations.

IRMM has introduced a transport system that guarantees safety and security. The system is based on the clear definition of responsibilities, the dispatch via a designated packaging and temporary storage room with access control and three independent radiation and contamination checks (inner package, outer package and truck). Due to the variety of samples and applicable regulations routine shipments are difficult or not even possible. Therefore, every shipment must be assessed individually.

This presentation details the internal transport organization and quality control measures at IRMM and shares experiences and problems encountered with the shipment of small quantities of especially fissile material due to the numerous applicable regulations.

INTRODUCTION

The Institute of Reference Materials and Measurements located in Geel, Belgium, is one of the seven Institutes of the European Commission's Joint Research Centre. As one of the leading producers of nuclear reference materials, the Institute annually ships approximately 200 packages with radioactive contents distributed over 50 consignments to worldwide customers. Incoming shipments amount to approximately 20 consignments per year.

The variety of radioactive samples (all types of isotopes, fissile and non-fissile) and quantities (µg for environmental samples, mg and g for nuclear fuel production and reprocessing activities, kg for transports from/to off-site storage site) as well as the worldwide destinations require an individual assessment of every transport. The transport organization of even relatively small quantities of radioactive material is a complex and sometimes challenging field including many technical (packaging, safety measures) and administrative (transport regulations, export/import licensing, fissile material accountancy, notifications to authorities) issues.

Together with these technical and administrative issues exists a relatively high public sensitivity of any kind of problem that could occur during radioactive transports. Therefore it is mandatory that these transports are very well organized to ensure a safe and secure transport execution.

In the following sections the complex regulatory framework is presented first, followed by the description of the IRMM transport organization and the discussion of the points that need special attention and may represent difficulties and problems related to the shipments. In the final section some conclusions are drawn.

REGULATORY FRAMEWORK

The regulatory framework for radioactive transports is very complex. Not only the different modal regulations for the transport of hazardous material (road, air, rail, water etc.) are applicable, but also regulations for the export of fissile materials (dual-use) and non-proliferation issues (safeguards) need to be followed. Many other authorities and bodies need to be notified either prior shipment or at least periodically. The following sub sections give an overview of the regulatory framework.

Transport regulations

International transport regulations have been established to guarantee the safe and secure transport of nuclear material. Specific regulations have been issued for the different transport modes. All these modal regulations have in common that they are developed from the recommendations of the IAEA [1]. At IRMM, the ADR regulations for road transport [2] and IATA regulations for air transport [3] are applied. Both regulations are regularly updated. Small differences in the regulations are mainly due to different quantity limits (less material allowed for air transport) and requirements for the placarding of the transport vehicle (no placarding for airplanes required). Mandatory training and certification is required to deal with transport issues (biannual refresher course with exam for IATA dangerous goods certificate; 5annual refresher course with exam for ADR Safety Advisor certificate).

Export regulations (Dual-use)

In addition to the transport regulations apply rules for the export of nuclear material. These so called dual-use regulations [4] require the issue of an export license from the Belgian competent authorities (Flemish Government) for nuclear materials depending on the importing country. Licenses are mandatory for the export of plutonium, uranium and thorium to all countries outside the European Union whereas licenses for the export to Member states of the European Union are only needed for samples of high enriched uranium and plutonium. Export to Benelux countries is not regulated. The dual-use regulations do not foresee exemptions for small quantities. In order to receive a license, the customer has to submit either an International Import Certificate (IIC) or an end-user statement depending of the bilateral agreement of Belgium with the respective importing country. For most countries an IIC is required (EU Member states, USA, Canada, Japan etc). It is sometimes difficult to find out the competent authority for issuing such an IIC as in all countries this is handled differently (i.e. an IIC is issued in the USA by the Bureau of Industry, in the UK by a local Chamber of Commerce, by the BAFA in Germany, by the SETICE in France etc). Generally, an application for an export license in Belgium may take from 6 weeks up to several months.

Safeguards regulation (non-proliferation)

The transfer of nuclear material between consignor and consignee requires the declaration of the material to the European Commission, Directorate General Transport and Energy (DG TREN, Directorate I) in Luxembourg according the Safeguards Regulation [5]. Both consignor and consignee have to make the declaration and DG TREN will check if both declarations are matching. Depending on the type, quantity and origin (obligation) of the material prior

notifications need to be made to the country of origin (i.e. 15 days advance notification required for material of Canadian origin [6], "MB10" approval required for material of US origin and quantities above 0.001 effective kg etc.[7]).

