

Contents of management plans
for incidents and accidents
involving the transport of
radioactive substances

GUIDE N° 17

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1. INTRODUCTION

This guide is intended for **transport operators (consignors, carriers, consignees, carriage commission agents, etc.)** and applies to shipments of packages containing radioactive substances (both approved models and models not subject to ASN approval) outside the perimeter of the consignor or consignee facilities, provided that they have an on-site emergency plan (PUI) or an on-site operations plan (POI) (in which case reference should be made to these plans within the perimeter of these facilities). It is intended for those carrying out transport operations taking place at least in part on the French national territory and therefore concerns the consignor and all the entities outside the consignor called on in its overall emergency organisation (carriage commission agents, carriers, package designers, etc.).

1.1. Context and regulatory references

About 980,000 packages of radioactive substances are transported each year in France, which represents a few percent of the total number of dangerous goods packages transported.

The safety of the transport of radioactive substances is based on the concept of defence in depth and is built around:

- package robustness;
- the reliability of the transport operations;
- emergency management in accident situations.

The management of an incident or accident involving a shipment of radioactive substances on the public highway is overseen by the public authorities and in particular by the Prefect, through the civil security response organisation (ORSEC) plan. In this respect, note 1 of section 1.7.1. of the European agreement on the international carriage of dangerous goods by road (ADR) and the regulation concerning the international carriage of dangerous goods by rail (RID) implemented in France by the modified order of 29th May 2009 concerning the carriage of dangerous goods by land (called the "TMD order") state that *"in the event of an accident or incident during the carriage of radioactive materials, the response plans as drawn up by the competent national or international organisations, shall be implemented in order to protect individuals, property and the environment."*

The regulations applicable to the carriage of dangerous goods stipulate that those involved in transport (consignors, carriers, etc.) are also concerned by the management of the event and specify that:

- *"those involved in the transport of hazardous goods must take steps appropriate to the nature and scale of the foreseeable hazards, in order to avoid damage and, as applicable, to mitigate its effects"* (section 1.4.1.1 of the ADR and section 1.4.1.1 of the RID);
- *"when public safety is liable to be directly jeopardised, the parties involved shall immediately notify the intervention and security forces and shall provide them with the information they need to act"* (section 1.4.1.2 of the ADR and section 1.4.1.2 of the RID).

The regulations also stipulate that in the event of an accident, the carrier shall:

- take the steps specified in the regulations applicable to the transport of dangerous goods (written instructions specified in section 5.4.3 of the ADR and in section 5.4.3 of the RID);
- alert the public authorities and the consigner in accordance with Articles 2.3.3 of Appendix 1 and Appendix 2 of the modified order of 29th May 2009 concerning the land transport of dangerous goods (called the "TMD order").



The above-mentioned steps to be taken by the carrier are not sufficient to fully address the requirements of the regulations and it would therefore be preferable for those involved in the transport of radioactive substances to draw up an emergency plan or a “radioactive substances transport incidents and accidents management plan”.

Note – For the purposes of this guide, the terms incidents and accidents are as defined on the international nuclear events scale (INES).

1.2. Objectives of the guide

This guide presents the essential topics to be developed in a management plan for incidents and accidents involving the transport of radioactive substances for civil use. It does not aim to be exhaustive and could be added to by each party involved in the transport, who can make the necessary adaptations and additions, taking account of the particularities of its shipments and its organisation, as well as those of the company or group to which it belongs.

The radioactive substances transport incident and accident management plan is a document comprising a descriptive part and an operational part. It presents the overall response of the party involved in the transport operation to an incident or accident situation concerning one of its shipments and the steps it intends to make in order to support the authorities in charge of this situation, in the best possible conditions. This response is designed to cover the cases of incidents or accidents whether or not they lead to a radiological emergency situation.

1.3. Scope

The guide exclusively concerns:

- road transport;
- rail transport;
- the “road” and “rail” parts of multimodal transport operations.

