

Emergency Response to Radioactive Material Transport Accidents

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ABSTRACT

Although transport regulations issued by IAEA is providing a high degree of safety during transport operations, transport accidents involving packages containing radioactive material have occurred & will occur at any time. Whenever a transport accident involving radioactive material occurs, and many will pose no radiation safety problems, emergency response actions are needed to ensure that radiation safety is maintained. In case of transport accident that result in a significant release of radioactive material, loss of shielding or loss of criticality control, those consequences should be controlled or mitigated by proper emergency response actions.

A safety guide, **Emergency Response Planning and Preparedness for transport accidents involving radioactive material**, was published by IAEA. This guide reflected all requirements of IAEA, regulations for safe transport of radioactive material this guide provide guidance to the public authorities and other interested organization who are responsible for establishing such emergency arrangements.

Key words: Transport accident, Emergency response, planning, training

INTRODUCTION

The type of emergency planning and preparedness for responding to transport accidents involving radioactive material is, to some extent, similar to that required for responding to transport accidents involving the other types of dangerous goods. The various international and state regulatory bodies require the use of communication tools to allow those who are first on the scene of a transport accident to define the hazard involved and hence determine how to respond properly. Thus emergency response organizations and personnel should be provided with practical emergency response plans and procedures. The plans and procedures should ensure that basic knowledge, skills and equipment are available to deal effectively with the wide range of possible consequences of such accidents.

A safety guide, **planning and preparing for Emergency Response to Transport Accidents Involving Radioactive Material**, was published in 2002⁽¹⁾. This safety guide reflects the requirements of the 2000 edition of the IAEA Transport Regulations⁽²⁾, and those of the International Basic Safety Standards for protection against Ionizing Radiation and for the safety of Radiation Sources BSS⁽³⁾. The objective of this safety guide is to provide guidance to the public authorities and others including consignors, carriers and emergency response authorities who are responsible for developing and establishing emergency arrangements. It provides guidance for those States whose involvement with radioactive material is just beginning. It also provides guidance for those States that have already developed their

radioactive material industries and the attendant emergency plans but that may need to review and improve these plans. It may be used to assist in preparation of national, regional and local emergency plans and procedures, account being taken of the specific governmental and legislative structures. In using this Safety Guide it should be recognized that emergency response plans and the ways in which they are implemented may vary from State to State.

This Safety Guide has been developed to deal specifically with particular problems associated with transport emergencies involving radioactive material. It should be recognized that the emergency planning and preparedness elements for responding to transport related accidents involving radioactive material are to great extent similar to those for other dangerous goods. This safety guide has been developed for responding to accidents known to involve radioactive material, the concepts involved herein should also be applied to transport accidents where the presence of radioactive material is suspected. A loss or theft of radioactive material during transport is not specifically dealt with in this Safety Guide. However, procedures developed for the notification of transport accidents involving radioactive material by various international, State and local organizations may also be applicable to cases of loss or theft during transport.

Framework For Planning And Preparing For Response To Radioactive Material Transport Accidents.

IAEA safety standards^{(2) (3)} establish a framework for requiring an adequate emergency response capability for responding to transport accidents involving radioactive material.

The Safety Fundamentals publication Radiation Protection and safety of radiation sources⁽⁴⁾ sets out the following.

- **Protection objective:** to prevent the occurrence of deterministic effects in individuals by keeping doses below the relevant threshold and to ensure that all reasonable steps are taken to reduce the occurrence of stochastic effects in the population at present and in the future.
- **Safety objective:** to protect individuals, society and the environment from harm by establishing and maintaining effective defences against radiological hazards from sources.

The Fundamentals also note that to achieve these objectives “ a system of protection founded on basic principles is needed. Intervention may be necessary to deal with the radiological consequences of an accident”.

The requirements on actions to be taken have been established at an international level⁽³⁾. These include:

- Requiring intervention in the case of accidents or emergencies in which an emergency plan or emergency procedures have been activated;
- Requiring each registrant or licensee responsible for sources for which prompt intervention may be required to ensure that an emergency plan exists;
- Requiring employers to provide workers who could be affected by an emergency plan with the appropriate information, instruction and training.