Notifications

Several other authorities and bodies need to be regularly informed about radioactive and nuclear shipments. These are the Euratom Supply Agency (ESA) for nuclear material (immediately for larger amounts and quarterly for small quantities) according the Euratom treaty [8], the Competent authorities of the Member states of the European Union (prior shipment for sealed sources, quarterly for non-sealed sources) according Council Regulation 1493/93 [9], the Competent authority in Belgium, the Federal Agency for Nuclear Control (FANC), for the import of radioactive material (monthly) and the Permanent Representatives of the Member States of the European Union at the European Commission for shipments of high enriched uranium and plutonium according the NSG London Guidelines [10].

TRANSPORT ORGANIZATION

There are various reasons that require the organization of a radioactive transport from IRMM to an off-site party (see Fig: 1) or vice versa (see Fig: 2). Either a customer has ordered a nuclear reference material, samples need to be distributed for an intercomparison campaign (i.e. REIMEP, NUSIMEP), an experiment has to be equipped with radioactive material from IRMM at an off-site irradiation facility (accelerator, reactor etc.), some material has to be sent to a temporary off-site storage facility or the dispatch of radioactive waste.

The reception of incoming radioactive material is required when suppliers send radioactive source material needed for the production of reference materials, when an experiment at one of IRMM's accelerator facilities has to be equipped with radioactive material from an off-site facility, when calibration sources for detection equipment are shipped or when material returns from the temporary off-site storage facility.

Key elements of the transport organization are the clear definition of responsibilities, the strict separation of the storage place of the radioactive material from the storage place of the empty transport containers, and the preparation of the package and temporary storage in a dedicated transport room with access control (badge reader and code). This separation prevents unintentional shipping of unfinished transport containers.

Key players in the transport organization and execution are the Institute Transport Officer (ITO), who is responsible for the overall coordination at Institute level, the Unit Transport Officers (UTOs), responsible for the issues specifically related to their scientific Unit, the Radiation Protection Officers (RPOs) and the Head of the Safety, Health, Environment and Security (SHES) department. The ITO holds the legal function of ADR Safety Advisor while the UTOs and RPOs have received internal or external transport specific training.

Preparation

The UTO of a scientific unit initiates a radioactive transport by submitting a transport application approved by his Unit Head to the ITO. The application must contain all relevant properties of the goods (physical and chemical state, quantity, isotopic composition, proposed packaging etc.) and the contact details of the receiving or consigning party (address, contact person, telephone and fax number etc.). Then the ITO verifies the correctness of the application and checks which documents and permits are needed for the transport. At this stage, the ITO may reject a transport request if the received information is incomplete. Generally, the UTO is responsible for all contacts with the off-site party (customer, supplier) concerning the radioactive material (material tender, sales/purchase contract…), whereas the ITO is responsible for obtaining the required

transport containers and the transport specific documents and he contacts the carrier and customer/supplier for all transport specific matters. In case of a material sale, before signing a sales contract the UTO should consult the ITO to verify if the transport and export control specific terms in the contract are correct. Generally, IRMM uses the "Ex Works" INCOTERM [11] for contracts, which means that the buyer has to pick up the ordered samples at the IRMM premises or has to appoint a transport company to do so. In case a transport has to be paid by IRMM, the ITO is responsible for the appointment of a transport company according the public procurement rules of the European Commission.

