Office for Nuclear Regulation

ONR Technical Inspection Guide (TIG)

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 – Schedule 2 – Radiation Emergencies

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Revision commentary

Issue	Description of update(s)
5	Major update: - Change in structure – Document now divided into four inspection "thematic areas". - Clarified expectations around the method of testing of emergency plans and the frequency of testing. - Removal of references to notifiable events as notification to ONR is dealt with in other ONR guidance. - Document made more consistent with the other TCA Inspection TIG and also LC 11 TIG which is also to do with emergency arrangements and testing of plans.

Contents

1. Introduction

1. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG) [1] introduces requirements for the carriage of dangerous goods by road and rail in Great Britain, including class 7 (radioactive material) dangerous goods.

2. An amendment to CDG came into effect on 21 April 2019 (known as the Carriage of Dangerous Goods (Amendment) Regulations 2019). The amendment replaced the previous emergency planning requirements with more detailed and explicit requirements. The legal duties relating to transport emergency planning are set out in Regulation 24 and Schedule 2 of the amended CDG. Consignors and carriers are identified as dutyholders for emergency preparedness requirements.

3. ONR is the competent authority for the civil carriage of class 7 (radioactive material) dangerous goods by road, rail and inland waterway within Great Britain. ONR enforces dutyholder compliance with CDG and judges the adequacy of dutyholder's arrangements for radiation emergency preparedness, testing of emergency plans and other requirements.

1.1. Purpose

4. ONR produces a suite of guidance to assist inspectors in making consistent regulatory judgements and decisions in relation to the adequacy of compliance. This Technical Inspection Guide (TIG) has been prepared as a guide to ONR inspectors in judging the adequacy of compliance with CDG radiation emergency preparedness requirements. It references other ONR guidance relevant to emergency preparedness and response and gives aspects to consider when undertaking compliance inspections of dutyholders.

1.2. Scope and applicability

5. The scope of the guidance in this TIG relates to the transport radiation emergency preparedness requirements within CDG, specifically Regulation 24 and Schedule 2. Regulation 5 of CDG requires that carriage of dangerous goods be in accordance with the Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) and the Regulations concerning the International Carriage of Dangerous Goods by Rail (RID). Although transport emergency preparedness requirements come primarily from CDG, where similar or relevant requirements exist in ADR/RID, reference is made to these requirements for completeness.

6. The guidance in this TIG is applicable to the civil carriage of class 7 dangerous goods by road, rail or inland waterway and is not applicable to class 7 dangerous goods transport by sea or air or carriage by vehicles or wagons belonging to or under the responsibility of one of the armed forces.

7. Certain provisions of the Ionising Radiations Regulations 2017 (IRR17) [2] are linked to the emergency preparedness requirements of CDG. Inspection of dutyholder compliance with the provisions of IRR17 is out of scope of this TIG. However, reference is made in this document to ONR guidance on the provisions of IRR17 where relevant for context and completeness.

8. The Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR19) [3] does not specifically apply to the transport of radioactive materials. However, operators of transit sheds, depots, warehouses or other premises where radioactive materials may or may not be unloaded and stored whilst being transported ("transit premises") will be subject to REPPIR19 if they handle or store non-exempt quantities of radionuclides or masses of fissile material greater than those indicated in Schedules 1 and 2 in REPPIR19, even on a temporary basis. ONR and the Health and Safety Executive (HSE) have established an Agency Agreement [4] such that the responsibility for regulating and enforcing REPPIR in relation to transit premises used during the civil transport of radioactive material is delegated to ONR. Such requirements are outside the scope of this TIG and inspectors should consult the REPPIR19 Approved Code of Practice and Guidance should such a premises fall within the scope of REPPIR19.

9. The guidance in this TIG is applicable to inspectors within the ONR Transport Competent Authority (TCA) undertaking inspections of dutyholder compliance with the radiation emergency preparedness requirements of CDG. This includes inspections of dutyholder radiation emergency plans and testing programmes as well as inspection of tests of plans and post-test requirements such as the report of the outcome of tests. This guidance will also be applicable to other ONR inspectors supporting TCA inspectors in assessing the tests of plans and other regulatory activities.

10. Where transport occurs over a large distance or internationally the ability / capacity of the consignor to respond to a radiation emergency may not be suitable or sufficient to meet the criteria of Schedule 2. In such cases, where the consignee is involved in arranging for the transport to occur, in accordance with CDG Reg 5, the consignee may have a duty to ensure that alternative emergency plans are put in place. This may include taking on the Schedule 2 duties of the role of the consignor; where this occurs it should be clear in any contract and documentation the identity and responsibilities of all parties (ADR 1.2.1 definition of "consignor").

2. Guidance on inspection of arrangements and their implementation

11. For the purposes of inspection of compliance with radiation emergency preparedness requirements, it can be useful to undertake inspections in the context of four broad thematic areas: preparedness and planning, review and testing programmes, testing of emergency plans and post-test requirements.

12. Inspections of dutyholder compliance with CDG emergency preparedness requirements should be proportionate, risk informed and targeted to those transport activities which give rise to the greatest hazard. Such activities are likely those involving the highest hazard radioactive material, where radiation emergencies have been identified which could give rise to significant doses and where transport is undertaken most frequently. In deciding whether to undertake an inspection, and on what aspects to inspect, inspectors should have cognisance of factors including, but not limited to, dutyholder compliance history, wider regulatory intelligence, the time since the last inspection of the dutyholder, new relevant good practice and ONR priorities.

13. Detailed guidance for planning and scoping inspections is given in ONR guidance document, ‘General inspection guide’ (ONR-INSP-GD-064) [5]. An inspector may choose to undertake a thorough inspection of just one of the thematic areas or choose to undertake an inspection with a broader scope encompassing several areas. Emergency planning can also form part of a routine compliance inspection of transport dutyholders for which guidance is available in the TIG, ‘Compliance inspection of transport arrangements’ (NS-INSP-GD-069) [6]. Introductory guidance on inspection against each of the four thematic areas is given in the following sections.