The Transport Regulations require that emergency provisions, as established by the relevant national and/or international organizations, be observed in the event of radioactive material transport accidents or incidents. Also, provide the framework for much of the needed

protection. They establish stringent design, test and operational controls on the packaging and transport of radioactive material. They impose the regulatory controls exercised by the competent authorities at the state level

The goal of a programme for planning and preparedness for an emergency involving radioactive material should be to assist in building competence and confidence that an emergency arising from a transport accident would be managed effectively.

Responsibilities for Planning And Preparing For Response To Radioactive Transport Accident

When a transport accident involving radioactive material occurs, several governmental organizations, the consignor, the carrier and their personnel may have responsibilities to act to mitigate its consequences. In most transport accident situations this response consists of life saving, medical aid, fire suppression and control, and the normal police work associated with any accident. Also, attention should be given to calling in specialized organizations trained to deal with radioactive material, assess the accident & to contain, control or eliminate any radiological hazard.

Responsibilities Of The National Co-Ordinating Authority

The responsibilities for planning and dealing with a transport accident involving radioactive material are generally divided among several involved organizations and persons⁽⁴⁾. The severity of the accident in terms of its consequences generally determines the level of governmental response and involvement. The national co-ordinating authority should consult with other organizations and agencies to ascertain their functions, roles and responsibilities in responding to an emergency.

At each governmental level several organizations and agencies that have responsibilities concerning transport accidents may exist. One agency should be assigned the lead agency responsibility; others should be assigned supportive roles. The concept of a lead agency is also applicable in cases where only a single national plan is envisioned.

The national co-ordinating authority concept, if applied should also be extended to the assignment of a co-ordination and control responsibility at the accident site. At the accident scene an "incident commander" should be designated with the authority and responsibility to direct the on-scene response. It should have the authority and responsibility to direct and control the activities of supporting agencies and organizations during an actual emergency once its representatives arrive on an accident scene.

Responsibilities For Notification And Communication

Although the persons and organizations involved may be different, notification and communications concerning transport accidents involving radioactive material should be handled in a manner similar to that used for other transport incidents involving dangerous goods⁽⁵⁾. The use of communication networks and procedures that are common to all

dangerous goods could be advantageous in terms of maintaining a high level of expertise and ensuring the proper and complete staffing of the communication facilities.

The establishment of regional emergency centers for any kind of accident that are manned 24 hours per day by trained staff should be considered. These centers could provide an effective liaison capability for alerting the appropriate agencies to the actions required. The centers should have information on the areas of jurisdiction of all the agencies that may become involved. They should have available up to date lists of names and the telephone numbers of agencies to be notified and experts who can be immediately dispatched to the accident scene. Ideally, the staff at the centers should also have the capability to give advice on how to handle accidents involving a broad spectrum of hazardous materials.

Responsibilities Of Governments

In developing governmental response plans and procedures for transport accidents involving radioactive material, the relevant government bodies:

- Should establish legislation to define the areas of responsibility and the functions the various national authorities having expertise in this field.
- Should define the responsibilities of national, provincial and local governments;
- Should establish radiation protection services;
- Should identify the authorities to be notified when a transport accident involving radioactive material occurs and establish a communications and notification system;
- Should determine and periodically review and test the adequacy of the plans; as well as the adequacy of the available trained personnel and equipment;
- Should provide for the periodic review and update of the plans;
- Should establish, where appropriate liaison with the authorities in relevant States for notification concerning accidents whose consequences may extend beyond national boundaries;
- Should define the responsibility for public information and education concerning the transport of
- Should establish appropriate training programmes;
- Should provide resources to implement the plans when required.

provincial and local governments should develop their own emergency response plans and procedures. At the local level planning should at least encompass the development of the capability to recognize a radioactive material package being familiar with basic precautions and knowing who should be called on to provide further assistance⁽⁴⁾.

Responsibilities Of Consignors And Carriers

The primary responsibility for ensuring preparedness for a given shipment of radioactive material in principle should rest with the consignor. The consignor should ensure that, carriers are fully aware of the procedures to be followed in the event of a transport accident. Although the prime responsibility for safe shipping is with the consignor, the carrier also has responsibility both for safety during transport and for the proper reaction in the event of an accident.

The consignor should ensure that adequate arrangements are available to deal effectively with transport accidents involving radioactive material. These arrangements could include

being prepared to provide information about the shipment, knowing how to deal with transport accidents involving radioactive material, provide information about the shipment, knowing how to deal with such an accident and providing emergency and/or technical assistance to an accident site, when requested or required. Also the consignor should make available to the carrier the appropriate emergency instructions and other information concerning emergency responses.