The case of an incident or an accident occurring during a particular stop such as a transit site, in a transshipment area (port, airport, railway station, etc.), or in a transport infrastructure, is also covered by the radioactive substances transport incident and accident management plan, which then supports the entities in charge of managing this situation (operator of the transshipment area or the transport infrastructure and – as applicable – their supervisory authorities).

The level of risk associated with transport incidents and accidents varies widely, according to the nature and quantities of the materials being carried, the number of shipments made and the package model used. The incident and accident management plan must therefore be tailored to the specific nature of the shipments by the party concerned.

The radioactive substances transport incident and accident management plan may be activated without the ORSEC plan being triggered by the public authorities.

As necessary, it may supplement the following plans, while remaining consistent with them:

- the on-site emergency plans or on-site operations plans drawn up pursuant to the BNI or ICPE regulations or the Public Health Code;
- the plans drawn up for the transit sites and the transshipment areas (marshalling yards for example, etc.);
- the safety plans mentioned in section 1.10.3.2 of the ADR and in section 1.10.3.2 of the RID, drawn up by the licensees;



- the public authorities' ORSEC plans, drawn up by the offices of the Prefects, in particular the ORSEC-TMR¹ plans;
- the national "Major nuclear and radiological accident" plan drawn up by the General Secretariat for Defence and National Security (SGDSN).

1.4. Conditions for drafting the document

In 2012, a draft guide was the subject of consultation with ASND, IRSN, EDF, CEA, AREVA, IBA (Cis Bio), Cegelec and Ionisos.

Following analysis of the comments received, the document was updated and sent for consultation to the hazardous materials transport mission (MTMD) and the Directorate General for Civil Security and Emergency Preparedness (DGSCGC).

The draft guide was submitted to the public for consultation, from 15th August to 22nd September 2014.

¹ These plans comply with the interministerial directive of 7th April 2005 on the action of the public authorities in the case of an event leading to a radiological emergency situation, and the circular of 23rd January 2004 approving the guide for the drafting of the ORSEC-TMR plans;



2. THE CONTENTS OF THE INCIDENT AND ACCIDENT MANAGEMENT PLAN

2.1. Preamble

The first respondents in the event of an accident during the transport of radioactive substances are generally the driver and the public authorities. The consignor may only be informed of the accident later on and have very little information about the situation. Its role is nonetheless an important one, more specifically with regard to the provision of the information in its possession and the identification of the means and equipment at its disposal and which it could make available to the public authorities at their request (for example for recovery of the damaged packages).

The modified order of 29th May 2009 concerning the land transport of dangerous goods (called the "TMD order") stipulates that:

- *"In addition to 1.4.1.2, the following provisions apply:
If a vehicle is in an abnormal and dangerous situation, it will whenever possible be moved away from any inhabited area.
In the event of an accident or incident, notably an explosion, fire, actual leak or potential leak following an impact, loss or theft of dangerous materials or objects during the handling or carriage of dangerous goods outside a guarded establishment, the person responsible for execution of carriage shall immediately notify or ensure notification of:*
 - a) *The fire and emergency services and the gendarmerie brigade or police service closest to the site of the accident. This notification shall specify:*
 - *the place and nature of the accident;*
 - *the characteristics of the goods carried (particular intervention instructions if necessary as well as any prohibited extinguishing agents);*
 - *the scale of the damage;*
 - *more generally, all details enabling the extent of the risk and the scope of the required response to be assessed.*
 - b) *the consignor"* (Article 2.3.3 of Appendix 1 of the "TMD" order);
- *"In addition to 1.4.1.2 of the RID, the following provisions apply:
When, for whatsoever reason, the condition of a dangerous goods load no longer offers the safety guarantees prescribed by this order, the rail carrier may call on the consignor and ask it for instructions. If this is detected during the course of shipment, the rail car shall be stopped at the most appropriate location. The carrier informs the infrastructure manager of the nature of the incident and provides it with information about the materials carried as shown on the consignment document. As applicable, the measures stipulated in the marshalling yard's on-site emergency plan stipulated in 2.3.4. of this appendix II are implemented without delay.
In the event of an accident or incident, more specifically an explosion, fire, actual or potential leak following an impact, loss or theft of dangerous materials or objects during the course of shipment, the infrastructure manager notifies or ensures immediate notification of the fire and emergency services and the gendarmerie brigade or police service closest to the site of the accident. This notification shall indicate:*
 - *the place and nature of the accident;*
 - *the UN number, the official carriage designation, the quantity and characteristics of the goods carried (particular intervention instructions if necessary as well as the prohibited extinguishing agents);*
 - *the scale of the damage;*
 - *more generally, all details enabling the extent of the risk and the scope of the required response to be assessed"* (Article 2.3.3 of Appendix 2 to the "TMD" order).