2.1. Preparedness and planning

14. An inspection of a dutyholder’s preparation and planning for radiation emergencies will relate primarily to judging the adequacy of the emergency plan produced in accordance with Paragraphs 3 and 4 of Schedule 2 of CDG [1]. This includes the ancillary arrangements put in place to enable the plan to be implemented.

15. CDG (Schedule 2, Part 1, 3(1)) makes an explicit link between IRR17 radiation risk assessments (RRA) and CDG emergency planning requirements. The basis for the emergency plan should be the RRA, produced in accordance with Regulation 8 of IRR17 [2] and Schedule 2 Paragraph 2 of CDG [1]. The RRA should identify reasonably foreseeable emergency scenarios, their likelihood and potential severity. A CDG emergency plan is required where the RRA identifies a reasonably foreseeable scenario which could give rise to an effective dose above 1 mSv to any individual over a period of one year following the emergency. Where there is the potential for such a scenario, the RRA should make a clear statement that a radiation emergency could occur and list all of the radiation emergency scenarios.

16. 'Radiation Risk Assessment Guidance in Relation to the Civil Transport of Radioactive Material by Road, Rail and Inland Waterway' (TD-TCA-GD-003) [7] provides guidance to dutyholders on the production of RRAs in relation to the transport of radioactive material. In particular, it provides guidance on possible emergency scenarios to consider, how to calculate doses to individuals who may receive a dose as a result of the radiation emergency and evaluating whether an emergency plan is required. The Radioactive Material Transport Users Committee (RAMTUC) has also produced a guidance note on assessment of accident doses as part of transport RRAs [8].

17. 'Five Steps to Transport Emergency Planning' [9] has been developed to provide further guidance to dutyholders on the evaluation of whether an emergency plan is required and, if so, the required contents of the plan.

18. Inspectors should note that Regulation 13 of IRR17 requires that where the RRA produced pursuant to IRR17 Regulation 8 shows that a "radiation accident" is reasonably foreseeable, the dutyholder under IRR17 must prepare contingency plans to respond to the radiation accident. Hence, where CDG emergency plans are required, IRR17 contingency plans are also required. Dutyholders may integrate CDG emergency plans and IRR17 contingency plans to reduce duplication.

19. An inspection of this thematic area will consider the adequacy of the emergency plan including, for example, arrangements for training of employees, arrangements for notifying ONR and the local authority, instructions on actions to take in the event of a radiation emergency, the availability of emergency equipment. Detailed guidance on aspects an inspector may sample and ONR's expectations is given in Appendix A.

2.2. Review and testing programmes

20. An inspection of a dutyholder's review and testing programme will relate to judging compliance with Schedule 2, Paragraph 5 of CDG, which sets out requirements for the review and testing of emergency plans. Where a dutyholder has determined that a radiation emergency can occur, and has hence developed an emergency plan, Schedule 2, Paragraph 5 of CDG requires that the plan be reviewed and tested at suitable intervals not exceeding three years. ONR's expectation is that, in most cases, a suitable interval for emergency plans to be reviewed and tested is annually.

21. When reviewing emergency plans, dutyholders should take into account factors including, but not limited to, changes occurring in the carriage of packages to which the plan relates, changes to legislation or industry guidance, operational experience and any changes to the RRA on which the plan is based. The review/revision should take place prior to the test of the plan so that the test of the plan can target any changes made to the plan to ensure that the revised plan can be implemented and is effective.

22. A testing programme is the dutyholder's strategy for how it will test the emergency plan, including which emergency scenario to test the plan against, the method of testing and which aspects of the plan will be targeted in the test. When developing testing programmes, dutyholders should consider any revision to the emergency plan made as a result of the review of the plan and any operational experience in deciding which aspects to target and the method of testing. Testing programmes should also be developed having cognisance of the length of time since the last test and the extent of testing undertaken on the last occasion.

23. There are a range of methods available to dutyholders on how plans are tested. Testing methods can range from a desktop exercise (such as a discussion of the actions required for different radiation emergencies) to modular tests (where one aspect of the emergency plan is tested, for example, notification arrangements) and full tests at a suitable site using vehicles and realistic props and involving all persons with a role in the emergency plan. Regardless of the method(s) employed to test the emergency plan, the test must be sufficient to test the dutyholder's ability to implement the plan. All aspects of the emergency plan need to be tested within the suitable interval.

24. Dutyholders who are required to develop and test emergency plans under other legislation, such as Nuclear Site Licence Condition (LC) 11, REPPIR or the Control of Major Accident Hazard Regulations 2015 (COMAH), may be able to demonstrate that aspects of their CDG Schedule 2 plan have been tested through tests of plans made under other legislation. This could include, for example, command and control arrangements and other aspects where there is commonality between the plans. In these cases, site inspectors and TCA inspectors should liaise on the development of the inspection scope and target inspection activities to transport specific aspects.

25. An inspection of this thematic area will consider the adequacy of the dutyholder's review and testing programme. This will include, for example, the method of testing, consideration of operational experience and how the testing programme will test whether the plan can be implemented and is adequate to respond to the range of identified radiation emergencies. Detailed guidance on aspects an inspector may sample and ONR's expectations is given in Appendix B.

2.3. Testing of emergency plans

26. An inspection of a dutyholder's test of an emergency plan will involve the observation of a test and judging the dutyholder's ability to implement the plan. The purpose of testing emergency plans is to ensure that a dutyholder is capable of implementing the plan and that the plan is sufficient to bring about a practical response to the radiation emergency. The dutyholder should take reasonable steps for all those with a role in the emergency plan to participate to ensure that the test is effective.

27. The scale of tests can vary depending on the dutyholder's testing method and be proportionate to the hazard presented by the radiation emergency scenario. For the most hazardous and/or complex radiation emergencies, the test could involve local level command and control response arrangements including the multi-agency Strategic Coordination Group and Tactical Coordination Group. For less hazardous or complex radiation emergencies, only the carrier and consignor may be involved in the test. Hence, inspectors should consider the size of the inspection team required to judge the adequacy of the test across the whole response.

28. Prior to undertaking the inspection, inspectors should be familiar with the test scenario, understanding what is expected to happen, when it is expected to happen, what radiological hazards will be assumed during the test and so on. Inspectors may request the emergency plan and relevant RRA for the test scenario be provided prior to the inspection. This will enable inspectors to check how the plan stipulates the dutyholder should deal with the radiation emergency so this can be compared with the actions taken during the test.