The carrier should ensure that proper emergency instructions are carried on board the transport unit. All efforts should be made by the carrier to ensure that applicable emergency information will be available to the first on the scene personnel, even in the event that the carrier personnel are incapacitated. Carrier personnel should be instructed that immediately after an accident, they should inform the police, the consignor and other appropriate authorities of the event.

Responsibilities Of The Radiation Protection Team

To support the emergency response organizations that generally respond to all transport accidents, specially trained and equipped radiation protection teams should be available to assess properly any consequences of an accident involving the release of radioactive material. Team members should be experienced persons with professional and technical training in the radiological safety field. Communications capabilities with the teams should exist on a 24 hours per day, 7 days per week basis so that they can be quickly and reliably notified when their assistance is required at an accident scene. Rapid means of transport for the team and its equipment, with pre approved funds, should be available to ensure quick movement from their locations to the accident site.

More specifically, the team should be authorized, prepared and equipped to:

- Travel to the site, with the appropriate equipment, in quick manner;
- Evaluate the radiological hazard;
- Take the appropriate steps to minimize personnel exposure to radiation and/or radioactive material;
- Take the appropriate steps minimize the spread of radioactive contamination;
- Provide technical information and advice to the appropriate authorities that would help in the treatment of affected people;

For large area or long term monitoring and assessment, additional personnel and equipment to assist the team at the accident site may be required. Methods for identifying the personnel, equipment and supplies required to support a large area or long term monitoring and assessment should be documented during the emergency planning process.

Planning For Response To Radioactive Material Transport Accidents

Radioactive material is transported by land (road and rail), inland waterways, sea and air. The Transport Regulations are applied to these shipments throughout the world, either directly by national regulations or by way of the requirements of relevant international modal organizations. The Transport Regulations⁽²⁾ require that emergency provisions, as established by the relevant national or international organizations, shall be observed to protect persons, property and the environment. A minimum level of planning for

emergency response arising from transport accidents involving radioactive material is appropriate in every State⁽⁶⁾

Emergency Planning And Preparedness

A main national plan for responding to transport accidents involving radioactive material should be developed. All provincial and local plans should be based on this plan. Consignors and carriers should also have emergency plans and the appropriate preparedness procedures. For protecting workers in the event of transport accidents planning should be undertaken by both the consignor and the carrier, whereas for protecting the public, planning should be undertaken by appropriate, local, regional, national and international officials⁽³⁾ the plan should cover:

- (a) The planning basis;
- (b) The responsibilities, capabilities and duties of the organizations involved;
- (c) The procedures for alerting and notifying key organizations and persons;
- (d) The methods for warning and advising the public;
- (e) The intervention and action levels for exposure and contamination;
- (f) The protective measures;
- (g) The procedures for response actions;
- (h) The resources for medical and public health support;
- (i) The procedures for training, exercises and updating plans;
- (j) Public information.

For determining the planning basis the responsible authorities should conduct an assessment of the radioactive material transported in their State and the systems used for transporting this material. They should generally determine which types of shipments pass through these systems and which main routes are used. Clear step by step procedures should be prepared for implementing the emergency plan, using the graduated responses required for the severity of the accident and its consequences.

Pre-established radiation exposure and contamination levels should be defined by governmental authorities as operational intervention levels (OIL,s)⁽³⁾ These OILs are required to be consistent with international standards. If these OILs are exceeded certain response and protective measures should be taken. A major consideration is that transport accidents may occur in any location, including remote areas where access for responders may be difficult and in populated areas where the control of public access may be required. Therefore, response plans should include considerations for implementation on difficult terrain and in adverse weather conditions. Since the type of emergency plans for responding to transport accidents involving radioactive material is often the same in structure as the plans for responding to accidents involving other dangerous goods, many of the same organizations will be involved and many of the same actions will be required. It is therefore preferable, wherever possible, to integrate the transport emergency plans for radioactive material with the plans for responding to accidents involving other dangerous goods.