It is however up to the consignor to make contact with the public authorities and/or transmit the alert and forward the information as soon as it receives it, in addition to any other information circuits as may have been activated elsewhere.



The plan in particular describes:

- the presentation of the shipments concerned;
- the internal organisation of the various entities concerned (in a normal situation, during the trigger phase, during the emergency phase and during the emergency phase exit period);
- the procedures for triggering and disseminating the alert;
- the interface with the first aid services;
- any technical support that can be provided;
- the envisaged intervention provisions;
- the intervention procedures and time-frames;
- the means of communication and recording;
- the event management tools;
- how the management plan is kept operational.

It covers all aspects of the management of a transport incident or accident and may differentiate between each of the following three main phases:

- the initial phase of detection of the incident or accident situation;
- the emergency phase, with assistance being provided to the public authorities to bring the incident or accident under control;
- the emergency phase exit period, with preparation for post-accident management. This phase includes assistance to the public authorities, for example help with taking charge of the damaged package(s) until they arrive inside the facility, which is in particular chosen in order to guarantee a satisfactory level of safety during storage and the operations planned within this facility. The ability to assist the public authorities in the initial environmental remediation operations is clarified.

2.2. Presentation of the shipments concerned

This part aims to provide general and contextual information concerning the traffic of shipments by the party concerned and covered by the plan (traffic consigned, commissioned, carried, transiting, or received). The aim is to provide a general description of the different types of packages or the large package families (for example: spent fuel package, waste package, gamma ray projectors, devices containing sealed sources (gamma ray projectors, gamma ray densitometers, etc.), package containing sealed or unsealed sources, etc.) which are liable to be transported, along with their handling and transport conditions.

The documents which could provide more details about these packages (packaging and contents) are also referred to. Generally speaking, references may be given to all the documents that the establishment feels could be useful in the event of an incident or accident (for example, approval certificates, content characteristics, package user's guide, etc.).

The information necessary for rapid access to these documents will also be specified.



2.3. Internal organisation of the various entities concerned

The aim is to present the organisational provisions planned by the party involved in transport in order to manage an incident or accident situation. These provisions could take account of the measures which also exist in the on-site emergency plan (PUI) or the on-site operations plan (POI) of the party concerned by the plan, if applicable to it, as well as those in the emergency organisation of the company or group to which it belongs. They must be consistent with the provisions mentioned in the emergency plans drawn up by the public authorities and mentioned in 1.3.

They concern the following points:

- the organisation for detecting a possible event, the reception (with any on-call duty system) and the dissemination of the alert;
- the organisation following the alert (differentiating between working hours and non-working hours)²;
- the organisation in the event of a long-term emergency (which can differ from that of the first stages of the incident or accident);
- the organisation during the emergency phase exit period.

In each case, the various **roles and responsibilities** of each actor in the planned organisation must be presented, specifying the measures taken to guarantee the **availability** of these actors and their **replacement** over the long-term if necessary.