29. The test of the plan should test the dutyholder's ability to implement arrangements in the plan for including, but not limited to, notification of the

local authority and other organisations, command and control of the emergency, actions taken to control the emergency and actions to limit risk and dose to persons affected by the emergency. The retrieval of dispersed material, packages and the vehicle involved should also be considered.

30. 'LC 11 – On-site emergency arrangements' (NS-INSP-GD-011) [10] provides detailed guidance on the inspection of tests of emergency plans. The guidance includes good practice on effective command and control, communication, liaison with emergency services, the deployment of emergency workers to take actions to control the radiation emergency and the use of effective personal protective equipment (PPE), amongst other aspects. This guidance is most likely to be of use for inspections of tests of emergency plans for the most hazardous radiation emergencies or where the planned response to the emergency is large and complex, involving coordination between several dutyholder locations/teams or a multi-agency response. This could include tests at nuclear licensed sites where the transport emergency plan is integrated with the LC 11 on-site plan.

31. For inspections of tests of dutyholders who are required to develop and test emergency plans under other legislation, such as LC 11, REPPIR or COMAH, inspectors may choose to target aspects which are unique to the CDG Schedule 2 emergency plan. This could include certifying a package involved in a radiation emergency as compliant with the regulations, for example.

32. Inspectors should be mindful of an intense training and / or rehearsal period prior to an ONR observed test of an emergency plan as this can give a false indication of a dutyholder's ability to adequately respond to a radiation emergency arising at any time. The test of the emergency plan should not form the primary means by which dutyholder's train their employees who have a role in the emergency plan. Employees should be trained prior to the test, and the test should be the means by which it is confirmed that the employees are competent and the plan can be implemented.

33. An inspection of this thematic area will, in essence, judge whether the dutyholder can adequately implement the emergency plan. The key consideration is whether, in the inspector's opinion, the dutyholder would have adequately responded to a real emergency. Detailed guidance on aspects an inspector may sample when inspecting a test and ONR's expectations is given in Appendix C.

2.4. Post-test equirements

34. An inspection of a dutyholder's compliance with post-test requirements will focus primarily on the report on the outcome of a test made in accordance with Schedule 2 Paragraph 5(5) of CDG.

35. A report on the outcome of a test must be prepared within 28 days of the test and sent to ONR within 28 days of its preparation (total of 56 days). It should identify whether the test met the dutyholder's objectives, as well as aspects

of the test the dutyholder considers went well and areas for improvement. The report may consider, for example, what further testing is required in order to test all aspects of the emergency plan, whether the testing method employed was effective or identify training requirements for employees. The report should identify potential changes required to the emergency plan, training of personnel or resources required to enact the plan. There should be a schedule of actions proposed to address all identified areas for improvement ahead of the next planned review / test cycle.
This review / revision of the plan based on the findings of the report on the outcome of the test is in addition to the review / revision required by Paragraph 5(1), as discussed earlier.

36. Detailed guidance on aspects an inspector may sample when inspecting post-test requirements and ONR's expectations is given in Appendix D.

Appendix A – Preparedness and planning

Detailed guidance on aspects an inspector may sample and ONR's expectations in relation to a dutyholder's preparedness and planning for radiation emergencies is given in Table 1.

Table 1 – Guidance on preparedness and planning aspects to sample.

Aspect to sample	Expectations
Has the dutyholder identified the full range of radiation emergencies?	A CDG emergency plan is required when the RRA identifies a reasonably foreseeable scenario which could give rise to an effective dose above 1 mSv to any individual over a period of one year following the emergency. Where there is the potential for such a scenario, the RRA should make a clear statement that a radiation emergency could occur and list all of the radiation emergency scenarios. Dutyholders should identify all reasonably foreseeable scenarios and have in place adequate plans to respond to the full range of radiation emergencies. Some initiators which, depending on the specific transport being undertaken, should be considered by dutyholders include; • Road traffic collisions • Vehicle fire where packages may be damaged • A loss of radiation shielding of a package • Release or all or part of the radioactive contents of a package • An uncontrolled criticality event • Theft of a package, including impacts on the public due to packages being opened • Immersion or flooding of the vehicle and or package • Events outside package test criteria for accident conditions of transport This list is not exhaustive. When considering the impact such initiators may have on the material being transported and on potential resultant doses, inspectors should check that dutyholders have considered the following;

Aspect to sample	Expectations
	• The steps the dutyholder has taken to prevent a radiation emergency occurring and to limit its consequences in accordance with Regulation 8(3) of IRR17. • The radioisotopes being transported, including the physical form of the material and activity being transported (in Becquerel), how easily dispersible the material is etc. • The number, frequency and type of packages being transported (excepted packages, industrial packages, Type A packages etc.), whether the material is unpacked, etc. • The security requirements of the consignment, as per ADR / RID 1.10. • Whether High Consequence Dangerous Goods are present (as defined in ADR / RID 1.10.3.1) and, if so, whether an associated plan exists (ADR / RID 1.10.3.2) • The mode(s) of transport and associated intermodal transfers. Initiators of radiation emergencies during transport by rail may be less obvious than for road transport, meaning the fault could progress further without being detected. • Whether stops (breaks, overnight etc.) and/or storage in transit are undertaken. Different stages of transport may give rise to different hazards which could initiate a radiation emergency. For example, storage locations may give rise to hazards from operations, such as the movement of loads at ports. • Whether adverse weather conditions are likely, including exceptional temperatures, wind and rain. • The population densities along the route of the transport. • Potential impact of human error in the form of incorrectly loaded packages. • The potential for package fault arising from packages being inadequately maintained. It is sufficient for dutyholders to plan for the worst case radiation emergencies if they adequately bound other radiation emergency scenarios. If such an approach is taken inspectors should check that the emergency plan is adequate to respond to the full range of radiation emergency scenarios.