Packing

The packing is formally divided into two phases, the packing of the inner package and the packing of the outer transport container.
The inner package is prepared in a controlled area by the UTO and the RPO. It has to be done according a written instruction of the Head of SHES and is finished when the inner package is stored in a secure place of the controlled area, the UTO has completed the schematic packing form and the RPO has made the radiation and contamination control (1^{st} control). UTO and RPO must sign this form.
The packing of the transport container is done in the dedicated transport room with access control. Only the ITO and RPO have access to this room. The UTO transfers together with the RPO the inner package to the transport room, whereas the ITO transfers the foreseen empty container from the container storage room to the transport room. The UTO hands over the inner package to the ITO together with the schematic packing form and the declaration form for fissile materials, if applicable. The ITO verifies the correctness of the inner package (identification, labels) by signing the schematic packing form. Then ITO and RPO will finalize the package according a working instruction (packing and labeling, 2^{nd} radiation and contamination control). The packing is finished when the container is filled with the inner package, sealed, labeled, foreseen with shipping documents (packing list, schematic packing) and both ITO and RPO have completed a checklist. The final container shall stay in the transport room until the transport company arrives. At no time a filled but unsealed and unlabelled container may stay in the transport room.
The packing of the outer container is always done in the transport room. The only exception is given when it is not feasible to transfer the inner package to the transport room due to safety and security issues, then the final packing might be done in a controlled area other than the transport room. This controlled area is usually the place where the material is stored. Prior authorization from the Head of SHES must be obtained for such a transport (example: large quantities of Pu or highly enriched U).

Dispatch

The ITO arranges with the selected transport company and the consignee the transport schedule. He prepares the Shipper’s declaration for dangerous goods, if applicable. On the day of the transport, the ITO transfers the finished transport container (sealed, labeled, shipping documents) from the transport room to the transport vehicle (place of loading). The container may only leave the transport room when the checklist has been fully completed and signed by UTO, ITO and RPO. The ITO checks the transport documents of the driver and surveys together with the RPO the loading. When the loading is finished, the RPO has made the radiation and contamination check of the transport vehicle (3^{rd} control) and all documents have been checked and signed then the transport vehicle may be released.