The following are also described:

- the **location** of these actors and their **decision-making level, including the level of communication with the outside (media)**;
- the **interactions between the various actors** (nature, subject, frequency, media and more generally the means devoted to these exchanges).

Any flowchart or organisation diagram considered to be useful for the description of this organisation could be enclosed.

If the organisation is based on actors from different companies, the relations between them and the distribution of actions and responsibilities shall be described in compliance with the existing regulatory requirements. The procedures designed to guarantee the consistency of all the incident and accident management plans involved in this organisation must then be specified.

The interactions with the public authorities must also be specified and the procedures involved clarified.

2.4. Procedures for triggering the plan and disseminating the alert

The goal is to describe all the means for detecting an incident or accident involving a shipment of radioactive substances, the criteria for triggering the plan and the procedures for alerting the external actors and/or the public authorities who need to be informed, so that they can deploy the planned response organisations, in particular:

- at detection of the event:

² The organisation adopted must then include the designation of the personnel competent to assess the severity of a situation and to trigger the events management plan



- description of the means for detecting an emergency situation (monitoring of the conveyance, regular telephone contact with the drivers, etc.);
- the procedures for disseminating and receiving an alert and the means available (telecommunication means and tools, for example: sheet to be filled out, listing the information to be collected in the event of an alert).
- the means of transmitting the alert (public and other authorities, etc.)

It should be recalled that the organisations to be alerted³ include:

- the fire and emergency services and the police or gendarmerie services;
- the consignor;
- The Nuclear Safety Authority (ASN - Autorité de Sûreté Nucléaire).

Triggering the alert does not relieve the parties involved of the obligation to notify ASN of a significant transport event in accordance with the regulatory procedures in force.

2.5. The envisaged intervention provisions

2.5.1. Personnel capable of intervening and any expertise or partnerships

This involves making provision for the skills that it may be necessary to make available to the public authorities in the event of an intervention on the package (except for the immediate interventions by the public authorities) stating which parties are liable to intervene (personnel or partner), the training and the qualifications required and the time-frame within which they could intervene (e.g.: class 7 qualified drivers, crane operator, etc.).

When the envisaged measures include calling in an outside company, the particulars and scope of said company shall be specified.

2.5.2. Incident and accident scenarios to be considered

This involves identifying the accident and incident scenarios to be considered and their consequences on individuals, property and the environment. The scenarios to be considered are conceivable scenarios which are not necessarily of the same nature or severity as the regulation tests. The different types of materials and packages transported should be studied. The events leading to single or combined failures of the package safety functions (confinement, protection against ionising radiation, heat dissipation capacity, maintaining sub-criticality) are covered. The risk of human error must be considered.

For each of the scenarios, the potential consequences are assessed. This in particular includes an assessment of the effective individual doses received. In the case of materials with secondary risks, an assessment of the toxic consequences is also made. The purpose of the assessment of the consequences is to define the intervention and human protection resources and acceptable intervention time-frames.

The level of detail in the description of the scenarios is tailored to the risk presented by the transport operations concerned.

³ If the accident occurs inside a site covered by an on-site emergency plan, the alert is to be organised in accordance with the provisions of the on-site emergency plan and is normally the responsibility of those in charge of this site.



2.5.3. Material resources deployable on the site of the event

This involves listing the equipment which could be necessary in the case of an event and how to procure it if needed:

- during the alert phase, for example:
 - o the means of telecommunication or data transmission (the available means are described, as are the conditions for verifying that they are in good working order);
 - o the means of detection and diagnosis (e.g.: measurement device available in the vehicle, conveyance monitoring instrumentation, mobile unit with various measuring devices⁴, etc.);
- for mitigating the effects of the accident (e.g.: radiological barriers, tarpaulins, breach filling tools, tools for clamping package closure systems, etc.), if action by the intervening party is requested by the Prefect;
- for package recovery (e.g.: lifting means, overpack, trailer, tie-down system, escort, etc.);
- for dosimetric monitoring of the personnel liable to intervene (for example passive dosimeter, operational dosimeter).