Aspect to sample	Expectations
	With specific regard to security initiators, dutyholders may have arrangements in place (such as packages never being left unattended) which mean that theft of a package is not reasonably foreseeable. If theft cannot be discounted in this way then dutyholders must estimate doses which could reasonably be accrued, e.g. through the package being manually handled. Dutyholders are not required to estimate doses associated with the package being intentionally opened and the contents ingested or inhaled.
Does the emergency plan demonstrate adequate cooperations between dutyholders?	CDG Schedule 2, Paragraph 3(8) requires that dutyholders cooperate with each other in preparation of their emergency plans to enable compliance with the regulations. This includes cooperation with operators of in-transit storage facilities (e.g. berths, rail or road depots and airport cargo sheds). Inspectors may check that consignors and carriers share the contents of their emergency plans with each other, the emergency plans are consistent or a joint plan is in place which has been approved by both dutyholders. The emergency plans should be clear on which dutyholder is responsible for aspects including; • Command and control of the emergency response • Notification and provision of information to emergency services, local authority and other external stakeholders • Provision of personnel and equipment to assist in the emergency response Although consignees are not dutyholders under the regulations, it should be clear that they have been included in the production of the emergency plan(s) where appropriate, for example, where the consignee has agreed to support the response to the radiation emergency where the incident occurs close to the consignee.
Does the dutyholder's emergency plan include adequate notification arrangements?	Several provisions of CDG require dutyholders to notify organisations of radiation emergencies upon initiation of the emergency plan. Such provisions include CDG Schedule 2, Paragraphs 3(5) and 6. Inspectors should check that the dutyholder's emergency plan provides adequate arrangements for notifying relevant agencies. The driver or escort commander of a vehicle or train carrying class

Aspect to sample	Expectations
	7 dangerous goods in the event of a radiation emergency or an event which could lead to a radiation emergency, must, as soon as reasonably practicable, notify; • The emergency services • The relevant local authority • The consignor • The carrier The consignor or carrier must also notify ONR of the event and other organisations may be notified depending on the nature of the event, for example the police and relevant environment agency for emergencies involving the theft of packages. The arrangements should state clearly who within the dutyholder's organisations is responsible for notifying each organisation. The dutyholder's arrangements may include a notification cascade which illustrates how all organisations are notified and by whom. Inspectors should check that specific contact details are given in the arrangements for the organisations to be notified, for example the phone numbers given on the Contact ONR web page: Notify ONR | Office for Nuclear Regulation. Where transport takes place across few local authorities, the arrangements should give specific contact details for the local authorities the transport will pass through. Where the transport takes place through many local authority areas, it is sufficient to have generic arrangements to identify which local authority area the radiation emergency has taken place and how their contact details would be obtained. The dutyholder's arrangements should include credible contingency arrangements to be deployed should a method of communication fail. This could include the dutyholder having several emergency phones available, for example. Inspectors should note that notification should be made as soon as is reasonably practicable but not immediately if the driver can take action to halt the radiation emergency or mitigate its consequences. Extinguishing fires and providing assistance to seriously injured persons should take priority over notification requirements. The arrangements should also state what information should be provided during the initial notification to relevant bodies. The purpose of the information given should be to enable the

Aspect to sample	Expectations
	relevant bodies and emergency services to effectively respond to the event. The information should, as a minimum, include: • The location of the radiation emergency. • The nature of the radiation emergency, such as fire or road traffic accident. • The hazards arising as a result of the radiation emergency, such as direct shine radiation doses, surface or airborne contamination. • Actions already taken to mitigate the impact of the radiation emergency, such as cordoning off areas and extinguishing fires. • The nature of the radioactive material concerned, for example special form, solid, liquid or gas, the amount of material (i.e. approximate volume, weight and activity in units of Becquerel) and whether the material is easily dispersible etc. • The number of persons involved and the severity of any injuries
Does the dutyholder's emergency plan include adequate arrangements for limiting the impact of the radiation emergency and limiting risks to persons likely to be affected?	Several provisions of CDG require the emergency plan to give a description of the action to be taken to control radiation emergencies, or occurrence which could lead to radiation emergencies, and actions which should be taken to limit the consequences of radiation emergencies. Such provisions include CDG Schedule 2 Paragraph 3(5) and Paragraph 4. The National Arrangements for Incidents Involving Radioactivity (NAIR) scheme cannot be claimed as being wholly or partially part of a dutyholders emergency plan. NAIR is a set of national arrangements enacted by the police that provide a "long-stop" to other emergency plans. Hence, citing NAIR is inappropriate as an emergency plan should exist and dutyholders nevertheless have no control on it being enacted. Members of the RADSAFE scheme can reference RADSAFE as part of an emergency plan, but this alone does not constitute an emergency plan under CDG. RADSAFE members can rely on the scheme being enacted but this does not cover all CDG requirements, such as certifying packages as compliant for onward transport or notification requirements. It is for dutyholders to determine what actions should be taken to control or limit the consequences of radiation emergencies, depending on the particular characteristics of the

Aspect to sample	Expectations
	scenarios identified in the RRA and the material and packages being transported. Inspectors may nevertheless check whether dutyholders have considered actions including: • Use of fire extinguishers where it is safe and appropriate to do so • Requesting that the consignor or carrier deploy resources to help manage the radiation emergency • Arrangements for limiting the spread of leaks and spills • Securing the vehicle if the vehicle has been broken into or one of several packages have been stolen • Obtaining specialist advice and support from appointed Dangerous Goods Safety Adviser (DGSA) or Radiation Protection Adviser (RPA). Security events may give rise to a radiation emergency, such as where the direct dose rate from the package could give rise to a dose of 1 mSv. In this case the radiation emergency plan should dovetail with the security plan produced in accordance with ADR/RID section 1.10. Similarly, it is for the dutyholder to determine the actions which should be taken to limit risks to persons likely to be affected by the radiation emergency, based on the particular hazards posed. Inspectors may check whether dutyholders have considered the following actions in the plan: • Cordoning off areas using simple methods such as barrier tape, markings or cones. • Alerting members of the public in the area of the hazard • Endeavouring to keep members of the public upwind of the event • Obtaining specialist advice and support from appointed Dangerous Goods Safety Adviser (DGSA) or Radiation Protection Adviser (RPA)
Are employees involved in, or likely to be impacted by, arrangements in the emergency plan provided with suitable and sufficient	Several provisions of CDG including Schedule 2, Paragraph 3(7) and Paragraph 7 require that dutyholders ensure that employees involved with or who may be affected by an emergency plan be provided with suitable and sufficient information, instruction and training. The aim should be to allow employees to effectively enact their roles in the emergency plan whilst restricting their exposure so far as is reasonably practicable.