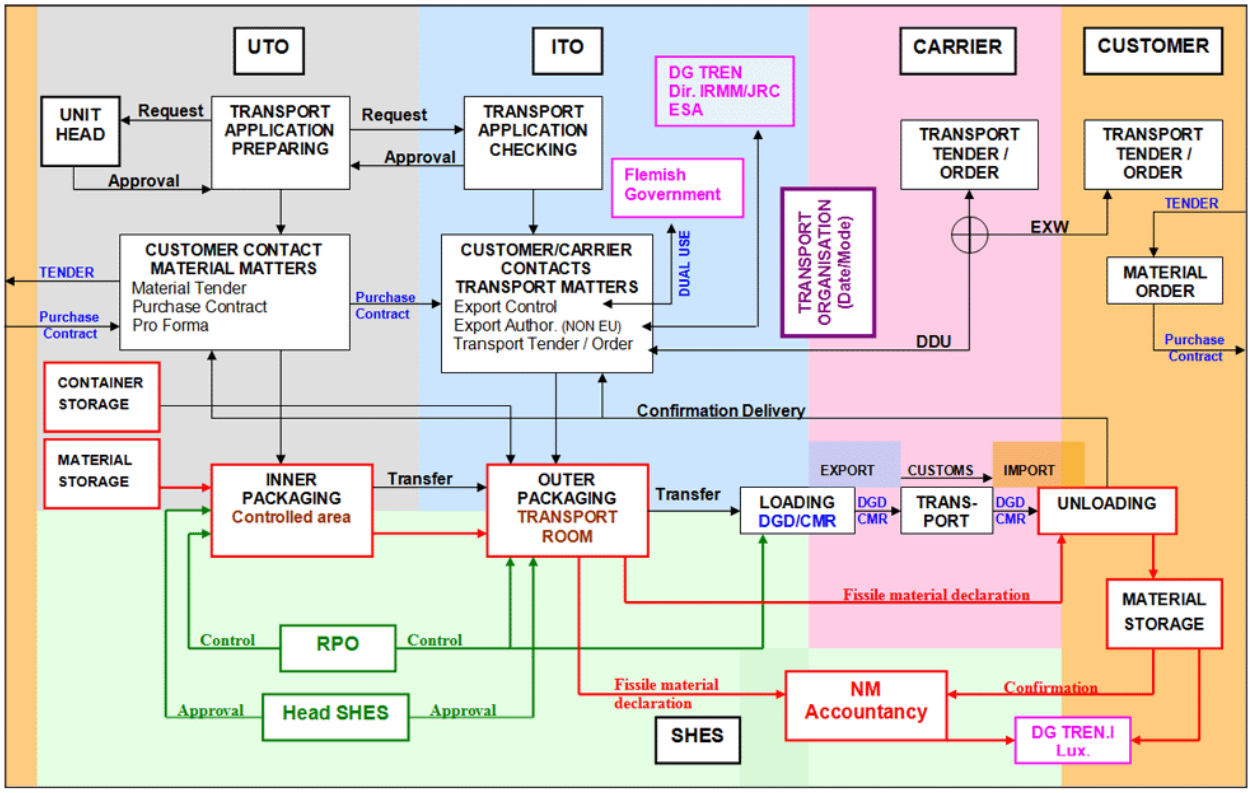

Figure 1. Flowchart Dispatch

Reception

In case of reception of radioactive material, the ITO arranges with the transport company, the consignor and the UTO the transport date. On arrival, the guards will inform the ITO about the delivery and he will direct the transport vehicle to the proper reception building.

The ITO checks the documents of the driver, identifies the parcel and verifies the correctness of the labels and markings. The RPO takes contamination and dose rate measures on the vehicle. If all is in order the parcel may be unloaded and handed over to the UTO. He signs for acceptance and brings the parcel into the controlled area. Here the UTO unpacks together with the RPO the container in the controlled area applying good radiation protection practices. The material must be marked and stored in a safe and secure place in the controlled area. The unpacking procedure has to be documented on a checklist and signed by UTO and RPO. The checklist contains additional information about the used container type and the radioactive material accountancy (fissile/non-fissile). The UTO hands over the completed checklist to the ITO for archiving. The RPO checks the emptied container for contamination. If a re-usable container is used, the ITO verifies that the container is empty (compare inner container dimension with container dimension specified in container certificate, if available) and the RPO seals it. It is then transferred to the container storage room. If a non re-usable container is used, the RPO decides upon his contamination measurement whether it will go to the radioactive or to the non-radioactive waste.