Emergency plans should conform as closely as possible to the existing capabilities and procedures for dealing with other transport accidents. Police fire fighting or military organizations frequently provide the first line of response action. The carriers employees, or members of the public who may be directly involved and initially on the scene of the accident, will most likely contact the police. Those involved in transporting radioactive material should be given advance instructions on the procedures to be followed in the event of an accident and in notifying the police and/or other organizations defined in the emergency plans. The emergency plans and procedures should also include provisions to provide information to the first on the scene personnel on the immediate response required for a transport accident involving radioactive material. The plans and the implementation procedures should specify the distribution of copies of these documents. All the organizations involved in the overall emergency response system should receive copies of the plans and procedures and all changes to them.

Preparing For Response To Radioactive Material Transport

In responding to transport accidents involving radioactive material the main actions to be taken are to:

- (a) Rescue and provide emergency medical aid to any victims,
- (b) Control fires and the other common consequences of transport accidents,
- (c) Identify the hazard and prevent the spread of radioactive contamination,
- (d) Control any radiation hazard and prevent the spread of radioactive contamination,
- (e) Recover the package or packages and transport vehicle,
- (f) Decontaminate personnel,
- (g) Decontaminate in the vicinity and restore to a safe state.

Once the radioactive material is under control and traffic flow has been restored at the accident scene, the emergency should be considered ended. In addition, if release or contamination has been identified, decontamination and the restoration of adjoining areas may be required.

The primary responsibility, in principle, should rest with the consignor and the carrier to ensure that adequate arrangements are available to deal effectively with accidents involving radioactive material. At all times during shipment, the consignor and/or carrier should be able to provide information concerning the hazards of the shipment and should be able to send a properly equipped and trained radiation protection team to the site of the accident.

The need for international co-operation in responding to transport accidents should be considered. The Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency provide the basis for such co-operation.

Phases Of Response For Transport Accidents

The response actions in any accident can be divided into three phases:

- The initial phase,
- The accident control phase,
- The post-emergency phase

Phases Of Response For Road Transport Accidents

Initial phase

The carrier and the consignor have responsibilities for some initial emergency actions. They should notify the local and other defined authorities at the earliest practicable time. Local civil emergency services should assume responsibility and should respond appropriately to an accident and assume the initial command and control responsibilities when they arrive at an accident scene.

Planning at the local level will usually involve being able to recognize a radioactive material package, being familiar with the basic precautions to be taken and knowing who should be called on to provide further assistance. Generally, local authorities should identify the consignor and contents of the package or packages involved and seek assistance from the responsible consignor and carrier.

During the first minutes after an accident, emergency actions by the local first responders should be directed towards⁽⁶⁾ :

- Saving lives;
- Attending to any injured persons;
- Isolating the location;
- Preventing or extinguishing fires;
- Identifying hazards;
- Determining the actions necessary to prevent a further threat to human life, property or the environment;
- Calling for the appropriate expert support.

Priority should be given to life saving and first aid actions. In general, the presence of radioactive material should not impede such actions, as the risks to the emergency responders will generally be low⁽⁶⁾ .

Essentially, only visual information will be readily available to the local, first on the scene personnel. This will be in the form of the transport documents, markings and labels on the packages and/or placards on the vehicles or freight containers. Emergency response guides and procedures are essential resources for conducting a response action. The level of response should be generally determined based upon the potential hazard posed by the contents of the packages involved .

Police, fire fighters or other qualified emergency response personnel should ensure that the scene is kept clear out to an appropriate distance. Generally, the public should be excluded (evacuated) from an accident site. The distance for such exclusion will depend on the circumstances of the accident. The police or other emergency personnel should record the names and addresses of the persons involved at the accident scene or in the immediate vicinity. If contamination is later found the people who have left the scene should be contacted to arrange for radiological monitoring. A clear chain of communication should be established from the person in charge at the scene to the relevant authorities. The person in charge at the scene should ensure that an open line of communication is maintained.

An initial investigation should be carried out by emergency personnel, taking into account the effect on human life, property and the environment. The results of the investigation should also form the basis of an initial report to the emergency response organizations and involved persons. The investigation should include inquiries that answer such questions as:

- (a) Were there any injuries to people ?
- (b) What labels, markings, placards and transport documents are present?
- (c) Is there (or was there) a fire near the radioactive material packages?