Aspect to sample	Expectations
information, instruction and training?	Inspectors may check that dutyholders have undertaken a suitable training needs analysis to understand what training employees require and develop, or identify external, training programmes to achieve this. Training programmes should be regularly reviewed and kept up to date and reflective of the extant emergency arrangements. Reviews of training material should take into account changes to emergency procedures, any operational experience and learning from tests of the emergency plan. Employees should be trained against specific emergency procedures where employees are required to undertake complex actions to mitigate the radiation emergency. Employees should also be trained in the use of any emergency equipment the emergency plan requires them to use. Dutyholders should have a system for managing training programmes and be able to identify who has received what training, when and what refresher training is required. Further guidance on inspecting a dutyholder's training arrangements and whether the dutyholder has suitable trained personnel to fulfil roles in the emergency plan is available in 'LC 10 – Training' (NS-INSP-GD-010) [11].
Does the emergency plan give a description of the required emergency equipment and is the equipment appropriately managed?	Several provisions of CDG set out requirements for emergency equipment, including Schedule 2 Paragraph 3(5) and 3(7). Emergency equipment should include both equipment used to control or limit the consequences of a radiation emergency and equipment to limit employee's and other person's exposure to ionising radiation. It is for dutyholders to determine what emergency equipment is required based on the particular characteristics of the identified radiation emergency scenarios and the nature of the package and material being transported. Inspectors may check whether the dutyholder has considered the provision of the following emergency equipment where appropriate; • Fire extinguishers • Means of cordoning off access to areas such as barrier tape or cones • Equipment to contain leaks of radioactive material • Radiological monitoring instruments • Personal protective equipment

Aspect to sample	Expectations
	• Emergency dosimetry, such as alarming electronic personal dosimeters The emergency plan should describe the emergency equipment which will be available to the driver in the vehicle and also the emergency equipment which is available to be deployed from dutyholder locations to assist in the emergency response. Inspectors may check that the emergency equipment claimed in the emergency plan is available and in good working order. Dutyholders should be able to demonstrate how the equipment is maintained and or calibrated. Dutyholders should also be able to demonstrate that employees who may be required to use the equipment as part of emergency response have received suitable training in its use.
Does the emergency plan contain adequate arrangements for management of emergency exposures?	CDG Schedule 2 Paragraph 7 gives provisions for emergency exposures. Emergency exposure means an exposure to ionising radiation of an employee engaged in the response to a radiation emergency whereby one of the individual dose limits referred to in Regulation 12 of IRR17 could be exceeded. Employees could receive emergency exposures during high hazard radiation emergency scenarios when enacting the emergency plan, for example to bring help to endangered persons or to significantly limit the consequences of a radiation emergency. Inspectors should note that the requirements for the control of emergency exposures are prescriptive. In order to comply with the provisions for emergency exposures as detailed in Paragraph 7, the dutyholder's emergency arrangements should address the following: • Identification of employees and roles within the emergency plan who could be subject to emergency exposures • The provision of appropriate training in radiation protection for employees to understand the health risks associated with exposure to ionising radiation, the precautions to take and training for any appropriate equipment or PPE to restrict their exposure • Arrangements for medical surveillance by appointed doctors or employment medical adviser to be carried out in the event of a radiation emergency where the dutyholder's employees have received an emergency exposure • Arrangements with an approved dosimetry service for dose assessment to be carried out in the event of a radiation emergency for employees who have received an emergency

Aspect to sample	Expectations
	exposure. The arrangements should also provide for the dose assessment to be notified to the employer, ONR and the appointed doctor or medical adviser • Identification of those employees who are authorised to permit any employee to be subject to an emergency exposure • Identification of dose levels which have been determined appropriate to be applied for the purposes of implanting the emergency plan and arrangements for ensuring that no employee is exposed to a dose greater than this. This does not apply to employees, who, after being informed of the risks involved in the intervention, agree to undergo an exposure greater than the dose level in order to save human life • Arrangements to ensure that that no employee under 18 years of age or female employee who is pregnant or breastfeeding is subject to an emergency exposure • Arrangements to ensure that no employee is subject to an emergency exposure unless the employee has agreed to undergo such an exposure • Arrangements to ensure that the report on the consequences of a radiation emergency and the effectiveness of the emergency plan put into effect (as required by Paragraph 6(6)), is kept and recorded for the specified time Paragraph 8 gives provisions for the disapplication of dose limits in Regulation 12 of IRR17 to enable emergency exposures. Notwithstanding this emergency workers cannot be exposed to an effective dose exceeding 500 mSv when engaged in the emergency response. Inspectors may check that dutyholders have arrangements for who can authorise the disapplication of dose limits, how the decision maker will be advised and that these individuals are appropriately trained. The arrangements should be clear that disapplication applies only where normal dose limits cannot be maintained during the emergency response, despite appropriate management of the emergency. Every effort should be made to re-apply IRR17 dose limits as early as possible. Disapplication of dose limits cannot be justified once the reasons for disapplication ceases to exist, for example where the radiation emergency has been prevented or mitigated, help has been provided to endangered persons or exposure has been prevented to a large number of persons. Paragraph 9 gives provisions for reference levels. The regulations allow emergency workers to undergo emergency exposures above the IRR17 dose limits when engaged in emergency