The time needed to make this equipment available and the planned resources must be stipulated (for example, agreements or partnerships with other companies).

A connection should be made with the scenarios identified in 2.5.2.

2.5.4. Provisions for the emergency phase

This entails specifying the steps to be taken to manage incident and accident situations. The principle of coordinating these steps with the organisation put in place by the public authorities will be clarified. These steps may in particular comprise:

- reflex measures to protect the individuals present on the site of the accident, including the conveyance personnel.
- the first steps that could be taken by the personnel of the conveyance to minimise the risks, in particular to limit the consequences of the event and prevent a “secondary accident”, consistently with the written instructions⁵ specified in sections 5.4.3 of the ADR and the RID. This could for example involve shutting off the engine, disconnecting the battery with the circuit-breaker, intervention by the personnel in the event of a limited fire on the vehicle.
- the package recovery strategies and associated actions. These strategies include possible reconditioning of the packages, their recovery and routing to one of the reception zones identified in 2.5.5. They must take account of the risks linked to the recommended actions, the expected benefits and the available material resources.

2.5.5. Reception areas for damaged packages

This entails identifying the sites to which the damaged packages could be routed, while guaranteeing a satisfactory level of safety. Any agreements or partnerships with the various sites shall be specified. Different sites could be selected according to the radionuclides or the contents to be transported.

In the event of an incident or accident, authorisation from the competent authority may be required before transferring damaged packages to these predetermined sites.

⁴ For example, for tightness, temperature, dimensional, radiological, toxic or meteorological measurements.

⁵ These are instructions concerning the steps to be taken by the conveyance personnel in the event of an accident and should be to hand in the crew cabin of the vehicle.



2.5.6. Provisions for the emergency phase exit period

This entails making provision for organisational measures for the emergency phase exit period, with preparation for post-accident management. This in particular entails identifying the conditions for exiting the emergency phase and the support that could be provided to the public authorities for the first operations to remediate the environment (e.g.: assessing the consequences of the pollution and defining a treatment strategy, initial radioactivity measurements, initial contamination mitigation measures, waste removal, etc.).

2.6. Event management tools

This chapter identifies the operational documents that can be used to manage the event. These tools can in particular be useful for:

- helping to assess the condition of the package;
- helping to assess the radiological consequences;
- transmission of information.

2.6.1. Decision aid

Implementation of a practical tool such as a logic diagram is recommended, in order to direct the user to the most appropriate recommendation for the situation encountered.

This tool takes account of the incident and accident management plan trigger criteria.

2.6.2. Reflex response sheets

There is a sheet for each step in the incident and accident management plan and for each actor involved, giving the required response and the steps to be taken, in chronological order. It in particular contains:

- the title of the step;
- the conditions for activating the reflex response sheet;
- the steps to be taken and the identity of the actor concerned;
- the expected results;
- the details of the persons to be contacted (if necessary);
- the conditions for closing the reflex response sheet.

These sheets supplement the emergency instructions in the possession of the drivers.

2.6.3. Standard messages

Standard media are recommended for transmitting messages, listing the information to be provided (details of the sender, date and time sent, reference, event concerned, situation status, etc.). Examples are given in the appendix.

2.6.4. External communications

External communication tools are recommended, for responding to the public and to other authorities (also see section 2.6.3) as well as to queries from the local or national media.



2.6.5. Recording and archival of communications

This entails describing how the various communications are logged during management of the incident or accident, how they are made available and then archived.

2.7. Keeping the incident and accident management plan operational

2.7.1. Training of the persons involved in transport

The purpose of the training given will be to make the personnel aware of the procedures to be followed for emergency interventions and handling in acceptable conditions of safety (see section 1.3.2.3 of the ADR and the RID). It will ensure that a **sufficient number of qualified and trained personnel** are available for implementing the organisation contained in the incident and accident management plan.