- (d) Are there large quantities of flammable liquids or gases in the immediate vicinity of the accident site?
- (e) Is there explosive, toxic or corrosive material in the immediate vicinity of the accident site?
- (f) Has containment of the packages been breached?
- (g) What kind of radiological or other hazards exist?
- (h) What are the meteorological conditions (including wind direction)?
- (i) Has relevant information concerning the location of the population, the expected path of runoff water, the accessibility of the site and alternative roads been gathered?
- (j) Were significant exposures possible? If yes, obtain information to allow the dose to be estimated.

The investigation should evaluate the situation at the accident site by making four basic determinations:

a-Confirming the presence of radioactive material

Information confirming the presence of a package containing radioactive material is given by visual inspection of the package; any markings or labels on the outside of the package ; any placards on the outside of the vehicle, freight containers or tanks; and the available transport documents. If suitable radiation monitoring equipment is available it should be used to assist in confirming the presence or absence of radioactive material.

b- Identifying the specific radionuclides involved and their quantity

The transport documents and labels should be used to assist in recognizing and providing specifics concerning the nature of the consignment and facilitate the proper response in the event of an accident.

c-Ascertaining the integrity of the shipping containers or packages

A visual inspection of the consignment may indicate whether the shipping containers or packages have been damaged. The presence of fire, smoke and fumes could preclude an initial determination in this regard. Saving lives, suppressing fires and dealing with flammable, explosive and toxic materials should generally take priority before any assessment of package integrity can or should be made. External damage to a container or package of radioactive material does not necessarily mean that the interior packaging components have been breached. Leaking liquids, gases or powders may indicate that package integrity has been compromised. Package integrity might also have failed with no visible indication. This can only be determined by qualified experts.

d- Assessing the potential radiological and related hazards

An early assessment of hazards should be undertaken. Early information is also useful for medical personnel caring for any injured persons who might be contaminated. Information concerning radiation levels, the loss of shielding and release of radioactive material from a container or package generally may only be obtained early in the emergency response if radiation monitoring equipment is available to the first on the scene emergency response personnel .

Accident control phase

The basic information that is available as a result of the actions taken during the initial phase should be used by the individual responsible for the accident control phase in defining the primary actions needed during the accident control phase. As a part of the emergency

planning process, prior arrangements should be made. This will allow the accident control phase to be handled properly by qualified experienced and equipped persons or teams.

It should be capable and authorized to perform the necessary radiation monitoring assess the hazard and provide appropriate advice.

The primary purpose of radiation monitoring is to provide timely information on the basis of which proper decisions can be made to initiate protective and recovery actions. The following additional measurements should be considered, depending upon the results of these first measurements:

- Measurements of airborne radioactive material and ground contamination around the scene of the accident;
- Measurements for assessing exposure to members of the public, transport workers and emergency personnel.

The team responding to an accident should have available the appropriate radiation monitoring instruments and should include qualified, trained personnel to operate that equipment. This equipment should be available as a basic instrument kit. It should be well maintained and properly calibrated for radiological monitoring. In some cases a mobile radiological laboratory may be needed, and an appropriate mobile communications capabilities should be provided for the team. Based on the results of the measurements, a qualified person should evaluate the radiological hazards and provide advice to other emergency responders, including the emergency manager. A good practice to follow is to use a map or sketch of the accident area and to document the measurement results on it. Based on an evaluation of the accident situation a decision should be taken as to what must be done with the packages (s) and what further remedial action is necessary. If fissile material is involved, special considerations, should be defined and implemented to ensure criticality safety.

Where a release of radioactive material in a transport accident necessitates a decision concerning the evacuation of persons from certain areas, that decision and the subsequent actions should be made by the responsible local authorities and the decision should be based upon expert advice.

Protective measures in transport accidents should be considered where significant radiation or radioactive contamination may exist as a result of the loss of integrity of the packages include:

- The control of access to and egress from the accident vicinity,
- Protective actions within the cordoned-off area,
- Personal protective measures,
- Sheltering or evacuation,
- The decontamination of persons,
- Controlling potentially contaminated food and water supplies,
- The protection of the local drainage system and/or area,

Control of access and egress

At each accident there are two principal areas of interest: limited access area and an inner cordoned-off area (see Fig.1)

Protective actions within cordoned-off areas

Emergency personnel working in cordoned-off areas may be exposed to a variety of hazards. Emergency workers should complete their work as quickly as possible in the cordoned-off area. Injured persons who need to be taken to a hospital should be wrapped in blankets, which will help to control the spread of contamination, if present. The receiving medical facility should be provided with the best available radiological information concerning the impending arrival of these injured persons. This information should be communicated as far in advance as possible by electronic means.