Aspect to sample	Expectations
	response but dutyholders must ensure that the emergency plan prioritises keeping doses below 100 mSv or an emergency specific reference level if applicable. Inspectors may check that dutyholders have established reference levels specific to their radiation emergency scenarios to guide dose management in emergency response and to contribute to the overarching requirement to reduce doses so far as is reasonably practicable.
Does the dutyholder's emergency arrangements include arrangements for certifying packages involved in a radiation emergency as compliant for onward transport	Paragraph 10 gives provisions for packages involved in a radiation emergency. A package that has been involved in an emergency must not be carried or caused to be carried unless the consignor, or consignor's agent, has undertaken an examination and issued a certificate to verify that the package complies with the requirements of CDG. Inspectors may check that the dutyholder's arrangement consider the following aspects prior to certifying a package as compliant: • Package damage that might result in contamination in excess of allowable levels for that type of package and contents • Shielding damage that could affect dose rate external to the package • Ingress of water that could have dispersed the contents, changed dose rates or affected the criticality safety index • Movement or redistribution of the contents that could have changed the dose rates • Damage to labelling making it non-compliance for onward carriage. There is no prescribed format nor specified contents for the certificate and the certificate may be in electronic or hard copy format. Inspectors may check that the consignor's arrangements ensure that the certificate is available during onward transport and that it makes a clear statement that the consignor confirms that the package is compliant with the relevant requirements of CDG and that it is suitable for onward carriage.
Does the dutyholder's emergency plan contain adequate command and control arrangements?	The dutyholder's emergency plan should contain arrangements for the command and control of the emergency response. This should include the name or position of the person authorised to set emergency arrangements into motion and the person in charge of coordinating the mitigatory

Aspect to sample	Expectations
	action. These individuals may be the same as those authorised to permit employees to be subject to emergency exposures and to authorise the disapplication of dose limits. For higher hazard radiation emergencies, coordination between several groups may be necessary. Inspectors may check that the dutyholder's arrangements details the following, where appropriate: • Arrangements for setting up access points to the scene of the radiation emergency. • Arrangements for the deployment of teams from the access point to undertake mitigatory action, including the roles which constitute the team (for example radiation monitoring personnel and those trained in the appropriate mitigatory action). • Arrangements for liaison with the emergency services, including identification of individuals for this role. • For significant radiation emergencies, arrangements for the deployment of personnel to local level multi-agency response at the Strategic Coordination Centre and/or Tactical Coordination Centre.
Does the dutyholder's emergency plan contain adequate arrangements for assisting the local authority and other responders with mitigatory actions?	Several provisions of CDG, including Schedule 2 Paragraphs 3(5), 3(6) and 12, require dutyholders to assist the local authority and other responders with mitigatory action. In addition to the initial notification to the local authority and emergency services, the dutyholder should have arrangements for the provision of more detailed information as it becomes available. The information should be sufficient to enable responders to perform functions which are allocated to them in the emergency plan. Such information may include: • Measured direct shine dose rates or levels of contamination • The characteristics of the package and the radioactive material • Mitigatory action already undertaken by the dutyholder Dutyholders are also required to make arrangements to assist in the transition from a radiation emergency to a situation where no further intervention is required. CDG does not require the emergency plan to cover the 'recovery phase' following the event as this is subject to other legislation. Recovery means bringing the situation back to normal following the radiation

Aspect to sample	Expectations
	emergency, for example wider decontamination and reopening of roads after the vehicle and package have been retrieved. ONR considers package retrieval, and where appropriate decontamination/recovery of radioactive material, to be part of the emergency until a stable state is achieved, i.e. the radioactive material is contained in a safe location or able to be transported in accordance with CDG09. Paragraph 12 requires that the consignor must prepare a handover report following a radiation emergency to the authority responsible for recovery. The purpose of the handover report is to highlight to the recovery authority any risk of environmental contamination in the area where the emergency occurred. Inspectors may check that the dutyholder's arrangements detail the production of such a report and that the report will provide the following information: • Details of the incident giving rise to the emergency • A statement of whether the emergency plan was initiated and if so, the actions taken • A statement on whether any part of the load was contaminated, and if so, the steps taken for the safe disposal of the relevant part of the load and any steps taken for the decontamination of the vehicle or train • A statement on the anticipated effects of the radiation emergency on the environment • Any other relevant information which may assist in the transition from an emergency state

Appendix B – Review and testing programmes

Detailed guidance on aspects an inspector may sample and ONR's expectations in relation to a dutyholder's testing programmes for tests of the emergency plan is given in Table 2.

Table 2 – Guidance on testing programmes aspects to sample.

Aspect to sample	Expectations
Has the dutyholder undertaken an adequate review, and where necessary, revision of the emergency plan?	Paragraphs 5(1) and 5(2) require dutyholders to review, and where necessary, revise the emergency plan at suitable intervals not exceeding three years if the carriage is taking place on more than one occasion. The purpose of reviewing emergency plans it to ensure that the plan is representative of the carriage being undertaken, up to date and effective. The aspects which must be considered when reviewing the emergency plan are prescriptive and inspectors should check how dutyholders have taken account of the following aspects in the review: • Changes occurring in the carriage of packages to which the plan relates, such as changes in the characteristics of the material and the package type being transported • Changes to the emergency services with a role in the emergency plan • Changes to key personnel identified as having roles in the emergency plan • New knowledge or guidance, whether technical or otherwise, concerning the response to radiation emergencies. This would also include any changes to legislation • Any material change to the IRR17 Regulation 8 RRA from which the radiation emergency scenarios are derived • Any relevant information derived from a report or review of the consequences of any radiation emergency • Operational experience gained from normal carriage or incidents which did not lead to radiation emergencies • Wider operational experience shared through industry bodies • Any recommendations made by the dutyholder's RPA or DGSA