2.7.2. Exercises

It would be advisable to hold in-house exercises (a good practice is one exercise per year). They could be either scheduled or unannounced. The topics of the exercises are identified (alert, readiness, deployment, etc.). Some of these exercises can involve companies or services from outside the transport party concerned, in order more specifically to test the agreements or partnerships included in the incident and accident management plan⁶.

2.7.3. Experience feedback

Experience feedback from the exercises and any real events is taken into account and included in an update of the plan, if felt necessary, in order to learn all necessary lessons and make all necessary improvements of use for the safety of transport or the management of emergency situations. The experience feedback analysis procedures will be specified (how feedback from the exercise participants is taken into account, topics to be considered, etc.).

2.7.4. Renewal of partnerships

The procedures for the renewal of any partnerships or agreements are specified.

2.7.5. Quality Assurance

The incident and accident management plan is drafted in accordance with the usual **quality assurance** rules. The document management provisions should be described (monitoring, updates, accessibility and conservation of the document, etc.).

⁶ The organisation of exercises on the public highway is the responsibility of the public authorities.



Appendix: Examples of standard messages

1. Example of an “Initial” standard message (to be sent for written confirmation after the oral alert)

7		
FACILITY	Sender:	ADDRESSEES
Consigning facility: Date: Written by: Details (tel., fax, email):	Time: Function:	<input type="checkbox"/> COD Prefect’s office <input type="checkbox"/> ASN <input type="checkbox"/> IRSN <i>Others, specify</i>

FIRST CHARACTERISTICS OF THE ACCIDENT
Place of the accident: Date, time of the accident: Nature of the accident: Commercial names of the packages involved: Presumed damage to the vehicle and packages: <i>Whenever possible, detail the damaged components and their functions.</i> Presumed radiological consequences (for the intervention personnel, the population and the environment): - <i>Dispersion of solid, liquid, gaseous or aerosol materials (presumed quantities) and consequences (as applicable, estimate of the doses received, estimate of the quantities inhaled).</i> - <i>Abnormal dose rates.</i> Recommended actions: Foreseeable development: Provisional summary of victims (in particular the number of persons irradiated, contaminated, intoxicated): Other information:

⁷ Strip reserved for the words “EXERCISE – EXERCISE – EXERCISE”, as applicable.



2. Example of “Evaluation of consequences” standard message (to be sent regularly to the emergency technical teams)

8		
FACILITY	Sender:	ADDRESSEES
Consigning facility: Date: Written by: Details (tel., fax, email): Next message expected about:	message n°: Time: Function:	<input type="checkbox"/> PCD ⁹ Consignor <input type="checkbox"/> IRSN <input type="checkbox"/> <i>Others, specify</i>

EVALUATION OF RELEASE		
<u>Meteorological conditions considered</u>		
* Wind direction:	degrees	* Speed: m/s
* Rain: <input type="checkbox"/> YES/Intensity:	mm/h <input type="checkbox"/> NO	* Atmospheric stability:
* Diffusion angle:		* Gusting:
<u>Releases</u>		
* Time of beginning of releases:		* Height of releases:
* Duration of releases:		
* Products (and quantities) released (total since beginning of releases (Bq or kg) or rate (Bq/s or kg/s)):		

IRRADIATION DUE TO THE PACKAGE
* Extent of damage to the package radiological shielding, nature of this shield:
* Dose rate for relevant distances (exclusion perimeter, 10 m, 1 m, etc.):

EVALUATION OF RADIOLOGICAL AND TOXIC CONSEQUENCES
* Main hypotheses (examples: doses at 24 h, target, etc.):
* Results of effective dose evaluations for certain distances:
* Results of concentration evaluations (mg/m ³) and expected effects, for certain distances:

Comments:

⁸ Strip reserved for the words “EXERCISE – EXERCISE – EXERCISE”, as applicable.

⁹ PCD = strategic management command post





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