Limited access area (outer cordoned-off area)	Keep public away Only police fire fighters. Ambulance service and qualified personnel allowed inside
Inner cordoned-off area	Suspected to be contaminated or to have excessive radiation levels (external gamma dose rates >100 uSv/h or predetermined evacuation distances. Only lifesaving/first aid/fire fighting actions under personnel protective measures allowed. Access or egress allowed only through the checkpoint/decontamination point
Checkpoint and Decontamination point	Locate upwind Provide a radiological control station to check for possible contamination. If there is any contamination of persons or animals, arrangements should be made for decontamination. If there is any contamination of equipment, vehicles or other items by radioactive material, it should be decontaminated or packed or suitably wrapped.

As a safe practice all packages or containers of radioactive material that have been ejected from a vehicle as a result of an accident should also be encompassed by a cordoned-off area to await the arrival of qualified personnel to examine them and conduct radiological monitoring.

Runoff water from any fire fighting efforts or leakage from damaged containers or packages should be retained within a cordoned-off area.

Animals, vehicles, material, equipment or other items suspected of being contaminated should not be permitted to be removed from cordoned-off areas unless released by qualified radiological monitoring personnel. Eating drinking and smoking should be prohibited in cordoned-off areas.

The checkpoints controlling access by emergency personnel to the cordoned-off area should be upwind of the radioactive material packages. Emergency response personnel should approach any accident site where radioactive material might have been released from the up wind direction only. The use of plastic sheets should be considered to cover loose material to help minimize its dispersion by wind or rain.

Personal protective measures

Personal protective measures to minimize radiological exposure are essential when responding to transport accidents involving a release of radioactive material or the loss of package shielding such as:

- Minimizing the time spent near the source of the radiation;
- Maximizing the distance from the source of the radiation;
- Using shielding between personnel and the source of the radiation;
- Using respiratory protection equipment to reduce the possibility of inhaling radioactive material;
- Using protective clothing, followed by careful washing, to reduce the possibility of skin contamination or ingestion.

Fire fighting and radiological monitoring personnel are generally well equipped with standard protective clothing and respiratory protection equipment. Police and emergency medical service personnel and other emergency workers will generally be less suitably equipped. They may acquire simple respiratory protection by covering their mouths and noses with an article of clothing or even soft absorbent paper products. Personal monitoring devices, should be used by emergency personnel as soon as they are available in order to measure personnel exposures.

Sheltering individuals may be necessary if dispersible radioactive material may be spread by local aerosol plumes or winds. Generally, houses and other buildings with closed doors and windows give good protection against contamination. Evacuating an area threatened by a release of radioactive material is the ultimate protective measure but it should only be necessary in very rare circumstances in response to a transport accident.

Decontamination of persons

Removing the outer clothing and shoes of persons contaminated with radioactive material will minimize the spread of contamination. Skin decontamination requires shower and washing facilities and possibly some medical assistance in the case of open wounds. Persons contaminated or suspected of being contaminated should be initially decontaminated at the accident site. They should be provided with a change of clothing at the accident site, and contaminated clothes should be collected for washing or disposal.

Handling damaged packages

Access to any packages that are damaged or leaking their radioactive contents should be limited. Such packages may be forwarded after repaired and decontaminated.

Post-emergency phase

Termination of emergencies

In most cases emergencies may be terminated when items for responding to transport accidents have been accomplished. Termination should be declared by the local responsible authorities using the news media. Persons qualified in radiological protection should be used in decontamination and restoration.

Several decontamination and restoration methods may be employed such as:

- Washing or vacuum sweeping of roads and other objects and surfaces:

- The fixing of contaminants using paints, liquid to solid strippable plastics and paving materials:
- Washing and cleaning hard surfaces and equipment with water and appropriate detergents or other chemicals.

The relevant local, provincial and national authorities should also be involved so as to ensure that decontamination and restotation are completeted in a safe and proper manner.

Control of food and water supplies

It is possible that an accident could affect these products, any contamination is likely to be localized to a specific area. Under such circumstances the agricultural products may have to be confiscated and disposed of under controlld conditions. If a potable water supply is contaminated by dispersed radioactive material it should be tested for contaminants, and control of the supply at its sources may then be necessary and the water should be monitored if a release of radioactive material is suspected.