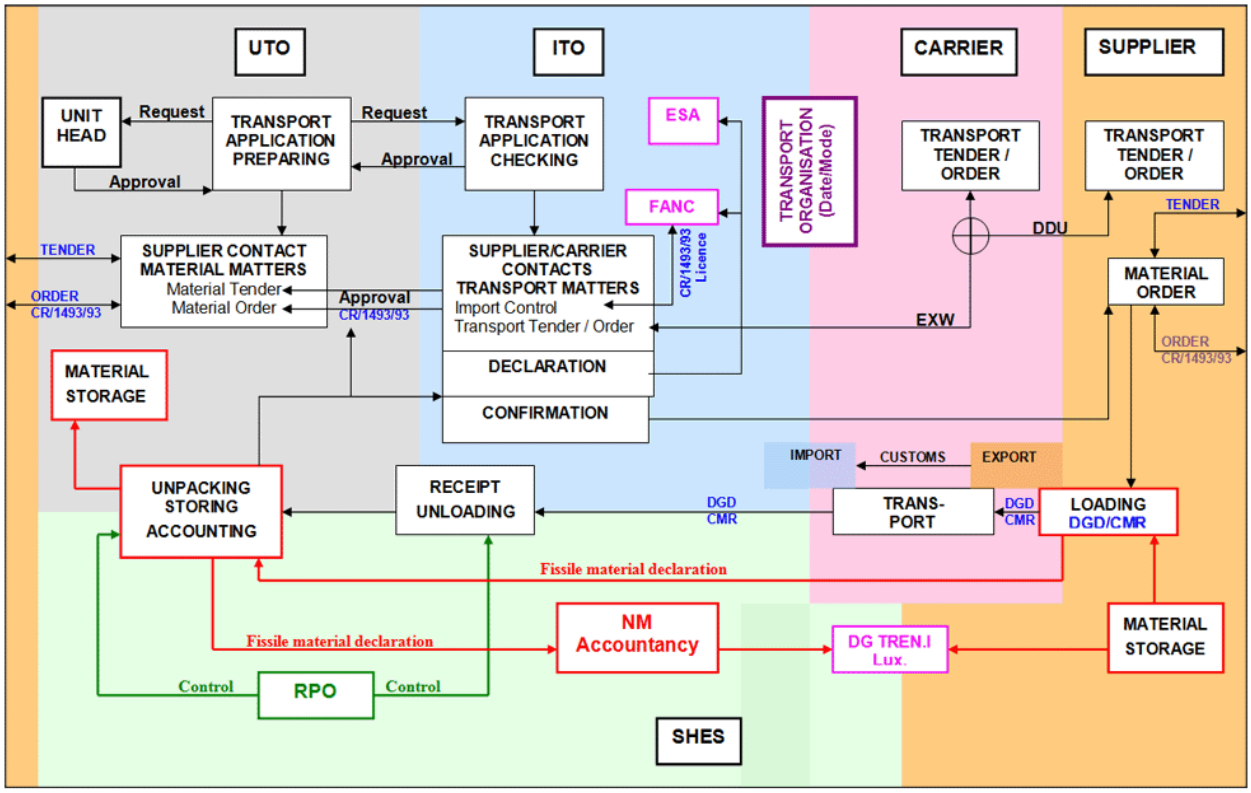

Figure 2. Flowchart Reception

After care

For a radioactive material dispatch, the ITO takes care of the nuclear material accountancy and requests a confirmation of delivery from the consignee. He will inform the UTO that the goods have been delivered. If applicable, the ITO retrieves the export license from the carrier and returns it to the Belgian competent authorities. He also makes the quarterly declarations to the ESA and the Member States (see [9]). In case of a reception of radioactive material, the ITO confirms to the consignor the arrival of the transport and the status of the goods. In case of an anomaly, he sends an anomaly report to the consignor and/or carrier. He will make the material declarations to the FANC and ESA, if applicable.

POINTS OF ATTENTION AND ASSOCIATED DIFFICULTIES

IRMM transports most of its radioactive material in small Type A or excepted packages and generally this does not create many difficulties from the aspect of the transport regulations. However, whenever type B packages must be used then problems can occur due to the container certificates and validations. Since IRMM is a research centre and thus uses a great variety of samples with different physical and chemical properties the container certificates must be carefully studied. The certificates contain lists of allowed contents (positive lists) and only material that is listed can be transported. If the material has an uncommon chemical composition it is most likely that it is not listed and thus can not be transported. This does not mean that the transport of the material would involve additional hazards or that the material is not compatible with the allowed contents; it just means that it was not thought of when the container has been certified and thus has been not included. In this case transport is only possible when the container has undergone a recertification that is expensive and time consuming. As example, the

respective certificate of a Type B(U)F container may allow the transport of high enriched uranium dioxide but not the transport of high enriched uranium alloy.
Other problems may occur related to the export controls imposed on nuclear material. The application for a dual-use license in Belgium is a tedious and time consuming process (6 weeks to several months) and is compulsory even for small quantities. Generally an IIC from the importing country is required for the license application. Most customers do not know from which competent authority they can receive such a certificate. The rules for dual –use licenses are also not harmonized. The export of a small quantity of high enriched uranium from Belgium to France requires the French customer to submit an IIC, whereas the same material can be exported from France to Belgium without an IIC. Here an end-user statement of the Belgian customer is sufficient. Streamlining of these requirements, at least at European level, would be really helpful.
Sometimes it is also difficult for the consignor to verify that the consignee is properly licensed to receive the requested material since these documents are in the official language of the consignee's country. This may require the translation of such documents.
If air transport is used this may cause problems due to the routing. The difficulties in finding airlines to transport radioactive material may lead to an unexpected itinerary. Therefore the routing must be carefully examined in order to respect all applicable rules of the used operators and involved countries.
In multimodal transports the whole transport chain needs to be considered. As example, for a combined road – air – road transport from IRMM to a customer, it must be considered that the road transport from the destination airport to the customer may impose additional requirements to the ones applicable for the road transport from IRMM to the departure airport.

CONCLUSIONS

IRMM has introduced the current transport system in the year 2000 and since then the system has demonstrated its efficiency. The strength of the system lies in:

- the overall co-ordination and transport execution by the Safety, Health, Environment and Security department,
- the installation of specifically trained and certified personnel (ITO, UTO, RPO),
- the performance of three independent radiation and contamination checks,
- the dispatch via a dedicated transport and temporary storage room with access control (no unauthorized dispatch),
- the individual assessment of every transport, and
- good communication between all actors (internal / external).

Most transports in Type A and excepted packages are going smoothly and do not create much difficulties. However it would be wishful to simplify and harmonize the certification and validation of Type B containers as well as to harmonize the current dual-use export regulations. Small quantities of fissile material (µg) could be even exempt from these regulations without the creation of proliferation risks.

ACKNOWLEDGMENTS

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