Aspect to sample	Expectations
	• Lessons learnt from tests of the emergency plan such as the ability of emergency workers to implement the plan and whether the plan was sufficient to mitigate the emergency. This also includes lessons identified in the report on the outcome of the test • Lessons learned from the United Kingdom's participating in emergency exercises at national and international level The review required under Paragraph 5(1) should take place prior to the test of the plan so that the test of the plan can target any changes made to the plan and to ensure that the revised plan can be implemented and is effective.
Does the dutyholder's testing programme test all elements of the emergency plan in an appropriate manner and within suitable intervals?	Following the review/revision of the plan, CDG Schedule 2 Paragraph 5 requires that dutyholders must, at suitable intervals not exceeding three years, test the emergency plan. The purpose of testing the plan is to ensure that the dutyholder is capable of implementing the plan and that the plan is sufficient to bring about a practical response to the radiation emergency. All elements of the emergency plan must be tested at suitable intervals not exceeding three years and the test should target any changes made by the review of the plan as required by Paragraph 5. There are various methods of testing emergency plans, including; • Desktop exercise – a discussion of the actions required for different emergency scenarios, including by whom and the use of which equipment and procedures. • Drill – this could include a test of the initiation of the emergency plan, including a rolls call of key personnel, testing telephone numbers and whether the notification cascade works as intended and all required information is received by responding agencies. This could also include a check of the functionality and availability of emergency equipment. • Partial test – this could include testing specific elements of an emergency plan, such as the arrangements in the plan for limiting the impact of a radiation emergency or the arrangements for certifying packages involved in a radiation emergency as compliant for onward transport. • Full test – this should test all elements of an emergency plan and how the plan as a whole deals with a radiation emergency, including how the different elements of the plan interact. This should include all roles specified in the emergency plan and so far as is reasonably practicable, all emergency services identified as having a role in the emergency plan. A full

Aspect to sample	Expectations
	test should also, where appropriate, test both the consignor's and carrier's emergency plans at the same time for how they integrate to respond to a given radiation emergency. The testing of individual elements of an emergency plan is often referred to as "modular testing", which may be delivered through desktop exercises, drills or partial testing. However, inspectors should be conscious that modular testing only tests elements of the dutyholder's plan in isolation and not how all elements interact to bring about the emergency response as a whole. Modular testing also does not test the command and control of the emergency response where the response is delivered through various locations and groups of emergency responders concurrently. Hence, inspectors should use their judgement in determining whether the dutyholder's testing programme is sufficient in terms of the method of testing by considering the following: • The length of time since the last test – If it has been several years since a full test has taken place it may be appropriate to undertake a full test of the plan. • The extent of testing undertaken on the last occasion – if only modular testing was undertaken in the previous three year interval it may be appropriate to undertake a full test. • Any revisions made by the review of the plan undertaken in accordance with Schedule 2 Paragraph 5(1) – if significant changes have been made to the plan a full test may be appropriate to test how the changes impact the wholistic response. Similarly, various factors can influence what constitutes a suitable interval between tests of the plan. Inspectors should use their judgment in determining whether the dutyholder's testing programme is undertaken within a suitable interval by considering the following: • The level of hazard posed by the package – it is appropriate to undertake more frequent testing of emergency plans for more hazardous radiation emergencies. • The frequency of transport – it may be appropriate to undertake more frequent testing if the transport which could give rise to the radiation emergency is undertaken regularly. • Any revisions made by the review of the plan undertaken in accordance with Schedule 2 Paragraph 5(1) – if significant changes have been made to the plan the plan should be tested shortly after to ensure that the revised plan can be implemented and is effective. • Significant changes in the personnel assigned roles in the emergency plan.

Aspect to sample	Expectations
	In addition to the above, Paragraph 5(3) is clear that in deciding how the plan is tested, dutyholders must consider lessons learned from past radiation emergencies and lessons learned from national and international level emergency exercises.
Does the dutyholder's testing programme contain sufficient challenge to the plan and emergency workers?	Scenarios for tests of emergency plans should be derived from the IRR17 Regulation 8 RRA where scenarios which could give rise to a radiation emergency are identified. However, additional elements can be added to the test to ensure the plan is adequate to deal with variable factors which may affect the severity of the emergency. Challenging the plan and emergency workers in this way can highlight areas for improvement in the plan, training requirements or the provision of additional emergency equipment, for example. Inspectors may check that the dutyholder has introduced the following variable factors into the test scenario, where appropriate: • Coincident events, e.g. multi-vehicle incidents, multiple classes of dangerous goods involved or other hazards involved. • Extreme weather conditions • Unavailability of emergency equipment • Loss of essential services, such as power or communications • Significant delays in support from consignor/carrier organisation or emergency services. This could be due to traffic, public interference or emergency services being required at other emergencies etc. In addition, tests of the emergency plan should also include unexpected elements as the scenario develops, to test how emergency workers respond and whether the emergency plan is adequate to deal with such developments.

Appendix C – Testing of emergency plans

Detailed guidance on aspects an inspector may sample when inspecting tests of emergency plans and ONR's expectations is given in Table 3.

Table 3 – Guidance on testing of emergency plans aspects to sample.

Aspect to sample	Expectations
Is the dutyholder capable of adequately implementing the emergency plan and is the plan sufficient to bring about an effective response to the radiation emergency?	The purpose of an inspection of a test of an emergency plan is to ensure that the dutyholder is capable of implementing the plan and that the plan is sufficient to bring about an effective response to the radiation emergency. The key consideration is whether, in the inspector's opinion, the dutyholder would have adequately responded to a real emergency. In judging the adequacy of a test of an emergency plan, inspectors should consider the following: • Has a radiation emergency been declared? Inspectors should consider whether the dutyholder has confirmed that the event meets its criteria for a radiation emergency and that the plan has been initiated. Inspectors should check that the plan has been initiated by an individual with authority to do so as stipulated by the emergency plan. • Have notification arrangements been adequately initiated? Inspectors should consider whether notification arrangements within the emergency plan are initiated as soon as reasonably practicable and the local authority, emergency services and other relevant agencies are given sufficient information about the radiation emergency to enable them to respond effectively. • Do the dutyholders demonstrate adequate command and control of the radiation emergency response? It should be clear who has authority to direct the emergency response and how liaison and joint working with the emergency services is achieved. The roles and responsibilities of emergency workers should be consistent with that observed during the test. It should be clear who has the authority to, for example, establish access points to the site of the radiation emergency, to deploy team of emergency workers from these points and who has the authority to permit employees to undergo emergency exposures and to authorise disapplication of dose limits. For high hazard radiation emergencies, there should