Special Considerations Relating To Transport By Other Modes

Rail transport

Road transport emergency response arrangements are generally applicable to rail transport. However, railways, which are often the carriers of spent fuel shipments, and many other types of radioactive material, have their own internal network of communication encompassing train crews, railway control points and consigning organizations. It is desirable to have a system for railway emergency response properly integrated into a general emergency system for transport accidents involving dangerous goods.

Water transport

Accidents occurring during the water transport of radioactive material may occur in three principal environments: ⁽¹⁾ inland waterways, ⁽²⁾ ports and harbours and ⁽³⁾ oceans and seas. Marine transport companies engaged in the transport of radioactive material. should have an emergency response plan that should be incorporated into the overall plan for handing all shipboard emergencies. Emergencies involving radioactive material on inland waterways and in ports and harbours can be managed in a manner similar to those occurring on land.

Emergencies occurring in ports and harbours may have the benefit of specialized emergency response teams. These port and harbour teams are usually trained to respond to marine related emergencies involving dangerous goods and asset in handling a radiological emergency .

Accidents involong radioactive material that occur on the ocean or sea pose some specific problems. An accident may occur in a remote location where the only available personnel to deal with the emergency is the crew of the ship .Crews of ships carrying radioactive material should be well trained.

Emergency planning to deal with accidents on board a vessel should comply with the relevant regulations of the vessels flag State. Also the guidelines for dealing with accidents at sea published by the International Maritime Organzation ⁽⁸⁾

Accidents at sea may not be covered in detail in a national emergency plan. Accordingly, a ship,s master should be in possession of information regarding which authorities to contact in the event of an emergency. Maritime authorities with whom the master may be in contact during a voyage should also know whom to contact in an emergency. While at sea, emergency advice can be given to the ship by radio. Nuclear Fuel (INF) Code should have on board a shipboard emergency plan Subject to the INF Code ⁽⁹⁾.

Air transport

Accidents occurring during the air transport of radioactive material may occur either at airports or at locations along the route of the aircraft. Arrangements for emergency response planning and preparedness for road transport are generally not applicable to air transport, except in the case of an accident occurring at an airport. An accident that occurs as a result of a crash of an aircraft may require a response in remote or not easily accessible areas, and may pose problems in locating and collecting the radioactive material, which may be scattered over a fairly wide area. Preparedness arrangements for aircraft accidents should be flexible and tailored to suit the circumstances of the time. In the event of an aircraft accident, the visual identification of the presence of packages of radioactive material depends on the ability to see their labels or markings. In the majority of cases the air transport of radioactive material involves radio-pharmaceuticals of limited hazard.

Training For Emergency Response In Transport Accidents

A training programme should be established for organizations that may be called upon to respond to transport accidents involving radioactive material. As appropriate, training should be given to the police, fire brigades, emergency medical services, radiation protection teams, other technical experts and representatives of the appropriate authorities based upon their response roles and functions to be performed.

Specifically, training should be provided for three groups:

- The first on the scene personnel,
- Technical experts,
- The representatives of the appropriate authorities.

Provision should be made for periodic refresher training in order to maintain the proficiency of all personnel in the emergency response organization and to review accident experience and practical problems.

The consignors and carriers involved in the transport of radioactive material should provide training to their own personnel related to their emergency instructions and the potential hazards of the types of material involved. Training programmes should be geared to the roles and responsibilities that personnel fulfil in responding to an accident.

First on the scene personnel

Two levels of training should be considered for the first on the scene personnel. The first level of training for them should provide basic information to that may be the first to reach the scene of a transport accident. For these personnel, such as the police and fire brigades, the training should cover the subjects clearly applicable to such accidents. The training should include the following:

- Radiological hazards;
- The identification of the package contents through marking, labelling, placarding and transport documents;
- Protective measures.
- The use of available measuring instruments, including personal dosimeters.
- The fundamentals of, first aid, fire control & crowd control.

The second level of training should be directed at those who are expected to be in charge at the scene of a transport accident. For these officials the training should contain the first level of training and, in addition, should contain information on the following points:

- Communications;

- The organization of operations at the accident site;
- The applicable transport regulations;
- Follow-up actions (notifications, responsibilities, initiation);
- The assessment of radiation and contamination monitoring;
- The protection of people from radiation exposure and radioactive contamination;
- The provision of information to the news media.