Aspect to sample	Expectations
	be clear and effective communication and coordination between different areas/teams, for example where dutyholder staff are deployed to local level multi-agency response centres. • Do the driver, consignor, and carrier implement the mitigatory actions as stipulated in the emergency plan? Inspectors should consider whether the dutyholders undertake actions identified in the plan to control or mitigate the impact of the radiation emergency. This could include use of fire extinguishers where it is safe and appropriate to do so, limiting the spread of leaks and spills or securing the vehicle if the vehicle has been broken into or one of several packages have been stolen, for example. • Do the dutyholders implement actions stipulated in the emergency plan to limit risks to persons who may be impacted by the radiation emergency? Inspectors should consider whether the dutyholders undertake actions identified in the plan to limit the risks to members of the public who may be impacted by the radiation emergency. This could include, but not limited to, cordoning off areas using barrier tape, markings or cones, alerting members of the public of the hazard, endeavouring to keep members of the public upwind of the hazard and obtaining specialist advice and support from appointed RPA or DGSA. • Do dutyholder employees appear trained and competent in fulfilling the roles assigned to them by the emergency plan? Do they understand the command and control arrangements, what their responsibilities are, who they are to take instructions from? Do they appear competent in utilising emergency equipment including firefighting equipment and equipment to cordon off areas for example? Do the employees appear competent in actions to minimise radiation exposure to themselves and members of the public? Are the employees familiar with any written procedures for notifying relevant organisations and stakeholders? • Is emergency equipment stipulated in the emergency plan available, in the location specified and in good working order? Do employees with roles to operate the emergency equipment appear competent in its use? Is the emergency equipment appropriate for the radiation emergency scenario and sufficient to mitigate the impact of the radiation emergency? • Do dutyholders initiate arrangements for emergency exposures where necessary? Is it clear who has the responsibility to permit employees to receive emergency exposures and have those employees agreed to undergo the exposure?

Aspect to sample	Expectations
	• Do the dutyholders assist the local authority and emergency services by providing information to assist in the transition to a situation where no further intervention is required? Do the dutyholders provide a handover report to the authority responsible for recovery?

Appendix D – Post-test requirements

Detailed guidance on aspects an inspector may sample when inspecting post-test requirements and ONR's expectations is given in Table 4.

Table 4 – Guidance on post-test requirements aspects to sample.

Aspect to sample	Expectations
Has the dutyholder prepared an adequate report on the outcome of a test of an emergency plan?	CDG Schedule 2 Paragraph 5(5) and 5(6) requires that after completion of a test of an emergency plan, the dutyholder must prepare a report on the outcome of the test. The report must be prepared within 28 days of the conclusion of the test and be sent to ONR within 28 days of its completion. The purpose of the report should be to aid the dutyholder in taking lessons learned from the test of the emergency plan and to provide evidence to ONR that a sufficient test of the emergency plan was carried out. Inspectors may check that the report on the outcome of the test contains, as a minimum: • An overview of the test, including the scenario and method of testing (i.e. desktop or full simulation) and who took part • An assessment of the strengths and weaknesses of the emergency plan, and in particular any areas where the plan was insufficient to deal with the emergency scenario or could not be implemented • Any areas where the carrier's and consignor's plans were not aligned • Any training requirements identified during the test • Whether any further testing is required to test all aspects of the emergency plan • Which aspects of the emergency plan should be targeted in future tests • Any other lessons learned from the test and recommendations to implement this learning • Whether test success criteria set by the dutyholder were met

Aspect to sample	Expectations
	Where the report identified any weakness in the emergency plan, training requirements or any other area for improvement, the report should be clear on how these areas for improvement will be addressed. This review/revision of the emergency plan following the test is in addition to the review/revision of the emergency plan before the test required by Paragraph 5(1) and discussed above.

References

[1] *The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, UK Government, 2009. https://www.legislation.gov.uk/uksi/2009/1348/contents.*

[2] *Health and Safety Executive. Work with ionising radiation. Ionising Radiations Regulations 2017 Approved Code of Practice and guidance. L121.*

[3] HSE. The Radiation (Emergency Preparedness and Public Information) Regulations 2019 Approved Code of Practice and guidance.

[4] *Agency Agreement Between the Health and Safety Executive and The Office for Nuclear Regulation Regarding the Delegation of Inspection Functions. https://www.onr.org.uk/media/rkaogqxy/agency-agreement-hse-20.pdf.*

[5] *ONR Technical Inspection Guide. ONR-INSP-GD-064 - General Inspection Guide.*

[6] ONR Technical Inspection Guide (TIG) Compliance Inspection of Transport Arrangements. NS-INSP-GD-069.

[7] *TD-TCA-GD-003 - Ionising Radiations Regulations 2017 (IRR17) Regulation 8 - Radiation Risk Assessment Guidance in Relation to the Civil Transport of Radioactive Material by Road, Rail and Inland Waterway. Issue 3. November 2022..*

[8] *Radioactive Material Transport Users Committee. Guidance Note. Guidance on Assessment of Acccident Doses during Carriage of Radioactive Material on Road/Rail as required under CDG09 (as amended). December 2023.*

[9] *Fice Steps to Transport Emergency Planning. May 2023. https://www.onr.org.uk/our-work/what-we-regulate/transport-of-radioactive-material/guidance-and-resources/.*

[10] *ONR Guide. NS-INSP-GD-011. Nuclear Safety Technical Inspection Guide. LC 11 - On-site Emergency Arrangements. Issue 7.1 March 2021.*

[11] *NS-INSP-GD-010. ONR Technical Inspection Guide. Licence Condiiton 10 - Training. December 2022.*

Glossary

ADR	Agreement Concerning the International Carriage of Dangerous Goods by Road
CDG	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended)
COMAH	The Control of Major Accident Hazard Regulations 2015
DGSA	Dangerous Goods Safety Adviser
HSE	Health and Safety Executive
IRR17	The Ionising Radiations Regulations 2017
NAIR	National Arrangements for Incidents Involving Radioactivity
ONR	Office for Nuclear Regulation
PPE	Personal Protective Equipment
RAMTUC	Radioactive Material Transport Users Committee
REPPIR19	The Radiation (Emergency Preparedness and Public Information) Regulations 2019
RID	Regulations Concerning the International Carriage of Dangerous Goods by Rail
RPA	Radiation Protection Adviser
RRA	Radiation Risk Assessment
TCA	Transport Competent Authority
TIG	Technical Inspection Guide