Technical experts

For personnel with backgrounds in radiation protection or nuclear applications, who may be called upon for technical support and response in the event of a transport accident, a more extensive training programme should be implemented. Training for these persons should include, in addition to the subjects described before the following:

- Accident assessment techniques using radiological monitoring instruments,
- The implementation of protective measures.
- The use of protective clothing and equipment,
- Basic meteorology,
- The collection of contaminated material,
- Sealing techniques for leaking packages.
- Dose estimation.

Representatives of the appropriate governmental authorities

The representatives of the appropriate governmental authorities should be trained on their roles and responsibilities in responding to an accident they should have access to information on existing emergency response plans and organizations that may be involved, as well as on communication procedures and dealing with representatives of the news media.

Emergency Drills And Exercises For Response To Transport Accidents

Drills and exercises simulate actual emergencies. they are the best means of accomplishing, at a minimum, the following goals and objectives:

- Revealing weaknesses in plans and procedures,
- Identifying deficiencies in resources (both in human resources and equipment)
- Improving co-ordination among various response personnel and agencies,
- Clarifying individual roles and areas of responsibility,
- Enhancing overall emergency response capabilities,
- Improving the speed of response,
- Monitoring the benefits over time of improvements made to a response system.

The type of drill or exercise should be such that over a given period of time all of the aspects of the response plan can be tested. Participants in drills and exercises should be rotated to ensure that all personnel experience the response plan in action. The representatives of the appropriate authorities should provide leadership in the development and conduct of drills and exercises for accidents.

Drills, which are more limited in scope than exercises, are designed to develop and maintain the skills of response personnel. A fire fighting drill could be limited to the operation of fire fighting equipment. The primary purposes of exercises are to test the adequacy of the emergency response system, to ensure that all elements are fully capable of responding to any emergency and to strengthen the confidence of the personnel involved so that they can adequately handle an accident. Exercise scenarios should be developed and used to test the response capabilities and skills of the emergency response organization. Those developing the exercise should not participate in the exercise, but may be evaluators or controllers.

Care should be taken in all communications and messages to indicate that the event is an exercise. Provision should be made for testing radiological instruments and communication and other equipment. The condition of equipment should be checked periodically, in conjunction with drills or exercises, and at other times as warranted.

Provision should be made for the critique of exercises by qualified observers the results critique should be used as a basis for improving the emergency plans, procedures and training. The recording of communications and videotaping the exercises are valuable aids for the participants, learning. Reports and critiques of actual emergencies should also be used as training aids. Provision should be made in the planning of exercises for a debriefing meeting. This should take place as soon as possible after the completion of the exercise in order to gather the comments of all those involved.

Review Of Transport Emergency Plans

A person should be appointed to be responsible for reviewing, maintaining and updating each plan. The person should ensure that the plan is modified as appropriate to take account of the results of drills, exercises and actual emergencies. In addition the person should update the information on names and telephone numbers at least once every six months. Names and communication numbers should be included as annex or appendix to the plan in order to simplify their frequent updating. After each drill, exercise and emergency the services and personnel involved should take part in a debriefing session. Their reports and experience should be evaluated. The conclusions and lessons learned should be considered for improving the plans. Provision should be made at a minimum, for an annual comprehensive review and update of emergency plans.

Public Information And Communication

Since there is considerable public sensitivity about the transport of radioactive material, for any accident that occurs involving radioactive material concerted efforts should be made to keep the news media and the public well informed at all times about the situation, actions taken and protective actions recommended⁽⁷⁾.

Transport accidents may result in inconvenience and potential risk to the public. In fact, any accident involving radioactive material, no matter how minor tends to create a sense of alarm that is usually not appropriate to the actual hazards present. The public should be adequately and accurately informed about the real risks involved in the transport of radioactive material and about the existence of emergency.

In general the public will receive information through the news media. Consequently, this emphasizes the importance that should be attached to the presentation of information to the news media. To minimize the risk of conflicting statements being given to the news media, the responsibility of communicating with news media representatives should be assigned to and co-ordinated by a specific well qualified individual. It should be recognized that the news media may need to be used to provide information to the public concerning the measures being taken to control the accident and to restore the situation to normal.

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